SOUTHAMPTON APPROACH CHANNEL DREDGE
ARCHAEOLOGICAL DESK-BASED ASSESSMENT

Prepared by:

Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
Wiltshire
SP4 6EB

Prepared for:

ABP Southampton Ltd.
Ocean Gate
Atlantic Way
Southampton
Hampshire
SO14 3QN

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Principal Author(s):	Kevin Stratford
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Summary

Wessex Archaeology was commissioned by the Association of British Ports Southampton Ltd to undertake an archaeological desk-based assessment in advance of the widening and deepening of the existing approach channel that runs from the Port of Southampton out to the Eastern side of the Isle of Wight by the Nab Tower

Data searches were undertaken within a Study Area that ran from the northern end of Southampton water following the current dredged channel into the Solent and along its eastern arm, where it terminates off of the east coast of the Isle of Wight close to the Nab Tower. A variety of sources have been examined, including the local Historic Environment Records, The National Monuments Record, The UK Hydrographic Office, The Ministry of Defence and data held within Wessex Archaeology's library.

Wessex Archaeology conducted a geophysical survey of selected proposed dredging areas between 31st March 2008 and 17th April 2008. Echo sounder, sidescan sonar, sub-bottom profiler (boomer) and magnetometer data were acquired and were subsequently processed and interpreted for archaeological purposes.

Wessex Archaeology also produced a geoarchaeological assessment of existing borehole/vibrocore records in order to assess the potential for submerged prehistoric archaeology.

Topographical, geological, sea-level and archaeological data have been combined to allow an assessment of archaeological potential within three broad temporal zones. These are defined as follows:

- Lower, Middle and Early Upper Palaeolithic remains, either as derived artefacts, or as possible *in situ* remains.
- *In situ* Late Upper Palaeolithic and/or Mesolithic Artefacts.
- Wrecks and related material, from prehistoric to modern times

Some or all of the proposed dredging areas would have been above sea-level at various times from the Lower Palaeolithic to the Iron Age. There is evidence for the human occupation in the region throughout this period, and there is evidence for human activity within now submerged parts of the Solent.

A total of 136 sites and findspots, ranging in date from prehistoric to modern, were recorded within the Study Area. Of these seven are known wrecks recorded by the UKHO and 72 are recorded shipping losses. The rest of the data set consists of findspots or unidentified features.

The assessment of the geotechnical and geophysical data identified two sedimentary units of potential archaeological significance: a Pleistocene gravel unit and a Holocene fine-grained sediment unit in which peat layers were identified. These units were identified within the majority of the survey areas.

All geophysical anomalies identified in the sidescan sonar and magnetometer data were assessed in terms of their archaeological potential. In all but one of the survey areas anomalies were observed in the data which were of likely anthropogenic origin. No sites of high archaeological significance were observed in the data.

The overall impact of the proposed dredging scheme on known archaeology is low however the potential for unknown buried remains is medium. The impact on the potential buried prehistoric land surfaces and associated archaeology is medium as large amounts of archaeology have been found throughout the Solent. The mitigation suggested for these impacts can be covered by the presence of an archaeological watching brief to be on the boat during the dredging process. Along with the watching brief further geotechnical surveying of any recovered sediments has also been suggested and will go some way to further the understanding of the regions prehistoric archaeological potential.

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Acknowledgements

Wessex Archaeology was commissioned by the Association of British Ports to undertake an archaeological desk-based assessment in advance of the widening and deepening of the existing approach channel that runs from the Port of Southampton out to the Eastern side of the Isle of Wight by Nab Tower. Wessex Archaeology would like to thank for Sue Simmonite, Dave Herod and William Heaps for their assistance.

The geophysical survey was conducted onboard the R/V *Wessex Explorer*. Wessex Archaeology would like to thank Hayes Marine Ltd and the crew of the vessel for all their help and support during the survey.

Data was provided by the UKHO, Southampton City Council SMR, Hampshire County Council SMR, Isle of Wight SMR and the National Monument Record (English Heritage). The Ministry of Defence was also consulted regarding Protected Places and Controlled Sites under the Protection of Military Remains Act 1986. We are grateful to the staff of the above organisations for their co-operation during the project.

Kevin Stratford carried out the assessment and compiled this report. Louise Tizzard and Stephanie Arnott processed and reviewed the geophysical data and contributed to the report. Jack Russell compiled the geotechnical assessment. Kitty Brandon prepared the illustrations. John Gribble managed the project for Wessex Archaeology.

Data Licences

The material derived from the UKHO is subject to licence 820/020220/11 and the conditions on End-Users and Third Parties contained therein. The following charts and wreck requests have been added to Schedule 1 Annex A:

- Digital use of Chart 5600.1 (2007 Edition)

A copy of the report will be sent to UKHO.

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1. INTRODUCTION

1.1.1. Wessex Archaeology was commissioned by the Association of British Ports Southampton Ltd to undertake an archaeological desk-based assessment in advance of the widening and deepening of the existing approach channel that runs from the Port of Southampton out to the Eastern side of the Isle of Wight by Nab Tower (**Figure 1**).

1.2. SCHEME PLANS

1.2.1. The proposed scheme is to deepen and widen sections of the approach channel to provide improved access for deep-draughted vessels and to improve the ability for these vessels to pass each other within Southampton Water.

1.2.2. The scheme will require four different areas of significant dredging, namely

- the Nab Channel;
- the Thorn Channel;
- Southampton Water; and
- Berths 201 and 202 at the Quay.

1.2.3. The Nab Channel section of the scheme will involve the deepening of the current channel from -13.3m to -14.8m CD.

1.2.4. The Thorn Channel section of the scheme will involve the deepening of the current channel from -12.6m to -13.8m CD.

1.2.5. The Southampton Water section of the scheme will involve deepening the existing channel from -12.6m to 13.6m CD and a section 100m wide will be dredged from approximately -6m to -13.6m CD.

1.2.6. It has been estimated that approximately 9 million cubic meters of material will be dredged during the scheme.

1.2.7. In addition it is proposed to deepen the existing berth pockets of the Quay at Berths 201 and 202 from -12.2m to -16m to accommodate the deeper draughted vessels.

2. LEGISLATION

2.1. NATIONAL PLANNING GUIDANCE AND LEGISLATION

Planning Policy Guidance: Coastal Planning (PPG 20)

2.1.1. Planning Policy Guidance: Coastal Planning (PPG 20) notes that ‘the coastal zone has a rich heritage both above and below low water mark, which includes buildings and areas of architectural or historic interest, industrial archaeology, scheduled and other ancient monuments and other archaeological sites (Para. 2.8).’

2.1.2. PPG 20 also makes specific references to sites of archaeological and built heritage interest in the information required by local planning authorities in addressing coastal planning (Para. 4.6).

2.2. REGIONAL AND LOCAL PLANNING POLICY: HAMPSHIRE

2.2.1. Policy **B4I** states:

'The District Council will encourage the conservation and protection of historic and archaeological sites and buildings on the District's coastline, and encourage protection of sites offshore.'

2.2.2. Policy **B4II** states:

'The District Council will take into account the presence of archaeological sites in the design and implementation of coastal defences, and will seek to avoid damage to them.'.

2.2.3. Policy **B4III** states:

'The District Council will encourage further research into the archaeology of the coast on and offshore.'

2.2.4. Policy **B4IV** states:

'The District Council will encourage projects to exploit the educational potential of historic and archaeological sites and buildings where this not conflict with other objectives.'

2.3. MARITIME LEGISLATION AND POLICY GUIDANCE

Protection of Wrecks Act (1973)

2.3.1. The area of the proposed development lies within UK territorial waters, in which the Protection of Wrecks Act (1973) may be applied. Under the Act, 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 license for those activities has been obtained from the Government. Generally, the relevant Secretary of State must consult appropriate advisors prior to designation, though it is also possible to designate a wreck in an emergency without first seeking advice.

2.3.2. In England, the Protection of Wrecks Act (1973) is administered by the Department for Culture, Media and Sport (DCMS). Specialist advice is sought from the Advisory Committee on Historic Wreck Sites (ACHWS) and a team of professional diving archaeologists employed on contract. Licenses can be obtained to carry out survey, excavation and other activities that would be otherwise prohibited.

2.3.3. If a wreck of historical, archaeological or artistic importance were to be discovered in the course of this project, then it would be possible for DCMS to designate it at very short notice.

Merchant Shipping Act (1995)

2.3.4. Within the context of the Merchant Shipping Act (1995) 'wreck' refers to flotsam, jetsam, derelict and lagan found in or on the shores of the sea or any tidal water. It

includes a ship, aircraft or hovercraft, parts of these, their cargo or equipment. It may be of antique or archaeological value such as gold coins, or a yacht or dingy abandoned at sea, or items such as drums of chemicals or crates of foodstuffs.

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

2.3.6. 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 being of historic or archaeological importance, a suitable museum is asked to buy the material at the current valuation and the finder receives the net proceeds of the sale as a salvage payment. If the right to, or the amount of, salvage cannot be agreed, either between owner and finder or between competing salvors, the Receiver of Wreck will hold the wreck until the matter is settled, either through amicable agreement or by court judgement.

Protection of Military Remains Act (1986)

2.3.7. Under the Protection of Military Remains Act (1986), all aircraft that have crashed in military service are protected, and the Ministry of Defence has powers to protect vessels that were in military service when they were lost. The Ministry of Defence can designate named vessels as 'protected places' even if the position of the wreck is not known. In addition, the Ministry of Defence can designate 'controlled sites' around wrecks whose position is known. In the case of 'protected places', the vessel must have been lost after 4 August 1914, whereas in the case of a wreck protected as a 'controlled site' no more than 200 years must have elapsed since loss. In neither case is it necessary to demonstrate the presence of human remains.

2.3.8. Diving is not prohibited at a 'protected place' but it is an offence to tamper with, damage, move or remove sensitive remains. However, diving, salvage and excavation are all prohibited on 'controlled sites', though licences for restricted activities can be sought from the Ministry of Defence. Additionally, it is an offence 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.

2.3.9. In most cases, records of aircraft lost on military service do not indicate their place of loss as this was often unknown. Any aircraft that have crashed while in military service are automatically protected by the Protection of Military Remains Act (1986).

2.3.10. Currently 37 sites around the United Kingdom and Northern Ireland are designated as Controlled Sites and Protected Places, none of which lie within the Study Area.

National Heritage Act 2002

2.3.11. The *National Heritage Act 2002* took effect on 1st July 2002. It broadens the power of English Heritage (EH), allowing EH to become involved in underwater archaeology in English territorial waters. EH are now responsible for the implementation and administration of the Protection of Wrecks Act (1973).

England's Coastal Heritage

2.3.12. *England's Coastal Heritage: a statement on the management of coastal archaeology* was published in 1996 by English Heritage and the Royal Commission on the Historical Monuments of England (RCHME). The statement set out a number of principles for managing coastal archaeology:

- The coastal zone of England includes a finite, irreplaceable, and, in many cases, highly fragile archaeological resource which by virtue of its value, variety, and vulnerability justifies a presumption in favour of the physical preservation *in situ* of the most important sites, buildings, and remains;
- Although archaeological remains situated within inter-tidal and sub-tidal areas may be less visible and accessible than remains on dry land, this does not affect their relative importance and they should be managed in accordance with the principles which apply to terrestrial archaeological remains;
- As historic landscapes can extend seamlessly from dry land, through the inter-tidal zone, and into sub-tidal areas, effective management of the coastal archaeological resource cannot be achieved without due consideration of marine as well as terrestrial archaeological remains.
- Where economic development in the coastal zone is likely to impact on important archaeological remains, decisions should be taken with regard to the best available information and the precautionary approach should be adopted wherever possible.
- Although it remains government policy not to extend the Town and Country Planning system to the territorial sea, the principles set out in PPG16: Archaeology and Planning should be applied to the treatment of sub-tidal archaeological remains in order to secure best practice.

2.3.13. The statement also included a number of detailed recommendations, which include the following:

Development control and environmental assessment	Coastal archaeological interests should be adequately reflected in structure and local plans, and consistently and comprehensively included in Environmental Assessment procedures for coastal and marine developments (including harbour works, mineral extraction, oil and gas related projects, capital dredging projects, cable projects, and waste water treatment and disposal) and other activities requiring sectoral consent.

2.3.14. *England's Coastal Heritage* list the Solent and Southampton Water as 'Areas of Recognised High Archaeological Potential'.

JNAPC Code of Practice for Seabed Developers (2006)

2.3.15. 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 is to ensure a best practice model for seabed development. The Code offers guidance to developers on issues such as risk management and legislative implications.

Maritime Designations

2.3.16. There are no wrecks designated under the Protection of Wrecks Act (1973) or the Protection of Military Remains Act (1986) within the Study Area.

3. METHODOLOGY

3.1. APPROACH

3.1.1. As noted above, this assessment is intended to inform the preparation of the archaeological section of an Environmental Statement that will accompany the planning consent applications for the proposed dredging of the Southampton Approaches. The methodology adopted reflects best practice in carrying out archaeological desk-based assessments, as codified by the Institute of Field Archaeologists (IFA) *Standard and Guidance for Archaeological Desk-based Assessment* (IFA 2001).

3.1.2. The assessment was also informed by the Joint Nautical Archaeology Policy Committee's *Code of Practice for Seabed Developers* (2006).

3.2. STUDY AREA

3.2.1. In order to assess the archaeological potential of the development area in relation to maritime archaeological remains, one large Study Area was established for the collation of information.

3.2.2. The Study Area followed the course of the existing dredged channel which can be seen in **Figure 1**. The Study Area runs from the northern end of Southampton water following the current dredged channel into the Solent and along its eastern arm, where it terminates off of the East coast of the Isle of Wight close to the Nab Tower.

3.3. SOURCES

3.3.1. Wessex Archaeology approached the following organisations holding the principle sources of information relevant to desk-based assessments as set out in the client brief:

- The NMR, which is maintained by English Heritage, was approached on the 20th April 2008 for information about sites within the Study Area.
- The Isle of Wight Sites and Monuments Record (IOWSMR), which is maintained by the IOW County Council was approached on the 14th April 2008 for information on sites within the Study Area.
- The Southampton City Council Sites and Monuments Record (SCCSMR), which is maintained by the Southampton City Council was approached on the 20th April 2008.
- The Hampshire County Sites and Monuments Record (Hants SMR), which is maintained by the Hampshire County Council was contacted on the 14th April 2008.
- The UKHO wreck data was acquired on the 18th April 2008.

3.3.2. Additional background information was collated from secondary and documentary sources held in Wessex Archaeology's library.

3.4. DATA

3.4.1. In order to assess the archaeological resource within the Study Area the records of wrecks, casualties and seabed features obtained from the NMR, UKHO, Hants SMR, SCCSMR, and the IOWSMR, were tabulated under a numerical sequence (**WA 2000-2135**), assigned for ease of reference within this report. A full gazetteer of wrecks and casualties is presented in **Appendices II** and **III** and illustrated in **Figures 2** to **5**.

3.5. CHRONOLOGY

3.5.1. Archaeological dating of remains relies on three distinct chronologies, as follows:

- Absolute (or calendar) dates, which are suffixed with **BC** (**B**efore **C**hrist), generically known as **big BC**. Such dates can be considered as part of our present day calendar, i.e. a date of 3,523 BC occurred 5,531 years ago;
- Calibrated radiocarbon dates, which are either related to our modern calendar as BC dates, or presented as **BP** (before present) dates. BP dates are calculated in years before 1950, and take into account the increased radioactivity background count following the proliferation of nuclear testing after this date. Therefore, a calibrated date of 4,500 BP indicates a point in time 4,558 years before today (i.e. 2,550 BC);
- Uncalibrated radiocarbon dates, which are suffixed with **bc** (i.e. **little bc**), and are the original radiocarbon determinations based on the half-life of C14 without compensating for changes in the background count.

3.5.2. Conventionally, dates relating to the Lower, Middle and Upper Palaeolithic periods are generally referred to in terms of years BP, whilst the Mesolithic and later periods are usually quoted in years BC. Where possible, these conventions will be adhered to in this report.

3.6. GEOPHYSICAL SURVEY AREAS

Introduction

3.6.1. Nine main areas where the maintained channel is to be widened or deepened by dredging were surveyed. These areas are Western Docks (abbreviated to WD), Fawley (abbreviated to FAW), ESSO, HOOK, THORN, SHOAL, HORSE, NAB and South Nab (abbreviated to SNAB). The survey areas were defined as the polygons defining areas to be dredged received from ABP except for SHOAL and SNAB. For these two areas a new polygon was drawn around the outer perimeter of the several small polygons defined by ABP. In all cases a 40m buffer was added to the survey areas. This buffer is to allow for sites centred just outside the survey areas which may extend into the survey areas.

3.6.2. In addition to the nine areas listed above WA were also asked to conduct two smaller scale surveys. The first of these was at 201 and 202 berth (abbreviated to Berth) to determine the extent of a concrete slab. The second survey was requested in order to locate the Esso pipeline across Southampton Water, and try to determine what sections were still buried under cobbles and if there were any sections in free-span. This survey area has been designated as PIPE. **Appendix I** contains the co-ordinates of all survey areas.

3.6.3. Data holes were unavoidable in most areas owing to the presence of navigation and mooring buoys which the survey vessel was required to deviate around. In addition a drilling rig was encountered in the Berth and FAW areas and the survey vessel again had to deviate from the planned survey lines to avoid it. For occasions when the survey vessel had to move off-line due to encountering vessels on the survey line the missed section was re-run.

3.6.4. Two charted wrecks (UKHO IDs 19569 and 19580) within the maintained channel were also investigated but these did not have specific survey areas designated around them. Instead, several survey lines were run in a grid pattern around the wrecks once their position had been established from the first line.

3.6.5. All areas were surveyed with sidescan sonar, boomer and magnetometer. Some areas also had additional lines on which magnetometer data were collected but not sidescan sonar or boomer. Single beam echo sounder data were collected on all lines run.

Berth

3.6.6. The Berth survey area is situated adjacent to the quayside at berths 201 and 202 in the River Test (**Figure 1**). Boomer lines were run parallel to the quayside with an approximately southwest to northeast orientation with the closest line approximately 3m from the edge and the furthest 60m out. A line spacing of 10m was used. One sidescan sonar line was run with a range of 50m along the central survey line to cover the whole area in one line. No magnetometer data was collected as the purpose of the survey was to identify the extent of the concrete slab here.

3.6.7. The survey lines were continued as far into the northeast corner of the dock as was possible. The cross-lines were not run perpendicular to the main survey lines as the distance involved was too short – the vessel could not approach close to the quayside due to the need to turn with the towfish deployed behind the vessel. Consequently four cross-lines were run diagonally.

WD

3.6.8. The WD area is situated on the western edge of the existing channel in the area of the ABP Western Docks (**Figure 1**). The survey area consisted of magnetometer lines with a 10m line spacing and lines run with sidescan sonar and boomer with a line spacing of 40m. The main lines were run along the length of the survey area with approximately a northwest to southeast orientation although they were split into five sections to accommodate changes in direction. Four cross-lines were also run with all equipment.

FAW

3.6.9. The FAW survey area is situated on the eastern side of Southampton Water between Dock Head (Weston Shelf) and Fawley (**Figure 1**). This long thin area was covered by 40m spaced lines surveyed using all equipment and with additional magnetometer lines in between these with a line spacing of 10m. The main survey lines were oriented approximately northwest to southeast along the length of the area. 12 cross-lines were acquired of which two were considerably extended so that they also formed cross-lines for the ESSO area.

ESSO

3.6.10. The ESSO survey area is situated on the western edge of the maintained channel close to the Esso Marine Terminal (**Figure 1**). The main survey lines oriented approximately northwest to southeast were surveyed using all equipment with a 40m

line spacing and magnetometer only lines with a 10m line spacing. The two cross-lines were extensions of two of the FAW cross-lines.

PIPE

3.6.11. The pipeline survey area extends across Southampton Water cutting across the ESSO survey area to the west and the southern end of the FAW survey area to the east. It was centred on the presumed location of the pipeline under investigation.

3.6.12. Lines were requested to be run 100m in length and with a spacing of 20m perpendicular to the length of the pipeline, which resulted in an approximate northwest to southeast orientation. The lines were extended to 200m length to make it easier for the survey vessel to get on-line and ensure full coverage of both pipelines here (Esso and BP) to ensure correct identification of the pipeline under investigation. Lines were run at high tide to maximise the number of lines that could be run approaching the shore. In total, 51 lines were run with all equipment.

HOOK

3.6.13. The Hook survey area is situated on the eastern bank of Southampton Water between the entrance to the Hamble and Hook buoy (**Figure 1**). The main survey lines were oriented approximately northwest to southeast. Lines were run with all equipment at a 40m line spacing and these were infilled with magnetometer only lines with a line spacing of 10m. Five cross-lines were also run with all equipment.

THORN

3.6.14. The Thorn survey area is situated in the Western Approach Channel and the southern end of the Thorn Channel in the Solent to the south of the entrance to Southampton Water (**Figure 1**). It also covers the vessel turning area in a projection on the east side of the survey area. The main survey lines have an orientation of approximately southwest to northeast and a line spacing of 60m. The lines were run with all equipment and there were no magnetometer only lines. Three cross-lines were also run with all equipment.

SHOAL

3.6.15. Shoal area is situated in the Solent to the north of Mother Bank in between the Thorn Channel Turn and the Nab Channel (**Figure 1**). The main survey lines were oriented in an approximately west to east direction. Lines were run with all equipment at a line spacing of 40m with magnetometer only lines run with a line spacing of 10m. One cross-line was run with all equipment. One additional line of sidescan sonar data was run along the central magnetometer only line with a range of 100m to provide an overview of the whole area in a single line.

HORSE

3.6.16. Horse survey area is situated to the south of Horse and Dean Sand, north of the northern entrance to the Nab Channel (**Figure 1**). The main survey lines are oriented in an approximately northwest to southeast direction along the length of the survey area. Lines were run with all equipment with a line spacing of 40 m and magnetometer only lines were run with a line spacing of 10m. Two cross-lines were run with all equipment.

NAB

3.6.17. The Nab survey area is situated in the Nab Channel to the east of the Isle of Wight (**Figure 1**). The main survey lines were oriented along the length of the survey area but this was done in three sections to accommodate the changes in direction

required. The lines were oriented approximately northwest to southeast. Lines were run with all equipment with a line spacing of 60m. No magnetometer only lines were run. Five cross-lines were also run with all equipment.

SNAB

3.6.18. The South Nab survey area is situated at the southern entrance to the Nab Channel (**Figure 1**). The main survey lines were oriented along the length of the survey area in an approximately northwest to southeast orientation. Lines were run with all equipment with a line spacing of 40m and magnetometer only lines were run with a line spacing of 10m. Two cross-lines were also run with all equipment.

3.7. GEOPHYSICS TECHNICAL SPECIFICATIONS

Introduction

3.7.1. The survey was conducted by WA aboard the vessel R/V *Wessex Explorer* from 31st March 2008 to 17th April 2008. Four types of geophysical data were collected in each area as detailed in **Section 3.6**. The technical specifications of each type of equipment are given below.

Echosounder

3.7.2. A Knudsen 320M single beam echosounder was used together with a TSS DMS2i Dynamic Motion Sensor, fitted to a pole on the port side of the vessel. The echosounder was operated at frequencies of 33kHz and 210kHz. Motion compensated depths were recorded digitally in Hypack and also as a hardcopy.

Sidescan Sonar

3.7.3. The data were acquired with a Klein 3000 towfish operating at 500kHz and 100kHz and were recorded digitally using SonarPro. For areas in which the line spacing was 40m or less the sidescan sonar data were collected with a range of 50m to ensure complete coverage of over 200% and some overlap to make certain that there were no data gaps below the vessel. For areas in which the line spacing was 60m the data were collected with a range of 75m.

Magnetometer

3.7.4. A Marine Magnetics Explorer magnetometer was used to acquire magnetic data using Coda Geosurvey software. In shallow waters the magnetometer was deployed on a dedicated cable at between 20m and 40m behind the vessel. In deeper waters the magnetometer was deployed on a 10m extension cable from the sidescan towfish. The data were collected with the towfish cycling at 4Hz.

Sub-Bottom Profiler

3.7.5. The system used was an Applied Acoustics surface-tow boomer, fitted with an AA200 plate. The boomer was triggered by Coda at an interval of 250ms and the plate fired at 100J. The boomer was towed 15m behind the vessel with an SES 10 element hydrophone deployed from the opposite side of the vessel, approximately 5.5m away. The data were recorded digitally in Coda and also as a hardcopy using an Ultra 120 printer.

3.8. GEOPHYSICAL DATA PROCESSING AND ANOMALY CHARACTERISATION

3.8.1. 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 and an image of each anomaly acquired.

3.8.2. The form, size and/or extent of anomalies is a guide to its 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.

3.8.3. The magnetic data were processed in MagPick software to give an x,y,z file comprising of grid co-ordinates (x,y) 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.

3.8.4. 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. Anomalies clearly caused by vessels and buoys were not selected.

3.8.5. The sub-bottom profiler data was studied in order to detect any in-filled palaeo-channels, potential land surfaces of archaeological significance and peat/fine-grained sediment horizons that may have archaeological potential. Features within the survey areas were mapped and digital images created for illustration purposes.

3.8.6. The sub-bottom profiler 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. The depth of boundaries sub-seabed were exported and gridded into layers using IVS Fledermaus software, referenced to the seabed depths acquired during the bathymetry survey.

3.8.7. The sub-bottom profiler 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 1,600 m/s. This is a standard estimate for shallow, unconsolidated sediments.

3.8.8. Also any small reflectors which appear to be buried material, such as a wreck site covered by sediment, were recorded and the position and dimensions of any such objects entered into a gazetteer and an image of each anomaly acquired. 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.

3.8.9. The bathymetric data were processed in Hypack for archaeological purposes and exported as xyz files to be gridded and made into a surface using IVS Fledermaus software. This data then provided a datum for the other geophysical data sets but was not of sufficient resolution for the identification of isolated anomalies.

4. BASELINE

4.1. SEA LEVEL CHANGE WITHIN THE SOLENT REGION

4.1.1. There has been human activity within the Solent region from the Lower Palaeolithic to the present day, and there is evidence that at times of lower sea level this activity has extended into areas that are currently submerged,

4.1.2. The Palaeolithic period (700,000 – 10,000 BP) is characterised by a series of long cold stages when ice sheets spread from the Arctic to cover northern Britain, separated by relatively short-lived warm stages during which conditions were more suitable for human habitation of Britain (Waller & Long 2003). When present, the ice sheets removed water from the oceans, reducing sea level by up to 120 metres. Although never covered by ice, Southern Britain experienced harsh periglacial conditions, and the major river systems, including the Palaeo-Solent, cut valleys into the underlying rock strata. seasonal thawing temporarily released large volumes of water which swept gravel and sand into the river valleys, where it was deposited until further down-cutting occurred. This repeated cycle of down-cutting, mass transport of gravel and deposition has resulted in sequences of plateau and terrace gravels stepping down into the modern channels of many major rivers in Southern Britain.

4.1.3. During the warm stages (interglacials) water released from the ice sheets caused the sea level to rise, drowning some coastal river valleys (such as the Palaeo-Solent). This inundation lead to the deposition of alluvium and organic horizons that were often eroded during subsequent cold stages, but which do survive in some locations around the Solent (Hosfield 2001).

4.1.4. The main archaeological consequence of these massive changes to the environment is that relics of human occupation may be present within areas that are currently below Mean Low Water. Artefacts from the Lower and Middle Palaeolithic have often been moved from the original site of activity and are now frequently found within the terraces of re-deposited gravel, as isolated stone axes and waste flakes. There are a few known cases where activity sites have been buried by reworked sediments or warm stage alluvium, and have survived the down-cutting and erosion of subsequent cold stages to be found as *in situ* deposits. As seen at the late Mesolithic to early Neolithic site at Boldnor Cliff on the Isle of Wight.

4.1.5. During the Upper Palaeolithic, at around 25-18,000 BP, the ice sheets of the Devensian glaciation had reached their maximum extent. Following this, as climatic conditions became more favourable to humans, Britain was re-colonised (Devoy 1982:66). This process started around 13,500 BP when the sea was still at least 60 metres below its current level. At this time Britain was linked to continental Europe and the Isle of Wight was linked to the mainland. The climate continued to warm until about 10,000 BP, at which point the British climate may have been as warm as it is at present.

4.1.6. Thereafter the Palaeolithic population was superseded by Mesolithic hunter-gatherers, who in turn were supplanted by Neolithic, and later Bronze Age farmers. Throughout this process the volume of dry land within the Study Area steadily decreased.

4.2. PALAEO-SOLENT

4.2.1.

4.3. LOWER, MIDDLE AND EARLY UPPER PALAEOLITHIC (700,000 –22,000 BP)

4.3.1. The Palaeolithic saw the emergence of the first tool using humans. During the Lower, Middle and Early Upper Palaeolithic, interglacials allowed for some human habitation in Hampshire and the Isle of Wight (Basford 1980: 11). This included areas within the Solent and Southampton Water.

4.3.2. There have been a significant number of Palaeolithic artefacts found within the Solent, an assemblage that is arguably second only in importance to those found in the Thames (Bridgeland 2001: 15). The most important concentrations of Palaeolithic find-spots on the Hampshire side of the Solent are in the Southampton and Bournemouth areas, where they largely coincide with old quarries or building sites, or have been dredged up by fishermen. (Bridgeland 2001: 16).

4.3.3. Most of the Solent finds are secondary context lithic assemblages found within fluvial gravels that have been moved during the interglacials. They are thought to derive from river beaches, old land surfaces and even earlier reworked terrace deposits (Wymer 1999: 21). A total of 14 terraces of the Solent river system have been identified, and it is within these gravels that Lower, Middle and Early Upper Palaeolithic finds are most likely to be found. One Palaeolithic findspot has been identified within the Study Area, this site produced one hand axe and unretouched flint flake (**WA 2022**).

4.3.4. The British Geological Survey sea bed sediment map for the area shows gravel, and sand and gravel, deposits within much of the area traversed by the current approach channel. These deposits, which form the surface sediments across much of the study area, represent elements of the fluvial gravels and terraces discussed above. Gravel dominates the surface geology of the western arm of the Solent, a fact that is reflected in the higher numbers of seabed finds of Palaeolithic artefacts in this area recorded by the *Artefacts from the Sea* project (Wessex Archaeology 2004).

4.3.5. *Artefacts from the Sea* recorded 298, largely prehistoric, finds dredged from the Western Solent by fisherman Michael White. The majority of these finds were of flint artefacts. However, following consultation with Michael and Stephen White as part of the project, further information and patterns in the artefact recovery were noted. It was determined that two patches of submerged forests in the area and many of the artefacts were found within peat deposits. Elsewhere in the Solent, Palaeolithic hand axes have been found on the seabed (Wessex Archaeology 2004).

4.3.6. Within the Solent four of Michael White's recovery areas are close to or overlap with the Study Area, see **Figure 1**. These four recovery areas have produced 10 prehistoric finds however they have not been added to the gazetteer as exact positions of the finds within the recovery area is not known. The potential for more of these types of finds to be recovered during any dredging is medium to high.

4.3.7. The lack of palaeo-environmental evidence and information from *in situ* archaeological remains means that it is difficult to accurately model the archaeological potential for the Lower, Middle and Early Upper Palaeolithic in detail. However, in general, Lower and Middle Palaeolithic populations were hunter-gatherers who relied on natural resources for their food supply. River valleys and coastal locations represent areas rich in natural sources of food, and as such were favoured areas of activity during these periods.

4.3.8. Changes in sea level during this period meant that at times during the Lower, Middle and Early Upper Palaeolithic elements of the (now submerged) Solent were formerly

dry land areas close to both rivers and, at times the sea, and were therefore likely to have been attractive activity areas for hominid populations. Finds of archaeological material from this period are known from the Study Area and the surrounding Solent area, typically occurring as artefacts within secondary gravel contexts, and as such there is demonstrable potential for such evidence to be contained within sediments throughout the Study Area.

4.4. LATE UPPER PALAEOLITHIC AND MESOLITHIC (C. 13,500 BP – 4,000 BC)

4.4.1. As the ice sheets retreated at the end of the last ice age (18,000 BP) people gradually began to migrate north through Europe, following watercourses where resources were most abundant. At this same time there was a steady rise in the sea level which lead to the separation of Britain from the Continent at approximately 5,000 BC. This process affected the Solent region such that by approximately 6,550 BC the 'land bridge' to the Isle of Wight started to disappear. By the end of the Mesolithic the islands of Britain and the Isle of Wight were completely cut off and sea levels were just a few metres lower than today (Momber 2000: 89).

4.4.2. During the period between 13,500 BP and 10,000 BP Britain was re-colonised by Late Upper Palaeolithic populations of modern humans moving westward across the 'land-bridge' that linked Britain to France.

4.4.3. As the climate improved, the human population adapted so that Mesolithic culture dominated in Britain between 10,000 BP and 4,000 BC. Both the Later Upper Palaeolithic and Mesolithic cultures were hunter gatherers who used stone (typically flint) and bone as the raw material for part of their tool sets, other items made of biodegradable organic materials such as wood are occasionally found, although this is far from common.

4.4.4. The effects of the Holocene marine transgression upon the archaeology of this period must not be discounted. Many of the coastal land surfaces that developed after the end of the Devensian glaciation have since been eroded by the sea. However, there is clear evidence for partial survival, particularly within the Solent.

4.4.5. The most easily identifiable evidence for the survival of post-Devensian coastal land surfaces occurs in the form of peat deposits, such as those off Bouldnor Cliff on the Isle of Wight and within Southampton Water. However, other deposits have been identified as fine-grained sedimentary in-fill within the broader Solent River valley, for example off Portsmouth (Wessex Archaeology 2004b).

4.4.6. Both peat and fine-grained sediments have the potential to provide palaeo-environmental evidence for the landscape and vegetational changes that affected the area during the period between the end of glaciation and full inundation. The effects of water-logging also present the possibility that there may be survival of organic human artefacts, particularly within peat deposits. Both artefactual and palaeo-environmental evidence is thus likely to be of high regional or national importance.

4.4.7. Evidence for Late Upper Palaeolithic human populations in Hampshire and the Isle of Wight is scarce. Hinton and Hughes (1996) have suggested that this is because most of the favoured activity areas of these people have been submerged by the subsequent rise in sea level. If this is the case then any find made within the Solent, even if only a stray find, would be of high regional, and possibly national importance.

4.4.8. After 10,000 BP new flint tool-making technologies started to appear, the long blades of the Upper Palaeolithic gave way to smaller microliths that mark the Mesolithic (Momber 2000: 87). A study published in 1980 identified ten areas of Mesolithic occupation or flint working sites and 47 Mesolithic find-spots on the Isle of Wight, and it is also very likely that a number of Mesolithic sites exist underwater (Basford 1980: 12).

4.4.9. No Late upper Palaeolithic or Mesolithic finds have been recovered from within the Study Area. In the surrounding areas there are some 15 Mesolithic findspots have been located which include stone axes, scrapers, flakes and a pick. These sites are all located within the inundated land surfaces of the Palaeo-Solent River valley and support the established view that watercourses were favoured activity sites for Palaeolithic and Mesolithic populations.

4.4.10. In addition to these finds further evidence for Mesolithic occupation of the Palaeo-Solent has been found in some of the submerged peat deposits fringing the Solent. Bouldnor Cliff, which lies to the south-west of the Study Area, is being investigated by the Hampshire and Wight Trust for Maritime Archaeology. The submerged prehistoric landscape dates back to 4,525-4,330 BC, the end of the Mesolithic and beginning of the Neolithic where there was an increase in population growth and development of a more sedentary way of life (Momber 1999/2000: 7). Over 3000 pieces of worked and burnt Mesolithic flint have been found in the site that lies 10-11 metres below Ordnance Datum (HWTMA 2002/2003: 10).

4.4.11. There is clear evidence for the presence of active Mesolithic populations within the region. Evidence for this activity survives within the submerged elements of the Palaeo-Solent River valley of which there could be some undisturbed deposits within the proposed development area, most notably in the Southampton Water section. Any Mesolithic site would be of high local and probably national importance.

4.5. NEOLITHIC TO IRON AGE (4,000 BC – 43 AD)

Check likely date of submergence and cut inot wreck section if necessary

4.5.1. By the Neolithic the adoption of farming lead to a steady increase in the human population, and contact with the Continent was now wholly maritime, the ‘land-bridge’ in the Straits of Dover having been breached. People, who had formally been hunter-gatherers, were beginning to settle, work the land, domesticate animals and produce pottery. This led to the establishment of the first permanent settlements, and the appearance of the first field monuments in the form of long barrows (burial mounds) and causewayed enclosures (earthworks).

4.5.2. However, at this time sea level rise meant that the Isle of Wight was separated from the mainland Britain by an 800-metre wide strip of water. As a result it is likely that all of the Study Area was below the Mean High Water mark, and thus only maritime activity was possible. There are no known Neolithic sites or finds within the Study Area.

4.5.3. Bronze Age archaeology is characterised by burial mounds, frequent in Hampshire, and other sites of ritual activity (Momber, Rackley & Draper 1994: 6). The barrows provided foci for settlement activity and the nearest barrow cluster to the Study Area lies on the western side of Southampton Water. A study published in 1980 identified one site of Bronze Age occupation and numerous finds including some hoards on the Isle of Wight (Basford 1980: 19, 26).

4.5.4. One of the most important aspects of the Bronze Age archaeology of the region is the role of the coastline as a subsistence resource (Hinton and Hughes 1996). Evidence includes a large array of fish traps found on the Isle of Wight coast at Wootten Quar in the eastern Solent (Tomalin 1993). These site exist below the Mean High Water mark, and thus may occur within submerged parts of the Study Area.

4.5.5. There are two known Bronze Age findspots recorded within the Study Area (**WA 2023** and **2024**). Both of the finds are Bronze Palstaves and show that the area was in use during the Bronze Age. The fact that the finds came from the channel, which would have been under water during this period, shows that there was maritime activity with the area.

4.5.6. The Iron Age heralded the arrival not only of a wetter climate but also of invaders from Gaul who established bridgeheads along the coast of Wessex (Momber, Rackley & Draper 1994: 8). Hillforts and Oppida (trading centres) become the foci for broad networks of rural farming activity during this period. The nearest hillfort to the Study Areas is that of Buckland Rings, near Lymington.

4.5.7. The Study Area has yielded two Iron Age finds which consists of the top of a dressel 20 amphora (**WA 2025**) and an Iron axe head with corroded wooden shaft (**WA 2026**). Both are likely to represent evidence of maritime activity, either vessel sinkings or chance losses of artefacts from vessels.

4.6. GEOPHYSICAL AND GEOTECHNICAL SURVEY RESULTS

Geology

4.6.1. The sub-bottom data is assessed on an area by area basis and includes a description of sub-surface sediments within the buffer zone. Additionally, where cross lines were surveyed extending outside the extents of the buffer zone and provide further information on the sub-surface geology, these details are also provided. This is of particular interest in the Solent where lines were purposefully extended to assess the difference between the banks, the area to be affected by the dredging proposals and the existing maintained channel.

4.6.2. Wherever possible the sub-surface geology has been interpreted in conjunction with the geotechnical data (Fugro Alluvium Offshore Limited 2008) and the results of the geoarchaeological analysis of the vibrocores (Wessex Archaeology 2008).

4.6.3. The underlying geological sequence consists of Tertiary bedrock overlain by Pleistocene gravels, Head deposits and more recent Holocene alluvium, peat and marine sediments (Hamblin *et al*. 1992, Melville and Freshney 1982).

4.6.4. Based on the geoarchaeological analysis the sub-bottom sediments can be divided into four distinct units identified in both the geophysical and geotechnical data The results of the geoarchaeological analysis of these units is summarised below:

Sedimentary Unit	Interpretation
Unit 1	Tertiary bedrock
Unit 2	Pleistocene valley gravels
Unit 3	Pleistocene and Holocene alluvium and peat
Unit 4	Recent estuarine alluvium and seabed

Sedimentary Unit	Interpretation
	sediments

4.6.5. Of these, Units 2 and 3 are considered to be of considerable prehistoric archaeological interest.

4.6.6. Although the Tertiary bedrock (Unit 1) sediment is not of archaeological interest, its surface may include glacial features, soil formation and archaeological artefacts.

4.6.7. Unit 2 may have some archaeological potential. If the sediments were deposited in a Pleistocene fluvial environment it may contain Palaeolithic remains. Unit 3 contains a sequence of interleaved silts, clays and peats which most likely represent Holocene sedimentation, in part created by sea level rise. These sediments often contain significant amounts of palaeoenvironmental, and potentially archaeological material.

4.6.8. The more recent sediments (Unit 4) within Southampton Water and the Nab Channel are of little prehistoric archaeological or palaeoenvironmental interest, although it is noted that they may contain more recent archaeological remains including shipwrecks and/or aircraft (Wessex Archaeology 2008).

4.6.9. Where applicable, in the descriptions of the sub-bottom profiler data below, the sedimentary units are described according to this scheme.

4.6.10. Water depths are provided to the nearest decimetre and are provided referenced to Chart Datum (CD) and Ordnance Datum (OD) Newlyn. CD is 2.74m below OD (Newlyn).

BERTH

4.6.11. The purpose of surveying in this area was twofold. Firstly, ABP requested that an area of concrete situated at the level of the seabed was identified; secondly, the potential archaeology of the area was to be assessed.

4.6.12. The general water depth in the survey area is approximately 12m below CD (15m below OD) with a minimum depth of 9.2m below CD (11.9m below OD) and a maximum depth of 14.7m below CD (17.4m below OD). At the northern end of the survey area is a large raised area. This measures approximately 275m long but extends to the northeast beyond the end of the survey area (**Figure 6**). This feature measures approximately 45m wide, although the northwest edge is not seen as it is beyond the extent of the survey area and may well adjoin the quayside. The feature is observed with a maximum of 2.6m above the adjacent seabed.

4.6.13. To the west of the area (Berth 202) the seabed is relatively flat. To the east of the survey area (Berth 201) the seabed shoals by approximately 2m and a very strong reflection marks the seabed **(Figure 6)**. This is interpreted as notably harder than the area of surrounding seabed. This hard ground masks any sub-surface reflectors. It is possible that this feature represents an area of concrete associated with the development of the quay wall.

4.6.14. To the east of the area borehole **BA** indicates the presence of a concrete slab 0.15m thick confirming the feature observed on the sub-bottom profiler and bathymetry data. The concrete observed in the borehole **BA** overlies at least 5m thickness of made ground.

4.6.15. To the west of the survey area two units are observed sub-seabed. Throughout this area a seismically structureless layer, with occasional chaotic reflections is observed. This unit is observed in areas from just below the seabed to a depth in excess of 15m. Based on borehole data (**BD** and **BI**) this unit is likely to represent layers of silts, sands, and clays. A unit of sediment is observed cutting into the underlying sediments to a depth of 6.3m sub-seabed (up to 24.3m below CD, 21.6m below OD). Seismically, this is observed as a more structured layer comprising strong reflections, possibly indicating coarser sediments. This is comparable with the unit observed in the top 2m of the borehole **BI** record which indicate the presence sands and gravels with angular fragments of concrete and flint.

4.6.16. Within the survey area the seabed appears to be covered with sediments although underlying material shows through in the southern half of the area. There are no sandwaves or other bedforms. Some scars, possibly from dredging, are visible running approximately parallel to the quayside.

4.6.17. There are no indications in the dredging proposals concerning Berths 201 and 202, however the maintained channel east of these berthing areas is to be dredged to 13.6m below CD. The area of hardground interpreted from the borehole data as concrete is situated outside the planned channel deepening. To the east of the berths the proposed dredging will remove up to 2m of sediments. Based on the borehole data the sediments will largely be composed of made ground to the north and silts and sands to the south (**Figure 6**).

WD

4.6.18. The depth of seabed is observed between 0.1m above CD to a maxmum of 14.3m below CD (2.6m to 17.0m below OD). The shallowest area is along the southern edge of the western section and at the southwest ends of the cross-lines to the western side of the dredged channel (**Figure 7**). The general seabed depth of the channel is approximately 12.9m below CD (15.6m below OD).

4.6.19. A reflector marking the boundary between Tertiary bedrock sediments (Unit 1) and overlying Pleistocene/Holocene sediments is observed throughout the northern section of the survey area **(Figure 7)**. This boundary is observed between <1m to 14m sub-seabed, between 3.2m and 18.0m CD (5.9m and 20.8m below OD). The Tertiary bedrock is close to the seabed within the channel. On the sides of the channel the overlying sediments thicken over the banks. The Tertiary bedrock is likely to belong to the Tertiary Eocene Barton Group.

4.6.20. In the north-western section of the survey area seismic blanking is observed on the sub-bottom profiler data. The blanking is observed just below the seabed on the western bank of the channel. The cause of the blanking could be due to coarse seabed sediments blanking the underlying sediments or due to shallow gas accumulations. As the character of the seabed does not appear to vary across the bank area but the blanking is only observed within a portion of the bank, it is likely that the blanking is caused by the presence of shallow gas. The source of the shallow gas is unknown but given the organic nature of the Recent estuarine sediments (Unit 4) in the area (borehole **20B**), it is possible that microbial methane is generated near surface and is the cause of the seismic blanking.

4.6.21. To the south of the area, particularly associated with the banks the boundary between Pleistocene/Holocene sediments and Tertiary bedrock is unclear. Vibrocores **24Va** and **27V** indicate Tertiary bedrock sediments between 4 and 5m sub-seabed, however no seismic reflections are observed due to seismic blanking.

Numerous hyperbolas are observed on the data at the seabed indicating coarse sediment which may cause the blanking. Alternatively, the presence of shallow gas could cause blanking.

4.6.22. On the western banks a reflector is intermittently observed on the data indicating a second phase of deposition in this area. The vibrocore data indicate that this sediment is Recent (Unit 4). However, it is considered that in places remnants of Unit 3 sediments may survive given similar sediments observed within Southampton Water

4.6.23. Unit 4 is observed on the sidescan sonar data as variable with generally sandy sediments interspersed with patches of both finer and coarser material. Dredging scars are visible in the channel.

4.6.24. Currently the existing dredged channel is maintained to a depth of 12.6m below CD. The new proposals plan to deepen the channel to 13.6m CD and to widen the channel to the extent of the WD survey area. Dredging will impact on all sediment units, removing Holocene sediments to the northwest of the survey area which may include peat layers. However, the Holocene sediments will remain on the western as illustrated in the northern cross-line of sub-bottom profiler data (**Figure 7**).

FAW

4.6.25. Water depths vary between 1.7m and 14.2m below CD (4.4m and 16.9m below OD) as illustrated in **Figure 8**. The shallowest area is along the northeastern edge in the centre of the survey area. This corresponds to Netley Shoal on the admiralty chart (1905). The survey area covers the northeast edge of the maintained channel with little coverage of the dredged channel itself. The general seabed depth is approximately 11m to the edge of the channel.

4.6.26. Three reflectors separating four sedimentary units are observed on the data within the FAW survey area. The deepest unit has been interpreted as the bedrock layer and is observed as sub-parallel reflectors (Unit 1) as illustrated in **Figure 8**. On the north-south orientated lines these are observed as relatively flat sub-parallel reflectors. On the east-west orientated cross lines the sub-parallel reflectors are observed dipping to the west. These are likely to correspond to the Eocene Bracklesham Group. The top of the bedrock layer is observed close to the seabed in the maintained channel (<0.5m below seabed) to 12m below seabed under the banks to the east of the survey area. The boundary is observed between 10.4m and 24.7m below CD (13.15m to 27.41m below OD).

4.6.27. Overlying the bedrock is a unit of chaotic reflectors interpreted as Unit 2 (Pleistocene gravels). This layer is observed less than 1m below seabed in the maintained channel; this unit is observed as a complete unit beneath the banks to the east of the survey area. Where the surface of this layer is apparent it is observed between <0.5m and 4.7m below seabed which is 5.5m to 17.0m below CD (8.2m and 19.8m below OD). On the bank, a strong reflector is observed marking the top of the gravel unit and the base of the overlying sediment unit. This strong reflector may indicate the presence of peat. The overlying unit is observed as a series of strong reflectors and based on the vibrocore results are interpreted as sandy clay with organic matter and peat (**37V**, **40V**, **49V**) (Unit 3).

4.6.28. The vibrocores indicate a veneer (<1m) of Recent sediments (Unit 4) which are not discernible on the sub-bottom profiler data, however these are observed partially covering the seabed on the sidescan sonar data. There are many dredge scars in

the channel along the length of the area, with the seabed being otherwise featureless in this area.

4.6.29. Seismic blanking is observed in the north of the survey area on the edge of the bank and is likely caused by shallow gas generated from the organic matter and peat in Unit 3.

4.6.30. Currently the existing dredged channel is maintained to a depth of 12.6m. The new proposals plan to deepen the channel to 13.6m and to widen the channel to the extent of the FAW survey area.

4.6.31. The proposed dredging strategy will remove the Holocene sediments observed on the eastern bank. The cross-lines of data extending beyond the extent of the survey area indicate that similar Holocene sediments will not be impacted (**Figure 8**). As such, the palaeoenvironmental record of this sediment unit will survive on the bank, however, any archaeology present within the peat and organic layers within the survey area will be impacted.

ESSO

4.6.32. Water depths vary between 9.6m and 13.9m below CD (12.4m and 16.6m below OD). The shallowest area is towards the southwest, near the edge of the maintained channel (**Figure 9**). The general seabed depth of the channel within the survey area is approximately 13m below CD (15.7m below OD). The seabed generally slopes down from southwest to the northeast.

4.6.33. The top of bedrock unit (Unit 1) is observed between 1.6 and 8.0m below seabed. The bedrock unit comprises a series of sub-parallel reflectors as observed in the other survey areas within Southampton Waters (**Figure 9**). This is likely to comprise sediments of the Tertiary Eocene Bracklesham Group. This boundary is observed between 9.7m and 13.8m CD (12.4m and 16.5m below OD). The top of the bedrock is obscured to the west of the survey area due to seismic blanking. Vibrocore **50V** documents 2m of very soft black clay with a strong hydrogen sulphide (H_2S) odour. H_2S is produced during the process of microbial generation of natural gas. The presence of this gas in the uppermost sediments is likely the cause of the seismic blanking on the sub-bottom profiler data elsewhere throughout the survey area.

4.6.34. Overlying the bedrock a unit of strong chaotic reflectors is observed and is interpreted as coarse sands and gravels (Unit 3) as illustrated in **Figure 9**. Intermittently throughout the site the top of this unit is observed overlain by a further unit of more recent (Holocene – Unit 2) sediments. Where observed, the top of the Pleistocene gravel unit is observed between 11.2m and 16.6m CD (13.9 and 19.3m below OD). The overlying unit is up to 3.8m thick. Although there is no direct evidence of peat in this unit, the vibrocore and presence of seismic blanking at this layer indicate the presence of fine-grained sediments and organic matter which may include peat.

4.6.35. Unit 4 interpreted as Recent estuarine alluvium from the vibrocores in this area is too thin to be discerned on the sub-bottom profiler records. The sidescan sonar data indicates that the seabed area is covered by sediments and is generally featureless along the eastern half or so of the area. Some scars are present, generally more prevalent along the western side of the area. The overlying sediments are patchy along the centre and northwest of the area where the underlying sediment shows through. No sandwaves were observed.

4.6.36. Currently the existing dredged channel is maintained to a depth of 12.6m below CD. The new proposals plan to deepen the channel to 13.8m below CD and to widen the channel to the extent of the ESSO survey area.

4.6.37. Up to 3.6m of sediments will be removed from the dredging. This includes up to 2.4m of Holocene sediments, up to 3.6m of Pleistocene gravel unit and up to 0.5m of the Tertiary bedrock.

PIPE

4.6.38. The minimum water depth is observed on the western bank of the channel at a depth of 0.1m above CD (2.6m below OD) and a maximum depth of 13.8m below CD (16.5m below OD) in the centre of the dredged channel (**Figure 10**).

4.6.39. As with the ESSO and FAW survey area three sedimentary units were observed on the sub-bottom profiler data. The deepest unit (Unit 1) observed is interpreted as bedrock. The top of the bedrock layer is only observed within the central section of the Pipeline survey area. To the western edge of the survey area no sediment boundaries are observed due to the presence of seismic blanking, most likely caused by the presence of shallow gas. Further isolated areas of seismic blanking are also observed on the eastern bank. To the eastern edge of the survey area the top of the bedrock boundary is obscured by the seabed multiple, due to the shallow water depths. Where observed the top of the bedrock unit is observed between 2.3m and 6.9m below seabed; between 8.8m and 18.5m below CD (11.5m and 21.2m below OD). Within the maintained channel bedrock is close to the seabed (less than 1m sub-seabed).

4.6.40. Overlying the bedrock unit is a sediment unit interpreted as comprising Pleistocene gravels (Unit 2). Overlying the Pleistocene gravels are Holocene silts, clays and peat (Unit 3) (**51V**, **52V** and **50V**). The seismic nature of these units is similar and as such a definite boundary is only observed on the eastern bank. Where this boundary is observed it is located between 1.0 and 8.0m below seabed; 2.0 to 13.9m below CD (4.7m to 16.6m below OD).

4.6.41. A veneer of modern estuarine sediments (Unit 4) likely overlies the silts, sands and clays (Unit 3). The seabed in this area is predominantly sandy with patches of gravel and coarse sands. In the centre of the area the channel bed appears featureless and to be covered by coarse sediments. The pipelines are not clearly visible and no areas of cobbles are seen. The pipes are throughout the entire survey area with no sections spanning. The mounds above the buried pipes can be discerned in places but do not appear clearly (**Figure 10**).

4.6.42. Numerous hyperbolas are observed in the dataset. Some of these mark the base of the trench in which the BP and ESSO pipelines were placed. Others identified possibly represent buried boulders. As such it is not possible to identify the exact location of the pipeline using the sub-bottom profiler data. However, the magnetic response of the pipelines is clearly observed and has been mapped (**Figure 10**).

4.6.43. Within the survey area the channel is maintained to 12.6m below CD. With the new proposals this will increase to 13.6m below CD. In the area of the existing channel the Pleistocene gravels and overlying Recent estuarine sediments will be impacted. The impact of the dredging proposals where the channel is being widened are discussed in detail in the ESSO and FAW sub-bottom profiler descriptions.

HOOK

4.6.44. Water depths vary between 4.7m and 17.5m below CD (7.4m and 20.2m below OD) as illustrated in **Figure 11**. A raised area along the northeast edge and towards the southeast end of the survey area has a general seabed depth of approximately 7.7m below CD (10.4m below OD). This area measures approximately 1,100m along the length of the survey area and has a maximum width of approximately 130m across the survey area (southwest-northeast). This area extends beyond the data to the northeast and is beyond the extent of the dredged channel. The general seabed depth in the channel is approximately 13.7m below CD (16.4m below OD).

4.6.45. Similar to the ESSO survey area to the northwest of the Hook survey area, three prominent sedimentary units are observed in the sub-bottom profiler data (**Figure 11**). The top of the Tertiary bedrock (Eocene Bracklesham Group) unit is observed at the seabed in the south of the area deepening to 10.2m sub-seabed within the centre of the survey area. The top of the bedrock layer is observed between 0.1m and 10.2m CD (2.8m to 12.9m below OD).

4.6.46. Overlying the bedrock is a unit comprising a series of strong parallel reflections interpreted as Pleistocene gravels (Unit 2), illustrated in **Figure 11**. To the south of the area this unit is observed at the seabed to a depth of 1 or 2m. In the northern half of the survey area the unit thickens to up to 7m. Where observed the uppermost boundary of this layer is observed between 8.7m and 21.7m CD (11.4m and 24.4m below OD).

4.6.47. In the northern half of the survey area a sediment unit generally 1 to 3m thick, is observed overlying the Pleistocene gravels. Towards the centre of the survey area this unit is up to 7m thick (**Figure 11**). This is observed as an acoustically transparent layer and based on the vibrocore data is interpreted as a fine-grained unit of Holocene age (Unit 3).

4.6.48. The unit representing Recent estuarine alluvium (Unit 4) observed in the vibrocores is generally to thin to be discerned from the sub-bottom profiler data (<0.5m thick). The sediment cover in this area is patchy, with some fine and some coarser patches. There are some areas of sandwaves, with the crests oriented approximately southwest to northeast. Occasional dredging scars are observed along the length of the area.

4.6.49. Four vibrocores were acquired in the Hook survey area (**60V**, **62V**, **63V** and **66V**). Of these, three vibrocores underwent stage 2 geoarchaeological recording (**62V**, **63V** and **66V**). In the location of vibrocore 60V, the geophysics data was interpreted as a this layer (<1m thick) of Holocene sediments overlying approximately 1.8m of Pleistocene gravel over bedrock. These units are confirmed in the vibrocore (sand overlying gravel to a depth in excess of 1.5m) as illustrated in **Figure 11**.

4.6.50. Vibrocore **66V** is situated to the south of the area on a terraced bank at the eastern edge of the channel. The geophysics data were interpreted as a veneer of modern sediments overlying approximately 2.5m thick unit of Pleistocene gravel overlying bedrock. The vibrocore sediments were interpreted as 0.3m of Recent marine sand overlying in excess of 1.5m of Pleistocene fluvioglacial gravel, confirming the geophysical results.

4.6.51. Layers of peat are recorded in vibrocores **62V** and **63V** within a unit interpreted as estuarine alluvium. This layer is identified on the geophysics data overlying the Pleistocene gravel layer.

4.6.52. A localised are of seismic blanking is observed on the edge of the eastern bank approximately 30m south of vibrocore **62V**. The vibrocore **62V** lists organic matter and peat layers within the top 3.5m. This is likely the source of the shallow gas causing the blanking.

4.6.53. It is proposed that the channel will be widened to encompass the Hook survey area and to a depth of 13.8m below CD. This results in up to 7.4m of sediments removed, which impacts all 4 identified sedimentary units identified. In particular, the Holocene layer of organic sediments and peat will be removed (**Figure 11**). Unit 3 sediments are observed on the cross lines extending onto the banks to the east of the survey area. As such, the palaeoenvironmental record of this unit will be preserved, however the extent of the peat within Unit 3 can not be estimated based on the sub-bottom profiler data.

THORN

4.6.54. Water depths vary between 5.8m and 22.5m below CD (8.5m and 25.2m below OD). Most of the area consists of the Western Approach Channel (WAC) and the southwest end of the Thorn Channel. This area is clearly defined in the bathymetry and has a general seabed depth of 13.5m below CD (16.2m below OD). There are shallower areas beyond this dredged channel to the west and east. Water depths increase sharply to the south of the WAC. A small natural channel runs approximately northwest-southeast near the centre of the WAC. The channel measures approximately 650m long by approximately 200m wide (at its maximum) by approximately 3m deep. A further channel/depression to the north of this runs approximately northeast-southwest. This measures approximately 650m long by approximately 100m wide by approximately 3m deep. The general depth of the eastern area beyond the dredged channel is approximately 10m below CD (13m below OD). The general depth of the deep southern area is 20.7m below CD (23.5m below OD).

4.6.55. Within the survey area three sedimentary units are observed (**Figure 12**). The dominant unit comprises a series of south-west dipping parallel reflectors interpreted as bedrock (Unit 1). Within the western section of the maintained channel area this unit is primarily observed close to the seabed with an overlying veneer of sediments. The overlying sediments thicken to the north-eastern limit of the survey area where and to the east of the survey area where the top of the bedrock is observed up to 6m below seabed. The bedrock is likely to comprise Eocene Barton Clay Formation of the Barton Group (British Geological Survey 1995).

4.6.56. Vibrocores **78V**, **79V** and **84V** are positioned in areas where the sub-bottom profiler data indicates the presence of bedrock at the seabed. The vibrocores indicate 0.12m, 1.3m and 0.07m of sand and gravel overlying bedrock, respectively. This veneer of sediments is not clearly defined on the sub-bottom profiler data. Vibrocore **77V** indicates 0.06m of gravel overlying sand to a depth of 2.3m sub-seabed. The vibrocore is not situated along a sub-bottom profiler data line and as such the two datasets are not directly comparable. The sub-bottom profiler data situated on either side of the vibrocore **77V** indicates that the bedrock is present at the surface and does not indicate a 2.3m thick layer of sediments below the seabed. This indicates a possible pocket of sediments around the location of **77V** rather than an extensive feature. The gravels are likely to be of Pleistocene age. Where observed, the surface of the Pleistocene gravel layer is observed between 9 and 22m OD. To the west of the survey on Bramble Bank the top of the gravel layer is observed between 11 and 16m below OD. To the east of the survey area the top of the gravel layer is observed between 16 and 25m below OD.

4.6.57. Vibrocores **81V** and **85V** are situated where the sub-bottom profiler data indicates a unit of sediments overlying the bedrock. The vibrocores indicate 3.96m and 2.7m of sand and gravel, respectively (the bedrock is not observed in the vibrocores). The sub-bottom profiler data indicates a sediment unit 3.9m thick at the location of **81V** and 3.5m 12m to the west of 85V.

4.6.58. A further unit of finer grained sediments indicated by an acoustically transparent layer is observed on the outside the maintained channel where the seabed deepens to the south of the maintained channel and to the north on Bramble Bank. This layer is predominantly 1 to 2m thick but does thicken to 5.3m on Bramble Bank and is interpreted as Holocene age (Unit 3).

4.6.59. A veneer of sandy sediments (Unit 4) are not observed on the sub-bottom profiler data but are observed on the sidescan sonar data. Sandy sediments are observed covering the seabed throughout the survey area. The southern edge of the Western Approach Channel is clearly seen. To the south of the area sandwaves are observed with crests aligned between northwest to southeast in the west and nearer north-south in the east. There is also a large patch of sandwaves in the eastern corner of the survey area, with the crests aligned approximately north-south. The sediments in the northwest of the area, in the Thorn Channel are more varied with some areas of coarser material. There are large areas of sandwaves here too with their crests oriented approximately northwest to southeast. Many dredging scars are seen to the north of the channel edge.

4.6.60. Currently, the Thorn Channel area is maintained to a depth of 12.6m below CD, but the current plans propose to deepen this area to 13.8m below CD. A large proportion of the area will be affected by the dredge deepening. Within the southwest-northeast orientated extent of the channel this deepening will affect the bedrock. To eastern portion of the area and around the edges of survey area, Pleistocene gravels will be removed. Only on the northeastern edge of the area (the western edge of Bramble Bank) will the surface of the Pleistocene gravels and any overlying Holocene sediments be affected by the dredging proposals. Up to 4.2m of sediments will be removed by the deepening of the dredged area. Of this up to 3.2m of Pleistocene gravels may be removed and up to 2.5m of Holocene sediments. However, as the removal of Holocene sediments only affects the very edge of the dredging area, impact on these sediments, overall, will be minimal.

SHOAL

4.6.61. In the SHOAL area the depth varies between 14.8m and 18.7m below CD (17.5m and 21.4m below OD). The area consists of three raised mounds (**Figure 13**), centred on 456633E 96253N (northern mound), 456601E 96180N (eastern mound) and 456479E 96176N (western mound). The northern mound is the shallowest with a minimum depth of 14.8m below CD (17.5m below OD) and measures approximately 120m east-west and approximately 60m north-south. The eastern mound has a minimum depth of 15.1m below CD (17.8m below OD) and measures approximately 110m east-west and approximately 75m north-south. The western mound has a minimum depth of 15.2m below CD (17.9m below OD) and measures approximately 70m east-west. The width cannot be measured as it extends beyond the survey area but it is in excess of 25m. The north and east mounds are connected by a less upstanding ridge. The deepest area is in the northeast of the survey area. The general seabed depth around the mounds is approximately 17.3m below CD (20m below OD).

4.6.62. The four sediment units identified in survey areas within Southampton Water are also observed within the SHOAL survey area (**Figure 13**).

4.6.63. A unit interpreted as bedrock (Unit 1) is observed in excess of 9m below seabed. The bedrock is interpreted as Tertiary Eocene sediments (likely Barton and Bracklesham Groups). Overlying the bedrock is a relatively thin unit of seismically transparent reflectors. The nature of these sediments is unknown but may represent weathered bedrock or an Early Pleistocene deposit.

4.6.64. Overlying this unit is a unit of sub-parallel sloping onlapping reflectors (Unit 2) (**Figure 13**). This unit is interpreted as coarse grained sands and gravels and forms a series of three banks which shoal in the area (**Figure 13**). It is likely that this unit is Pleistocene in age and was deposited as banks within a fluvial deposition environment. A unit of younger sediment is observed draping the flanks of the banks (Unit 3) (**Figure 13**) which is likely to be Holocene in age. Vibrocore **86V** is situated approximately 90m south of the survey area and indicates a veneer of modern seabed sediments overlying 4.4m of soft clay becoming gravelly with depth. Outside the survey area, to the east, an extensive area of seismic blanking is observed associated with a strong reflector observed directly overlying Unit 2. If the blanking is caused by the presence of shallow gas then this would indicate the presence of organic matter within the Holocene sediments.

4.6.65. The uppermost sediment unit (Unit 4) is observed throughout the survey area as a veneer of sediment increasing in thickness where small sandwaves occur, orientated north south, associated with the gravel bank. This sediment unit is interpreted as recent marine seabed sediments. To the north of these sandwaves is a featureless area of sandy seabed.

4.6.66. The water depths in this area are between 14.5m to 18.9m CD. The dredging design proposes to dredge to a depth of 15.0m below CD. This only affects two small areas within the survey area and one within the buffer zone to the southwest. Dredging of 0.5m in these areas will impact recent seabed sediments, namely those forming the sandwaves. Where the sandwaves are absent the dredging may have some impact on the Pleistocene gravel bank.

HORSE

4.6.67. The water depths vary between 15.0 and 21.6m below CD (17.8m and 24.3m below OD). The shallowest area is in the centre of the survey area and the seabed slopes away in all directions towards the edge of the survey area and beyond (**Figure 14**).

4.6.68. On the sub-bottom profiler data three distinct sedimentary units are observed. The uppermost unit is relatively acoustically transparent with occasional dipping reflectors and is observed overlying a unit of high amplitude sub-parallel reflectors overlying an acoustically transparent layer.

4.6.69. The deepest unit is interpreted as bedrock and is likely to belong to the Eocene Barton Group (British Geological Survey 1995). The uppermost layer of this unit is observed between 9m sub-seabed towards the north of the survey area and 22m sub-seabed in the centre of the survey area. This boundary is observed between 29m and 41m below OD.

4.6.70. Unconformably overlying the bedrock unit is a unit interpreted as coarse sands and gravels and are likely to be Pleistocene gravels (Velegrakis 2000). The uppermost boundary of this unit is observed between 2.5m sub-seabed towards the north and

east of the survey area and 12m sub-seabed in the centre of the area (22m and 33m below OD). This unit varies between 3 and 12m thick. It is thickest to the east and thinnest in the centre of the area. A strong reflection is observed within this unit in the centre of the survey area and is interpreted as possibly marking a separate phase of deposition of the gravels (**Figure 14**).

4.6.71. The uppermost unit is interpreted as Holocene sands and gravels and varies in thickness between 2.5m and 12m. A veneer of Recent sediments (Unit 4) are not discernible on the sub-bottom profiler data, however are observed on the sidescan sonar data thickening in places to form low sandwaves over the entire area, oriented with there crests aligned approximately south to north. There are three isolated mounds covered with sandwaves in the southern corner (**Figure 14**).

4.6.72. Within the Horse area the current proposal is to dredge to a depth of 15.0m. The bathymetry survey indicated seabed depths of 15.0 to 21.6m CD. As such, the sediments in the survey area will not be impacted by the proposed dredging operations.

NAB

4.6.73. Water depths vary between 11.6m and 19.9m below CD (14.3m and 22.6m below OD). The survey area covers the Nab Channel with the shallowest areas to the east and west extremes at the ends of the cross-lines. The deepest area is at the northwest end of the survey area. The general seabed depth along the channel is approximately 17.5m below CD (20.2m below OD). Across the northwest arm of the channel are two shallower areas. These are oriented north to south and northeast to southwest, measuring approximately 500m wide and 2m high, and up to 600m wide and 2.5m high, respectively (**Figure 15**).

4.6.74. Four distinct units are observed on the sub-bottom profiler data (**Figure 15**). The basement layer is interpreted as bedrock (Unit 1). To the north of the survey area this unit is seismically transparent, however, in the southwest corner of the survey area a bedrock high is observed. This high is observed as an anticline, and the top of the anticline is observed less than 1m sub-seabed on the edge of the survey area (**Figure 15**). Apart from this anticline feature the top of the bedrock layer is observed between 1.4m in the northeast of the survey area deepening to 26.3m sub-seabed. This is 15.2m to 41.3m below CD (17.9m to 44.0m below OD). The top of the anticline is observed at 16.5m below CD (19.2m below OD).

4.6.75. Overlying Unit 1 is a unit up to 13m thick of chaotic reflectors indicating a high energy deposition environment and is interpreted as likely Pleistocene gravels (Unit 2). The top of this unit is observed throughout the survey area between less than 1m sub-seabed associated with the anticline structure and also in the northeastern section of the survey area. Apart from around the anticline structure the top of this unit is observed between 15.5m below CD (18.2m below OD) in the northeastern section of the survey area and 36.4m below CD (39.1m below OD) to the extreme southeast of the survey area. A gravel unit is also associated with the anticline structure in the southwest of the survey area (**Figure 15**). A unit of closely parallel reflectors are observed draping the edges of the structure. Although, seismically the bedrock and the draping unit have similar seismic responses the change in reflector angle indicates a difference in deposition times i.e. the sediments draping the anticline were deposited after the formation of the anticline. It is difficult to discern if the sediments draping the anticline are the same age or were deposited in the same environment as the Pleistocene gravels (Unit 2). However, it is likely that they were deposited during the Late Tertiary/Early Pleistocene.

4.6.76. Overlying the Pleistocene gravels is a series of closely spaced sub-parallel reflectors generally dipping to the north and west. These sediments are observed draping the gravel banks associated with the anticline structure (**Figure 15**). To the northeast of the survey area the sediments are observed draping the Pleistocene Gravel highpoint described above. Based on vibrocore data (**91V**, **93V**, **94V** and **96V**) this is interpreted as a series of silt, clay and sand layers with occasional instances of organic staining within the clay layers. These sediments are interpreted as Holocene and are possibly equivalent to the Unit 3 silts and clays observed in Southampton Water.

4.6.77. A localised are of blanking is observed in towards the north of the southeast-northwest orientated section. The area of blanking measures 295m wide (orientated southwest to northeast) by 200m.

4.6.78. A unit of sediment is observed over the survey area, generally less than 1m thick thickening to approximately 4m in localise areas, and is interpreted as Recent sediments (Unit 4).The seabed in the northwest of the survey area is covered by sandy sediments with patches of sandwaves with their crests aligned approximately north-south. Patches of gravel are seen in the middle of the area along the centre of the survey area. At the southeastern end are patches of coarser sediments on the eastern side while the western side appears covered by sands. Where the southernmost cross-line extends to the west beyond the survey area the seafloor appears to be covered by gravel, possibly indicating the presence of Unit 2 gravels at the seabed associated with the top of the anticline structure. Just to the north of this southernmost cross-line is a patch of rippled, coarse sediment.

4.6.79. The Nab Channel is currently maintained to a depth of 13.3m below CD. The new scheme proposes that the channel will be maintained to a minimum of 14.8m below CD.

4.6.80. Dredging to a depth of 14.8m below CD will impact the outer edges of the survey area in the southern section of the survey and localised sections of the western edges of the survey area in the north. The dredging will primarily impact Units 4 and the upper sediments of Unit 3. Over the anticline structure in the south the thin layer of Unit 3 overlying the structure will be impacted. If the area is dredged to in excess of 15.2m below CD the anticline structure and any gravel associated with the top of this unit will be impacted.

SNAB

4.6.81. Water depths vary between 14.1m and 20.8m below CD (16.8m and 23.5m below OD). An east-west orientated ridge marks the shallowest area at the southeast end of the survey area. Along the southwest edge of the survey are two mounds are observed (**Figure 16**). The western mound measures approximately 100m long orientated northwest to southeast and approximately 60m wide. It has a minimum depth of 14.9m below CD (17.6m below OD). The eastern mound measures approximately 90m long orientated northwest to southeast and approximately 55m wide. It has a minimum depth of 14.6m below CD (17.3m below OD). These mounds form part of a main ridge which curves around the southwest edge of the survey area. To the north of each mound a depression is observed, possibly caused by scouring, and measure approximately 150m across and approximately 1.5m deep.

4.6.82. Throughout the South Nab area no sub-seabed reflectors were observed on the sub-bottom profiler data (**Figure 16**). This area has been interpreted as a thin layer of surficial sediment (<1m) overlying bedrock. The surficial sediment is likely to

comprise gravel (British Geological Survey 1990) however was observed on the sidescan sonar data to be primarily to be covered by sandy sediments. Along the southwest side of the area the underlying material shows through. The southern half of the westernmost of these areas is surrounded by a patch of sandwaves with their crests aligned approximately northwest to southeast (**Figure 16**). Discontinuous patches of sandwaves are also present along the southern edge of the rest of the exposed bedrock.

4.6.83. The bedrock is likely to belong to the Wealdon Group of the Lower Cretaceous (British Geological Survey 1995).

4.6.84. Within the South Nab survey area the seabed is observed 14.1 to 20.8m below CD. The dredging proposal is to deepen the shoal patches to 15.0m CD.

4.6.85. There are three shoals observed on the bathymetry data which will be impacted by the dredging operations. The dredging proposal is to reduce these shoal patches to 15.0m. As such, across the three shoals around 0.9m of sediment will need to be removed. This is likely to comprise surficial sediments and possibly bedrock.

UKHO Wreck 19569

4.6.86. The UKHO charted wreck 19569 is situated approximately 1.1km to the west of the Shoal survey area (**Figure 17**).

4.6.87. The water depth varies from a minimum depth of 17.5m below CD (20.2m below OD) to the northeast, to a maximum depth of 21.3m below CD (24.0m below OD) in the southwest. Small sandwaves are observed throughout much of the area with occasional rocks visible.

4.6.88. UKHO 19569 is situated in the maintained channel, but does not lie within an area where channel deepening is proposed.

UKHO Wreck 19580

4.6.89. The UKHO charted wreck 19580 is situated less than 0.1km to the west of the northwestern end of the Horse survey area (**Figure 18**).

4.6.90. Within the survey area around the wreck the water depth varies between 16.2m and 24.5m below CD (18.9m and 27.2m below OD). The seabed slopes down from the northeast to the southwest and the general depth within the area is observed at 21m below CD (24m below OD). An upstanding area near the position of wreck 19580 (**7010**) is observed measuring approximately 0.8m high, with a minimum target depth of 22.2m below CD (25.2m below OD). It appears to be a spur or ridge projecting out from the northeast to the southwest. This area is covered by sediments with low sandwaves over much of the area. It is otherwise featureless.

4.6.91. UKHO 19580 is situated in the maintained channel, but does not lie within an area where channel deepening is proposed.

Add summary of prehistoric potential

4.7. ROMAN AND LATER ACTIVITY WITHIN THE STUDY AREA

The Roman Period (43AD – 410AD)

4.7.1. Roman occupation of Britain did little to disturb the settlement patterns of the local population (Basford 1980: 31). Two Roman finds have been recovered from within the Study Area, firstly parts of amphora and other remains dredged up from the seabed (**WA 2028**) and the second was a 'large ancient vessel' was found in the mud in 1848 (**WA 2027**) and at the time believed to be Roman in date. No remains from the vessel survive today and it is thus not possible to conclude whether or not the interpretation made at the time was correct. The local terrestrial finds along with the existence of a Roman town on the River Itchen suggests that there is some possibility for Roman remains to be discovered during the proposed development. .

The Medieval Period (1066AD – 1539AD)

4.7.2. The only recorded find from within the Study Area is that of a piece of pottery (**WA 2029**). This may relate to a vessel loss, however it is more likely to represent material discarded overboard within what would have become and increasing busy waterway during this period.

4.8. MARITIME ARCHAEOLOGY

Known Sites

4.8.1. Records of wrecks and obstructions within the Study Area were gathered from data provided by the NMR, Hampshire County Council SMR and UKHO data. All co-ordinates were converted into National Grid OSGB36 using the Geodetic Calculator v2.4.1 converter. 46 features fall within the Study Area.

4.8.2. The records may be classified by type as follows:

Wreck type	Total
Live Wrecks	5
Lifted Wreck	0
Dead Wrecks	2
Seabed Finds	3
Wreckages	9
Net Fasteners	27

4.8.3. There are seven identified wrecks within the Study Area two of which are 'Dead', and five are 'Live' wrecks. A 'Dead' wreck is a wreck not detected by repeated surveys and therefore considered to not exist by the UKHO. A 'Live' wreck is a wreck considered to exist by the UKHO.

4.8.4. The sites classified as 'Dead' by the UKHO are **WA 2009** and **2010**. The *Moody Blue* (**WA 2009**) wrecked in 1983 has yet to be located since it was first recorded. It is probable that the wreck was of a modern yacht and holds little archaeological importance. The *Lucile* (**WA 2010**) wrecked at an unknown date, has not been located and is believed to have broken up following explosives being used to remove the mast; if anything does survive. It is difficult to establish the level of surviving archaeology on these sites without further research. However, it is possible that even though the sites are considered 'Dead' that there may be some remains from these vessels surviving within the Study Area.

4.8.5. The sites classified as 'Live' by the UKHO are **WA 2000, 2001** and **2004 – 2006**. The *Sir Jasper* (**WA 2000**) was a British J24 class yacht that sank in 1981 whilst

overtaking in a race. It was recorded as sinking near nab buoy 3 although no exact position is known for the wreck. It is a relatively modern wreck and has little or no archaeological potential. The *Luciston* (**WA 2001**) is a British steam ship that was torpedoed in 1917 whilst on its way to Boulogne. It had a portion of its hull from the boiler to the stern blown away. A recorded length of 96m of the hull still remains on the seabed along with 11.6m of its beam. The *Moonraker* (**WA 2004**) was a fishing vessel, wrecked in 1990 that measured 4.9m in length and 0.6m in height. The *Glen* (**WA 2005**) is a British fishing vessel that was wrecked in 1981. It is recorded as being 10m long by 2m wide and 2.8m high. The *Vanessa* (**WA 2006**) was a British cabin cruiser that was wrecked in 1981. It is recorded with a height of 1.8m and a 1m deep scour around it.

4.8.6. From the data available it is possible to make an initial assessment of the archaeological importance of these 'Live' wrecks. Sites (**WA 2000, 2004 - 2006**) seem to poses a low level of importance due to their relatively modern date and their lack of features of special interest.

4.8.7. The outline history of the *Luciston* (**WA 2001**) is that she was built as the *Red* Cross in 1890 with a gross registered tonnage of 2877. The vessel, renamed the *Luciston* in 1917, was torpedoed by submarine UC71 while travelling from Southampton to Boulogne with government stores on December 24th 1917. It is difficult to establish the importance of this vessel without further research, however as a vessel built within a period of considerable change in shipbuilding and as a wartime loss, the *Luciston* may be considered to have at least local importance.

4.8.8. There are three sites that have been classified as seabed finds (**WA 2008, 2018** and **2020**). Record **WA 2008** was identified as swamped moorings, ground chains remain on seabed following the removal of the After Barn mooring buoy. The feature has a very low level of archaeological importance. Record **WA 2018** was recorded as 8.2m long, 2.7m high with a diameter of 2.1m and a 1.3m scour surrounding it. Upon further investigation it was discovered that the feature was in fact the remains of a tree trunk, the date of which is unknown, and until further research is completed it will not be possible to accurately assess any archaeological importance for this feature. Record **WA 2020** has been identified by divers as a 1.7m high cylindrical navigation buoy fitted with a tripod light. The feature is likely to posses a very low level of archaeological importance. However, if it can be identified as a historic marker buoy then this archaeological importance may need to be re-assessed.

4.8.9. The nine sites classified as 'Wreckages' include seven unknown, undated wrecks (**WA 2014 and 2130-2135**), and two wrecks of known dates, but nameless vessels (**WA 2002 and 2007**).

4.8.10. The seven unknown undated wrecks represent noted anomalies from various surveys. However due to the lack of data no assessment can be made regarding their archaeological importance. The fact that there has been material recorded in those positions means that the potential for archaeological remains must be considered to be medium to high. The two unnamed wrecks of known date could both be assessed as being of low to medium archaeological importance due to their relatively modern date of loss (1988 and 1970 respectively).

4.8.11. The sites classified as 'Net Fasteners' by the UKHO, NMR and Hampshire County Council SMR are **WA 2011-2013, 2015 – 2017, 2019 and 2110-2129**. There are 26 unidentified net fasteners/features that have been recorded within the Study Area. These features could represent some of the 72 Named Location loses (referred to in 4.6.12. below). However no assessment can be made regarding the archaeological

importance of these features due to the lack of information available. It is also entirely possible that the 'Net Fastenings' sites could be caused by natural geology. In which case the archaeological importance would not be an issue (but any environmental impacts on the natural features would then have to be assessed by suitable contractors).

Archaeological Potential

4.8.12. The NMR and SMR hold records of documented losses for which no grid reference can be confirmed. These records are attached to arbitrary points called Named Locations (NLOs). These points have been chosen to represent general loss locations, and do not (except by chance) relate to actual seabed remains.

4.8.13. The NMR/SMR holds a total of 72 records for Named Location losses within the Study Area (**WA 2030-2101**). 64 of these are represented by one point, British National Grid 462500 095050. The other eight Named Locations are for the point, British National Grid 447169 104958. As stated previously these positions are only general positions and do not (unless by chance) relate to actual seabed remains. However, this does not rule out the possibility of such remains appearing within the Study Area.

4.8.14. All the processes by which casualties or wrecks have been recorded militate against the desktop identification of older wreck sites. The potential for wrecks within the Solent covers all periods, perhaps dating as far back as the inundation of the area during the period between the Mesolithic and the Iron Age. Although the potential for the survival of early prehistoric boats in UK waters is speculative, slender Mesolithic log-boats have been found in Denmark. Various Bronze Age boats and cargoes have been found around the coast of England and Wales, notably in Langdon Bay near Dover, the Ferriby Boats found on the Humber and the Poole Harbour Log Boat, found in Poole Harbour. To date these discoveries have been made at or close to the shore rather than in open waters, possibly reflecting patterns of ancient seafaring that favoured inland waters or routes close to the shore.

4.8.15. By the sixth century AD cross-Channel vessels were clearly using Portsmouth Harbour and were also docking at the Saxon port of *Hamwic*. The Anglo-Saxon Chronicle records that in AD 501 'Port and his two sons…came to Britain with two ships at the place which is called Portsmouth' (Cunliffe 1993). The Victoria County History records historic events associated with the Solent, such as the embarkation of Edward I in 1114 and 1123 (Doubleday and Page 1920). The strategic advantages of the Solent were such that King John had a number of galleys permanently stationed at Portsmouth, for which an enclosed dock was ordered in 1212. England's first dry-dock was built at Portsmouth in 1496 in what was to become the Royal Dockyard. All these references testify to the regular use of the Solent as a shipping lane.

4.8.16. The Solent can therefore be considered to have been in use for shipping for over 2000 years. However, it was the years between 1650 and 1800 that were of vital importance for the region as Portsmouth and Southampton grew and the Solent area acquired a status that was both national and international. The volume of traffic and the congestion caused by the (relatively) narrow waterway are hazards that can be expected to have caused maritime casualties in the past. In addition to the potential for wrecks consideration must also be given to the potential for stray items, lost or thrown overboard within the Solent over the centuries that are now of archaeological interest.

4.9. GEOPHYSICAL SURVEY RESULTS

4.9.1. All geophysical anomalies identified in the sidescan sonar and magnetometer data were assessed in terms of archaeological potential and classified in terms of anomaly type e.g. debris, seafloor disturbance etc. Anomalies were then grouped where the same object was seen in more than one line of data or several anomalies form a discrete site. Groups of anomalies and individual anomalies of potential archaeological interest that are contained within the area were given 7000 identification numbers. Where UKHO records fall within an area these are grouped with the geophysical anomalies where appropriate or otherwise given their own 7000 number. The original 2000 numbers from the table of UKHO wrecks and obstructions (**Appendix II**) are retained within the geophysics gazetteers (**Appendix IV**).

4.9.2. It should be noted that in order to ensure the required survey areas were fully covered the majority of survey lines extend beyond the boundaries of these areas. All sites described as being within an area are those contained within the survey area and 40m buffer (see **Section 3.6**).

4.9.3. The sites of potential archaeological interest are discussed on an area by area basis. Not every anomaly is described in detail but a summary of all sites within each area is given and a detailed list of all sites is included in the geophysics gazetteers in **Appendix IV**.

4.9.4. It is not possible to tell whether features interpreted as dark reflectors, bright reflectors, seafloor disturbances or small items of debris are of anthropogenic origin. Further investigation would be necessary to define their archaeological potential.

BERTH

4.9.5. Although the principle reason for surveying this area was to determine the extent of concrete here the data was also examined for items of potential archaeological interest. Apart from the extent of the concrete, which was determined in the bathymetry data (**Section 5.1**) five sidescan sonar anomalies and one bathymetric anomaly were observed over the area. No magnetic anomalies were observed. The observed anomalies were grouped to produce a total of five sites. All are listed in a gazetteer of sites in **Appendix IV-A**. No known wrecks or obstructions were present in the survey area.

4.9.6. Site **7020** is a scatter of modern debris measuring 64.9m x 17.6m x 0m observed at the southern end of the survey area.

4.9.7. Site **7021** is a bright, sharp-edged reflector measuring 12.8m x 2.9m x 0m of modern origin (**Figure 6**). It has a diffuse dark area extending for 1.4m to the west that may possibly be a scour feature. This feature corresponds with a depression (~ 15m x 15m x 0m) observed in the bathymetry data at the southern end of the concrete.

4.9.8. The remaining three sites are all objects of debris towards the northern end of the survey area. **7022** measures 1.6m x 1m x 0.3m while **7023** measures 0.8m x 0.5m x 0m and has a bright reflector in front that extends out by 1m and may be a scour. **7024** measures 5.9m x 0.2m x 0.1m but is situated on the turn at the end of the survey line and hence has poor positioning and inaccurate dimensions.

WD

4.9.9. A total of 31 sidescan sonar anomalies and one magnetic anomaly were observed in the data collected over this area. These were grouped together to produce a total of 20 sites, of which five are of potential archaeological interest and contained within the area. These are listed in a gazetteer of sites in **Appendix IV-B**. No known wrecks or obstructions are present in the area.

4.9.10. Sites **7182** and **7183** are both areas of seafloor disturbance. **7182** measures 8m x 6.9m x 0m and contains several dark reflectors. **7183** measures 11.8m x 8.7m x 0m and contains some debris. Both are situated near the northwestern end of the area.

4.9.11. A single item of debris (**7180**) was observed (**Figure 7**). This linear object measures 8m x 0.4m x 0.3m.

4.9.12. A large bright reflector (**7181**) with hard edges measuring 10.2m x 2.2m x 0m is located near the southeast end of the survey area, on the edge of the main channel. It has been interpreted as possibly being an item of debris.

4.9.13. The final site (**7184**) is a dark reflector that also may be an item of debris. It measures 6.2m x 0.2m x 0m and is situated near the northwestern end of the area.

FAW

4.9.14. A total of 45 sidescan sonar anomalies and 10 magnetic anomalies were observed in the geophysical data collected during the survey of this area. These were grouped together with the known wrecks and obstructions to produce a total of 45 sites, of which 29 were of potential archaeological interest and contained within the survey area. These are listed in a gazetteer included in **IV-C**.

4.9.15. The sidescan sonar anomalies were located near the ends of the survey area with the central portion not containing any. The magnetic anomalies however were contained within the central and eastern portions of the survey area.

4.9.16. Over half the sites (17) are individual items of debris (**7060-8, 7070-3, 7075-8**) which are spread throughout the area (**Figure 8**). Except for one feature they are all less than 6m in size with the smallest being 0.7m x 0.4m x 0.1m (**7068**) and the largest a linear object measuring 13.7m x 0.1m x 0m (**7067**).

4.9.17. Two dark reflectors were observed measuring 4.4m x 0.9m x 0m (**7069**) and 2.3m x 0.6m x 0m (**7074**) (**Figure 8**).

4.9.18. The nine sites containing magnetic anomalies (**7080-8**) range in magnitude from 12.79nT (**7080**) to 85.98nT (**7081**). None are associated with any sidescan sonar anomalies and are thus likely to indicate buried metal debris.

4.9.19. The one known wreck or obstruction is site **7079**. This is classified by the UKHO as undefined and was a wreck observed during route survey operations in January to February 2006. No details were given. Nothing was observed at this location in the geophysical datasets.

ESSO

4.9.20. A total of 33 sidescan sonar anomalies and two magnetic anomalies were observed in data collected during the survey of this area. The observed anomalies were grouped to produce a total of 31 sites, of which 26 were of potential archaeological interest and contained within the survey area. These are listed in a gazetteer of sites

in **Appendix IV-D**. No known wrecks or obstructions are present within this survey area.

4.9.21. The sites are concentrated in the eastern half of the survey area. The majority of sites, 14, are objects of debris (**7030-3, 7036, 7039, 7040,7046-9, 7051-3**). These vary in size from the smallest (**7053**) at 1m x 0.8m x 0.3m to the largest (**7040**) at 6.2m x 0.1m x 0.1m.

4.9.22. Site **7035** is the sole dark reflector that was observed in this survey area. It measures 3m x 0.3m x 0m.

4.9.23. Four bright reflectors (**Figure 9**) were observed (**7042-5**) located close together and with sizes from 1.4m x 0.5m x 0m (**7042**) to 4.2m x 0.6m x 0m (**7043**).

4.9.24. The remaining five sites (**7034, 7037, 7038, 7041** and **7050**) are areas of seafloor disturbance and are the largest features seen in the area at up to 16.9m x 8.2m x 0m (**7034**).

4.9.25. The two magnetic anomalies are sites **7054** and **7055**. These have magnetic amplitudes of 93.98nT and 157.49nT and were not associated with any of the sidescan sonar anomalies. It is likely that they are associated with buried metal debris.

PIPE

4.9.26. This area was investigated to try and locate the position of a pipeline (**Figure 10**) and was not assessed for sites of archaeological interest.

HOOK

4.9.27. A total of 23 sidescan sonar anomalies and 16 magnetic anomalies were observed in the geophysical data collected over this survey area. Once grouped together this produced a list of 20 sites of which 17 were of potential archaeological interest and located within the survey area. These are listed in a consolidated gazetteer of sites included in **Appendix IV-F**. No known wrecks or obstructions are contained within this area.

4.9.28. Eight sites (**7090-1, 7093-4, 7099-102**) are individual items of debris, all below 5m in size.

4.9.29. Two linear dark reflectors were observed near the northwestern end of the area measuring 4.1m x 0.1m x 0m (**7097**) and 2.1m x 0.2m x 0m (**7098**).

4.9.30. Two sites are bright reflectors (**Figure 11**) measuring 3.6m x 0.9m x 0m (**7092**) and 2.7m x 0.7m x 0m (**7095**).

4.9.31. One site (**7096**) consists of a seafloor disturbance measuring 5.8m x 1.1m x 0m situated adjacent to the bright reflectors (**Figure 11**).

4.9.32. The four sites (**7103-6**) containing magnetic anomalies are contained within the southeastern half of the area. No sidescan sonar anomalies are associated with them and they are therefore likely to result from buried metal debris. They range in magnitude from 22.20nT (**7106**) to 92.33nT (**7105**). The other 12 magnetic anomalies that are not included in the gazetteer of sites were located in a line across the survey area and approximately halfway along it. These resulted from a

tunnel under Southampton Water from Fawley power station that contains electrical cables and is marked on the Admiralty charts covering this area.

THORN

4.9.33. A total of 135 sidescan sonar anomalies and four magnetic anomalies were observed in the geophysical data collected over this area. These were grouped with the known wrecks and obstructions to produce a total of 62 sites, of which 25 sites are contained within the area and are of potential archaeological interest. These sites are listed in a gazetteer of sites included in **Appendix IV-G**.

4.9.34. One site, **7158**, is a broken up and widely scattered wreck covering an area measuring 112m x 72m x 0m within the survey area (**Figure 12**). There are many pieces of debris with sizes ranging from 0.8m x 0.5m x 0.3m up to 13.4m x 0.2m x 0.2m. Many of these objects are linear in form. In addition to the debris there are two large seafloor disturbances measuring 33.9m x 27.2m x 0m and 12.4m x 4.4m x 0m. The wreck is of a wooden day boat that was run down by a container vessel on 02/06/2005 (W. Heaps, pers. comm.). There is no magnetic anomaly associated with this wreck but this would not necessarily be expected given the boat's wooden construction. The wreck is located in the Thorn Channel at the northeastern end of the survey area. Further objects of scattered debris were observed beyond the survey area.

4.9.35. A further 15 sites (**7151-7, 7160-1, 7164-7, 7169, 7171**) consist of individual items of debris. These are generally located around the edges of the area, with the exception of **7165** which is located in the vessel turning area.

4.9.36. Five bright reflectors were observed (**7150, 7159, 7162, 7163, 7168**) with the smallest (**7163**) measuring 2.8m x 2.4m x 0m and the largest (**7162**) measuring 15.1m x 3.9m x 0m.

4.9.37. Two sites contain magnetic anomalies, **7173** has an amplitude of 20.72nT and **7174** has an amplitude of 9.92nT. Neither is associated with any other anomalies.

4.9.38. One area of seafloor disturbance (**7170**) was observed away from wreck **7158**. This measures 7.9m x 3.6m x 0m.

4.9.39. The only known wreck or obstruction is an area of foul ground (**7172**) which is classified by the UKHO as dead and for which no details are given. This site was not identified in the geophysical data.

SHOAL

4.9.40. A total of 20 sidescan sonar anomalies and one magnetic anomaly were observed in the geophysical data collected over this area. These anomalies were grouped with the known wrecks and obstructions to produce a total of 20 sites. Of these, 10 are of potential archaeological interest and contained within the area. These are listed in a gazetteer of sites included in **Appendix IV-H**.

4.9.41. Five sites are objects of debris (**7141-3, 7147-8**). These range in size from 0.7m x 0.5m x 0.3m (**7141**) to 4m x 0.3m x 0.4m (**7143**).

4.9.42. Four sites (**7140, 7144-6**) are bright reflectors. These are situated throughout the area with the smallest (**7145**) measuring 1.7m x 0.7m x 0m. The largest of these features is **7140**, a very bright reflector measuring 4.5m x 1.3m x 0m.

4.9.43. The single magnetic anomaly is site **7149**. It has an amplitude of 6.52nT and is not associated with any of the sidescan sonar anomalies.

HORSE

4.9.44. A total of five sidescan sonar anomalies and four magnetic anomalies were observed in the geophysical data collected over this survey area. These were grouped with the known wrecks and obstructions to produce a total of six sites, of which three were contained within the survey area and of potential archaeological interest. These sites are included in a gazetteer of sites in **Appendix IV-I**.

4.9.45. The rejected sites include the wreck **7010** as this was not located within the HORSE survey area. A full description of this site is given in the section on the Wreck 19580 survey area (this section).

4.9.46. The sites in the HORSE area consist of one seafloor disturbance (**7110**) and two magnetic anomalies (**7111-2**). The seafloor disturbance measures 3.6m x 2.6m x 0m and is interpreted as a possible depression or scour with an object. It is located on the southwest edge of the area towards the southeastern end. The magnetic anomalies are located also near the southwestern edge of the area but towards the centre. **7111** has a magnetic amplitude of 40.62nT while **7112** is somewhat smaller at 13.33nT.

NAB

4.9.47. A total of 33 sidescan sonar anomalies and four magnetic anomalies were observed in the geophysical data collected over the NAB survey area. These were grouped with the known wrecks and obstructions in the area to produce a total of 27 sites, of which 13 are located within the survey area and are of potential archaeological interest. These sites are listed in a gazetteer included in **Appendix IV-J**.

4.9.48. Five sites are objects of debris (**7120-2, 7124, 7126**). These are spread throughout the survey area and all are below 3m in size except for **7126** which measures 7.9m x 2.4m x 0m.

4.9.49. Two dark reflectors were observed (**7123** and **7127**) measuring 3.7m x 1.4m x 0m and 6.4m x 1m x 0m (**Figure 15**).

4.9.50. Only one bright reflector was observed (**7128**), near the northwest end of the channel. It measures 3.4m x 2.7m x 0m.

4.9.51. Of the three sites containing magnetic anomalies two were not associated with any other anomalies. **7131** has an amplitude of 14.74nT and **7132** has an amplitude of 11.21nT. The third site, **7125**, contains a magnetic anomaly with an amplitude of 271.75nT and a seafloor disturbance measuring 6.7m x 4.8m x 0m seen in the sidescan sonar data. This is located 21m southwest of the UKHO live obstruction 20192 which is situated 14m outside the area. The obstruction is described as having a minimum depth of 10.8m in a general depth of 12m but no further details are given. The seafloor disturbance appears as a bright reflector with dark areas in front and to one side with a possible depression behind.

4.9.52. Two known wrecks are reported to be contained in the area but neither were seen in the geophysical data. The positions of both are described as unreliable so it is possible that neither lies within the area. Site **7129** is the wreck of the *Sir Jasper*. This was a British J24 class yacht that capsized and sank in the vicinity of the Nab No 3 buoy while overtaking in a race on 01/11/1981. A small item of debris

measuring 2.1m x 0.7m x 0.2m was observed in the sidescan sonar data to lie 33m northeast of the given position of the wreck, 31m outside the area. It is possible that this object is related to the wreck. Site **7130** is the yacht *Moody Blue* which sank on 10/08/1983. This wreck is now classified as dead.

SNAB

4.9.53. A total of two sidescan sonar anomalies were observed in the data collected over this area. No magnetic anomalies were observed and there are no known wrecks or obstructions. Of the sidescan anomalies, one was located outside the area and the other was interpreted as fishing gear or other rope/cable caught on an upstanding rocky area. No sites of potential archaeological interest were observed in this area.

Wreck 19569

4.9.54. A total of nine sidescan sonar anomalies and one magnetic anomaly were found in the geophysical data in the survey over this wreck. These were grouped with the known wrecks and obstructions to produce nine features in total. All are listed in a gazetteer of sites in **Appendix IV-L**.

4.9.55. Site **7004** is a UKHO listed wreck (**Figure 17**). This wreck was seen on two lines of sidescan sonar data and the maximum anomaly dimensions are 10.7m x 9.2m x 0m. No magnetic anomaly was associated with this site. The UKHO record details that the wreck is an unknown GRP cabin cruiser that was lost in August 1988. It is reported to be largely buried in the seabed with some scattered debris around. It was last surveyed on 21/08/06 but no details were given. The most recent information comes from a survey on 17/06/05 with anomaly dimensions given as 10.7m x 2.6m x 2.8m. The length observed in the current dataset is the same as that from 2005 but the height is no longer apparent, suggesting perhaps that the wreck is now more broken up.

4.9.56. Site **7000** is an area of disturbed seafloor that measures 6.4m x 5.8m x 0m. It is similar in appearance to site **7004** and may possibly be an uncharted wreck.

4.9.57. Sites **7001, 7002, 7003, 7005** and **7006** are individual items of debris. These are generally approximately 1m in length but **7001** is considerably larger. This site is a linear item of debris measuring 6m x 0.6m x 0m.

4.9.58. Of the remaining sites, **7007** is a scatter of small debris items measuring 2.6m x 2.5m x 0m and **7008** is a magnetic anomaly with an amplitude of 71.05nT.

Wreck 19580

4.9.59. A total of 17 sidescan sonar anomalies were observed in the data collected over this wreck. No magnetic anomalies were observed. The sidescan sonar anomalies were grouped with the known wrecks and obstructions to produce six features in total. All are listed in a gazetteer of sites in **Appendix IV-M.**

4.9.60. Site **7010** is a UKHO listed wreck and was seen on four lines of sidescan sonar data (**Figure 18**). The wreck appears to be fairly coherent with maximum anomaly dimensions of 9.7m x 4.5m x 1.6m. Within the main structure of the wreck is an object measuring 2m x 1m although its height cannot be determined. Approximately 1m to the southeast of the wreck is an object of debris measuring 1.8m x 1.5m x 0.1m.On the southwest side of the object is a feature that appears to be a scour. This measures 4.6m x 1.9m x -0.5m. The UKHO records that the wreck is a wooden Torpedo Recovery Search Boat that sank whilst under tow on 30/05/1970. The

wreck was observed on 13/06/89 when it was surveyed by sidescan survey, with anomaly dimensions of 10m x 3m x 2.5m being recorded.

4.9.61. Of the remaining five sites, three are items of debris that may or may not be associated with the wreck (**Figure 18**). They are situated approximately 30m east of the wreck. **7011** is the largest at 3.8m x 0.2m x 0.1m while **7012** and **7013** measure 1.8m x 0.1m x 0.1m and 1.1m x 0.2m x 0m respectively.

4.9.62. Sites **7014** and **7015** are situated approximately 90m to the southwest of the wreck. Both are items of debris with **7014** possibly part of a mooring and measuring 3.5m x 1.2m x 0m. **7015** is somewhat larger at 5.5m x 1.1m x 0m.

Add summary

5. IMPACT AND MITIGATION

5.1. IMPACT

5.1.1. Two types of site may be present within the Study Area: drowned prehistoric sites and landscapes, and shipwrecks and their associated material. Both of these site types are likely to have been subject to disturbance prior to any potential effect arising from this development.

5.1.2. The main processes militating against the survival of prehistoric land-surfaces and any associated sites are the reworking of those deposits during the course of marine transgression. 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. That sites do survive this process is evidenced by the survival of many peat horizons and drowned forests around the coast of England.

5.1.3. The process of wreck formation is itself likely to be the main source of previous disturbance to wrecks within the marine study areas, as vessels reaching the seabed are likely to suffer various forms of collapse and decay before stabilising. The main post-depositional processes active in the area are likely to be sand movement and trawling. Sand movement may expose and rebury wreck, causing periodic instability that leads to physical, biological and chemical decay.

5.1.4. Where it exists, the construction of the current dredged channel and those before it may also have caused damage to any archaeological sites and finds, both in the area of the channel itself and the associated working corridor.

5.1.5. Any anomalies that lie within the current dredged channel are likely to be modern, as they are most likely to have been deposited following the creation of the existing dredged channel. The likely modern date for any anomalies within this area suggests that any finds would offer limited or no archaeological significance. However the potential for archaeological material to be discovered within the existing channel is still present.

5.1.6. The dredging scheme will definitely impact on areas of archaeological potential. The dredging will be completed by scraping up layers of the seabed down into the Pleistocene valley gravels in places. Any unknown wreck or aircraft remains will therefore be heavily impacted by the dredging process. Along with this the Prehistoric record that possible survives in the Pleistocene valley gravels and the Pleistocene and Holocene alluvium and peat is likely to be heavily impacted.

5.1.7. The areas where the widening and deepening of the existing dredged channel are those that hold the highest potential for discovering historical finds which will in turn hold the most archaeological significance. These areas have been given eleven separate names and the impact of the development on each will be looked at separately.

BERTH

5.1.8. The Berth area is already heavily developed and the geophysical results show that there is a large area of hard ground which probably represents an area of concrete associated with the development of the quay wall. The boreholes recovered from the area show the concrete section and suggest that it lies on natural geology which would suggest that any dredging in the area will not impact any of the Pleistocene/Holocene alluvium an peat or the Pleistocene gravels where there is the highest potential for prehistoric remains.

WD

5.1.9. The WD area will be deepened from 12.6m to 13.6m below CD, the dredging will impact on all of the sediment units including potentially significant Holocene sediments which may include peat layers. The impact on the Holocene sediments is not totally destructive as elements of this will survive on the banks to the west of the survey area. However any archaeology that is present within the removed sediments will be impacted.

FAW AREA

5.1.10. Currently the existing dredged channel is 12.6m below CD deep and will be deepened to 13.6m below CD during the proposed scheme. The sediments within the study area that will be impacted are the Holocene sediments observed during geophysical survey. During the survey the cross-lines of survey outside of the study area show that the Holocene sediments will still survive. The impact will not be as great as expected however any archaeology that is present within the removed sediments will be lost.

ESSO

5.1.11. Up to 3.6m of sediments will be removed during the dredging in the ESSO area. This will included up to 2.4m of Holocene sediments and up to 3.6m of Pleistocene gravels. The impact on the potential archaeology will therefore be high as both the Holocene and Pleistocene layers are being affected and it is unsure to what extent the same sediment layers survive outside of the study area.

PIPELINE

5.1.12. The pipeline section will be deepened by 1m from 12.6m to 13.6m below CD and will impact the Pleistocene gravels along with the recent alluvium. This offers a medium impact level as not all of the Pleistocene gravels in the section will be removed, but due to the potential for archaeology within this layer a more substantial impact than low is necessary.

HOOK

5.1.13. The existing channel will be widened in order to incorporate the Hook study area and will be deepened to 13.6m below CD removing up to 7.4m of sediments. This will impact on the Holocene sediments along with the Pleistocene gravels both of which offer the highest potential for archaeological remains. For this reason along with the unknown level of the sediments that will survive outside of the study area a high impact level is being atoned to this section of the scheme.

THORN

5.1.14. The Thorn channel area will be deepened from 12.6m to 13.8m below CD in total up to 4.2m of sediments will be removed including up to 2.5m of Holocene sediments and up to 3.2m of Pleistocene gravels. As this only affects the very edge of the study area the impact will be minimal and therefore will cause a low impact on any archaeology.

SHOAL

5.1.15. The water depths within the area are between 14.5m to 18.9m below CD. The dredging design for this area proposes dredging to a depth of 15m below CD and will only affect two small sections within the study area. Dredging of 0.5m will mainly impact the recent seabed sediments, namely those forming the sandwaves. However where the sandwaves are absent the dredging may have some impact on the Pleistocene gravels. Due to the small sections being impacted by the dredging the impact on archaeology in the area can be considered low.

HORSE

5.1.16. Within the Horse study area the current proposal is to dredge to a depth of 15m below CD. The Bathymetry survey indicates a seabed depth of 15.0 to 21.6m below CD. Therefore the sediments within the study area will not be impacted by proposed dredging operations. If no sediments are being impacted then the potential archaeology will not be impacted at all during the dredging scheme in this area.

NAB

5.1.17. The NAB channel is currently maintained to a depth of 13.3m below CD. The new scheme proposes deepening this to a minimum of 14.8m below CD. The dredging will primarily impact the recent seabed sediments along with the upper elements of the Holocene sediments. The impact on potential archaeology is therefore low as only the top layer of the sediment will be removed leaving behind a considerable amount of the Holocene sediments.

SOUTH NAB

5.1.18. The south NAB survey area is observed as being between 14.1m to 20.8m below CD. The dredging proposals are to deepen the shoal patches to 15m below CD. The three shoal patches will need approximately 0.9m of sediments to be removed. This is likely to comprise only surficial sediments and bedrock therefore the impact on potential archaeology is none existent.

5.2. MITIGATION

5.2.1. Should the footprint of the scheme change following the production of this report, a further full archaeological assessment of any new areas not covered by this document will be necessary.

5.2.2. The following measures are designed to mitigate the impact of the development upon known sites, and to clarify the situation with regard to unknown sites. It is recommended that all aspects of any further archaeological work be detailed by a Written Scheme of Investigation (WSI). The protocol would also provide for the reporting of any archaeological discoveries to Hampshire and Isle of Wight County Councils along with English Heritage.

5.2.3. Site **7158** is the scattered remains of a modern vessel sunk in 2005. It is not of archaeological interest and does not require any mitigation. Site **7000** west of the UKHO charted wreck 19569 is a possible uncharted wreck. It lies in the main channel but not in an area which is marked for deepening or widening. It therefore does not need any mitigation. Should dredging be required in this area in future further investigation of this site may be required.

5.2.4. The presence of sandwaves and significant thicknesses of recent sediment in several survey areas, which reach up to 4m thick in localised zones, indicates the possibility for buried material to be contained within these areas. This material may be of archaeological interest or may be modern debris. Many magnetic anomalies have been observed that do not have objects associated with them observed in the sidescan sonar data and it is likely that these are caused by buried objects.

5.2.5. The survey areas are the areas where potential archaeological remains are being removed from. Therefore whenever an impact on the archaeology is considered to be present, further work will need to be carried out during the dredging scheme. A watching brief is the preferred method to prevent the complete destruction of any unknown sites or find spots that might be uncovered during the dredging process. Therefore it is advisable that during any stage of the scheme that involves the removal of sections of sediment, an archaeologist should be present on the dredging vessel observing the sediment as it comes to the surface.

5.2.6. Along with the inspection of any marine geotechnical data by a suitably qualified archaeologist, the provision for the complete recovery of grab samples containing pre-inundation prehistoric material and/or organic deposits should be considered. The Pleistocene valley gravels (Unit 2) along with Pleistocene and Holocene alluvium and peat (Unit3) outlined in section **5.1.** present the highest potential for prehistoric or geoarchaeological remains to survive. These layers will be impacted by the dredging however more examples of these sediment layers will survive at other places along the water way. Therefore when these layers are cut into by the dredging only a small sample of each layer should be recovered for further geoarchaeological analysis.

5.2.7. A protocol should be prepared setting out procedures for dealing with any features that appear to be of archaeological importance that are discovered in the course of construction. The protocol will make provision for the institution of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice and, if necessary, for archaeological inspection of important features prior to further construction in the vicinity. The protocol will comply with the Merchant Shipping Act (1995), including notification of the Receiver of Wreck, accordance with the JNAPC Code of Practice for Seabed Developers and will follow the protocol for finds of Archaeological Interest (BMAPA/EH, 2005).

5.2.8. The WSI will also make provision for other forms of archaeological mitigation that might be required in the light of pre-construction investigations, including field investigation, post-fieldwork activities, archiving and dissemination of results.

5.2.9. It should be noted that if a wreck of historical, archaeological importance were to be discovered in the course of construction, then it would be possible for to be designated at very short notice, irrespective of any inconvenience to construction activities. Similarly, any aircraft wreck discovered in the course of construction will be automatically protected under the Protection of Military Remains Act (1986). It would then be an offence to carry out any unauthorised excavations within the immediate vicinity of such remains.

6. CONCLUSIONS

6.1. ARCHAEOLOGY WITHIN THE STUDY AREA

- There are six prehistoric find spots within the Study Area
- There are two Roman find spots within the Study Area.
- There have been no Anglo Saxon sites recorded within the Study Area.
- There has been one piece of medieval archaeology recovered from within the Study Area.
- There are no wrecks designated under the Protection of Wreck Act (1973) or the Protection of Military Remains Act (1986) within the Study Area;
- Within the Study Area there are 18 known wreck sites of varying conditions and status, therefore the potential for recovery of debris artefacts from one of these is medium to high.
- There are 27 unidentified net fastenings/features within the Study Area all of which have low to medium potential of producing recovered artefacts associated with them.

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APPENDIX I: CO-ORDINATES OF GEOPHYSICAL SURVEY AREAS

The co-ordinates of the vertices of the geophysical survey areas are all given in British National Grid (OSGB36 datum).

These areas do not include the 40m buffer zone that was added for the purposes of data processing and interpretation.

Berth

Vertex	Easting	Northing
1	438967	111743
2	439012	111711
3	439265	112236
4	439311	112215

WD

Vertex	Easting	Northing
1	439692	111715
2	439692	111715
3	439774	111738
4	440086	111658
5	440104	111692
6	440600	111437
7	440600	111437
8	440878	111230
9	440894	111232
10	441012	110933
11	441239	110746

FAW

Vertex	Easting	Northing
1	442592	109426
2	443144	108932
3	443863	108153
4	443984	108180
5	447148	105541
6	447211	105596

ESSO

Vertex	Easting	Northing
1	446403	105861
2	447140	105276
3	447172	104989

PIPE

Vertex	Easting	Northing
1	446505	105472
2	446580	105408
3	447096	106313
4	447178	106251

HOOK

Vertex	Easting	Northing
1	448099	104608
2	448303	104203
3	448781	103414
4	448857	103556
5	449194	102936
6	449576	102559

THORN

Vertex	Easting	Northing
1	447326	97965
2	447718	98114
3	448106	98091
4	448743	98916
5	448772	98615
6	448959	99372
7	448972	97907
8	449008	99931
9	449257	98227
10	449266	99730

SHOAL

Vertex	Easting	Northing
1	456452	96223
2	456462	96198
3	456542	96224
4	456597	96260
5	456603	96160
6	456668	96165
7	456687	96253
8	456692	96231

HORSE

Vertex	Easting	Northing
1	467605	92673
2	467640	92699
3	467646	92619
4	467771	92721
5	467967	92391
6	468484	92297
7	468504	92380
8	468522	92352
9	468524	92307

NAB

Vertex	Easting	Northing
1	471996	91116
2	472118	91013
3	472223	90984
4	472294	90925
5	472336	90741
6	472347	90671
7	472401	90772

8	472464	90898
9	473175	90386
10	473312	90656
11	473566	90119
12	473753	89717
13	473788	90331
14	474088	89914
15	474670	87466
16	474689	87572
17	474695	87502
18	474763	87648
19	474790	87828
20	474825	87854
21	474971	87801

SNAB

Vertex	Easting	Northing
1	473689	82628
2	473694	82668
3	473718	82683
4	473725	82598
5	473774	82669
6	473914	82616
7	474208	82375
8	474462	82403
9	474463	82348

Wreck 19569
Survey lines were centred on 455123E 96187N.

Wreck 19580
Survey lines were centred on 467464E 92609N.

APPENDIX II: GAZETEER OF UKHO SITES

WA ID	Type	Period	Description	Easting	Northing	Reference
2000	Live Wreck	Modern	Wreck of the 'Sir Jasper' British J24 class yacht, sank in 1981, capsized while overtaking in a race. Sank in vicinity of nab 3 buoy, exact position not known.	474139	89890	UKHO 20192
2001	Live Wreck	Modern	Wreck of the 'Luciston', Torpedoed in 1917 by U74 on its way to Boulogne, original dimensions Length 96.m, Beam 11.6m, portion from stern to boiler room blown away, fast embedded. Last located on 1.10.04 using side scan sonar, sonar dimensions length 89m, width 35m, shadow height 1.7m, orientation 135/335 degrees. No further information available.	449287	100262	UKHO 19202
2002	Live Wreck	Modern	Lost in 1988. Length as built 13.4m, largely buried in seabed with debris scattered. Surveyed with side scan sonar on 17.6.05 giving dimensions of length 10.7m, width 2.6m, shadow height 2.8m. Observed again on 21.8.06 during route survey by HMS Walney. No further detail reported.	455123	96187	UKHO 19569
2003	Live Wreck	Modern	Lost in 1940, surveyed using side-scan sonar on 20.6.05 giving dimensions length 14m, width 4.2m, shadow height 0.0m. Confirmed as an aircraft by diver. No further information available.	459538	96055	UKHO 19602
2004	Live Wreck	Modern	Wreck of the 'Moonraker', wrecked in 1990, last recorded using side-scan sonar on 31.7.90 giving dimensions of length 3m, shadow height 0.6m. Not located on 18.6.05 by side-scan sonar and multibeam sonar survey. No further information recorded.	457397	96072	UKHO 19599
2005	Live Wreck	Modern	Wreck of the 'Glen', wrecked in 1981, located on 18.10.04 during route survey. Last surveyed on 30.7.90 by side-scan sonar giving dimensions of shadow height 2.8m, length 10m, width 2m. No further information available.	462887	94869	UKHO 19390
2006	Live Wreck	Modern	Wreck of the 'Vanessa', wrecked in 1981, build dimension of length 5.5m, last surveyed on 24.9.85 using side-scan sonar giving a shadow height of 1.9m, and a scour pit 1m deep. No further information available.	464907	94106	UKHO 19387

WA ID	Type	Period	Description	Easting	Northing	Reference
2007	Live Wreck	Modern	Wooden torpedo recovery boat lost in 1970. Small wreck observed 13.6.89, surveyed using side-scan sonar which gave dimensions of shadow height 2.5m, length 10m, width 3m. No further information available.	467464	92609	UKHO 19580
2008	Live Feature	Modern	Swamped moorings, ground chains remain on seabed following the removal of after barn mooring buoy. No further information available.	446316	106329	UKHO 70905
2009	Dead Wreck	Modern	Wreck of the 'Moody Blue', wrecked in 1983, not found on survey on 8.1.90 so amended to dead.	474144	89519	UKHO 20201
2010	Dead Wreck	Modern	Wreck of the 'Lucile', possibly broken up after explosives were used to remove mast. No further information available.	449141	97315	UKHO 58178
2011	Live Wreck	Unknown	Undefined. Wreck observed during route survey operations jan-feb 2006 by HMS Walney, VIA MWDC. No further information recorded.	442356	109707	UKHO 68413
2012	Dead Wreck	Unknown	Foul Ground, possible wreck location recorded in September 2007. HMS Hurworth, Solent operations in 2005. No further information available.	448388	98235	UKHO 70916
2013	Live Obstruction	Unknown	Undefined, small obstruction located on 24.5.90 using tri-sponder, not located using side-scan or multibeam sonar. No further information available.	457798	96186	UKHO 19612
2014	Live Wreck	Unknown	Dangerous Wreck, last recorded 12.5.90 using side-scan sonar, giving dimensions of length 12m, width 4m, shadow height 0.7m. Not recorded during route survey 18.10.04 by HMS Penzance. No further information available.	459877	96039	UKHO 19151
2015	Dead Wreck	Unknown	Undefined, believed to be wreck of large barge or lighter, not located when searched for by echo sounder in 1982 and was therefore amended to dead wreck. No further data recorded.	453812	96495	UKHO 19161
2016	Dead Anomaly	Unknown	Undefined, height 0.5m in saucer-shaped depression. Amended to dead on 22.9.80. No further information available.	456222	96122	UKHO 19157
2017	Live Wreck	Unknown	Dangerous Wreck, scattered wreckage consists of light alloy sheeting and steel fastenings. Surveyed using side-scan sonar on 13.5.90 giving dimensions of shadow height 2.3m, length 5m, lying 030/210 degrees. Last located on 18.10.04 during route survey. No further information available.	463073	94979	UKHO 19142

WA ID	Type	Period	Description	Easting	Northing	Reference
2018	Live Anomaly	Unknown	Tree trunk, identified by a diver on 17.3.86. Last surveyed on 4.1.90 using tri-sponder giving dimensions of scour 0.2m. Side-scan sonar survey in 1986 gave following dimensions shadow height 2.7m, length 27ft, diameter 7ft. No further information available.	464472	94333	UKHO 19545
2019	Dead Anomaly	Unknown	Undefined, no report of contact in this position on 22.8.80 therefore amended to dead. No further information available.	466309	93214	UKHO 19125
2020	Live Feature	Unknown	Cylindrical navigation buoy fitted with tripod light, height 1.7m, scour 18.3m measured by a diver. Last visited by diver on 8.1.90, recommend to remain charted. No further information available.	474933	85838	UKHO 20048

APPENDIX III: GAZETEER OF NMR/SMR SITES

WA ID	Type	Period	Description	Easting	Northing	Reference
2021	Archaeological Find Spot	Prehistoric	Flint axe recovered off calshot spit	449900	101000	Hants - 30182
2022	Archaeological Find Spot	Palaeolithic	Hand axe and unretouched flake	442618	109226	SCC - MSH528
2023	Archaeological Find Spot	Bronze Age	Palstave	439200	112200	Hants - 25716, NMR - 226805
2024	Archaeological Find Spot	Bronze Age	Bronze Palstave	439228	112216	SCC - MSH97
2025	Archaeological Find Spot	Iron Age	Top of dressel 20 amphora	448800	103200	SMR - 1448-MIW1551
2026	Archaeological Find Spot	Iron Age	Iron Axe Head with corroded wooden shaft	442679	109251	SCC - MSH525
2027	Archaeological Find Spot	Roman	Large ancient vessel found in the mud in 1848 (it was thought at the time that it might be a Roman Galley)	442564	109255	SCC - MSH526, Hants - 57487
2028	Archaeological Find Spot	Roman	Parts of amphora and other remains were dredged from Southampton Water	442646	109301	SCC - MSH527, Hants 57489
2029	Archaeological Find Spot	Medieval	Pottery	449300	102900	SMR - 1860-MIW1963
2030	Recorded Loss	Post Medieval	Wreck of the 'Hudibras', a British ketch, wrecked in 1895	447169	104958	Hants - 27903
2031	Recorded Loss	Post Medieval	Wreck of the 'Neptune', British transport, wrecked in 1781	462500	95050	Hants - 27573
2032	Recorded Loss	Post Medieval	Wreck of the 'Lark', merchantman, wrecked in 1794	462500	95050	Hants - 27574
2033	Recorded Loss	Post Medieval	Wreck of the 'Sisters', wrecked in 1795	462500	95050	Hants - 27576
2034	Recorded Loss	Post Medieval	Wreck of the 'Hornett', wrecked in 1794	462500	95050	Hants - 27575
2035	Recorded Loss	Post Medieval	Wreck of the 'Prince of Wales', British vessel, wrecked in 1795	462500	95050	Hants - 27577

WA ID	Type	Period	Description	Easting	Northing	Reference
2036	Recorded Loss	Post Medieval	Wreck of the 'Betsy', British vessel, wrecked in 1795	462500	95050	Hants - 27578
2037	Recorded Loss	Post Medieval	Wreck of the 'Maria Carolina', transport, wrecked 1795	462500	95050	Hants - 27579
2038	Recorded Loss	Post Medieval	Wreck of the 'Britannia', British transport, wrecked in 1795	462500	95050	Hants - 27580
2039	Recorded Loss	Post Medieval	Wreck of the 'Commerce', British transport, wrecked in 1795	462500	95050	Hants - 27581
2040	Recorded Loss	Post Medieval	Wreck of the 'Princess Maria Carolina', wrecked in 1795	462500	95050	Hants - 27582
2041	Recorded Loss	Post Medieval	Wreck of the 'Gloriana', wrecked in 1795	462500	95050	Hants - 27583
2042	Recorded Loss	Post Medieval	Wreck of the 'Britton', wrecked in 1795	462500	95050	Hants - 27584
2043	Recorded Loss	Post Medieval	Wreck of the 'Thomas Wilson', wrecked in 1796	462500	95050	Hants - 27585
2044	Recorded Loss	Post Medieval	Wreck of the 'Greyhound', wrecked in 1796	462500	95050	Hants - 27586
2045	Recorded Loss	Post Medieval	Wreck of the 'Mary', wrecked in 1796	462500	95050	Hants - 27587
2046	Recorded Loss	Post Medieval	Wreck of the 'Iris', wrecked in 1798	462500	95050	Hants - 27588
2047	Recorded Loss	Post Medieval	Wreck of the 'Industry', wrecked in 1800	462500	95050	Hants - 27589
2048	Recorded Loss	Post Medieval	Wreck of the 'Two Friends', wrecked in 1800	462500	95050	Hants - 27590
2049	Recorded Loss	Post Medieval	Wreck of the 'Jupiter', Burnt and wrecked in 1800	462500	95050	Hants - 27591
2050	Recorded Loss	Post Medieval	Wreck of the 'Sarah Ann', wrecked in 1807	462500	95050	Hants - 27592
2051	Recorded Loss	Post Medieval	Wreck of the 'Valiant', wrecked in 1811	462500	95050	Hants - 27593

WA ID	Type	Period	Description	Easting	Northing	Reference
2052	Recorded Loss	Post Medieval	Wreck of the 'Providence', wrecked in 1813	462500	95050	Hants - 27594
2053	Recorded Loss	Post Medieval	Wreck of the 'Queen Charlotte', wrecked in 1813	462500	95050	Hants - 27595
2054	Recorded Loss	Post Medieval	Wreck of the 'Ann', wrecked in 1814	462500	95050	Hants - 27596
2055	Recorded Loss	Post Medieval	Wreck of the 'Caroline', wrecked in 1816	462500	95050	Hants - 27597
2056	Recorded Loss	Post Medieval	Wreck of the 'Unity', wrecked in 1817	462500	95050	Hants - 27598
2057	Recorded Loss	Post Medieval	Wreck of the 'Hemsley', wrecked in 1818	462500	95050	Hants - 27599
2058	Recorded Loss	Post Medieval	Wreck of the 'Lark', wrecked in 1834	462500	95050	Hants - 27600
2059	Recorded Loss	Post Medieval	Wreck of the 'Fareham Trader', wrecked in 1852	462500	95050	Hants - 27601
2060	Recorded Loss	Post Medieval	Wreck of the 'Eastern Monarch', burnt and wrecked in 1859	462500	95050	Hants - 27602
2061	Recorded Loss	Post Medieval	Wreck of the 'Willem II', Dutch steamship, wrecked in 1871	462500	95050	Hants - 27603
2062	Recorded Loss	Post Medieval	Wreck of the 'Four Brothers', British ketch, wrecked in 1877	462500	95050	Hants - 27604
2063	Recorded Loss	Post Medieval	Wreck of the 'Julie', British brig, wrecked in 1881	462500	95050	Hants - 27605
2064	Recorded Loss	Post Medieval	Wreck of the 'Queen Charlotte', wrecked in 1872	462500	95050	Hants - 27606
2065	Recorded Loss	Post Medieval	Wreck of the 'Richard', British barge, wrecked in 1884	462500	95050	Hants - 27607
2066	Recorded Loss	Post Medieval	Wreck of the 'Laura', British wherry, wrecked in 1887	462500	95050	Hants - 27608
2067	Recorded Loss	Post Medieval	Wreck of the 'Lark', British sailing barge, wrecked in 1887	462500	95050	Hants - 27609

WA ID	Type	Period	Description	Easting	Northing	Reference
2068	Recorded Loss	Post Medieval	Wreck of the 'Nightingale', British ketch, wrecked in 1894	462500	95050	Hants - 27610
2069	Recorded Loss	Post Medieval	Unknown wreck of a British yacht, wrecked in 1894	462500	95050	Hants - 27611
2070	Recorded Loss	Post Medieval	Wreck of the 'Emily Kate', British sailing barge, wrecked in 1895	462500	95050	Hants - 27612
2071	Recorded Loss	Post Medieval	Wreck of the 'Swift', British cutter, wrecked in 1897	462500	95050	Hants - 27613
2072	Recorded Loss	Post Medieval	Wreck of the 'Edgar', British 3rd rate warship, wrecked in 1711	462500	95050	Hants - 27619
2073	Recorded Loss	Post Medieval	Wreck of the 'Julia', wrecked in 1804	462500	95050	Hants - 27621
2074	Recorded Loss	Post Medieval	Wreck of the ' Diamon', wrecked in 1827	462500	95050	Hants - 27622
2075	Recorded Loss	Post Medieval	Wreck of the 'HMS Prince Fredrick', burnt in 1799	462500	95050	Hants - 27630
2076	Recorded Loss	Post Medieval	Wreck of the 'Marlborough', wrecked in 1776	462500	95050	Hants - 27631
2077	Recorded Loss	Post Medieval	Unknown French galley lost in 1545	462500	95050	Hants - 27632
2078	Recorded Loss	Post Medieval	Wreck of the ' Rotterdam', wrecked in 1883	462500	95050	Hants - 27634
2079	Recorded Loss	Post Medieval	Wreck of the 'Boyne', wrecked in 1795	462500	95050	Hants - 27635
2080	Recorded Loss	Post Medieval	Wreck of the 'Colonist'	462500	95050	Hants - 55508
2081	Recorded Loss	Modern	Wreck of the 'JWV', British ketch, wrecked in 1908	447169	104958	Hants - 27898
2082	Recorded Loss	Modern	Wreck of the 'Henry', British sailing barge, wrecked in 1911	447169	104958	Hants - 27899
2083	Recorded Loss	Modern	Wreck of the 'Eros', British steam yacht, wrecked in 1907	447169	104958	Hants - 27900

WA ID	Type	Period	Description	Easting	Northing	Reference
2084	Recorded Loss	Modern	Wreck of the 'Olive Branch', British ketch, wrecked in 1913	447169	104958	Hants - 27901
2085	Recorded Loss	Modern	Wreck of the 'Elizabeth', British cutter, wrecked in 1901	447169	104958	Hants - 27902
2086	Recorded Loss	Modern	Wreck of the 'Rosina', British dumb barge, wrecked in 1912	447169	104958	Hants - 27904
2087	Recorded Loss	Modern	Wreck of the 'Martin', British cutter, wrecked in 1900	462500	95050	Hants - 27614
2088	Recorded Loss	Modern	Wreck of the 'Beatrice', British lugger, wrecked in 1902	462500	95050	Hants - 27615
2089	Recorded Loss	Modern	Wreck of the 'Pearl', wrecked in 1903	462500	95050	Hants - 27616
2090	Recorded Loss	Modern	Wreck of the 'Lancer', wrecked in 1905	462500	95050	Hants - 27617
2091	Recorded Loss	Modern	Wreck of the 'Thistle', wrecked in 1912	462500	95050	Hants - 27618
2092	Recorded Loss	Modern	Wreck of the 'Kingston Jacinth', wrecked in 1943	462500	95050	Hants - 27620
2093	Recorded Loss	Modern	Wreck of the 'LCP 895' Royal Navy landingcraft, wrecked in 1944	462500	95050	Hants - 27624
2094	Recorded Loss	Modern	Wreck of the 'LBV 154', Royal Navy landingcraft, wrecked in 1944	462500	95050	Hants - 27626
2095	Recorded Loss	Modern	Wreck of the 'Hillary II', wrecked in 1916	462500	95050	Hants - 27627
2096	Recorded Loss	Modern	Wreck of the 'Lucknow', wrecked in 1917	462500	95050	Hants - 27628
2097	Recorded Loss	Modern	Wreck of the 'Kittyhawke', wrecked in 1917	462500	95050	Hants - 27629
2098	Recorded Loss	Modern	Wreck of the 'E.B', wrecked in 1915	462500	95050	Hants - 27633
2099	Recorded Loss	Modern	Wreck of the 'Three Sisters', wrecked in 1903	462500	95050	Hants - 27636

WA ID	Type	Period	Description	Easting	Northing	Reference
2100	Recorded Loss	Modern	Wreck of the 'Zulu', wrecked in 1910	462500	95050	Hants - 27637
2101	Recorded Loss	Modern	wreck of a torpedo recovery boat	467463	92589	Hants - 55548
2102	Recorded Loss	Modern	Hurricane P3836, Aircraft crash site	463000	95000	Hants - 57241
2103	Recorded Loss	Modern	Spitfire MkII, Aircraft crash site	463000	95000	Hants - 57242
2104	Recorded Loss	Modern	Messerschmitt BF110, Aircraft crash site	463000	95000	Hants - 57244
2105	Recorded Loss	Modern	Messerschmitt BF109E, Aircraft crash site	463000	95000	Hants - 57246
2106	Recorded Loss	Modern	Grumman Wildcat AL254	463000	95000	Hants - 57254
2107	Recorded Loss	Modern	Fairey Fulmer N1924, Aircraft crash site	463000	95000	Hants - 57255
2108	Recorded Loss	Modern	Spitfire P7684, Aircraft crash site	463000	95000	Hants - 57259
2109	Recorded Loss	Modern	Blackburn Botha Mk 1', Aircraft crash site	459570	96040	NMR - 805624
2110	Net Fastener	Unknown	Unidentified net fastener / Feature	460500	95811	Hants - 27544
2111	Net Fastener	Unknown	Unidentified net fastener / Feature	460688	95850	Hants - 27545
2112	Net Fastener	Unknown	Unidentified net fastener / Feature	461236	95912	Hants - 27546
2113	Net Fastener	Unknown	Unidentified net fastener / Feature	460770	95833	Hants - 27560
2114	Net Fastener	Unknown	Unidentified net fastener / Feature	459746	95932	Hants - 27911
2115	Net Fastener	Unknown	Unidentified net fastener / Feature	459357	95927	Hants - 27912

WA ID	Type	Period	Description	Easting	Northing	Reference
2116	Net Fastener	Unknown	Unidentified net fastener / Feature	459110	96017	Hants - 27914
2117	Net Fastener	Unknown	Unidentified net fastener / Feature	464493	94246	Hants - 28131
2118	Net Fastener	Unknown	Unidentified net fastener / Feature	468530	92148	Hants - 28205
2119	Net Fastener	Unknown	Unidentified net fastener / Feature	459110	96020	NMR - 766470
2120	Net Fastener	Unknown	Unidentified net fastener / Feature	459750	95930	NMR - 766466
2121	Net Fastener	Unknown	Unidentified net fastener / Feature	468530	92150	NMR - 766435
2122	Net Fastener	Unknown	Unidentified net fastener / Feature	461260	95910	NMR - 766464
2123	Net Fastener	Unknown	Unidentified net fastener / Feature	464490	94250	NMR - 766456
2124	Net Fastener	Unknown	Unidentified net fastener / Feature	460690	95850	NMR - 766462
2125	Net Fastener	Unknown	Unidentified net fastener / Feature	458960	95890	NMR - 766465
2126	Net Fastener	Unknown	Unidentified net fastener / Feature	474980	85680	NMR - 1028105
2127	Net Fastener	Unknown	Unidentified net fastener / Feature	474980	85680	NMR - 766539
2128	Net Fastener	Unknown	Unidentified net fastener / Feature	460500	95810	NMR - 766461
2129	Net Fastener	Unknown	Unidentified net fastener / Feature	459350	95930	NMR - 766467
2130	Unidentified Wreck	Unknown	Unknown undated wreck	463092	94980	Hants - 28142
2131	Unidentified Wreck	Unknown	Unknown undated wreck	453709	96552	Hants - 28090

WA ID	Type	Period	Description	Easting	Northing	Reference
2132	Unidentified Wreck	Unknown	Unknown undated wreck	459883	96018	Hants - 57417
2133	Unidentified Wreck	Unknown	Unknown undated wreck	470589	91323	Hants - 28100
2134	Unidentified Wreck	Unknown	Unknown undated wreck	453710	96550	NMR - 767434
2135	Unidentified Wreck	Unknown	Unknown undated wreck	462990	95060	NMR - 1397757

All co-ordinates are presented in British National Grid (OSGB 1936 datum)

APPENDIX IV: GAZETEER OF GEOPHYSICAL ANOMILIES

IV-A BERTH

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7020	Debris	438988	111719	Scatter of modern debris (64.9m x 17.6m x 0m)	3000	
7021	Debris	439129	111971	Bright, sharp edged reflector (12.8m x 2.9m x 0m) with diffuse dark area extending for 1.4m on far side, possible scour. Modern. Poss concrete. In the bathymetry here is a depression measuring approx 15m x 15m x -0.6m.	3004, 5000	
7022	Debris	439209	112000	Debris (1.6m x 1m x 0.3m)	3005	
7023	Debris	439187	112083	Debris (0.8m x 0.5m x 0m). Bright reflector in front, extending out 1m, may be scour.	3006	
7024	Debris	439261	112124	Probably modern debris (5.9m x 0.2m x 0.1m). On turn so poor positioning.	3007	

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Note 2: The dimensions of the sidescan sonar anomalies are calculated by Coda Geosurvey software using the easting and northing of the points at the ends of the measurement line. Therefore these measurements are a guide only.

IV-B WD

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7180	Debris	440923	111260	Linear debris (8m x 0.4m x 0.3m)	3015, 3019, 3025	
7181	Bright reflector	441020	111053	Possibly debris, hard edged (10.2m x 2.2m x 0m)	3024	
7182	Seafloor disturbance	439725	111680	Seafloor disturbance (8m x 6.9m x 0m) containing dark reflectors	3027	
7183	Seafloor disturbance	439814	111682	Seafloor disturbance (11.8m x 8.7m x 0m) containing debris	3032	
7184	Dark reflector	439847	111669	Possibly debris (6.2m x 0.2m x 0m)	3033	

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IV-C FAW

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7060	Debris	442814	109215	Debris (3.1m x 1.6m x 0m). Possibly in scour	3059, 3092	
7061	Debris	442822	109217	Debris (2.5m x 1.3m x 1.2m)	3060, 3066, 3093	
7062	Debris	442891	109160	Circular debris (2.1m x 2.1m x 0.5m)	3061	
7063	Debris	442894	109158	Circular debris (1m x 0.7m x 0m)	3062	
7064	Debris	442931	109173	Debris (1m x 1m x 0.5m)	3063	
7065	Debris	442573	109431	Debris (1.9m x 0.2m x 0.5m)	3065	
7066	Debris	445376	106979	Debris (2.2m x 0.2m x 0.1m)	3069	
7067	Debris	445735	106683	Linear dark reflector (13.7m x 0.1m x 0m)	3070	
7068	Debris	445747	106667	Debris (0.7m x 0.4m x 0.1m)	3071	
7069	Dark reflector	445757	106651	Dark reflector (4.4m x 0.9m x 0m)	3072	
7070	Debris	446733	105905	Debris (1.9m x 1m x 0.3m)	3074	
7071	Debris	447086	105631	Debris (1m x 0.8m x 0.2m)	3075	
7072	Debris	447080	105627	Debris (1.6m x 0.4m x 0.3m)	3076	
7073	Debris	447133	105656	Debris (1.8m x 0.2m x 0m). Possible scour in front.	3077	
7074	Dark reflector	447132	105657	Dark reflector (2.3m x 0.6m x 0m)	3078	
7075	Debris	447164	105646	Linear debris (5.9m x 0.3m x 0m)	3083	
7076	Debris	447083	105568	Debris (1.5m x 1.5m x 0.4m)	3084	
7077	Debris	447033	105404	Linear debris (3.7m x 0.1m x 0.4m)	3085	
7078	Debris	442826	109212	Debris (1.7m x 0.5m x 0.6m)	3094	
7079	Undefined	442356	109707	Wreck observed using DGPS during route survey operations Jan - Feb 2006. Unreliable position. Live.	2011	UKHO 68413
7080	Magnetic	445775	106623	12.79nT	4020	
7081	Magnetic	444651	107541	85.98nT	4021	

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7082	Magnetic	444543	107648	30.35nT	4022	
7083	Magnetic	443965	108174	29.91nT	4023	
7084	Magnetic	444355	107863	28.13nT	4024	
7085	Magnetic	446264	106338	75.45nT	4025	
7086	Magnetic	445058	107314	24.78nT	4027	
7087	Magnetic	444640	107573	20.96nT	4028	
7088	Magnetic	443911	108171	32.02nT	4029	

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IV-D ESSO

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7030	Debris	447033	105403	Linear debris (3.8m x 0.1m x 0.4m)	3085	
7031	Debris	446809	105529	Debris (1.4m x 0.7m x 0.5m)	3130	
7032	Debris	446839	105503	Debris (1.3m x 0.6m x 0.6m)	3131, 3150	
7033	Debris	446841	105500	Debris (1.5m x 0.4m x 0.7m)	3132, 3149	
7034	Seafloor disturbance	447142	105076	Seafloor disturbance (16.9m x 8.2m x 0m)	3133	
7035	Dark reflector	447178	105119	Dark reflector (3m x 0.3m x 0m)	3135	
7036	Debris	447104	105127	Debris (1m x 1m x 0.5m)	3136	
7037	Seafloor disturbance	447121	105083	Extends beyond range, area covered measures 14m x 4.2m x 0m.	3137	
7038	Seafloor disturbance	447186	105150	Extends beyond range, area covered measures 5.6m x 2.3m x 0m.	3138	
7039	Debris	447040	105302	Linear debris (3.8m x 0.2m x 0m)	3139	
7040	Debris	447044	105305	Linear debris (6.2m x 0.1m x 0.1m)	3140	

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7041	Seafloor disturbance	446906	105345	Seafloor disturbance (6.3m x 5.6m x 0m)	3141	
7042	Bright reflector	446897	105350	Bright reflector (1.4m x 0.5m x 0m)	3142	
7043	Bright reflector	446900	105356	Bright reflector (4.2m x 0.6m x 0m)	3143	
7044	Bright reflector	446908	105353	Bright reflector (2.3m x 0.5m x 0m)	3144	
7045	Bright reflector	446914	105356	Bright reflector (2.5m x 0.9m x 0m)	3145	
7046	Debris	446935	105424	Debris (2.1m x 0.2m x 0.4m)	3146	
7047	Debris	446884	105410	Circular debris (1.5m x 1.2m x 0m)	3147	
7048	Debris	446857	105500	Debris (1.2m x 0.2m x 0.2m)	3148	
7049	Debris	446809	105494	Debris (2.5m x 0.4m x 0.6m)	3151	
7050	Seafloor disturbance	446689	105618	Possible anchor scar (6m x 1.4m x 0m)	3152	
7051	Debris	447178	105162	Debris (3.7m x 0.3m x 0.1m). Possibly natural, appears to be in a large scour.	3154	
7052	Debris	447158	105294	Circular debris (1.1m x 0.8m x 0.3m), possible tyre.	3155	
7053	Debris	447093	105298	Circular debris (1m x 0.8m x 0.5m)	3156	
7054	Magnetic	446768	105482	93.98nT	4011	
7055	Magnetic	446807	105406	157.49nT	4012	

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IV-E PIPE

There were no sites of potential archaeological interest observed in this area.

IV-F HOOK

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7090	Debris	448283	104305	Debris (3.2m x 1.9m x 0.7m). Possible scour around.	3100	
7091	Debris	448457	104066	Debris (1.1m x 0.1m x 0.4m)	3101	

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7092	Bright reflector	448639	103891	Triangular bright reflector (3.6m x 0.9m x 0m). Possibly a shadow but can't see an object in front.	3102	
7093	Debris	448796	103669	Sharp cornered object (2.3m x 1.3m x 0.9m)	3103, 3121	
7094	Debris	448917	103344	Debris (3m x 0.9m x 0.2m)	3104, 3111	
7095	Bright reflector	448597	103899	Bright reflector (2.7m x 0.7m x 0m)	3105	
7096	Seafloor disturbance	448593	103905	Seafloor disturbance (5.8m x 1.1m x 0m)	3106	
7097	Dark reflector	448254	104398	Linear, possibly has height (4.1m x 0.1m x 0m)	3107	
7098	Dark reflector	448161	104394	Linear dark reflector (2.1m x 0.2m x 0m)	3108	
7099	Debris	448535	103908	Debris (0.8m x 0.4m x 0.5m)	3109	
7100	Debris	448675	103727	Debris (1.6m x 0.4m x 0.2m)	3110	
7101	Debris	448627	103635	Debris (2m x 0.7m x 0.5m)	3115-6, 3120	
7102	Debris	448990	103150	Debris (4.6m x 0.2m x 0.1m)	3119	
7103	Magnetic	448910	103397.6	41.83nT	4042	
7104	Magnetic	449240	102936.8	35.26nT	4043	
7105	Magnetic	449251	102943.8	92.33nT	4044	
7106	Magnetic	448984	103344.6	22.2nT	4045	

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IV-G THORN

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7150	Bright reflector	447866	98630	Bright reflector (4.8m x 3.1m x 0m)	3203	
7151	Debris	447924	98694	Linear debris (11.9m x 0.2m x 0.5m), looks like one end is sticking up off the seabed.	3204	

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7152	Debris	448132	98915	Curved dark reflector (3.4m x 0.8m x 0m)	3206	
7153	Debris	449099	99802	Debris (2.8m x 0.3m x 0.1m)	3208, 3245	
7154	Debris	449103	99801	Debris (1.8m x 0.4m x 0.2m)	3209, 3244	
7155	Debris	449107	99805	Linear (5.2m x 0.4m x 0.3m)	3210, 3243	
7156	Debris	449123	99829	Linear (6.6m x 0.3m x 0.2m)	3211, 3242	
7157	Debris	449133	99831	Linear (3.8m x 0.2m x 0.2m)	3241	
7158	Wreck	449179	99772	Scattered wreck (112m x 72m x 0m). Many linear pieces of debris and other pieces covering a large area. Debris size ranges from 0.8m x 0.5m x 0.3m up to 13.4m x 0.2m x 0.2m. Two large seafloor disturbances are also contained. These measure 33.9m x 27.2m x 0m and 12.4m x 4.4m x 0m. The wreck is of a wooden day boat that was run down by a container vessel on 02/06/2005.	3212-39, 3249-56, 3262-85, 3333-4	ABP
7159	Bright reflector	449146	99858	Bright reflector (8.5m x 2.3m x 0m)	3240	
7160	Debris	449066	99811	Debris (9m x 0.6m x 0.2m). Bit distorted.	3246	
7161	Debris	449053	99807	Debris in scour (3m x 1.5m x 0m)	3247	
7162	Bright reflector	448424	98581	Patchy bright reflector (15.1m x 3.9m x 0m)	3290	
7163	Bright reflector	448651	98753	Bright reflector (2.8m x 2.4m x 0m)	3291	
7164	Debris	448657	98759	Debris (1.3m x 0.1m x 0.6m)	3292	
7165	Debris	448759	98176	Debris (4.4m x 0.3m x 0.2m)	3295	
7166	Debris	448987	98493	Debris (1.1m x 0.3m x 0.3m)	3296	
7167	Debris	448931	98524	Debris (6m x 0.1m x 0.1m)	3297	
7168	Bright reflector	449196	98120	Bright reflector (3.4m x 0.3m x 0m)	3326	
7169	Debris	449198	98118	Debris (1.9m x 0.2m x 0.3m)	3327	
7170	Seafloor disturbance	449097	98002	Seafloor disturbance (7.9m x 3.6m x 0m)	3329, 3332	
7171	Debris	449058	98019	Debris (1.4m x 0.1m x 0.3m)	3331	
7172	Foul	448388	98235	Foul Ground. Dead.	2100	UKHO 70916

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7173	Magnetic	448875	99328	20.72nT	4081	
7174	Magnetic	448340	98789	9.92nT	4082	

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IV-H SHOAL

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7140	Bright reflector	456602	96184	Bright reflector (4.5m x 1.3m x 0m). Very bright and nothing similar around.	3175	
7141	Debris	456555	96171	Debris (0.7m x 0.5m x 0.3m)	3176	
7142	Debris	456557	96170	Linear debris (2.2m x 0.4m x 0.3m), wiggly (though that might be fish movement) with parts having height	3177	
7143	Debris	456555	96168	Linear debris (4m x 0.3m x 0.4m), wiggly, possibly in water column above seabed as shadows not connected to object	3178	
7144	Bright reflector	456491	96195	Bright reflector (2.4m x 0.9m x 0m)	3179	
7145	Bright reflector	456480	96188	Bright reflector (1.7m x 0.7m x 0m)	3180	
7146	Bright reflector	456724	96250	Possible shadow (1.7m x 1m x 0m) of one or more indistinct objects.	3181	
7147	Debris	456684	96243	Debris (2.3m x 0.2m x 0.3m)	3182, 3186	
7148	Debris	456519	96216	Debris (1m x 0.2m x 0.1m). Possible scour in front.	3183	
7149	Magnetic	456528	96250	6.52nT	4070	

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IV-I HORSE

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7110	Seafloor disturbance	468271	92310	Possible depression/scour with object (3.6m x 2.6m x 0m).	3340	
7111	Magnetic	467995	92397	40.62nT	4051	
7112	Magnetic	468154	92323	13.33nT	4052	

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IV-J NAB

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7120	Debris	474601	87701	Debris (2.6m x 0.9m x 0.3m)	3371	
7121	Debris	474512	88022	Debris (2.8m x 1.1m x 0.2m)	3373	
7122	Debris	472788	90589	Debris (1.4m x 0.4m x 0.6m)	3375, 3399	
7123	Dark reflector	474541	87945	Dark reflector (3.7m x 1.4m x 0m)	3377	
7124	Debris	474013	89305	Debris (1.1m x 0.7m x 0.5m)	3378	
7125	Seafloor disturbance	474614	88747	Bright reflector with dark in front and to one side (6.7m x 4.8m x 0m). Possible depression behind. 21m to SW of UKHO live obstruction, which is just outside the survey area. This obstruction is given as having a minimum depth of 10.8m in a general depth of 12m. Magnetic anomaly of 271.75nT.	3383, 4062	UKHO 20199
7126	Debris	474502	88689	Debris (7.9m x 2.4m x 0m)	3385	
7127	Dark reflector	472905	90780	Dark reflector (6.4m x 1m x 0m)	3397	
7128	Bright reflector	472202	91037	Bright reflector (3.4m x 2.7m x 0m)	3398	

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7129	Sir Jasper	474139	89890	British J24 class yacht. Capsized and sank in vicinity of Nab No 3 buoy while overtaking in a race on 01/11/1981. Position noted as unreliable. Live. Item of debris 3380 measuring 2.1m x 0.7m x 0.2m is located 33m northeast of this position and may possibly be connected to this wreck.	2000	UKHO 20192
7130	Moody Blue	474144	89519	Yacht that sank on 10/08/1983. Position unreliable. Dead.	2009	UKHO 20201
7131	Magnetic	474743	88076	14.74nT	4061	
7132	Magnetic	474414	89195	11.21nT	4063	

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IV-K SNAB

There were no sites of potential archaeological interest observed in this area.

IV-L Wreck 19569

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7000	Seafloor disturbance	455215	96144	Possible wreck (6.4m x 5.8m x 0m)	3420	
7001	Debris	455238	96189	Linear debris (6m x 0.6m x 0m)	3421	
7002	Debris	455233	96175	Debris (1.1m x 0.2m x 0m)	3422	
7003	Debris	455223	96174	Debris (0.8m x 0.2m x 0.4m)	3423	
7004	Wreck	455119	96178	Unknown wreck. GRP cabin cruiser lost in August 1988. Length as built 13.4m. Reported by the UKHO as largely buried in seabed with debris scattered. Surveyed with sidescan sonar on 17.6.05 giving dimensions of length 10.7m, width 2.6m, shadow height 2.8m. Observed again on 21.8.06 during route survey by HMS Walney but no details reported. Live. SSS anomaly in current data measures 10.7m x 9.2m x 0m.	2002, 3424, 3425	UKHO 19569

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7005	Debris	455114	96232	Debris (0.9m x 0.5m x 0.4m)	3426	
7006	Debris	455114	96237	Debris (1.4m x 0.2m x 0m)	3427	
7007	Debris	455069	96172	Possible scatter of small debris items (2.6m x 2.5m x 0m)	3428	
7008	Magnetic	454848	96211	71.05nT	4000	

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IV-M Wreck 19580

WA ID	Name / Classification	Easting	Northing	Description	Sources	External References
7010	Wreck	467467	92608	Wooden Torpedo Recovery Search Boat. Sank while under tow on 30/05/1970.This small wreck was observed on 13/6/89 when it was surveyed using sidescan sonar, which gave dimensions of shadow height 2.5m, length 10m, width 3m. It now appears to be a fairly coherent wreck (measuring 9.7m x 4.5m x 1.6m in the SSS data) within which is discernible an object measuring 2m x 1m although its height cannot be determined. Approximately 1m to the southeast of the wreck is an object of debris measuring 1.8m x 1.5m x 0.1m. On the southwest side of the object there appears to be a scour measuring 4.6m x 1.9m x -0.5m.	2007, 3341-4, 3350-2, 3356-8, 3361-2	UKHO 19580
7011	Debris	467507	92612	Possibly associated with 6010 wreck or may be natural (3.8m x 0.2m x 0.1m)	3353	
7012	Debris	467510	92610	Possibly associated with 6010 wreck or may be natural (1.8m x 0.1m x 0.1m)	3354	
7013	Debris	467513	92603	Possibly associated with 6010 wreck or may be natural (1.1m x 0.2m x 0m)	3355	
7014	Debris	467407	92531	Possible mooring/buoy (3.5m x 1.2m x 0m)	3359	
7015	Debris	467403	92535	Debris (5.5m x 1.1m x 0m)	3360	

Note 1: All co-ordinates are presented in British National Grid (OSGB 1936 datum)

Note 2: The dimensions of the sidescan sonar anomalies are calculated by Coda Geosurvey software using the easting and northing of the points at the ends of the measurement line. Therefore these measurements are a guide only.