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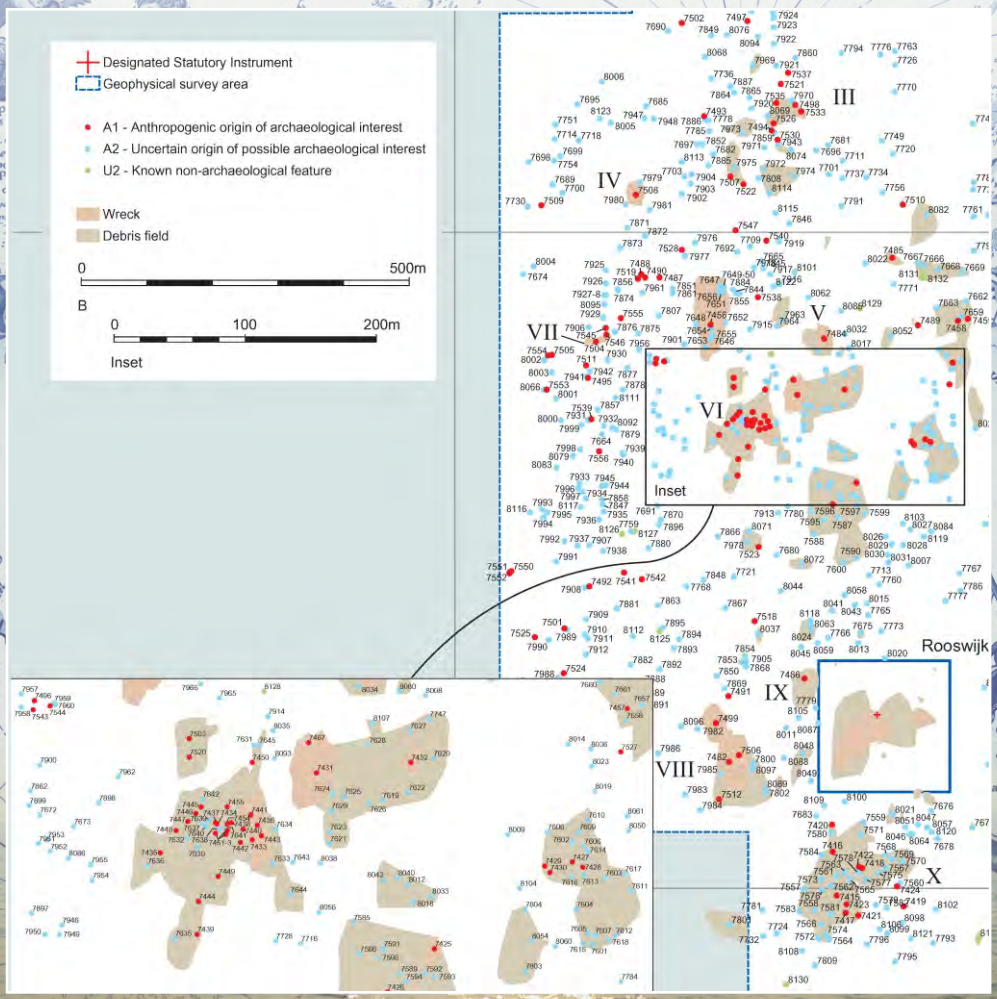
NHPP National Importance Programme Pilot Projects

# National Importance and Marine Assets – the Goodwin Sands and Farne Islands Case Studies

## Final Report

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**NHPP Project 6982: National Importance Programme Pilot Projects**

# National importance and marine assets – the Goodwin Sands and Farne Islands case studies

**Final Report**

**EH 7050 MAIN**

**Prepared for:**
**English Heritage**

**Prepared by:**
Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
SP4 6EB

www.wessexarch.co.uk

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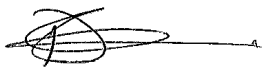
| v01 | I | *David Howell/Graham Scott* | *Dan Atkinson* |  | 17/11/14 |
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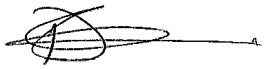
| v02 | E | *David Howell/Graham Scott* | *Dan Atkinson* |  | 25/02/15 |
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* I = Internal Draft; E = External Draft; F = Final

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**Summary**

The project was commissioned under NHPP Measure 5: Protection of Significance and specifically National Importance Programme Pilot Projects (Activity 5A2).

The project had the following objectives:

1. To review by means of case studies the criteria and methodologies previously used to map the boundaries of large marine landscape-scale sites containing many dispersed, overlapping and multi-period marine heritage assets and to make recommendations as to how such mapping should be approached in the future; additionally to consider whether and in what circumstances it may be appropriate to identify such sites as being of national importance on the basis of this mapping;
2. To review by means of case studies the criteria and methodologies previously used to identify and define the boundaries of individual marine heritage assets within those landscape-scale sites and to make recommendations with regard to how this should be approached in the future;
3. To review by means of case studies the criteria and methodologies previously used to identify, record and map nationally important marine heritage assets within those landscape-scale sites and to make recommendations with regard to how this should be approached in the future, limited to relevance to the 1979 Act;
4. To review by means of case studies any criteria and methodologies previously used to identify and map those nationally important marine heritage assets which are likely to lack the 'structure' required to schedule them under the 1979 Act and to make recommendations with regard to how this should be approached in the future; and
5. To present recommendations about both criteria and methodology in 'toolkit' format in the delivered project report so that they can be more readily incorporated in subsequent national guidance produced by EH.

The project aimed to meet these objectives by means of a rapid, high-level review of two case study areas, part of the Goodwin Sands off Kent and of the Farne Islands off Northumberland. The case study areas were selected because they appeared to have Large Marine Landscape-Scale Sites (LMLSS) for which there was a relative abundance of data.

Although there are issues including data coverage and scale, a practical method of mapping the boundaries of LMLSS was devised, based upon the use of a primary geophysical dataset and by reference to the distribution of clusters of anomalies of high archaeological potential. Diver survey and other datasets were used as secondary data to refine LMLSS boundaries. A mapping method was also devised in respect of Individual Site (IS) boundaries, based upon the interpretation of anomalies as either wreck structure or scattered debris, although IS boundary mapping within the Farne Islands case study area proved to be reliant upon secondary data. IS mapping has similar issues to LMLSS boundary mapping and there is additional uncertainty concerning the practical distinction of these two categories.

The availability of secondary datasets proved essential in terms of assessing LMLSS and IS importance. English Heritage guidance on criteria to be applied to ships and boats when assessing under the 1979 Act proved to be fit for purpose in respect of the case studies.

The nearest equivalent to the terrestrial concept of sites without structure appears to be scattered debris with no clear association with a moveable structure such as a shipwreck. Such scatters are potentially identifiable in geophysical data. However, proving association between debris and wrecks is likely to depend upon the availability of secondary data.

The recommendations of the project have been presented in the form of a flowchart for mapping and assessing LMLSS and IS within them.

# National importance and marine assets – the Goodwin Sands and Farne Islands case studies

## Final Report

**Acknowledgements**

This project was commissioned by English Heritage, and the assistance provided by Paul Jeffery, Carrie Cowan and Helen Keeley of English Heritage is gratefully acknowledged.

This report was compiled by Senior Geophysicist David Howell and Senior Archaeologist Graham Scott, with contributions by Geoservices Project Manager Louise Tizzard. Richard Milwain undertook external data acquisition and archiving and Kitty Foster and Karen Nichols prepared the illustrations. Dan Atkinson undertook quality assurance and managed the project for Wessex Archaeology.

# National importance and marine assets – the Goodwin Sands and Farne Islands case studies

## Final Report

## 1 BACKGROUND

### 1.1 Call for proposals

1.1.1 English Heritage issued a Call for Proposals for NHPP Project 6982: National Importance Programme Pilot Projects in May 2014. The call fell under NHPP Measure 5: Protection of Significance and specifically National Importance Programme Pilot Projects (Activity 5A2).

1.1.2 Not all archaeological sites identified as being of national importance can be or are designated and nowhere is this more apparent than in the marine environment. Nevertheless, paragraph 2.6.6.5 of the UK Marine Policy Statement requires that these heritage assets should be considered subject to the same policies as designated heritage assets.

1.1.3 The call was for pilot projects to undertake a rapid, high-level review of the criteria and methodologies used to collect, collate and manage data on sites of national importance, providing example case studies within a defined geographical area. The results of the pilots are intended to feed into a wider project, with the production of guidance an ultimate objective.

1.1.4 The call addressed the following issues:

- What the mechanisms might be for identifying, recording and mapping sites considered to be of national importance;
- How sites which cannot legally be scheduled under the terms of the 1979 Act, 'sites without structure' can be identified and mapped;
- How to define boundaries for large landscape-scale sites containing many monuments in rural contexts; and
- How to assess national importance and define boundaries in urban contexts.

### 1.2 Project background

1.2.1 The Goodwin Sands is an area of highly mobile sandbanks off the east Kent coast (**Figure 1**). It is offshore of what was formerly one of the most important naval and commercial anchorages of the English coast, the Downs. Several of the most important historic trade routes of northern Europe skirt or pass close to the Goodwins. The sandbanks, which are shallow and partially dry, extend about 10 miles north to south and are up to several miles wide. The Goodwins shift rapidly and have proved difficult to mark or chart effectively. Historically they have been one of the most feared navigational hazards in the UK.

1.2.2 The Goodwins are archaeologically extraordinary for three reasons. Firstly, due to the very large numbers of ships that sailed or anchored close to them and aircraft that overflew them, they have perhaps the highest density of wrecks and therefore of marine heritage assets in the UK. Recent estimates are that over 800 shipwrecks have been recorded on the Goodwins (Cant 2013: 15). Secondly, owing to the very favourable preservation conditions that can be found, thanks to a depth of sand that can be as much as 25m, they have acquired a reputation for abnormally well preserved wrecks. Thirdly, due to this combination of asset numbers and preservation, the Goodwins also contain one of the highest densities of designated marine heritage assets in the UK. These include the 1703 wreck of the *Stirling Castle* (GAD 1) that emerged from the sands in 1979 almost complete.

1.2.3 The Goodwin Sands also contains perhaps the largest single concentration of important undesignated historic shipwrecks in the UK. For instance the wreck GAD 23, a large 19th century trading ship, was so well preserved when found that it was nicknamed 'the bowsprit wreck' in recognition of the fact that its bowsprit was still *in situ* (WA 2012c: 5). Pre-1840 wrecks are sufficiently rare in the UK that they are almost automatically considered as potential candidates for designation. The potential presence of large numbers of these wrecks means that the Goodwins is likely to represent one of, if not the largest concentration of undesignated historic assets in the UK.

1.2.4 Most of the wrecks on the Sands are of wooden ships that have not remained intact. Most have been battered to pieces by the gales that stranded them. As a result their remains now lie in dispersed debris fields. These scattered sites can still merit designation as nationally important assets and the 1739 wreck of the Dutch East Company ship *Rooswijk* (GAD 6) is one such dispersed wreck.

1.2.5 The Goodwins are regularly subject to gales from the north-east and east. At those times they are potentially a hazard to shipping anywhere in the southern North Sea and along the Dutch and Belgian coasts. As a result large numbers of sailing ships have been driven onto the eastern flank of the Sands. These have included most of the many important Dutch ships claimed by the Goodwins, including GAD 6.

1.2.6 Ships wrecked on the east side of the Goodwin Sands are perhaps the most likely to result in dispersed sites. The sand there is often only a relatively thin veneer above the chalk platform that the Goodwins sit upon and the seabed rises only very gradually, which means that wrecked vessels can be pushed some distance by a storm as they break up. This is how the GAD 6 site is thought to have formed. Thereafter, a combination of a high energy shallow environment and a lack of seabed sediment mean that wreck material on the seabed tends to be subject to a continuing process of dispersal. The very high density of losses and this process of continuing dispersal mean that it is strongly suspected that debris fields from different wrecks overlap in places. This tendency to merge and the difficulty in distinguishing one from another makes it both laborious and difficult to map and identify and to create boundaries for them.

1.2.7 The presence of these dispersed wreck sites has been clearly demonstrated in previous work. In 2008 WA carried out a geophysical survey of the GAD 6 site and an area to the north, discovering a large number of anomalies around what was previously thought to be a single discrete site (WA 2009a: 9-10). In 2009 a geophysical survey in a 3km by 1km area identified the remarkable total of 717 anomalies and probably the remains of a number of post-medieval wrecks (Figure 1; WA 2010: 18). Survey nearby in the Kellet Gut area of the Goodwins identified a further 132 anomalies including at least two wrecks in a spread of debris about 4km long. GAD 23 is close to another wreck and many of the 28

anomalies discovered during the 2009 survey could have been associated with either wreck.

1.2.8 The difficulty that this poses to those tasked with dealing with these sites as both designated and undesignated historic assets are considerable but certainly not unique. Similar challenges of varying degrees of complexity and scale are faced all around the English coast. For example, English Heritage has recently carried out a staged marine investigation of the Farne Islands in the north-east (**Figure 2**). In addition to throwing up questions of how to deal with a nationally important undesignated early 18th century wreck site 'without structure', the project also faced the problem of how to identify the wreckage of an iconic ship (Grace Darling's *Forfarshire*) from a background mass of geophysical anomalies at a location known for its high density of dispersed shipwrecks.

1.2.9 Within a chain of islands that is thought to have claimed hundreds of ships and boats, geophysical survey identified 150 anomalies of potential archaeological interest dispersed over a wide area (WA 2013). A high proportion is likely to be associated with wrecks. However, none could be definitively associated with the *Forfarshire*, despite subsequent ground-truthing by divers.

1.2.10 These seabed areas containing large numbers of multi-period overlapping diffuse wreck sites are the marine equivalent of complex landscape-scale rural sites or smaller multi-phase complex urban sites containing many monuments. They all have the potential to be nationally important and pose many of the same challenges.

1.2.11 The examples given above give rise to a number of key questions concerning how marine planning policy is applied to landscape-scale sites that contain many diffuse marine heritage assets of multiple periods and varying importance:

- How should the boundaries of large marine landscape-scale sites containing many dispersed, overlapping and multi-period marine heritage assets be mapped?
- How should individual marine heritage assets within those landscapes be identified and their boundaries defined?
- How should nationally important marine heritage assets within those landscapes be identified, recorded and mapped?
- Is it possible to identify and map those nationally important marine heritage assets which are likely to lack the 'structure' required to schedule them under the terms of the 1979 Ancient Monuments and Archaeological Areas Act (the '1979 Act')) without undertaking lengthy sub-sea interventions?

# 2 AIMS AND OBJECTIVES

## 2.1 Aims

2.1.1 The project aims to answer the above questions by producing a series of evidence-based recommendations for EH, to be delivered in the form of a practical, cost-effective and proportional 'toolkit'. The guidance will be capable of being applied to existing datasets, without creating a requirement for further acquisition.

## 2.2 Objectives

2.2.1 The specific objectives of the project are as follows:

- O1 To review by means of case studies the criteria and methodologies previously used to map the boundaries of large marine landscape-scale sites containing many dispersed, overlapping and multi-period marine heritage assets and to make recommendations as to how such mapping should be approached in the future; additionally to consider whether and in what circumstances it may be appropriate to identify such sites as being of national importance on the basis of this mapping.
- O2 To review by means of case studies the criteria and methodologies previously used to identify and define the boundaries of individual marine heritage assets within those landscape-scale sites and to make recommendations with regard to how this should be approached in the future.
- O3 To review by means of case studies the criteria and methodologies previously used to identify, record, and map nationally important marine heritage assets within those landscape-scale sites and to make recommendations with regard to how this should be approached in the future, limited to relevance to the 1979 Act.
- O4 To review by means of case studies any criteria and methodologies previously used to identify and map those nationally important marine heritage assets which are likely to lack the 'structure' required to schedule them under the 1979 Act and to make recommendations with regard to how this should be approached in the future.
- O5 To present recommendations about both criteria and methodology in 'toolkit' format in the delivered project report so that they can be more readily incorporated in subsequent national guidance produced by EH.

# 3 METHODOLOGY

## 3.1 Overview

3.1.1 The method is a rapid, high-level review of the criteria and methodologies used to collect, collate and manage data on sites of national importance, providing example case studies within a defined geographical area.

3.1.2 The project does not involve a detailed reinterpretation of available geophysical and other data for the case studies. However, it is important that the guidance produced from it should be evidence-based if it is to improve confidence in decision making. Therefore the method involves a high level review of selected geophysical and other data sets, in order to examine the overall effectiveness of the criteria and methodologies used and to determine the likely viability of alternative approaches. The geophysical data sets used were existing interpretation shapefiles resulting from surveys undertaken by WA on the Goodwin Sands in 2009 and from the Farne Islands in 2013, and already presented in previous reports (WA 2010, WA 2013). The Study Areas were created from the extents of the geophysical (sidescan sonar) data coverage of each area, so all of the Study Areas are known to be completely covered by geophysical data. The exception is the relatively small area around GAD 23 (Goodwin Sands) which is clipped to a specific Study Area (explained in more detail in **Section 4.2.6**). However this area is known to have been completely covered by geophysical data.

3.1.3 The use of two separate study areas allows for any devised approach to be tested for areas where the nature of the environment and the surviving wreck material differ. Around the Farne Islands, the environment is predominantly rocky with little sediment

cover, and the identified wreck material comprises individual find spots rather than whole, or even partial, surviving wrecks. In the assessment area on the Goodwin Sands the environment is very different, with a thicker deposit of mobile seabed sediment and more substantial, though still often scattered and broken, surviving wreck material.

3.1.4 This study focusses on the mapping of whole marine sites at different scales, rather than identifying individual anomalies for further investigation as has been done previously within the study areas (and is generally undertaken during geophysical data interpretation of such sites). The emphasis is on how, and if, the extents of dispersed, more ephemeral wreck sites can be identified within geophysical data and where boundaries around these sites should be drawn, at both a landscape and individual site scale. This has previously been identified as part of a key research area for marine geoarchaeology and investigative methodologies (Dix & Sturt 2013).

## 3.2 Definitions

3.2.1 Terminology in this project is based upon the EH Thesauri (http://thesaurus.english-heritage.org.uk/). In addition, the following project-specific definitions have been used:

**Large marine landscape-scale site (LMLSS)** – A spatially very large concentration of anthropogenic seabed or sub-bottom features with the potential to contain multi-period and/or overlapping diffuse vessel and/or aircraft wreck sites.

**Individual site (IS)** – A single wreck within an LMLSS.

**National importance** – Heritage assets that meet the criteria for national importance used by the Secretary of State for considering whether a monument should be scheduled under the Ancient Monuments and Archaeological Areas Act 1979.

## 3.3 Objective 1

3.3.1 The following workflow was followed for Objective 1 (O1):

*Step 1* A rapid data review was carried out to confirm that the case study areas proposed in the project design were suitable.

*Step 2* Relevant geophysical and other datasets were identified. These were selected from geophysical and diving surveys previously carried out by WA, together with UKHO and NRHE data.

*Step 3* The criteria and methodologies used to map boundaries and assess importance of large marine landscape-scale sites were identified. This included relevant national and sector guidance (including designation criteria, selection guides and IHARs), together with the criteria and methodologies previously applied to the case study areas. The definition of importance was also considered.

*Step 4* Using geophysical data LMLSS boundaries were mapped for the case study areas. These were then refined and assessed using diving survey and UKHO/NRHE data.

*Step 5* Using the guidance identified in Step 3, each LMSS was examined to determine whether it could be identified as being of national importance on the basis of the mapping undertaken.

Step 6 Recommendations for guidance on best practice for mapping the boundaries of LMLSS and for assessing their importance were then formulated.

### 3.4 Objective 2

3.4.1 The following methodology was followed for Objective 2 (O2):

Step 1 Criteria and methodologies used to identify and map individual marine heritage assets within large landscape-scale marine sites have been identified, as in O1.

*Step 2* The effectiveness of their application has then been assessed using the case studies, as in O1.

*Step 3* The effectiveness of any alternative approaches identified during Step 2 have been tested, as in O1.

*Step 4* Recommendations for guidance on best practice for identifying and mapping individual marine heritage assets within large landscape-scale marine sites have then been formulated.

### 3.5 Objective 3

3.5.1 The following methodology was followed for Objective 3 (O3):

*Step 1* Criteria and methodologies used to identify and distinguish marine heritage assets of known and potential national importance within landscape-scale sites have been identified. This has included a summary review of existing guidance, policy and legislation applying to nationally important marine heritage assets generally, limited to relevance to the 1979 Act.

*Step 2* The effectiveness of their application has been assessed using the case studies, as in O1.

*Step 3* The effectiveness of any alternative approaches identified during Step 2 have been tested, as in O1.

*Step 4* Recommendations for guidance on best practice for identifying nationally important marine heritage assets within large landscape-scale marine sites has been formulated.

### 3.6 Objective 4

3.6.1 The following methodology was followed for Objective 4 (O4):

*Step 1* Criteria and methodologies used to distinguish marine heritage assets that lack ‘structure’ have been identified. The definition of ‘structure’, ‘vessel’ and ‘vehicle’ have been briefly reviewed for this purpose.

*Step 2* The effectiveness of their application has then been assessed using the case studies, as in O1.

*Step 3* The effectiveness of any alternative approaches identified during Step 2 have been tested, as in O1.

*Step 4* Recommendations for guidance on best practice on how to distinguish sites with and without ‘structure’ have been formulated, with the emphasis being on

recommendations that may reduce the requirement for sub-sea interventions, i.e. are relevant to geophysical data interpretation.

# 4 RESULTS

## 4.1 Defining spatial extent under the 1979 Act

4.1.1 A 'site comprising, or comprising the remains of, any vehicle, vessel, aircraft or other moveable structure or part thereof' can be scheduled under the 1979 Act. The site of a monument is also defined to include the land on which it stands and any adjacent land essential for its support or preservation. The 1979 Act applies to sites situated in, on or under the seabed within territorial waters. It therefore applies to the seabed under, over and around the remains, which can be buried or unburied.

4.1.2 The 1979 Act offers only vague guidance on spatial extent and therefore how to identify site boundaries, although a site or monument is usually interpreted as encompassing the extent of the visible presence or strong likelihood of presence of archaeological features. In the context of an LMLSS, this is potentially problematic, because not all of the archaeological features may be contiguous or because the spatial extent of the site may be unclear.

4.1.3 Two approaches to the question of where to place LMLSS boundaries could have been taken in the context of the case studies. Firstly, a boundary can be created by drawing around the outermost anomalies considered to be part of the LMLSS, using the shortest distance between them. Secondly, the spatial extent suggested by that analysis can be buffered, using a buffer size determined by professional judgement about the potential of the surrounding seabed to contain archaeological features. Given that there was no evidence within the geophysical datasets to suggest that there were buried features beyond the boundary, no buffering was used.

## 4.2 O1: Mapping LMLSS boundaries – Goodwin Sands case study

4.2.1 Mapping of potential LMLSS boundaries was carried out by a geophysicist with expertise in archaeological interpretation and involved the assessment of point locations of individual identified anomalies from within the case study area. These anomalies were divided into two categories based on the classification ascribed during the previous archaeological interpretation: those with a high probability of archaeological potential; and those of a more ambiguous nature.

4.2.2 The anomalies with a high probability of archaeological potential were determined to be those previously described as being anthropogenic in origin, including specifically identified pieces of debris (such as wrecks, cannons, anchors, lengths of rope or chain) and non-specified pieces of debris and debris fields. The anomalies of a more ambiguous nature were those not definitively described, including: dark and bright reflectors; areas of seafloor disturbance; non-specified linear features; and isolated magnetic anomalies not found associated with identified seabed features.

4.2.3 Separate boundaries were then drawn around the extents of all of the previously identified geophysical anomalies at a scale of 1:10,000, and around those deemed to be of higher archaeological potential only. This combination of two levels of feature comprised the LMLSS interpretation of the case study areas (**Figure 3**). The LMLSS containing those anomalies deemed to be of high potential were termed Class 1 LMLSS, those drawn around both high potential and ambiguous anomalies Class 2.

4.2.4 As well as being an accepted scale for the mapping of marine geophysical interpretation, which takes into account uncertainties concerning GPS positioning, etc., 1:10,000 is also the nominal scale for the National Mapping Programme, a broadly analogous form of mapping (EH 2010).

4.2.5 The case study area totalled 1.25 square kilometres, split into three separate areas. Area A and Area B, which includes the designated site of GAD 6, comprised the majority of the study area. Area C, located further to the west, comprised a small area located around the site of the GAD 23 wreck (**Figure 1**). Two Class 2 LMLSS were identified within Area A, and one within the Area B. A further one was identified within Area C around GAD 23. Class 2 LMLSS covered an area of 1.12 square kilometres in total, or 90% of the case study area. However, the interpretation indicated that all Class 2 LMLSS extended beyond the study area boundaries. Therefore the analysis did not establish the actual size of either Class 1 or 2 LMLSS.

4.2.6 This is especially the case with Area C around the GAD 23 wreck. In this area, the previous geophysical interpretation was clipped to a study area box measuring 200m x 200m instead extending to the edges of the geophysical coverage as was done for the interpretation of Area A and Area B. Clipping to a predefined Study Area in this manner is generally standard procedure when undertaking geophysical interpretation, as it concentrates the interpretation on the area of interest of the specific project.

4.2.7 WA has previously undertaken a number of diving investigations within the Goodwins Sands case study area. These include: designated site assessment surveys of GAD 6 and undesignated site assessment surveys of four other sites (GAD 14, GAD 9 and GAD 16, **Figure 1**). These investigations were acoustically tracked, which enabled the areas surveyed to be plotted against the geophysical LMLSS boundaries. Observations points recording significant archaeological and environmental features were then compared with the boundaries.

4.2.8 The results correspond well with the ten Class 1 LMLSS boundaries interpreted across the three areas (**Figure 3**). No observation points corresponded with areas of seabed that only contained features that did not have high archaeological potential. However, there are two problems with the use of this data. Firstly, with the exception of GAD 6, the data was acquired during ground-truthing of potential sites identified during the interpretation of the geophysical data sets. Therefore the observation point distribution inevitably coincides with the Class 1 boundaries. Secondly, only a very small part of the study area has been subject to diver survey. The sample is therefore too small to provide a useful test.

4.2.9 It is similarly difficult to assess the effectiveness of the mapping using UKHO and NRHE data due to the small sample size, there being only three relevant records of each (**Figure 1, Figure 3**). However, all of these records, with the exception of the NRHE record for the *Lord Hamilton*, lay within the boundary drawn using high potential anomalies. The NRHE position is probably incorrect, as it lies to the north of the UKHO position for the same wreck.

4.2.10 Use of observation point distribution to assess the boundary of the GAD 23 LMLSS is impracticable due to the very localised nature of the diving carried out. There are also too few UKHO/NRHE records to use in this way.

4.2.11 An alternative approach to the mapping of LMLSS boundaries was tried within Area B of the Goodwins case study area, based upon a non-standard method of anomaly mapping undertaken by a specialist archaeologist. The approach taken was to zoom in to a larger scale than 1:10,000 and then draw a polygon connecting all of the anomalies on the

periphery of the LMLSS. A ten metre buffer was then applied to take into account potential errors in anomaly positioning due to GPS and layback errors. Although mapping in this way produced different LMLSS shapes and slightly smaller LMLSS areas, the LMLSS contained a similar number of anomalies (**Figure 4**). The decision as to which anomalies to regard as being peripheral was also somewhat subjective. Also a large 20th century wreck located by a crude echo-sounder survey of charted UKHO wreck 13807 (NRHE 831734, possibly the *Salina* (GAD 56)) did not lie entirely within the Class 1 LMLSS boundary.

### 4.3 O1: Mapping LMLSS boundaries – Farne Islands case study

4.3.1 Applying the same methodology to the Farne Islands study area, the assessment clearly identified areas with concentrations of geophysical anomalies and those within which no anomalies were identified (**Figure 5**). LMLSS boundaries could therefore be adequately drawn as GIS polygons at a scale of 1:10,000.

4.3.2 The case study area totalled 2.32 square kilometres split into two regions – one in the east around Staple Island, Brownsman and the Wamses, and one in the west around Stiel Reef (**Figure 2**). A total of three main Class 2 LMLSS and three smaller Class 2 LMLSS were identified within the study area. The Class 2 LMLSS covered an area of 0.93 square kilometres, or 40% of the case study area. However, the interpretation indicated that most Class 2 LMLSS extended beyond the case study boundaries (**Figure 5**), and therefore the analysis did not establish the full extents of all of the Class 1 or 2 LMLSS.

4.3.3 As the seabed around the Farne Islands is generally rocky with little or no sediment cover and the environment can be characterised as high energy, no clearly defined wreck structure was identified during the previous geophysical interpretation. Instead, individual anomalies with high archaeological potential tend to be widely scattered across the seabed. Therefore, whilst Class 2 LMLSS boundaries could be drawn with relatively high confidence, Class 1 boundaries proved much harder to define due to the general lack of anomaly concentrations (**Figure 5**).

4.3.4 Some clusters of Class 1 anomalies were identified, and boundaries of sufficient size to be regarded as LMLSS could be drawn around them. Nine Class 1 LMLSS boundaries were created, although a number of the identified Class 1 areas consist of only one or two isolated anomalies. The two main Class 1 LMLSS identified are relatively small and ambiguous relative to the equivalent Goodwins LMLSS. This is not surprising due to the higher energy environment and smaller amounts of seabed sediment at the Farne Islands relative to the Goodwin Sands, though it does confirm the previously held assumption of the differences between the two sites and how this may affect the confidence in creation of LMLSS boundaries between the two site types.

4.3.5 WA undertook a diving project for EH within the case study area in 2013. The work consisted of the ground truthing of selected high potential anomalies, concentrating upon a known 17-18th century wreck site at Gun Rocks and areas immediately to the north and south, where wreck material associated with the loss of the *Forfarshire* and other vessels was thought to lie.

4.3.6 Only a small proportion of the anomalies were groundtruthed and therefore diver survey data is only available for a small percentage of the total area defined by both Class 1 and Class 2 LMLSS boundaries. In the case of the *Forfarshire* LMLSS, all of the wreck material located by diver survey lies within the Class 2 LMLSS. However, a small discrete cluster of wreck material located during diving at one of the high potential anomalies lies

within the Class 2 *Forfarshire* LMLSS to the north and therefore not within the equivalent Class 1 LMLSS, as do two items of wreck structure just to the north of the Class 1 boundary. The Class 1 boundary in this area was therefore adjusted to include this additional information (**Figure 7**).

4.3.7 The main Gun Rock site located by diver survey in 2013 lay just south of the largest of the three Gun Rock Class 1 LMLSS (**Figure 5**). The Class1 boundary in this area was therefore readjusted to include this additional information (**Figure 7**). Groundtruthed evidence of a possible 19th or 20th century vessel lay within the same Class 1 area, to the east of the main Gun Rock Site. The alternative approach for this site produced a similar result, although the Class 1 LMLSS covered a much greater area (**Figure 6**).

4.3.8 The same alternative approach to the mapping of LMLSS boundaries that was undertaken for the Goodwins was applied to the eastern region of the Farne Isles case study. Although mapping in this way produced different LMLSS shapes and slightly smaller LMLSS areas, the LMLSS contained the same number of anomalies (**Figure 6**).

### 4.4 O1-3: Importance

4.4.1 The criteria used by the Secretary of State for assessing the national importance of a monument for the purposes of scheduling under the 1979 Act are as follows:

- Period
- Rarity
- Documentation
- Group value
- Survival/Condition
- Fragility/Vulnerability
- Diversity
- Potential

4.4.2 Maritime specific guidance on the above is given in EH's *Designation Selection Guide Ships and Boats: Prehistory to Present* (2012c). This guidance states that the key criteria for ships and boats are as follows:

- Period
- Rarity
- Documentation
- Group value
- Survival/Condition
- Potential

4.4.3 The analysis of importance in this study is based upon these criteria. However, as the definition of the diversity criterion talks of the potential value of high quality combinations, it appears to have relevance to the concept of an LMLSS and has therefore been added.

4.4.4 The selection guide also provides guidance on the two additional criteria that apply to sites designated under the Protection of Wrecks Act 1973 ('PWA'), historic interest and artistic interest. The PWA is a hitherto more commonly used means of protecting nationally important wreck sites than scheduling. It does not however consider the application of the criteria to LMLSS, specifically to sites containing wrecks of more than one period and engaged in more than one activity.

4.4.5 Key to the understanding of national importance under both the 1979 Act and the PWA is a sound understanding of the existing resource and of the subject matter itself. EH has issued a series of Introductions to Heritage Assets (IHAs), of which two, *Ships and Boats: Prehistory to 1840* (EH 2012a) and *Ships and Boats: 1840 to 1950* (EH 2012b), are directly relevant. These guides provide a rapid introductory survey of the range and chronology of ships and boats of these periods, drawn from specially commissioned studies considering the special interest of boats and ships of different periods and from a survey of archaeological, technical and maritime history literature generally.

4.4.6 In addition, some guidance has been prepared in the context of offshore development licensing that is potentially relevant to a consideration of national importance. *The Selection Guide Boats and Ships in Archaeological Contexts* (WA 2008) considers the criteria for determining whether a ship or boat wreck is of 'special interest', a more widely based category than national importance and very broadly comparable to the term 'significance' used in the 1979 Act.

## 4.5 O1: Assessing LMLSS importance – Goodwin Sands Case Study

4.5.1 The concept of LMLSS as devised for this project is a new one and guidance on assessing their importance is lacking as a result. The project has therefore set out to determine whether the existing criteria for determining national importance devised for the 1979 Act could be applied to LMLSS. However, possible analogous systems exist for the terrestrial historic environment within established hierarchies of GIS polygon mapping of archaeological sites.

4.5.2 For example, in the Historic Environment Polygonisation Standards (Scotland) (RCAHMS 2010), a 'Buffered Site Extent Polygon' is defined as a polygon which *"…defines the limits of recorded remains and includes an additional buffer around the monument to protect areas where professional judgement suggests there is significant potential for further surviving remains…*". This appears similar to the definition of LMLSS provided here, though no guidance is given as to assessing the importance of Buffered Site Extent Polygons. It is also not stated whether these polygons are intended to be used for individual sites, or whether they can contain a number of sites over a larger area as intended by the LMLSS.

4.5.3 For the purposes of this project, the national importance of both the Goodwins and Farne LMLSS has been assessed using the key scheduling criteria used by EH for vessels: period; rarity; documentation; group value; survival/condition; and potential (EH 2012c: 9; extracts in italics below).

4.5.4 The Goodwins LMLSS currently contains one site already designated under the PWA on the basis of its perceived national importance, the *Rooswijk*.

***Period***

*Vessels from all periods are important in reflecting technological advances in boat construction and materials, and providing evidence of trade networks, industry, and*

*transport. Those vessels which best illustrate or epitomise this development can have strong claims to national importance.*

4.5.5 UKHO and NRHE records indicate that the Goodwins LMLSS contains the wreck of a Dutch East Indiaman merchant ship wrecked in 1739, a merchant ship wrecked in 1924 and a barge wrecked in 1921. In addition, what is reported as being a bronze cannon of the 16th century has been recovered from wreck GAD 16 (**Figure 1)**; WA 2011a: 25-6; Peacock 2007), which suggests that the wreck of an armed ship of the 16th or early 17th centuries is present. GAD 9 was investigated in 2010 and appears to be an armed wooden sailing vessel of the 17-19th centuries (WA 2011a).

4.5.6 A wide variety of periods from the 16th to 20th centuries are already known to be represented in the wrecks within the Goodwins LMLSS. It is arguable that dispersed wreck sites are only likely to be of national importance in terms of technological advances in boat construction and materials if shipwreck material of the relevant period is rarely found, in which case the LMLSS does appear to contain pre-1700 shipwrecks. Most of the ships wrecked on this side of the Goodwins are also likely to be linked to trade networks within or passing through the southern North Sea. Whether dispersed shipwrecks can be argued to best illustrate or epitomise trade networks, industry or transport is a moot point, but taken together it surely must.

***Rarity***

*The remains of vessels for periods before 1700 are so rare that any firmly dated vessels from this period are likely to be of national importance and may merit scheduling. For vessels of later date, particularly those types for which examples survive today, scheduling will always be exceptional.*

4.5.7 Other guidance suggests that boats and ships as late as 1815 are rare and that therefore the majority of wrecks from this period can be expected to be of special interest (WA 2008: 11). The diving survey and existing wreck data that is available suggests that dispersed pre-1700 and pre-1815 wrecks are present within the Goodwins LMLSS boundaries. There are likely to be others, but they fall under the category of 'potential'. The Goodwins LMLSS can therefore be argued as being important in terms of this criterion, because a number of rare wrecks are present within its area as defined by a concentration of anomalies.

***Documentation***

*Our understanding of shipbuilding, transport, trade and industry can be greatly enhanced by the survival of historical documentation relating to particular vessels and their service. Where modern analytic documentation can provide evidence for especially strong historical claims, for example confirming a ship to be the last of its type, this may be a key factor in establishing its importance.*

4.5.8 Previous studies suggest that there is a documentary archive for GAD 6 and this is likely to be regarded as an integral part of the importance of the wreck. There is also likely to be historic documentation for the 20th century vessels charted by the UKHO. However, documentation is currently lacking for most of the Goodwins LMLSS, as the other anomalies and confirmed wrecks are currently unidentified.

***Group value***

*In some instances, a vessel's importance may be strengthened by an association with other vessels of a similar type, for example the Scottish fishing boats at Kilspindie or the group of gunpowder boats at Waltham Abbey Gunpowder works, which allows for*

*comparative study. Association within a wider context which reflects their use can also be a consideration. In the case of hulks, as well as having intrinsic interest, they can contribute to the story of a landscape, and its long-term evolution and management.*

4.5.9 GAD 6 is one of an important group of known shipwreck sites in the UK and worldwide associated with the Dutch East India Company. Otherwise the lack of diving and other additional data concerning the other known wreck makes it impracticable to assess their group value. However, they are all likely to be associated with trading activity within or that passed through the southern North Sea and its margins. Furthermore, if they are seen as hulks in the context of a landscape, and that landscape is defined as the historically and internationally important navigational hazard of the Goodwin Sands (of which the east side is arguably the most significant), then the Goodwins LMLSS can be perceived as having group value.

***Survival/Condition***

*Given the range of materials used in boat-building, survival of vessels can be highly varied, from the sand-imprint of the ship at Sutton Hoo or fragment of the log boat at Shardlow (Derbyshire) to the concrete boats of Second World War date at Purton. Given the rarity of surviving vessels of pre-1700 date, even fragmentary survivals are likely to be of national importance although a judgement must be reached as to the degree of survival and intactness. For vessels of later date, increasingly complete survival, allied to strong archaeological and historical importance, will be expected before scheduling would be considered.*

4.5.10 The emphasis placed upon 'intactness' in current guidance means that the study area is unlikely to meet this criterion. Dispersed wreck sites are a well-known characteristic of the east side of the Goodwin Sands, which has a shallow east to west gradient and lacks the deep sandbanks that promote the survival of intact wrecks elsewhere in the Goodwins.

***Diversity***

*The importance of wrecked vessels can reflect the interest in their architectural design, decoration and craftsmanship, or their technological innovation or virtuosity, as well as their representativeness. Consideration should be given both to the diversity of forms in which a particular vessel type may survive and to the diversity of surviving features. Some vessel types may be represented in the surviving record by a wide variety of building types and techniques which may be chronologically, regionally, or culturally conditioned. The sample of protected sites should reflect this wide variety of forms. In addition, some wrecks may be identified as being of importance because they possess a combination of high quality surviving features or, occasionally, because they preserve a single important attribute.*

4.5.11 GAD 6 is the only protected VOC wreck in territorial waters around England. However, too little is known about the other wrecks present in the Goodwins LMLSS to rate this criterion. The lack of intact wrecks undoubtedly reduces the evidential value in terms of diversity.

***Potential***

*England's maritime past is one of its defining characteristics throughout all periods. Evidence for the construction and use of vessels gives us great insight into not only the exploitation of our marine environment, but also into the development of wider trade and transport networks. This is especially true of earlier periods which are lacking in the rich literature and documentation of later times. Surviving vessels may also provide evidence of their use and construction, reflecting technological developments which in some*

*circumstances may be all but lost. For the prehistoric period, in particular, the remains of vessels may be some of the largest artefacts discovered which demonstrate the technology of woodworking and management of woodland resources. Similarly, where vessels are found in situ, associated deposits may be rich in palaeoenvironmental remains. The potential which a vessel has for answering questions about our maritime past will be a consideration in establishing its importance. If the remains of a cargo vessel survive it is likely to add very considerably to the vessel's significance, for its evidence of trade and material culture at a particular point in time.*

4.5.12 Although lacking in intact wrecks, the Goodwins LMLSS appears to have high potential for three reasons. Firstly, the sheer number of high potential anomalies. Secondly, anomalies within the Goodwins LMLSS have already been demonstrated to be significant historic wrecks. Thirdly, the Goodwins LMLSS lies within an area on the east side of the Goodwins that has historically been a significant navigational hazard for trade and other shipping in the southern North Sea. Wreckings can be expected to have occurred there in all periods.

## 4.6 O1: Assessing LMLSS importance – Farne Islands Case Study

4.6.1 The suitability of the 1979 Act criteria has been tested using the same approach adopted for the Goodwins LMLSS. The two Farne Islands LMLSS currently contain no designated or scheduled sites.

### *Period*

4.6.2 Secondary sources suggest that at least nineteen post medieval and modern period merchant ship losses have occurred within or close to the case study area (Young 2012: 91-118). Given that the case study area is only 2.32 square kilometres, this is a very high density and reflects the notoriety of the Farnes as navigational hazards. Its principal evidential interest lies in the English post-medieval and modern coastal trade that was fundamental to the growth of the UK economy during this period and vessels both typical and untypical of this trade. However, the very dispersed and partial nature of the surviving material greatly reduces its ability to epitomise and illustrate.

### *Rarity*

4.6.3 No wreck material has been identified that predates 1700. However, there are pre-1815 wreck sites present, including those of two early 18th century vessels, an unidentified vessel at Gun Rocks and the collier *Pearle*. There is also the *Forfarshire*, whose association with Grace Darling arguably renders it unique. However, the evidential value is diminished by the paucity of identified evidence for the latter two. A case might be made that taken as a whole such a concentration of known losses of post-medieval cargo vessels is rare in itself, but again the evidential value is reduced by its paucity.

### *Documentation*

4.6.4 There is a plethora of documentary evidence associated with the *Forfarshire* and its loss which enhances our understanding of a famous 19th century event and, to a limited extent, our understanding of early steamships and their uses. Documentary evidence may exist in relation to other vessels which may enhance our understanding of post-medieval coastal trade and ships, but this area of evidence appears to be poorly researched at present.

### *Group value*

4.6.5 The wrecks within the Farnes LMLSS certainly have potential group value in terms English coastal trade and vessels. However, their potential in this respect is limited by the dispersed and limited nature of the evidence.

***Survival/Condition***

4.6.6 As with the Goodwins LMLSS, the emphasis placed upon 'intactness' in current guidance (EH 2012c-d) means that the study area is unlikely to meet this criterion. Dispersed wreck sites are a well-known characteristic of the Farnes, which lack stable environments conducive to survival.

***Diversity***

4.6.7 Diver survey, secondary literature and NRHE data suggests that the Farnes LMLSS is likely to contain a diverse range of 17th-19th century ships and boats, including the *Forfarshire* and Gun Rocks sites (WA 2013b-c; Young 2012: 91-118). However, the lack of surviving evidence significantly reduces the importance of this criterion.

***Potential***

4.6.8 The high density of post-medieval losses of important vessels or type of vessels suggests that the Farnes LMLSS should score highly in terms of potential. However, the poor survival and dispersed nature of the evidence suggests that potential is in fact fairly limited.

## 4.7 O2: Identifying and mapping individual sites - Goodwin Sands Case Study

4.7.1 The extent and character of the Goodwins LMLSS precludes it being material from a single wreck. Therefore it is necessary for IS boundaries to be mapped using the previously interpreted boundaries established for Class 1 anomalies. To achieve this, area boundary shapefiles from previous geophysical interpretations were also loaded into GIS and adapted for use in this study. The shapefiles were again split into two separate levels of feature – one comprising any boundary which mapped out the extents of surviving pieces of wreck structure, and one comprising more scattered debris field boundaries. As with the LMLSS interpretation, the combination of these two levels of feature comprised the IS interpretation of the case study area.

4.7.2 The results identified a large number of individual sites interpreted as wrecks. It suggests that most interpreted wreck structures are surrounded by a debris field, as would probably be expected with broken and dispersed wreck sites (**Figure 8**). However, the boundaries between sites that are closely adjacent or possibly overlapping are much more difficult to interpret. The analysis resulted in some uncertainty with regard to the precise identification and mapping of adjacent sites, and did not identify any overlapping boundaries so the technique could not be tested in this respect.

4.7.3 Integration of diving and other data was partially successful. In the case of GAD 6, wreck material that is interpreted as being from or probably from the vessel has been found within the two sites identified during geophysical interpretation; although only part of each IS has been ground-truthed (**Figure 8**). This is confirmed by desk-based research of previous site investigations (WA 2012b). In the absence of this additional data, it is unlikely that these sites could have been associated on anything more than a possible basis. The so-called 'North Site', within which wreck material was found in 2011 and which has a possible but unconfirmed association with GAD 6, is identifiable from diving observation data but was not identified during geophysical interpretation and lies just to the north of the IS interpretation carried out for this study.

4.7.4 Diver ground-truthing of GAD 60 and Site GAD 9, indicates that wreck material lies outside the IS boundaries. Those boundaries have therefore been reinterpreted by creating a polygon whose boundaries have been drawn by connecting tracked archaeological observations of wreck material (**Figure 8**).

4.7.5 Echo sounder data collected during archaeological operations has also enabled the IS boundary interpretation of GAD 56 to be refined (**Figure 1**, **Figure 8**). Other data for the LMLSS is sparse and has not assisted in identifying IS or in defining their boundaries.

### 4.8 O2: Identifying and mapping individual sites - Farne Islands Case Study

4.8.1 As noted previously, the seabed around the Farne Islands is a rocky, high energy environment. No intact or partially intact wreck structures have been interpreted in the case study area, with the present wreck remains represented by individual find spots. As a result no IS assessment could be undertaken using the geophysical data set as no interpreted wreck structure/debris fields boundary shapefiles exist.

4.8.2 The diver and other data have however allowed for two concentrations of wreck material to be identified within the *Forfarshire* LMLSS (**Figure 7**). The northern cluster, 7086, is likely to represent wreckage from a single shipwreck, probably not the *Forfarshire* (WA 2013b: 14). The southern cluster, 7087, is also shipwreck material, not necessarily from a single vessel or in situ and also probably not the *Forfarshire* (WA 2013b: 14-15). In addition a single large piece of wreckage was found at 7065. Tracked diver searches around 7086 and 7087 failed to locate any additional wreck material, suggesting that boundaries for these sites had been established. The survey of 7065 was not tracked and no mapped boundary was therefore established, although the geophysical data suggested that the feature located was isolated.

4.8.3 Diver ground-truthing of the Gun Rock LMLSS was similarly limited in its scope. Two clusters of wreck material were located around anomalies 7075 and 7023/7125-8 (**Figure 1**, **Figure 7**; WA 2013c). The use of tracking enabled these to be mapped. Whilst these were identified as being two discrete sites, they were also identified as being part of the same wreck, a possible Dutch 18$^{th}$ century merchant ship. Ground-truthing also established that two isolated anomalies, 7139 and 7044 were of archaeological interest, although they appeared to be isolated features rather than discrete sites (**Figure 7**). Other available data did not allow individual site boundaries to be identified or further refined.

### 4.9 O3: Identifying individual sites of national importance within LMLSS

4.9.1 Geophysical interpretation allows anomalies to be distinguished in terms of those that are likely to be anthropogenic and those that are not likely to be. An anomaly can be characterised in terms of its physical attributes, typically its xyz dimensions and presence or absence of a magnetic anomaly (indicative of ferrous material). Similar anomalies can be grouped and interpreted as sites and a wreck distinguished from a debris field. If the data is of high enough quality, then it is possible to identify certain classes of object, for example the frames of a wooden shipwreck or cannons with a high degree of probability. However, only in exceptional cases, usually involving intact vessels or recognisable sections of particular types of vessels is it possible to go much further. In those cases it may be possible to infer the type of vessel and its likely date range, however identification of the actual vessel relies on the availability of other types of data, for example loss records.

4.9.2 Identifying IS as being of national importance relies upon evidence being available about a site's period, rarity, documentation, group value, survival/condition and potential. Geophysical data on its own can only provide evidence about survival/condition, potential, and possible construction (i.e. wooden or steel hulled), which in turn can be used to indicate possible period, but not about the other criteria.

4.9.3 For the purposes of identifying IS of national importance, two sites within the Goodwins case study area and one sites within the Farne Islands case study area were selected,

GAD 6 and GAD 23 from the former and Gun Rock from the latter. These sites were selected because they had previously been assessed by other studies as being of national importance, using either the PWA or 1979 Act criteria. This provided a baseline for determining the contributions of the different datasets to the assessment.

4.9.4 The test devised was straightforward. As the interpretation of geophysical data is the primary means of mapping LMLSS and IS boundaries, the scheduling criteria were first assessed using that interpretation alone to determine whether national importance could be determined from it. Then the additional data, including diving surveys and their associated research and UKHO/NRHE data was added and the criteria reassessed by way of comparison.

4.9.5 In the case of GAD 6, the geophysical interpretation identified areas of wreck and debris. The geophysical data interpretation has provided the following information relevant to the criteria:

- Period: The anomalies present are undoubtedly more likely to be characteristic of a dispersed wooden ship than one with an iron or steel hull.
- Rarity: Insufficient data to assess.
- Documentation: No evidence.
- Group value: Insufficient data to assess.
- Survival/Condition: There is no evidence of an intact wreck. Although anomalies interpreted as wreck structure have been identified, the distribution and character of those anomalies suggest a dispersed wreck. More anomalies were originally identified in the 2009 than in the 2008 dataset and it was inferred from this that the condition of the site as a whole changed during this period.
- Potential: Insufficient data to assess.

4.9.6 Geophysical data interpretation alone is clearly insufficient to identify the GAD 6 site as being of national importance. However, by adding additional data from diving surveys and research carried out for EH and from NRHE and UKHO data, it is possible to enhance the assessment as follows:

- Period: The site has been identified as the wreck of the *Rooswijk*, a large Dutch VOC merchant vessel lost in 1739 whilst carrying a valuable cargo. It is therefore representative of a crucial period in the post-medieval worldwide expansion of Western European trade and of perhaps the most famous type of vessel engaged in this trade. Wrecks of this period are generally considered to be of special interest (WA 2008: 11).
- Rarity: GAD 6 dates from the 1730s and according to the relevant EH guidance, the scheduling of vessels dating to periods after 1700 will always be exceptional (EH 2012c: 9). However, only 93 wrecks dating to the period 1500-1815 are recorded by the NRHE (EH 2012a: 7) and it is highly unlikely that GAD 6 would be turned down for scheduling on the basis of this criterion.
- Documentation: We only know of the existence of GAD 6 because contemporary documents mention it. Investigations carried out for EH have not addressed this area of evidence in any detail. However, VOC records including cargo manifests survive and form a rare and important account of 17$^{th}$ and 18$^{th}$ century maritime trade. In addition there is a body of other documentary evidence including newspaper accounts relating to the *Rooswijk*.

- Group value: As one of a number of VOC wrecks in the Goodwins and UK territorial waters, GAD 6 is an important sub-component of discovered maritime archaeological sites (EH 2009: 11).
- Survival/Condition: Although the site is dispersed, archaeological and other investigations have concluded that the site contains high quality surviving features of the wreck, including fittings, armament, equipment, personal belongings and cargo (EH 2009: 11). Archaeological studies and the site's management plan have concluded that there is strong evidence for much archaeological material to be buried and therefore currently unknown.
- Potential: The site has a demonstrably rich potential in terms of archaeological evidence for many subjects, including 18th century maritime trade, the technology of 18th century merchant ships, shipboard life and 18th century manufacturing. EH guidance indicates that cargo ships are considered particularly important in terms of potential (EH 2012c: 10).

4.9.7 It can be concluded that only by adding additional data to the geophysical data set, is it possible to make a sustainable case that the GAD 6 site is nationally important. Indeed, in the absence of that additional data it is inconceivable that the site would be scheduled or would meet the criteria for designation under the PWA.

4.9.8 GAD 23 is the only other wreck within the Goodwins case study area assessed by an archaeological study as being of national importance (WA 2012c: 18-22). Although not subsequently designated or scheduled, a far less well preserved wreck of probably similar vessel type and date elsewhere has subsequently been designated under the PWA. Based upon the geophysical data collected in 2005-2009 alone, the scheduling criteria have been assessed as follows:

- Period: The ship had a bowsprit when first surveyed and is therefore almost certainly a large sailing ship. On a balance of probability it is therefore likely to pre-date 1914. Even taking into account the fact that it is likely to have been largely buried since sinking, the fact that it appears largely intact suggests that it is very unlikely to be earlier than the 19th century. The vessel is statistically likely to be a merchant ship.
- Rarity: As a probable 19th or early 20th century wreck the site is not particularly unusual. It can be argued that this wreck falls within the class of post-1700 'exceptional' wrecks, although lack of information concerning the type of vessel is limiting.
- Documentation: No evidence.
- Group value: Insufficient data to assess.
- Survival/Condition: It is readily apparent from the geophysical data that the wreck is intact or largely intact, although it lacks its masts and the preservation of fixtures and fittings and other contents is uncertain. Condition is likely to be but not certain to be good.
- Potential: Insufficient data to assess.

4.9.9 A 2012 diving survey confirmed the 30m long wreck as being a partially intact merchant sailing ship with *in situ* deck and internal fixtures and fittings and a cargo of coal. Dating was given as mid to late 19th century, although this type of vessel was still in service in

lesser numbers in the early 20th century. By adding the results of the diving survey and NRHE data (WA 2012c), the above assessment can be revised as follows:

- Period: The wreck is very probably a wooden merchant sailing ship of the mid-late 19th or possibly very early 20th century and was engaged in arguably the most important maritime trade of the 19th century, the coal trade.
- Rarity: As a probable 19th or early 20th century wreck the site is not particularly unusual. However, this wreck falls within the class of post-1700 vessels likely to be regarded as 'exceptional' wrecks.
- Documentation: No evidence, although the vessel, its voyage, the trade it was engaged in, its loss, its builders and owners and perhaps even its crew are likely to be recorded in contemporary documentation.
- Group value: The site is one of many wrecks in UK territorial waters associated with the coal trade. This trade has recently come to be regarded as archaeologically important (WA 2009).
- Survival/Condition: Although there is evidence of deterioration in condition since first discovered in 2005, the vessel is exceptionally well preserved. It is intact to the weatherdecks, with deck machinery in place. In terms of well-preserved wooden wrecks of this period in the UK, there appears to be no equivalent. A less well preserved wreck in the Solent, probably of a similar date range, has recently been designated.
- Potential: The site has an even greater potential in terms of archaeological evidence than the *Rooswijk*, including evidence of 19th century maritime trade and technology, shipboard life and the coal trade. As noted above, EH guidance indicates that cargo ships are considered particularly important in terms of potential.

4.9.10 For GAD 23 it is possible to make the case that the site is important, perhaps of national importance, just on the basis of the geophysical data. However, by adding the diving survey data, the case for regarding the site as being nationally important becomes significantly stronger.

4.9.11 The Gun Rocks site in the Farne Islands has been known since early investigations took place in the 1970s. The site consists principally of a number of iron cannon lying within two discrete areas a short distance apart. The site, likely to be that of an early 18th century Dutch merchant ship was subject to both geophysical and diving surveys in 2013. An assessment of the site against the criteria of the 1979 Act was carried out at that time and the results indicated that the site was of national importance. However, it lacks 'structure' and has not been designated.

4.9.12 Based upon the geophysical data collected in 2005-2009 alone, the scheduling criteria have been assessed as follows:

- Period: Several cannon-like anomalies have been detected. If this identification can be confirmed, then the site is likely to be the wreck of an armed ship and is likely to pre-date the mid-19th century.
- Rarity: Insufficient data to assess.
- Documentation: No evidence.
- Group value: Insufficient data to assess.

- Survival/Condition: No evidence of ship structure, etc., has been found and the wreck appears to be dispersed.
- Potential: Insufficient data to assess, although the guns if confirmed may provide evidence of gun founding and naval/merchant ship armament.

4.9.13 Adding the results of the 2013 diving survey and NRHE data (WA 2013c), the above assessment can be revised as follows:

- Period: The wreck is probably that of a Dutch vessel lost in the early 18th century. Despite the lack of vessel remains, what is likely to be the cargo survives. This provides potentially important evidence concerning the international armaments trade. Wrecks of this period are generally considered to be of special interest (WA 2013).
- Rarity: The same considerations apply as per the *Rooswijk* and it is arguably unlikely that the site would be refused for scheduling on this criterion.
- Documentation: There are known secondary sources concerning the wrecking event. There is a low possibility that Dutch records are traceable.
- Group value: The site adds to the diversity of an important group of wrecks connected with the navigational hazard of the Farnes.
- Survival/Condition: No evidence of the vessel itself survives, although the guns appear to be in good condition.
- Potential: The site has considerable potential with respect to 17th century ordnance and trade. A number of possibly linked anomalies remain to be investigated. Potential is reduced by the limited survival of the vessel.

4.9.14 Gun Rocks has previously been argued as being of probable national importance (WA 2013c: 21). It is not possible to make this case on the basis of the geophysical data only, but it is possible by taking into account additional data.

## 4.10 O4: Identifying sites lacking structure

4.10.1 In order to be scheduled under the 1979 Act, a site must be nationally important and in physical terms meet the definition of a monument. The definition of a monument under the 1979 Act includes “any site comprising the remains of, any vehicle, vessel, aircraft or other moveable structure or part thereof”.

4.10.2 Moveable structures such as vessels or aircraft can only be considered as monuments if they form part of an archaeological site, in other words are *in situ*. Key to this is the question of moveability. If a vessel is intact and can still be moved, then it does not form part of a site and does not have archaeological potential.

4.10.3 Neither the 1979 Act nor EH wordlists appear to define ‘vessel’. However, ‘watercraft’ is defined as “any vehicle/craft used for transportation on water” and a vehicle as “a means of transportation”. It appears appropriate to simply treat vessel as another word for a watercraft.

4.10.4 Terrestrially-focussed guidance concerning sites of human activity that lack structure is already available (EH 2012d). There is no such guidance tailored to marine sites other than submerged landscapes. However, there are clearly two main types of sites relating to watercraft or aircraft that may lack evidence of structure. The first is sites where only spilled cargo or contents survive. These are capable of being monuments and considered

for scheduling, even though the remains of the wrecked vessel are not present. However, the lack of vessel remains clearly limits this type of site in terms of the survival and potential criteria (Paul Jeffery, pers. comm., Nov. 2014).

4.10.5 The second type of site is anthropogenic material that forms a surface scatter on the seabed and that is not associated with a wreck. Such sites are broadly equivalent to certain types of terrestrial lithic scatter and are not normally considered capable of being scheduled. They are typically comprised of objects dumped or lost from a vessel.

4.10.6 In the case of the Gun Rocks wreck at the Farne Islands, the site is clearly one of scattered pieces of debris related to the wreck without any distinct, coherent wreck structure being visible. This debris includes clusters of cannons, which would have once been part of a vessel that has now mostly broken up and disintegrated. From a geophysical perspective, and the perspective of mapping the extents of such a site, the boundaries can prove difficult to define (as previously explained in relation to the Class 1 LMLSS from the Farne study area).

4.10.7 However, concentrations of material, especially if, as in this case, they are later found by diver survey to be archaeologically significant, can be identified within the geophysical data and tentative boundaries drawn. Although it is likely that diver survey would be required to confirm the nature of the identified anomalies before they would be classified as a definite site. It is due to this uncertainty that the interpretation of the Farne Islands study area stopped at the LMLSS level.

4.10.8 In the case of GAD 6, the situation is a little different. Whilst the site is still scattered and generally without structure, there are a number of coherent pieces of surviving wreck material which can be identified from the geophysical data. The problem then becomes not whether this is likely to be an archaeological site, but exactly where the boundaries lie. This is especially the case for the Goodwins, where mobile sand can periodically bury and expose broken up wreck material, which will effectively change the site boundaries.

4.10.9 Sites such as this should be identifiable in the first instance from the geophysical data (provided it is of a high resolution), though mapping the boundaries between wreck, debris field and the final edge of the site will prove problematic and is likely to be subject by some degree to individual interpretation.

# 5 DISCUSSION

## 5.1 Geophysical data as the primary data set

5.1.1 The formation of the previously outlined methodology, and the results obtained by applying it to case study areas, have indicated that mapping areas of relatively high and low archaeological potential based on geophysical interpretation is possible. However, it has raised a number of questions, possibilities for improvement, limiting factors, and caveats that should be applied to any assessment undertaken in this fashion. These points are outlined and discussed individually below.

5.1.2 It is a clear and common sense lesson from this project that LMLSS boundaries can only be fully mapped if interpreted geophysical survey data exists and the extent of coverage exceeds the boundaries of the LMLSS itself. This is most clearly apparent in the Goodwins case study, where the LMLSS boundary could only be partially mapped and in places continues to an unknown extent beyond the data coverage. The two case studies

examined for this project suggest that diving and other data sets cannot be relied upon as an alternative or to fill in the gaps where geophysical data does not exist.

5.1.3 Two approaches to this could be adopted. Firstly, the approach could be taken that an LMLSS boundary should not be mapped unless there is sufficient data coverage. However, this then raises the question of what would qualify as 'sufficient' coverage, as it would not be known whether a data set covers a large enough area to fully define an LMLSS until after interpretation. Secondly, the approach could be taken that boundaries can be completed by drawing around the limit of data coverage where a boundary based upon interpreted data is not available, and it made explicitly clear in the final presented results where the limits of data coverage lie. This would not remove any erroneous boundaries created due to the limits of the data coverage, but should inform the reader that the LMLSS boundaries are incomplete and likely to extend beyond those presented. This should help remove confusion related to location bias similar to that reported from Wales, where locations of monuments were clearly linked to the bus routes used by the monuments officer concerned (Davis 2014); in other words 'these monuments are here because this is where we've looked'. As this is an obvious selection bias that may result in misinterpretation of the LMLSS or the seabed beyond, it is vital if this approach is taken then the bias should be clearly communicated in the LMLSS record.

5.1.4 Two potential problems arise from the original interpretation of the geophysical data on which the assessment is based. The first results from the subjective element of geophysical interpretation. Whilst distinct wreck sites or other large, anthropogenic features such as well heads and pipelines are easily identifiable, as are definite natural features such as sand waves and rock outcrops, there are often numerous anomalies of a more ambiguous nature whose classification inevitably depends to an extent on individual interpretation. This also applies to the difference between wreck structures and debris/debris fields during IS mapping. This is especially the case for broken, scattered sites where the decision about whether to class something as a wreck or just as debris is highly subjective.

5.1.5 The second potential problem arises from interpretational bias related to location. If a survey is undertaken based around a wreck site, an interpreter may be more likely to classify any anomalies close to the recorded location as related to a wreck site, whilst those further away from the location are more likely to be classed as debris. Again, this is more likely to be the case for scattered wreck sites such as those that occur within the study areas assessed here.

5.1.6 These problems are likely to impact upon both LMLSS and IS boundary mapping. Other data sets such as diving surveys should therefore be used to mitigate their effect where available.

5.1.7 Probably the most important question occurring from this type of assessment is where exactly to draw the boundary line around a broken and scattered site – another factor which is likely to be influenced by individual interpretation.

5.1.8 No definite criteria have been reached to determine exactly where boundaries around such sites should be placed, although it is clear that the scale at which the data is viewed is a large influencing factor. Viewing the data at larger scale will result in fewer individual boundaries drawn over a large area, whilst numerous smaller boundaries will be the result of working at a smaller scale (**Figure 9**). As such, the boundaries for this report were consistently drawn using a map scale of 1:10,000; a generally accepted scale for the mapping of marine geophysical interpretation which takes into account uncertainties concerning GPS positioning, etc., and is also the nominal scale for the National Mapping

Programme, a broadly analogous form of mapping (EH 2010). However, the scale at which boundaries are drawn is likely to depend initially upon the size of the landscape or site that is under assessment, and so change from place to place.

5.1.9 This problem of where to place boundaries is not confined to mapping archaeological sites, and parallels can be drawn with biological surveys, specifically those designed to map out reefs. As with how to determine at what point a debris field becomes a wreck site, biological seabed mapping often has to determine at what point scattered seabed communities become a reef. Often, the scattered communities are not of particular interest, though the reef itself may be eligible for protection – another parallel between this kind of mapping and that attempted in this study.

5.1.10 Unfortunately, no definite guidelines for the creation of biological boundaries, and exactly what does and does not constitute a reef, have been produced. An example of the process of attempting to create such a system, and a description of the problems involved, is provided in Hendrick & Foster-Smith (2006).

5.1.11 The definition of a 'reef' was reached in this study by applying a scoring system to various reef characteristics, such as area of extent, percentage of seabed coverage of the feature within this area, degree of consolidation and protrusion of the reef above the seabed. Some of these features, such as the protrusion above seabed, do not correlate with archaeological sites as they do not take into account sites which can either be buried or lay flat on the seabed.

5.1.12 However, characteristics such as area and percentage seabed coverage are potentially analogous, as concentration of material could help define the extents of sites. The problem then returns to exactly where to draw the boundary, as this will affect both the area and percentage of seabed covered by material within that area – a fact which is acknowledged for reefs by Hedrick & Foster-Smith (2006) and is likely to cause debate if the precise positioning of boundaries affects whether or not a site is to be protected, be the site archaeological or environmental. Unfortunately, with precise boundary creation being often uncertain and subject to individual interpretation, it is debatable as to whether a precise mathematical basis for site identification as attempted in Hendrick & Foster-Smith (2006) is actually possible.

## 5.2 Can an LMLSS be scheduled?

5.2.1 A 'site comprising, or comprising the remains of, any vehicle, vessel, aircraft or other moveable structure or part thereof' can be scheduled under the 1979 Act. The wording used is singular, i.e. one vessel or aircraft. However, a terrestrial site can incorporate evidence of quite different activities that occurred during different periods and for which the only direct link is provided by location.

5.2.2 Logically, therefore, a site at sea should be able to include the remains of wrecks of different periods engaged in different activities that are only linked by location. Location is not arbitrary in either instance; just as different phases of occupation of a terrestrial site are likely to be linked to common factors such as the availability of water, the location of an LMLSS is likely to be a dangerous one for shipping of all periods. For the purposes of this project, LMLSS are considered to fall within the definition of sites that can be scheduled under the 1979 Act.

5.2.3 It is noted that section 33 of the 1979 Act allows for 'areas of archaeological importance' to be designated. Five historic city centres have been designated in this way. Whilst there appears to be nothing in the wording of the 1979 Act to prevent this provision being

applied to the seabed, EH has stated that there are no plans to designate additional areas.

### 5.3 Importance

5.3.1 The criteria used for assessing national importance under the 1979 Act appear to be readily transferable to both LMLSS and IS using the interpretation provided by EH in the relevant Selection Guide, which appears to be fit for its purpose (EH 2012c). However, whilst geophysical data appears to be capable of being used to map LMLSS boundaries it is quite clear that any assessment of importance relies on the availability of additional datasets. In both case studies the availability of data derived from diving investigations has been of fundamental importance in this respect, confirming and adding to the geophysical interpretation and enabling the use of documentary evidence relevant to identification.

### 5.4 Sites lacking structure

5.4.1 The concept of sites without structure originates from a specific type of terrestrial site. However, the concept is transferable to marine sites as they exist as surface scatters for which there is no evidence of association with moveable structures such as shipwrecks. Surface scatters can be detected in geophysical survey data. Evidence of association with a wreck can be inferred, for example if the scatter shares a boundary with a wreck, or direct, for example is the association is proved by diver survey. In the absence of strong inferred or direct evidence, scheduling is unlikely to be justifiable.

## 6 OUTCOMES

6.1.1 During the course of this assessment, it has been found that the boundaries LMLSS and IS can be mapped from geophysical data, albeit alongside caveats and stated limitations based on such a technique such as survey data extents upon which the interpretation is based and the scale at which the boundaries were drawn. It has also been found that this kind of interpretation can also, in relationship with other data sources and via assessment against criteria within the 1979 Act, be used to assess whether such sites may be of national importance or potential candidates for scheduling.

6.1.2 As the process between initial data interpretation of a site to the eventual decision of whether a site is of national importance involves a number of different steps and different data inputs, two separate flowcharts have been proposed to be used as guides. The first is a methodology flowchart describing the creation of LMLSS and IS boundaries (**Figure 10**). This flowchart assumes an initial geophysical survey and interpretation of the area in question has already been undertaken, and ends with the creation of the LMLSS and IS boundaries (if present).

6.1.3 The second flowchart outlines the assessment methodology, whereby the LMLSS and IS boundaries and material contained within are assessed against a number of criteria to determine whether the identified sites are of national importance and of possible consideration for scheduling (**Figure 11**). This flowchart follows directly on from the methodology flowchart, and as such assumes an LMLSS/IS interpretation has already been undertaken and that boundaries have been drawn that are available to be assessed.

6.1.4 Although arrived at during the process of carrying out the assessment of the two case study areas, these flowcharts are considered as draft proposals and are open to

discussion, alteration and refinement if necessary, though they should serve as a good starting point.

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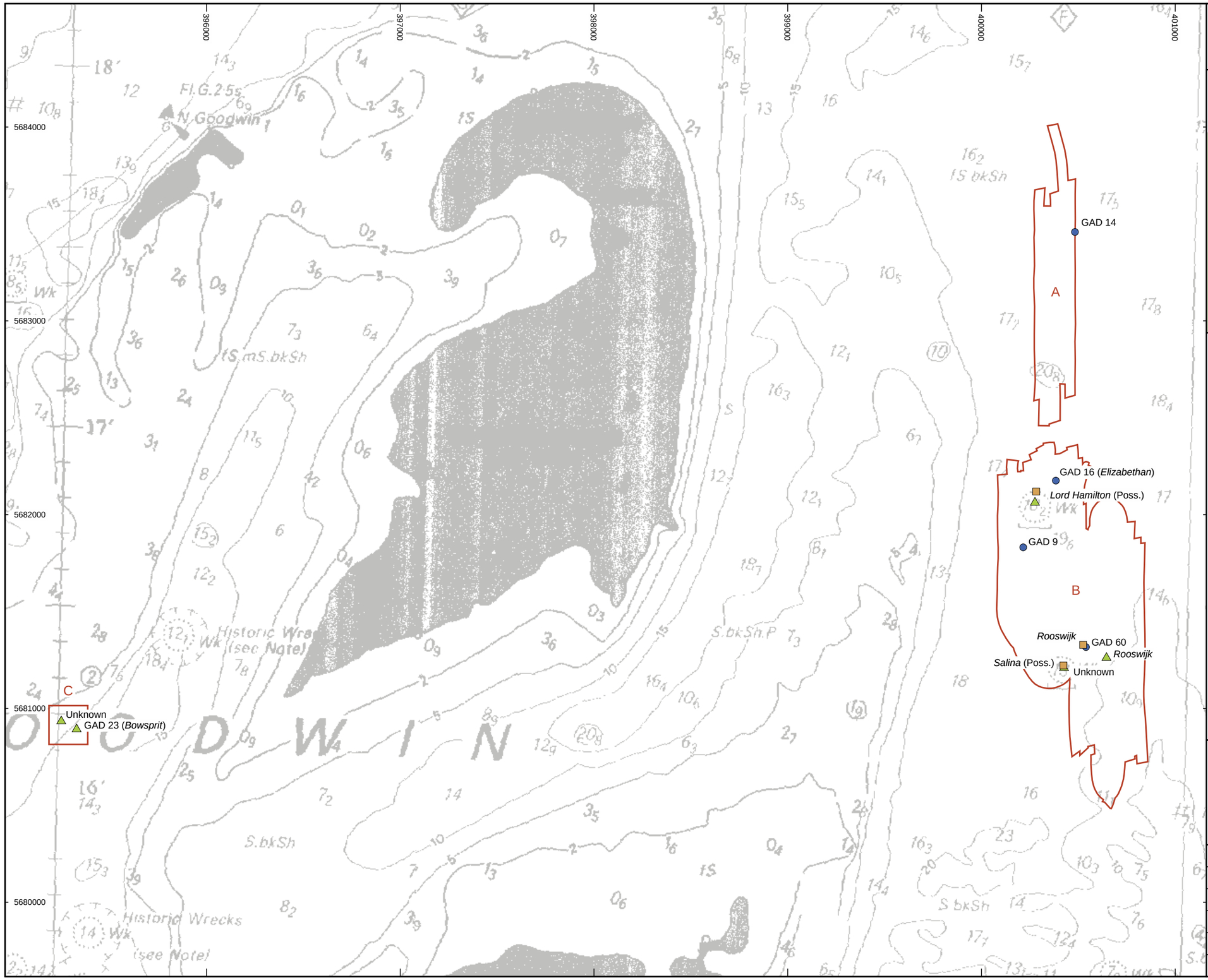


Study Area
WA data
UKHO data
NRHE data

0 1 km

Admiralty chart 1828 (dated 1999)
Projection: UTM WGS84 z31N



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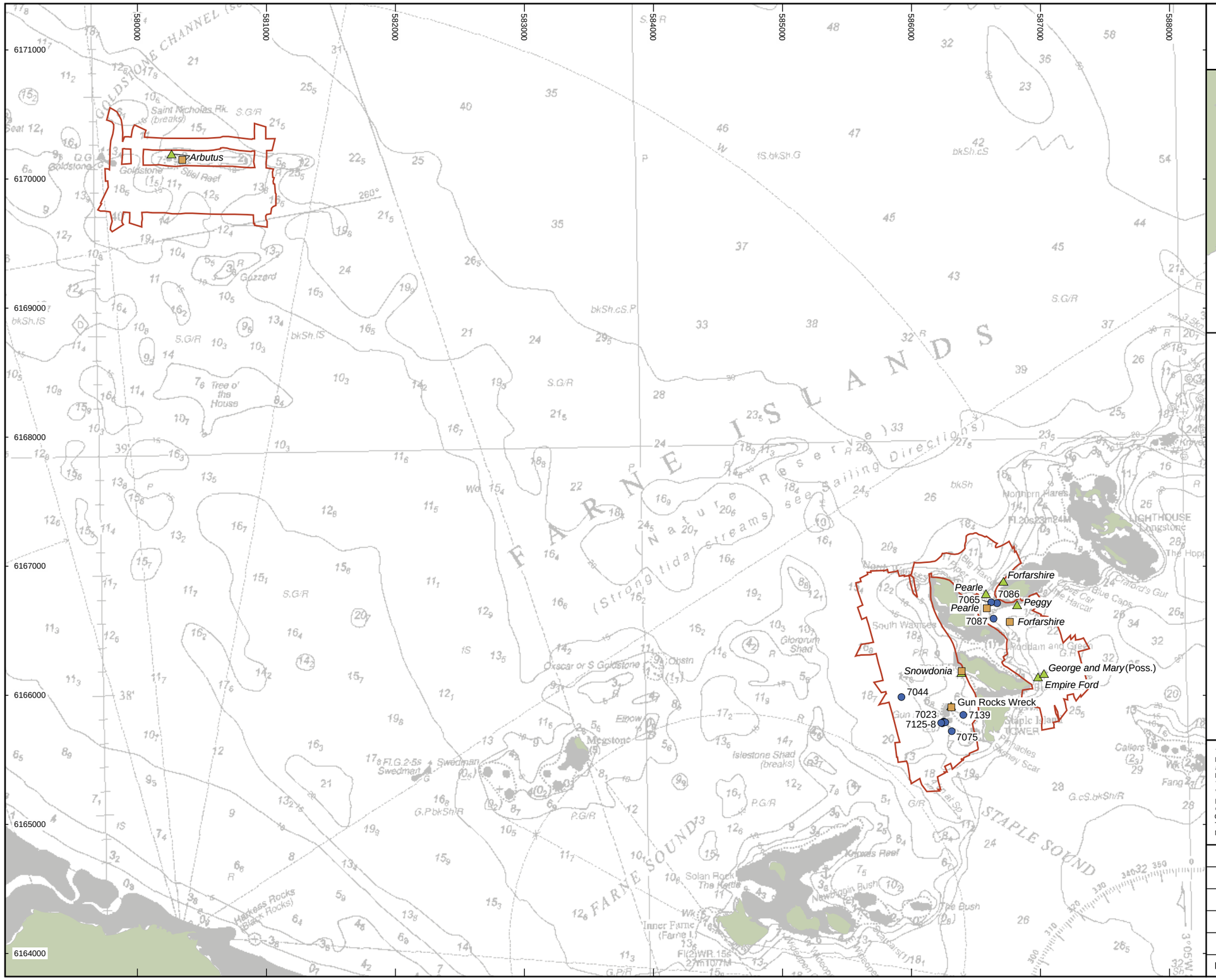
Goodwin Sands Study Area Location

Figure 1



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Farne Islands Study Area Location

Figure 2

A. Original Geophysical Interpretation

B. LMLSS Interpretation

A

B

C

Main figure

Inset

Study Area
WA data
UKHO data
NRHE data

Previously Identified Anomalies
Magnetic, dark reflector, bright reflector and seafloor disturbance
Debris, debris field, rope/chain, mound and cannon
Wreck

LMLSS Interpretation
Class 1
Class 2

Archaeological Dive Observations

0 1 km

Admiralty chart 1828 (dated 1999)
Projection: UTM WGS84 z31N



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Goodwin Sands LMLSS Interpretation

Figure 3

A. Original LMLSS Interpretation

B. Alternative LMLSS Interpretation

Area shown

Study Area

LMLSS Interpretation
Class 1
Class 2

0 500 m

Admiralty chart 1828 (dated 1999)
Projection: UTM WGS84 z31N



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Goodwin Sands Alternative LMLSS Interpretation Comparison

Figure 4

A. Original Geophysical Interpretation

B. LMLSS Interpretation

Inset

Main figure

Study Area
WA data
UKHO data
NRHE data

Previously Identified Anomalies
Magnetic, dark reflector, bright reflector and seafloor disturbance
Debris, debris field, rope/chain, mound and cannon

LMLSS Interpretation
Class 1
Class 2

Archaeological Dive Observations

0 1 km

Admiralty chart 0111
Projection: UTM WGS84 z30N



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Farne Islands LMLSS Interpretation

Figure 5

A. Original LMLSS Interpretation

B. Alternative LMLSS Interpretation

Area shown

Study Area

LMLSS Interpretation
Class 1
Class 2

0 500 m

Admiralty chart 0111
Projection: UTM WGS84 z30N



| | |
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| Date: | 04/03/2015 |
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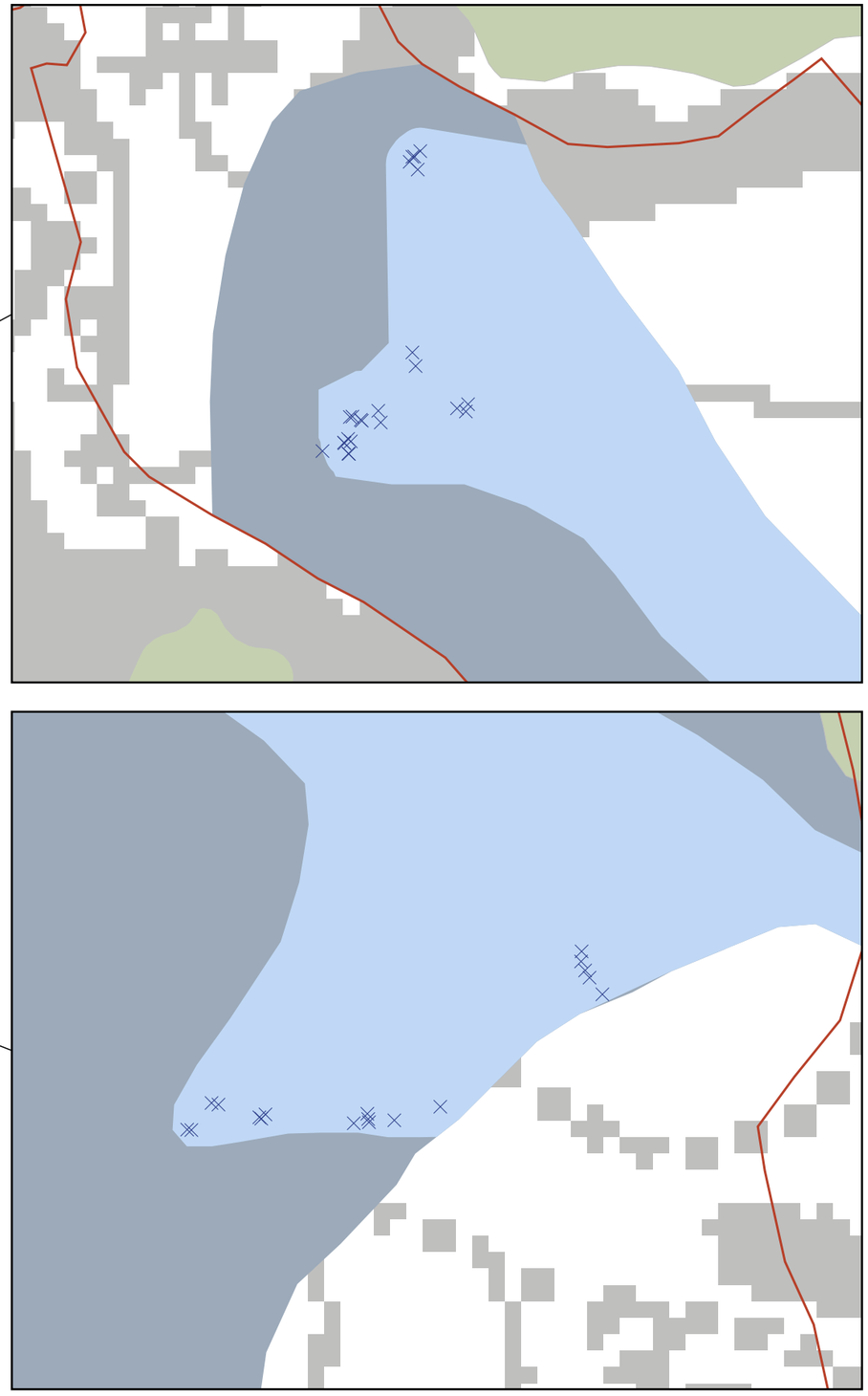
Farne Islands Alternative LMLSS Interpretation Comparison

Figure 6

A. Original LMLSS Interpretation

B. Edited LMLSS Interpretation based on Diver Observations



Area shown

Study Area

LMLSS Interpretation
Class 1
Class 2

Archaeological Dive Observations

A 0 500 m

B 0 100 m

Admiralty chart 0111
Projection: UTM WGS84 z30N



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Farne Islands Diver Observation Corrected LMLSS Interpretation

Figure 7

A. Original IS Interpretation

B. Edited IS Interpretation based on Diver Observation

A

B

C

Inset

Main figure

Study Area

LMLSS Interpretation
Class 1
Class 2

IS Interpretation
Debris field
Wreck

Archaeological Dive Observations

A 0 500 m

B 0 100 m

Admiralty chart 1828 (dated 1999)
Projection: UTM WGS84 z31N



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| Date: | 04/03/2015 |
| Revision Number: | 1 |
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Goodwin Sands IS Interpretation

Figure 8

A. LMLSS Interpretation at 1:10,000 Scale

B. LMLSS Interpretation at 1:5,000 Scale

Area shown

Study Area

LMLSS Interpretation at 1:10,000 Scale
Class 1
Class 2

LMLSS Interpretation at 1:5,000 Scale

0 500 m

Admiralty chart 0111
Projection: UTM WGS84 z30N



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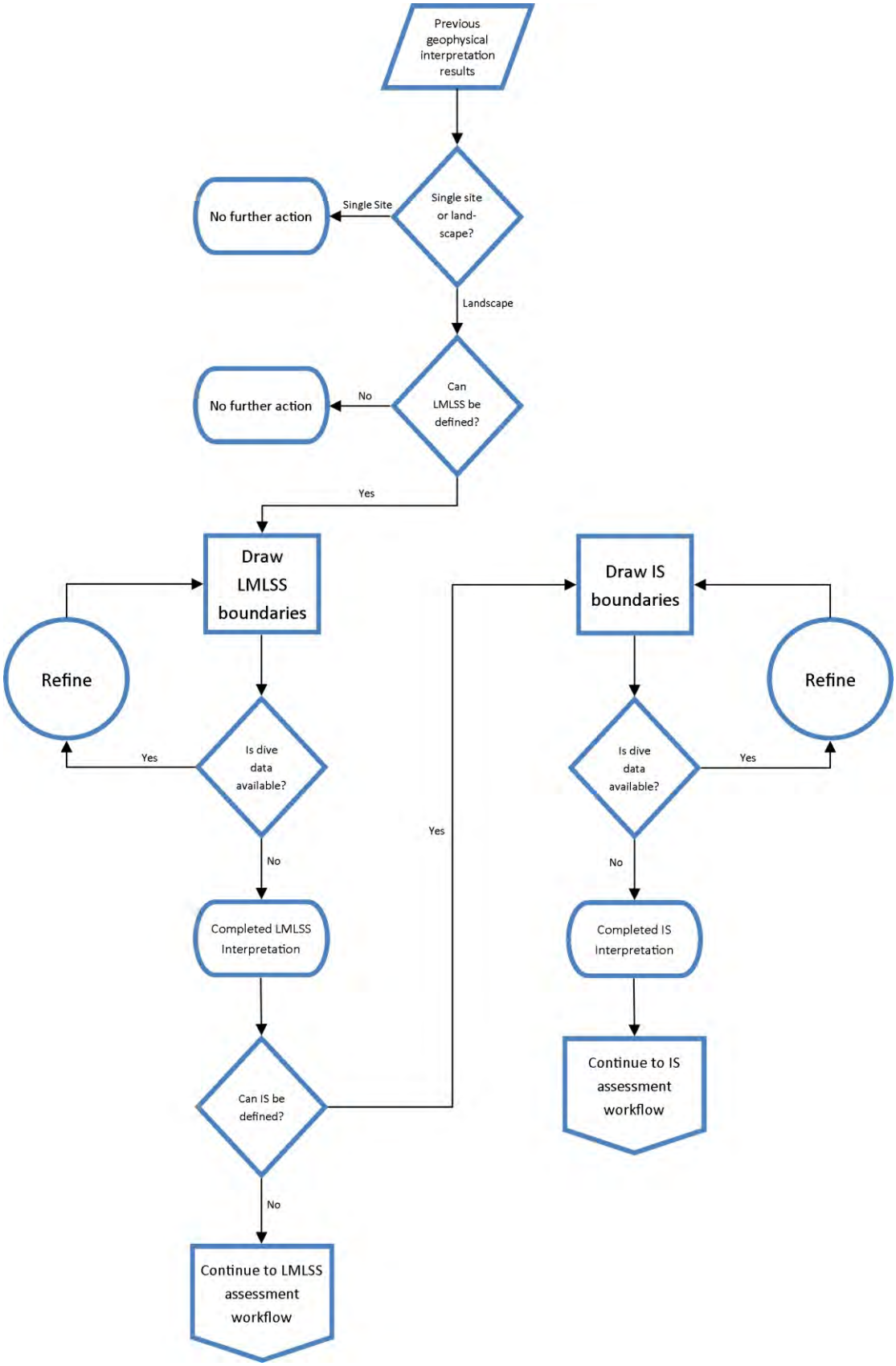
LMLSS Interpretation Scale Comparison

Figure 9



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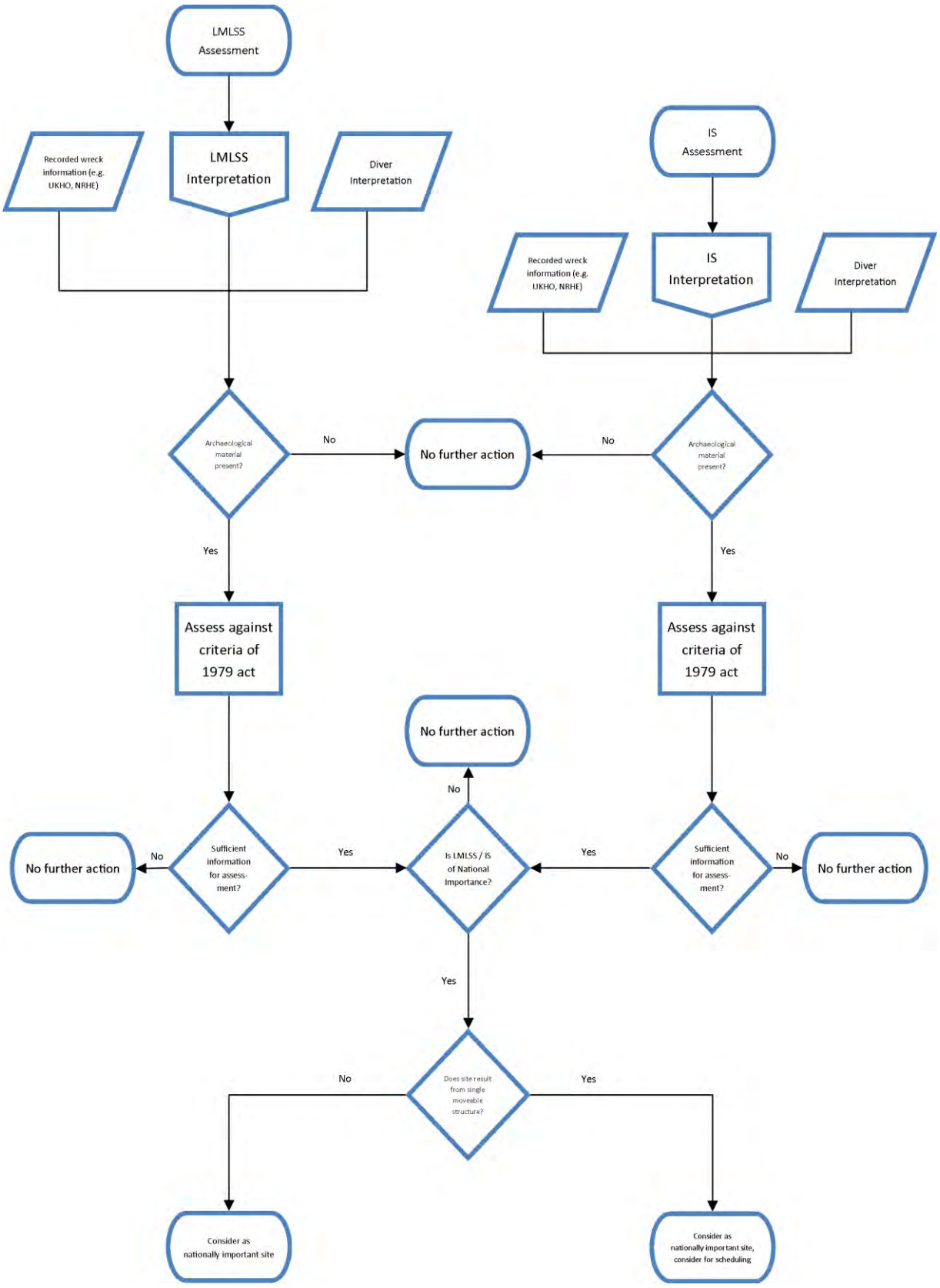
LMLSS and IS Methodology Workflow

Figure 10



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LMLSS and IS Assessment Workflow

Figure 11

wessex archaeology

salisbury rochester sheffield edinburgh

Wessex Archaeology Ltd registered office Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk