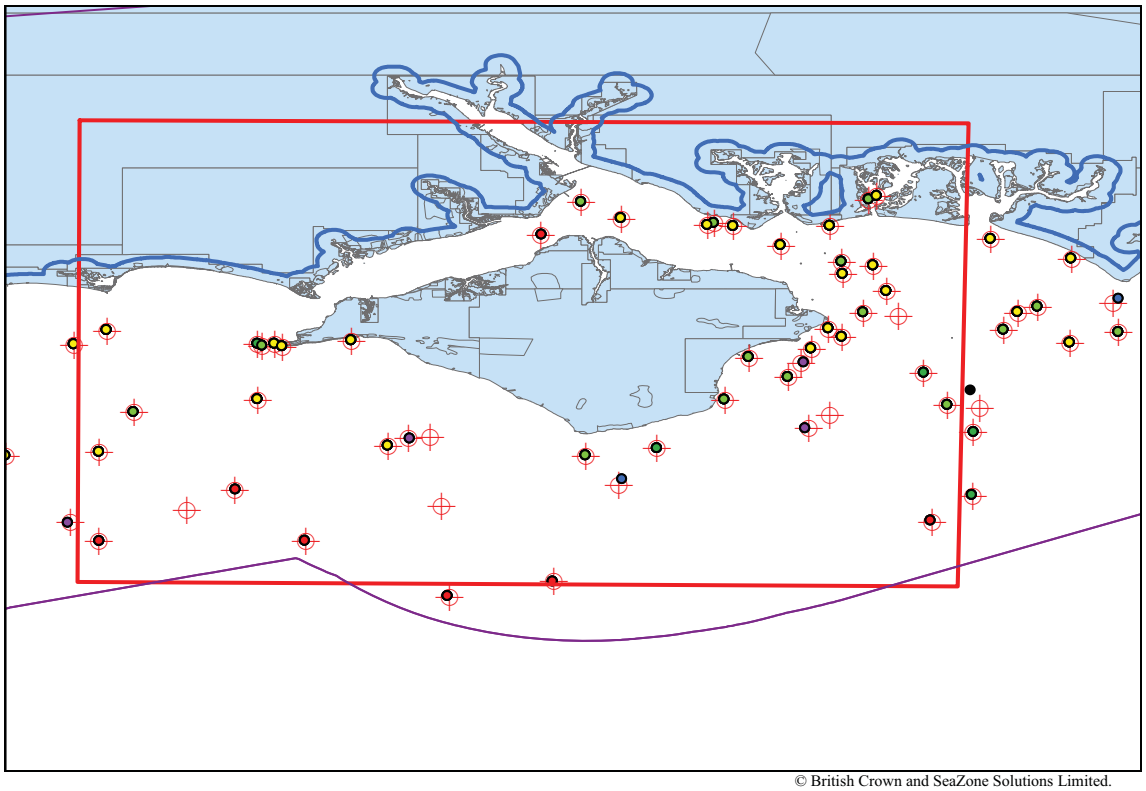
Refining Areas of Maritime Archaeological Potential for Shipwrecks - AMAP 1

SHIPWRECK DATA REVIEW 1.2

October 2007



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1 BACKGROUND

1.1 Introduction

1.1.1 In May 2007 English Heritage commissioned Bournemouth University to undertake a project entitled *Refining Areas of Maritime Archaeological Potential for Shipwrecks – AMAP1* funded by the Aggregate Levy Sustainability Fund (ALSF). The aim of the project is to undertake quantitative spatial analysis of shipwreck data using GIS to compare typologised wreck scatters to environmental, historical and hydrographic datasets in order to identify biases in the data and refine areas identified as AMAPs during the *Navigational Hazards* project.

1.1.2 The final deliverable for the AMAP1 project will be a Geographic Information System (GIS) layer and a written report to be supplied to the English Heritage (EH) Maritime Team as a resource for informing staff during the marine planning process, and the National Monuments Record (NMR) for integration with the English Heritage archive.

1.1.3 In order to put the results of the spatial analysis of shipwreck data into context, it is necessary to gain a comprehensive understanding of the constraints of available digital shipwreck data. A review of the data held by the UK Hydrographic Office (UKHO) and the National Monument Record (NMR) has therefore been undertaken to identify user constraints in combining the data into a single dataset and querying information. The NMR wreck dataset is held in its Archive Monuments Information England (AMIE) in the form of an Oracle database and a Geographical Information System (GIS) depiction. The results will inform both the AMAP1 project and proposed English Heritage project to enhance the AMIE shipwreck database. This document constitutes deliverable 1 for the AMAP1 project.

1.1.4 The results of the review will ensure that the use of wreck data during the spatial analysis phase of the project is optimized to produce a justified characterization of the potential for shipwreck remains to exist and survive within different types of marine environment.

1.1.5 The characterization of the potential for shipwreck remains within seabed sediments will directly benefit the aggregate industry by improving the basis on which assessments of archaeological potential are made during the licensing process. Current assessments of potential in advance of remote sensing rely on the presence of known wreck data suggesting the potential for further sites. This approach does not take into account the archaeological and historical evidence for human activity within the area and the effects of the local marine environment on the preservation of different archaeological materials. The characterization of these variable based on currently available data will enhance the basis for undertaking a more justified interpretation of potential.

1.2 History

1.2.1 *Areas of Maritime Archaeological Potential* (AMAP) are defined as areas where it is considered that the navigational (i.e. reefs or sandbanks) or environmental conditions (i.e. tidal races or overfalls) present in the area are likely to have caused shipping loss in the past, and where the seabed conditions are such that preservation of archaeological material is thought to be likely (Merritt, 2007) (Merritt et Al., 2007).

1.2.2 The AMAP1 project has been commissioned to further develop the results of the *Mapping Navigational Hazards as Areas of Maritime Archaeological Potential* project also funded through the Aggregate Levy Sustainability Fund (ALSF) by English Heritage. The output of the project was a set of AMAP polygons derived from UKHO and the British Geological Survey (BGS) data which characterize the hazardous nature of different marine environments and their potential for preserving archaeological materials in situ (Merritt et Al., 2007).

1.2.3 The AMAP1 project seeks to enhance the interpretation of potential for archaeological materials on the seabed through spatial analysis of mapped data, and to take forward the recommendations made by Dr David Gregory (Merritt et Al., 2007) to enhance the interpretation of the potential for preservation through further investigation of environmental parameters affecting site formation and the analysis of borehole data.

1.2.4 The project output is reliant on making best use of available digital shipwreck records. It was therefore proposed that as part of the AMAP1 project, a review of the structure and content of shipwreck databases held by the UKHO and the NMR should be undertaken. The aim of the review is to identify potential constraints to the project methodology created by inconsistencies in current wreck database structures which may affect the way that they are used in GIS. The results will inform both the AMAP1 project and the broader scale review and enhancement of the AMIE shipwreck database to be undertaken internally by English Heritage in 2008, subject to funding being secured (Dellino-Musgrave, MDIP News July 2007).

1.2.5 The project proposed by English Heritage to enhance the AMIE wreck database will deal with redressing inconsistencies in data, overlaps with the UKHO, tackling issues relating to data formats and data standards through the manipulation of the data structure and updating of records. The review for the AMAP1 project will complement this project by identifying areas for investigation from the perspective of a GIS user.

1.2.6 A meeting was held at the start of the AMAP1 project with staff from the English Heritage Maritime Team, National Monument Records office and Seazone Solutions Ltd. to discuss issues surrounding the conflicts between both UKHO and NMR wreck databases, such as the spatial contrasts in wreck locations and the need for the UKHO to produce a conversion table for their unique identifiers to enable the NMR and UKHO databases to be joined together. The minutes of the meeting are reported in Appendix 1.

1.3 Aims and Objectives of the Review

1.3.1 The aim of the Shipwreck data review is to identify potential constraints to the project methodology created by inconsistencies and constraints in current wreck database structures specifically affecting their application to GIS. The results will contextualize the AMAP1 methodology by highlighting potential data constraints and inform the methodology for reconciling inconsistencies between wreck data through the enhancement of the AMIE shipwreck database to be undertaken internally by English Heritage (Dellino-Musgrave, MDIP News July 2007).

1.3.2 The main aim of the Shipwreck Data Review has been achieved by meeting the following objectives:

- Assessing Data Format
- Assessing Data Coverage
- Reviewing Attribute Contents
- Identifying Data Conflicts

1.3.3 The methodology used to join the UKHO and NMR wreck data using the UKHO conversion table has also been outlined within the methodology (see Section 2).

2 METHODOLOGY

2.1 Introduction

2.1.1 This section outlines the method used to assess the shipwreck databases held by the UKHO and NMR.

2.1.2 The full set of shipwreck data available from the AMIE database for the project study area, including known wrecks, named locations and fishing snags, was requested from the NMR. UKHO shipwreck an obstruction data was ordered from Seazone Solutions Ltd. distributors of digital UKHO data. This included the Hydrospatial Wrecks and Obstructions layers and the wrecks and obstructions database upgrade. Both datasets were requested by sending in an ArcGIS shapefile containing a polygon for the project study area, which encompasses all of the Eastern English Channel.

2.1.3 Each of the objectives of the report constitutes a single phase of the assessment and are reported on in individual sections within the report. The methodology for each phase is outlined below.

2.2 Assessing Data Format

2.2.1 The format in which data is provided determines to a large degree its ease of use. The assessment was made on the basis that the data was being requested for use in a GIS format.

2.2.2 The delivery method has been assessed, including the file formats used, the supporting information provided with the data, the availability of metadata and ease of integration into a GIS package. Any processing of the files received which was required to make it useable in GIS is outlined in the review.

2.2.3 The review also reports on the provision of supporting data, such as instructions for use and metadata, to help the user make best use of the data received.

2.3 Joining UKHO and AMIE Records in GIS

2.3.1 In order to compare the extent and contents of UKHO and NMR shipwreck databases, the two databases need to be joined together so that the data can be viewed within a single table and queried. This requires a basis on which to match the data.

2.3.2 The AMIE database contains the identifiers for equivalent UKHO records where known, allowing the two datasets to be compared. The identifier system for UKHO records has however been changed since the data was integrated within the AMIE database, so that the identifiers (IDs) were not the same ones recorded within the current UKHO database.

2.3.3 To enable the two datasets to be brought together, the UKHO has produced an MS Excel table containing the old UKHO identifiers and their equivalent new shipwreck record identifiers. This table was used to join the UKHO and NMR databases together in order to identify matching records and contrasts in data. The two databases have therefore been joined together on the basis of old unique identifiers used by the UKHO. The method applied is described below:

2.3.4 The identifiers were joined to the UKHO shipwreck data using the current Hydrographic Office identifiers (filed name: HOIDs) present within the ID conversion table and those listed within the attributes of the unrestricted wrecks and obstructions data provided in the upgrade database provided by Seazone Solutions. The old UKHO identifiers (field name: HYDROGRAPH) were provided by the NMR as part of the **AMAP Other Identifier Data.xls** file. The UKHO identifiers were extracted from the excel file (.xls) and saved as a database file (.dbf), enabling the identifiers to be joined to the NMR shipwreck data. The UKHO wrecks already joined to the conversion table could then be joined to the NMR data using the old UKHO hydrographic identifiers.

2.3.5 The conversion table was supplied with the leading zeros missing from the old IDs. These were added by customizing the cell format in MS Excel and

converting the table to a delimited text to ensure that the GIS recognized the field as numeric.

2.3.6 The UKHO and NMR wrecks were brought into ArcGIS and cropped to cover the AMAP1 study area within the 12 mile limit. This was done because the coverage for AMIE records is mostly limited to the 12 mile territorial limit, to which English Heritage's full marine responsibilities extend. The UKHO records for wrecks and obstructions extend to the edge of the continental shelf and, in some directions, further.

2.3.7 The UKHO conversion table was imported into an ESRI ArcMAP 9.2 GIS package and joined by attributes using the HOIDs as the joining field. This provided all of the UKHO records within the shapefile with a HOID listed in the conversion table with their equivalent original UKHO IDs (field name: HYDROGRAPH)

2.3.8 The AMIE shipwreck point data shapefile was then joined to the UKHO shapefile via the appended conversion table fields by using the old UKHO ID fields (HYDROGRAPH) as the joining field.

2.3.9 The data was linked in both directions, joining the NMR data to the UKHO and vice versa to identify any potential differences in the results. All queries were run in both directions. The results showed a contrast between the number of resulting records depending on direction, with the NMR containing more records per join than the UKHO. The presence of duplicates in shipwreck records or duplicates in old UKHO identifiers recorded for different wrecks due to errors in the input would affect the number of records resulting from a join, creation a difference depending on whether the NMR database was joined to the UKHO database or vice versa. Both datasets were therefore assessed for duplicate records.

2.4 Assessing Data Coverage

2.4.1 The responsibilities of the UKHO and NMR to their customers are very different. The UKHO gather data on shipwrecks which may present a hazard to navigation or be a hindrance to offshore activities. The NMR collates data on shipwrecks of potential historic significance and currently has a cut off date of 1950. It is therefore recognized that as they gather data for different purposes, the two databases have substantially different coverages in data but that some shipwrecks are recorded in both databases.

2.4.2 The review identifies how many records within the two databases match, how many are proximal to each other and the sites in each database which do not have an equivalent record.

2.4.3 To ensure that the extent of the two datasets was equal, both sets of records were cropped to cover all records within the 12 mile limit within the AMAP1 study area. The use of a smaller pilot area proved too small to ensure that results gave a fair reflection of contrasts within the overall datasets, so

coverage has been assessed both for the proposed Solent pilot area and for the entire AMAP1 study area.

2.4.4 The numbers of records have been compared to identify which records have matching IDs and are recorded as being in the same location. The data coverage has therefore been assessed on the basis of their attributes as well as on the basis of spatial location.

2.5 Reviewing Attribute Contents

2.5.1 Data attributes were assessed to compare the contents attached to each record. This provides an insight into the type of information available across both datasets.

2.5.2 The aim of the assessment is to identify areas where the datasets overlap and information is being duplicated, where the data is being independently updated by multiple data providers. The independent update of records by the NMR and UKHO can generate errors and inconsistencies between the databases if the equivalent records have not received the same update. The assessment has demonstrated the presence of both duplicate records and inconsistencies due to independently updated records. The results of queries of attribute contents and accompanying illustrative examples are outlined in section 3.5.

2.5.3 The presence of such inconsistencies can have important consequences for end-users and is a problem which needs to be addressed. The identification of records which have been updated independently demonstrates a lack of effective communication between the two organizations. This is however an issue which can rapidly be resolved through the development of an infrastructure for information exchange.

2.5.4 The extent to which data fields have been completed in both datasets has also been reviewed to identify areas where blank fields may be completed using data held in another database and where they may be scope for exchanging information.

2.6 Identifying Data Conflicts

2.6.1 Queries were run to identify records where the identification of wreck sites are contradictory. This was done by adding a field to both sets of point data with matching identifiers to records whether the site identification are the same, null or contradictory. This enabled the contents of the UKHO name field (field name: SZLABEL) to be compared with that of the AMIE record name field (field name: NAME) for all records matched by their IDs. Due to variations in the spelling of wreck names, the identification of matching records had to be done manually as only a limited number of records could be matched by running queries.

2.6.2 It was also noted during the coverage assessments that some of the UKHO records held by the NMR are recorded as obstructions rather than wrecks. For

example, UKHO record HOID 20066 is an obstruction, recorded in the AMIE database as an unidentified feature. The historic value of these features is often unclear due to the lack of data contained in the attributes delivered by the NMR within both the AMIE GIS depiction and the accompanying .xls tables delivered for the AMAP1 project.

2.6.3 As the historical value of obstruction data cannot be readily demonstrated, the value of maintaining obstruction records within the AMIE database should therefore be questioned.

3 DATA REVIEW

3.1 Introduction

3.1.1 This section outlines the results of the review based on the methodology outlined above used to assess the shipwreck databases held by the UKHO and NMR.

3.1.2 The distribution and attributes of the UKHO and NMR wreck databases have been compared. Data was initially assessed using the Solent as a case-study area. To ensure that the results provided a fair representation of the data issues identified, the same queries were then run using the entire AMAP1 project study area to provide a broader scale analysis of trends in the data

3.2 Assessing Data Format

UKHO Shipwreck Data

3.2.1 The wrecks and obstructions data held by the UKHO is available in two forms. Records can be requested in paper form from the UKHO Wrecks Service using a range of search parameters such as dates, location, depth and cargo. This is viable approach when requesting information for a limited number of wrecks. However, for broader scale GIS projects, where the cost of inputting data manually would be prohibitive, the availability of digital data is a necessary requirement.

3.2.2 Digital UKHO wreck data can be ordered as one of the Hydrospatial datasets provided by Seazone Solutions Ltd. The data was requested for the AMAP1 project study area by sending in a shapefile containing a polygon of the study area.

3.2.3 In order to receive the full set of attributes provided by the UKHO, and upgrade database for the wrecks and obstructions data is however required in addition to the Hydrospatial dataset. The wrecks and obstructions upgrade contains a layer identical to the Hydrospatial wrecks layer and a second layer containing the wrecks and obstructions data in the form it was provided in before the Hydrospatial format was created.

3.2.4 The Hydrospatial wreck data is provided as two shapefiles, separating wrecks from obstructions. These shapefiles have been reformatted as Hydrospatial layers to reduce the number of attribute fields to make the data easier to understand.

3.2.5 Database upgrade is divided between a wrecks layer and a total unrestricted feature layer. The unrestricted data layer is the only dataset delivered which contains the UKHO identifiers (HOID). This was therefore the layer used to join the UKHO and NMR shipwreck records.

3.2.6 The data was delivered as part of a series of the Seazone Hydrospatial dataset. The data is provided in multiple formats to accommodate all leading GIS packages including MapInfo, Cadcorps and ArcGIS. The ArcGIS compatible data was divided into a series of shapefiles accompanied by an .mxd file for ease of use, which enables the data to be immediately viewed.

3.2.7 The data is provided unprojected and referenced to the WGS84 horizontal datum, which is an internationally recognized global reference system for marine data

3.2.8 The conversion table which enables the UKHO and NMR shipwreck data to be joined together was produced by the UKHO and delivered via Seazone Solutions Ltd. In the form of a MS excel spreadsheet. The spreadsheet contains the old identifiers used by the UKHO (field name: HYDROGRAPH) and their equivalent identifiers used in the current system (field name: HOID) although the fields had not been named.

NMR Shipwreck Data

3.2.9 As with the UKHO shipwreck records, NMR records of known ship losses are available either as individual paper records or in a digital format from the National Monument Record office. The NMR was contacted to request all known shipwreck records from the AMIE database in a digital format due to the nature of the project and extent of the study area.

3.2.10 For the purpose of the AMAP1 project the AMIE shipwreck data was delivered as two shapefiles, one for point data and the other for polygons, accompanied by five additional MS Excel spreadsheet containing additional fields. These require varying degrees of processing depending on the fields required for integration within the GIS. The processing required for each .xls file to enable its integration within GIS has been outlined below (paras. 3.2.13 - 3.2.19).

3.2.11 Each of the files delivered is described in the table below:

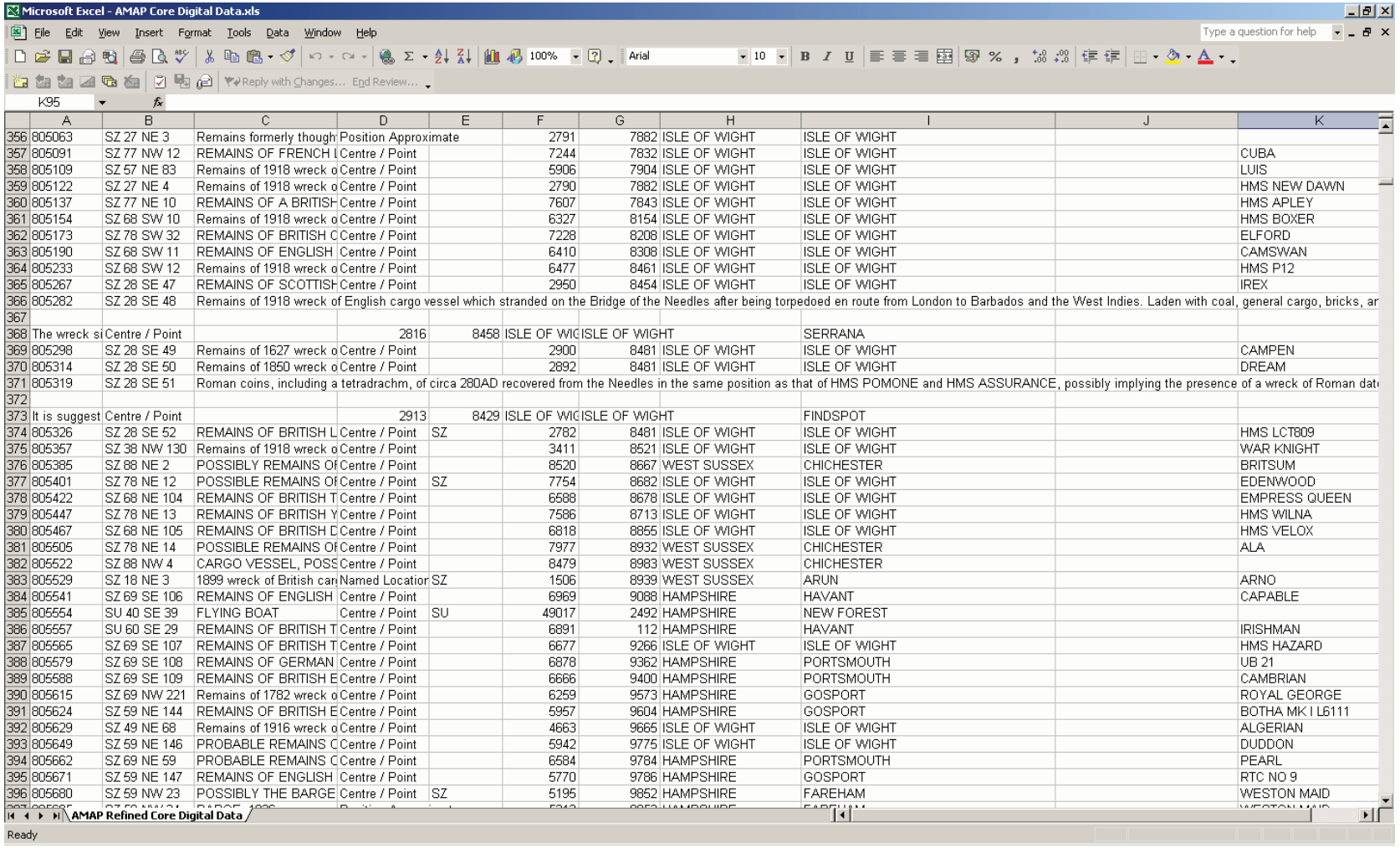
File Name	Description	Fields
AMAP Refined_AMIEMonumentPoint.shp	Contains mapped records of known shipwreck data	HOB_UID, Name, Description, Mon_precis, Capture_sc, Easting, Northing

AMAP Refined_AMIEMonumentPolygon.shp	Contains mapped records of known shipwreck data	HOB_UID, Name, Description, Mon_precis, Capture_sc, Easting, Northing
AMAP Core Digital Data.xls	Contains the unique identifier (UID), name (where known) and eastings and northings, enabling the core point data to be plotted, along with the text description and location details	UID, NMR number, summary, 100km, Easting, Northing, County, District, Parish, Primary Name
AMAP Phase_Class Data.xls	Contains details of each site's period where known along with feature type classifications.	HOB_UID, Period, Min_date, Max_date, Class scheme, Term
AMAP Condition Status Data.xls	Contains data on the nature of the evidence on which the record is based and whether it lies in the intertidal, marine or terrestrial zone	UID, Condition scheme, Status
AMAP Other Identifier Data.xls	Contains the identifiers for other records of the same site including the old UKHO identifiers	HOB_UID, Identity method, Value
wreck_numbers.xls	Table provided by the UKHO to the NMR. Contains the old and current UKHO identifiers	No field names

Table 1: Description of contents of AMIE records delivered for the AMAP1 project

3.2.12 The GIS data provided contains the core data required to plot each of the features recorded in the database. In order to view information such as the name of the wrecks (where known), the data held within the associated MS Excel files need to be joined to the shapefiles where possible using the unique identifiers for each record. These identifiers are present in each of the files provided although their filed names did vary between being labeled as HOB_UID and UID.

3.2.13 Initial viewing of **AMAP Core Digital Data.xls** in MS Excel revealed that some of the records had been modified during their export from the AMIE database. Although none of the data had been lost, field attributes for 29 records had transferred to the rows below, leaving blank fields in the unique identifier column and fields containing the wrong types of information (Fig 1). For example, AMIE HOB_UID 805319, is a findspot record for some roman coins. The textbox has been split so half is where it should be in row 371 and the rest of and the second part along with all successive fields have moved down two rows to 373 and into the wrong columns. As the errors were clear and only a few records had been affected, it was possible to be cut and pasted the data back to their correct field. The error may have been due to the length of some of the description fields. A list of HOB_UIDs for the records affected will be delivered to the NMR.



	A	B	C	D	E	F	G	H	I	J	K
356	805063	SZ 27 NE 3	Remains formerly though	Position Approximate		2791	7882	ISLE OF WIGHT	ISLE OF WIGHT		
357	805091	SZ 77 NW 12	REMAINS OF FRENCH I	Centre / Point		7244	7832	ISLE OF WIGHT	ISLE OF WIGHT		CUBA
358	805109	SZ 57 NE 83	Remains of 1918 wreck o	Centre / Point		5906	7904	ISLE OF WIGHT	ISLE OF WIGHT		LUIS
359	805122	SZ 27 NE 4	Remains of 1918 wreck o	Centre / Point		2790	7882	ISLE OF WIGHT	ISLE OF WIGHT		HMS NEW DAWN
360	805137	SZ 77 NE 10	REMAINS OF A BRITISH	Centre / Point		7607	7843	ISLE OF WIGHT	ISLE OF WIGHT		HMS APLEY
361	805154	SZ 68 SW 10	Remains of 1918 wreck o	Centre / Point		6327	8154	ISLE OF WIGHT	ISLE OF WIGHT		HMS BOXER
362	805173	SZ 78 SW 32	REMAINS OF BRITISH C	Centre / Point		7228	8208	ISLE OF WIGHT	ISLE OF WIGHT		ELFORD
363	805190	SZ 68 SW 11	REMAINS OF ENGLISH	Centre / Point		6410	8308	ISLE OF WIGHT	ISLE OF WIGHT		CAMSWAN
364	805233	SZ 68 SW 12	Remains of 1918 wreck o	Centre / Point		6477	8461	ISLE OF WIGHT	ISLE OF WIGHT		HMS P12
365	805267	SZ 28 SE 47	REMAINS OF SCOTTISH	Centre / Point		2950	8454	ISLE OF WIGHT	ISLE OF WIGHT		IREX
366	805282	SZ 28 SE 48	Remains of 1918 wreck of English cargo vessel which stranded on the Bridge of the Needles after being torpedoed en route from London to Barbados and the West Indies. Laden with coal, general cargo, bricks, ar								
367											
368	The wreck si	Centre / Point		2816	8458	ISLE OF WIC	ISLE OF WIGHT		SERRANA		
369	805298	SZ 28 SE 49	Remains of 1627 wreck o	Centre / Point		2900	8481	ISLE OF WIGHT	ISLE OF WIGHT		CAMPEN
370	805314	SZ 28 SE 50	Remains of 1850 wreck o	Centre / Point		2892	8481	ISLE OF WIGHT	ISLE OF WIGHT		DREAM
371	805319	SZ 28 SE 51	Roman coins, including a tetradrachm, of circa 280AD recovered from the Needles in the same position as that of HMS POMONE and HMS ASSURANCE, possibly implying the presence of a wreck of Roman dat								
372											
373	It is suggest	Centre / Point		2913	8429	ISLE OF WIC	ISLE OF WIGHT		FINDSPOT		
374	805326	SZ 28 SE 52	REMAINS OF BRITISH L	Centre / Point	SZ	2782	8481	ISLE OF WIGHT	ISLE OF WIGHT		HMS LCT809
375	805357	SZ 38 NW 130	Remains of 1918 wreck o	Centre / Point		3411	8521	ISLE OF WIGHT	ISLE OF WIGHT		WAR KNIGHT
376	805385	SZ 88 NE 2	POSSIBLY REMAINS Of	Centre / Point		8520	8667	WEST SUSSEX	CHICHESTER		BRITSUM
377	805401	SZ 78 NE 12	POSSIBLE REMAINS Of	Centre / Point	SZ	7754	8682	ISLE OF WIGHT	ISLE OF WIGHT		EDENWOOD
378	805422	SZ 68 NE 104	REMAINS OF BRITISH T	Centre / Point		6588	8678	ISLE OF WIGHT	ISLE OF WIGHT		EMPRESS QUEEN
379	805447	SZ 78 NE 13	REMAINS OF BRITISH Y	Centre / Point		7586	8713	ISLE OF WIGHT	ISLE OF WIGHT		HMS WILNA
380	805467	SZ 68 NE 105	REMAINS OF BRITISH D	Centre / Point		6818	8855	ISLE OF WIGHT	ISLE OF WIGHT		HMS VELOX
381	805505	SZ 78 NE 14	POSSIBLE REMAINS Of	Centre / Point		7977	8932	WEST SUSSEX	CHICHESTER		ALA
382	805522	SZ 88 NW 4	CARGO VESSEL, POSS	Centre / Point		8479	8983	WEST SUSSEX	CHICHESTER		
383	805529	SZ 18 NE 3	1899 wreck of British car	Named Location	SZ	1506	8939	WEST SUSSEX	ARUN		ARNO
384	805541	SZ 69 SE 106	REMAINS OF ENGLISH	Centre / Point		6969	9088	HAMPSHIRE	HAVANT		CAPABLE
385	805554	SU 40 SE 39	FLYING BOAT	Centre / Point	SU	49017	2492	HAMPSHIRE	NEW FOREST		
386	805557	SU 60 SE 29	REMAINS OF BRITISH T	Centre / Point		6891	112	HAMPSHIRE	HAVANT		IRISHMAN
387	805565	SZ 69 SE 107	REMAINS OF BRITISH T	Centre / Point		6677	9266	ISLE OF WIGHT	ISLE OF WIGHT		HMS HAZARD
388	805579	SZ 69 SE 108	REMAINS OF GERMAN	Centre / Point		6878	9362	HAMPSHIRE	PORTSMOUTH		UB 21
389	805588	SZ 69 SE 109	REMAINS OF BRITISH E	Centre / Point		6666	9400	HAMPSHIRE	PORTSMOUTH		CAMBRIAN
390	805615	SZ 69 NW 221	Remains of 1782 wreck o	Centre / Point		6259	9573	HAMPSHIRE	GOSPORT		ROYAL GEORGE
391	805624	SZ 59 NE 144	REMAINS OF BRITISH E	Centre / Point		5957	9604	HAMPSHIRE	GOSPORT		BOTHA MK I L6111
392	805629	SZ 49 NE 68	Remains of 1916 wreck o	Centre / Point		4663	9665	ISLE OF WIGHT	ISLE OF WIGHT		ALGERIAN
393	805649	SZ 59 NE 146	PROBABLE REMAINS C	Centre / Point		5942	9775	ISLE OF WIGHT	ISLE OF WIGHT		DUDDON
394	805662	SZ 69 NE 59	PROBABLE REMAINS C	Centre / Point		6584	9784	HAMPSHIRE	PORTSMOUTH		PEARL
395	805671	SZ 59 NE 147	REMAINS OF ENGLISH	Centre / Point		5770	9786	HAMPSHIRE	GOSPORT		RTC NO 9
396	805680	SZ 59 NW 23	POSSIBLY THE BARGE	Centre / Point	SZ	5195	9852	HAMPSHIRE	FAREHAM		WESTON MAID

Figure 1: Screen capture showing some of the records modified during their export from the AMIE database

3.2.14 The data in table **AMAP Core Digital Data.xls** was then formatted to ensure that there were no blank fields and was saved as a database file (.dbf) before adding it to the GIS. The table was then joined to the shapefiles to enable wreck names and locality information to be viewed as shapefile attributes.

3.2.15 Several of the excel spreadsheets contain data from more than one attribute field within the same columns, creating duplicates in identifiers within the HOB_UID field, producing a one-to-many relationship with individual sites un the AMIE GIS depiction. In order to join the data to the shapefiles within the GIS, the identifiers had to be separated by attribute type in order to create a one-to-one relationship. In some cases the duplications within the attribute fields were too extensive to divide the data into separate tables. These datasets have been saved as database tables (.dbf) and imported into the GIS where they can be related to the NMR point data as a one-to-many relationship. As the data is linked to the correct records but remains in a separate table, this is not an ideal solution as the data is more difficult to view and query.

3.2.16 In order to view the full range of NMR data provided, most of the excel spreadsheets had to be restructured to enable the data to be joined or related to the shapefiles. The following processing was undertaken in order to link the data:

3.2.17 The data within **AMAP Phase_Class Data.xls** contained duplications not only within the HOB_UID but also within the CLASS_FIELD column. The duplications within these fields are too numerous to extract the data into separate tables. The data was therefore saved as a database file (.dbf) and added to the GIS. The data was related to the shapefile in order to view associated information.

3.2.18 The records of equivalent identifiers for the AMAP **Other Identifier Data.xls** include IDs and chart numbers from the UKHO, Historic Environment Record (HER) numbers and Droit numbers. Multiple identifiers for the same site have been recorded in the same table, resulting in extensive duplication in HOB_UIDs. The UKHO identifiers were required as a separate table to enable the UKHO wrecks to be joined to the NMR wrecks. These were therefore exported as a separate database file and joined to the NMR shapefiles. The rest of the records were related to the table.

3.2.19 The data within **AMAP Condition Status Data.xls** also contains numerous duplications of HOB_UIDs. The table contains data on the nature of the evidence on which the record is based and whether it lies in the intertidal, marine or terrestrial zone. To meet AMAP1 project deliverables, the data in this table needs to be compared to condition data provided within the UKHO records. Therefore, the comparable fields have been extracted as far as possible. The Condition scheme data which specifies designated sites such as war graves and protected wrecksites. Evidence data can list multiple sources for a site and has therefore been saved as a file which is related to the shapefiles. Land-use information contains a single record for each site and can therefore be joined rather than related.

3.2.20 Therefore key issues arising with respect to delivery format can be summarized as follows:

- The format in which data is provided varies between data requests
- Errors created in the data during extraction from the AMIE database increase the need for processing and risk of mistakes being made
- In many cases, data requires substantial processing to enable it to be viewed as a single dataset and/or imported into a GIS package
- Field names need to be standardized between data files to facilitate the linking of matching record fields
- The combination of differing datasets within the same table, producing duplication of unique IDs increases the need for processing to make the data useable
- Lack of background information on data contents such as instructions and metadata

3.2.21 Based on the issues identified, the following recommendations are being made to inform the English Heritage AMIE record Enhancement project:

- Provide instructions for integrating the files provided
- Standardise data delivery so that data requested for different projects are received in the same format with the same fields
- Check for format errors

3.3 Assessing Data Coverage

Introduction

3.3.1 The coverage of shipwreck data was assessed using GIS to compare the coverage of data within the NMR and UKHO shipwreck databases. The assessment was undertaken by joining the records within the two databases together to quantify the numbers of matching records and non-matching records.

3.3.2 Two methods were used to join the data. The data was first joined using the old Hydrographic Office IDs listed in the two databases to identify records which could be matched using unique identifiers and separate out those without old UKHO identifiers. The records were then joined spatially to assess differences between the spatial distribution of records with matching identifiers.

Attribute Analysis

3.3.3 The NMR database contains unique identifiers for Hydrographic records for some of its records. The system of unique IDs for UKHO wreck data was changed in the 1990s, after the transfer of UKHO data to the NMR had been made. Therefore, the IDs held in the AMIE record attributes were out of date. The UKHO records do not hold Identifiers for equivalent NMR records.

3.3.4 The UKHO and NMR datasets have been joined using the conversion table containing old Hydrographic Office identifiers and the equivalent new identifiers, to enable the contents of the attributes to be compared. The method is outlined in section 2.3

3.3.5 The following relationships between the two datasets were assessed by querying the attributes within the joined data:

- UKHO records with matching NMR records
- UKHO records of known shipwrecks with matching identifiers
- UKHO data with no records of old identifiers
- NMR records with matching UKHO records
- NMR records of known shipwrecks with matching identifiers
- NMR data with no records of old identifiers

3.3.6 The comparison of data is reliant on the presence of matching UKHO identifiers in both databases. The numbers of matching records vary with the direction of the join. The results of the UKHO records being joined to the NMR database differs from the number of matching records when the NMR records are joined to the UKHO database. It remains unclear why this is occurring as queries have been designed to be used in both directions. Until this issue has been resolved, the results of queries have been presented separately.

3.3.7 The data in the table below shows the results of attribute queries run to identify matching records in the UKHO and NMR databases based on the old UKHO identifiers, and the numbers of sites matched which have been identified as the same wrecksite (Table 2).

Description	Query	UKHO		NMR	
		Solent	Study Area	Solent	Study Area
Total number of sites		775	1891	389	1488
Number of records with matching IDs from the other database	"HYDROGRAPH" = "HYDROGRA_1" AND "HYDROGRA_1" = "HYDROGRA_2" AND "HYDROGRA_2" = "HYDROGRA_3" AND"HYDROGRAPH">0	133	705	139	735
Number of records with matching IDs and wreck names	"HYDROGRAPH" = "HYDROGRA_1" AND "HYDROGRA_1" = "HYDROGRA_2" AND "HYDROGRA_2" = "HYDROGRA_3" AND "SZLABEL" = "SZLABEL_1" AND "NAME" = "NAME_1" AND "MATCH" = 'Y' AND "MATCH_NA" = 'Y'	45	263	49	267

Table 2: Summary of Attribute Queries used to identify records matching using the table of old hydrographic IDs and of those, known wreck with matching identifications

3.3.8 The results of the queries run to compare the records of NMR and UKHO shipwreck data highlighted the following issues:

- The total number of wrecks listed in the project study area differs considerably between the NMR and UKHO, with 1891 UKHO wrecks and obstructions and 1488 NMR wrecks. This was a result anticipated as the focus of the two datasets varies. UKHO wreck data is collated to notify the marine community of potential navigational hazards. The NMR collates shipwreck data for site of historical significance.

- Attribute queries revealed that less than half of the records in both the NMR and UKHO databases can be joined using Hydrographic Office identifiers. There are potentially a large number of matching records within those databases although these require an equivalent field, such as standardized name fields, to enable them to be identified.

- The numbers of known wrecksites with have been identified as the same site is currently very low at around 1/6th of the records delivered.

3.3.9 The results of the attribute analysis showed that the conversion table will work to some degree to marry up the two databases but that extensive work is required to enable data to be matched where UKHO identifiers cannot be used.

Spatial Analysis

3.3.10 Spatial analysis was undertaken to test the results of the attribute analyses, assess the spatial differences between the matching records in order to identify any potential spatial issues relating to the data.

3.3.11 The slight spatial discrepancy between UKHO and NMR plotted points was an issue which is widely recognized and had been discussed between English Heritage and the UKHO at the shipwreck data meeting held at the NMR in March 2007.

3.3.12 The offset recorded between the plotted location of NMR wrecks and UKHO wrecks is thought to be due in part to projection issues between WGS84 and OSGB36 (Dellino-Musgrave, MDIP News, July 2007). The offset between the two projections was discussed with Seazone in 2007.

3.3.13 They found that by setting the geographic transformation to "OSGB_1936_to_WGS_1984_Petroleum" during the projection process. This solution substantially reduced the average offset. For example, the distance between the two points for the site of the Royal George is reduced from 112 m to 4 m.

3.3.14 An assessment of the variability between known wrecksites from the two databases with matching identifiers and names was undertaken using the join by location tool to join NMR points to the UKHO point closest to them. The join was initially undertaken on known wrecksites matched by name and ID.

By using a smaller dataset, the likelihood of the matching records to be joined by location to equivalent records which had already been joined by attribute is greater. The join by location was set to join points to the nearest point from the other layer. Therefore the less dense the data, the more likely it was that sites with matched attributes would be joined without being intercepted by a closer non-matching feature. The method was also applied to site matched by IDs and the entire dataset to compare the number of matching records. The results are outlined in table 3.

FULL DATASETS	**Matching IDs**	**Matching Name and IDs**
Spatial join from UKHO to NMR	668	246
Spatial join from NMR to UKHO	707	258
MATCHING IDs	**Matching IDs**	**Matching Name and IDs**
Spatial join from UKHO to NMR	688	256
Spatial join from NMR to UKHO	716	260
MATCHING ID AND NAMES	**Matching IDs**	**Matching Name and IDs**
Spatial join from UKHO to NMR	260	260
Spatial join from NMR to UKHO	261	261

Table 3: The variations in results of spatial joins between UKHO and NMR shipwreck data

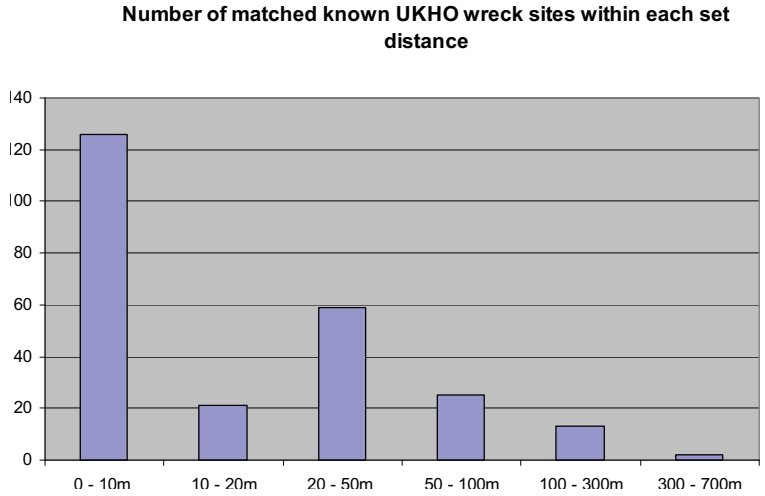
3.3.15 The attributes of the shapefiles resulting from the joins contain a field which records the distances between the points joined. The points have been categorized by the distances between them (Table 4) and plotted based on those distances in Figure 2.

3.3.16 The analysis of distances between matching sites indicates that they are not all equidistant or show any recognisable trends around the coast as would be expected if projection was the primary issue. The analysis of distance outlined in table 4 suggest that the distribution and distances between matching sites is too variable for the offset to be caused solely by projection The reason for the variable offsets is therefore still unclear but may be due to a combination of projection issues as the mapping of data from a wide range of sources.

3.3.17 Overall, the results of the spatial analysis demonstrated that most wrecks which have been matched through identifiers and vessel name lay within 10 m of each other and only two records were matched to sites over 300 m away.

3.3.18 The consequence of this variation in point locations is that spatial queries to identify matching records cannot be applied to the point data alone. In order to assess the spatial variations in data, different scale buffers of each dataset were used to join to the point data of the other database. The results were then compared to the results of attribute queries.

3.3.19 The conflicting spatial location of wreck points is however an issue that needs to be addressed. Unless the problem can be resolved using GIS to ensure that points appear in exactly the same location irrespective of projections and co-ordinates used, it is recommended that a definitive location be agreed between the UKHO and NMR for sites where matching records have been identified.



Distance between UKHO and NMR points	Number of points
0 - 10m	126
10 - 20m	21
20 - 50m	59
50 - 100m	25
100 - 300m	13
300 - 700m	2

Table 4: Graph and table showing the results of spatial queries showing the variations in differences between matching UKHO and NMR known wrecks

3.3.20 In the long term, it is recommended that a structure for data exchange be developed to facilitate the agreement of wrecksite co-ordinates. The development of a structure for such an agreement between the NMR and UKHO could be considered as one of the potential deliverables for the English Heritage *Enhancement of AMIE Shipwreck Data* project.

3.4 Reviewing Attribute Contents

3.4.1 The structure of the data within both databases also affects how the data between the two databases can be joined or compared and how the data can be queried in order to extract meaningful trends. These issues therefore need to be assessed in order to make best use of wreck data during the AMAP1 project.

3.4.2 The data fields and their contents have been compared to identify areas within the two databases where data may coincide in either a complementary or contradictory way.

Description	UKHO Field name	NMR field name
Site Location Datasets	Lat/long co-ordinates	Easting and Northing co-ordinates County Parish Land Use
Wreck Name	SZ Label Name	Name Primary Name
Description of Remains	Wreck Category Contact Description Type of Obstruction General Comments	Summary Description Evidence
Site Status	Status	Area Status
Period	Date_sank	Period Max date Min date Dating method

Table 5: Table showing fields within UKHO and NMR attributes with contain equivalent types of data which may be compared

3.4.3 As seen from the results of the assessment of data coverage, wreck data can currently only be matched using the old identifiers issued by the Hydrographic Office. The scope for standardizing other attribute structures to enable further identification of matching records has been assessed. The standardization of site names and dates of loss between the two databases would facilitate further matching of records.

3.4.5 Both UKHO and NMR databases contain long descriptive text fields due to the original format in which the data was gathered. The usability of long text fields is limited in GIS as there is no scope for querying the data. In addition, when converted to a GIS compatible format, text fields have a limit to the number of characters which can be entered, causing the data to be truncated when viewed within the GIS. The solution to this problem is either to break up the text fields by using their contents to populate other fields, or to provide the data in a separate table which can be appended to the data in the GIS by relating it.

3.4.6 During the review of attribute data, it was noted that although both datasets contain numerous fields, some of the key fields contain only a limited number

of entries. The data is however often present within the descriptive fields. The potential for data enhancement through the extraction of data from text fields was identified during the formation of the project brief.

3.4.7 The AMAP1 project is therefore being run in collaboration with Seazone Solutions Ltd. who will be responsible for extracting data on the circumstances of loss, site conditions and preservation of wrecks based on the descriptions recorded by the UKHO. There may be scope for similar work to be undertaken on the NMR text fields during the Enhancement of AMIE Shipwreck Data project.

3.4.8 The structure of UKHO wreck data is being undertaken by extracting key words from each text field and using them to populate alternative fields with a standardized set of terms. The terms used to populate the new fields will be formatted to meet data standards once the data has been extracted. The field entries will be agreed by both the NMR and UKHO as part of this process. The data is being extracted from text held within the Circumstances of loss, Surveying Details and General Comments fields available from the Shipwreck Database Upgrade delivered by Seazone Solutions Ltd.

3.5 Identifying Data Conflicts

3.5.1 As part of the coverage assessments, the numbers of known wrecksites was assessed. Sites with no matching names was either due to conflicts in the identification of sites, despite matching identifiers, or because the records are recognized as obstructions.

3.5.2 Data conflicts have been assessed for queriable fields such as the identification of ratios in wrecks to obstructions within the matched records and the numbers of sites with conflicting identifications.

	Total
Records matching by identifiers and wreck name	263
Records with matching identifiers but different wreck names	71
Records with matching identifiers which are obstructions	371
Total sites with matching IDs	**705**

Table 6: Results of queries run to characterize potential contradictions between matched UKHO and NMR datasets

	UKHO	**NMR**
Records with UKHO identifiers but no match	34	21

Records with no old UKHO identifiers	255	732

Table 7: Results of queries run to characterize potential contradictions between unmatched UKHO and NMR datasets

3.5.3 The numbers of conflicting records which have been matched using identifiers is comparatively low with only 10% of records with matching identifiers where site names differ and only 21 records provided by the NMR which are have identifiers which are not recognized by the UKHO. 30 NMR records were identified as having duplicate identifiers. These contradictions, though not numerous, need to be addressed by individual data providers or as part of the English Heritage Enhancement project.

3.5.4 An investigation of the 21 NMR records containing old UKHO identifiers not held by the UKHO was undertaken in collaboration with Seazone Solutions Ltd and English Heritage. The cause of these discrepancies were identified as follows:

Cause of Error	**Number of Records**
Discrepancies due to typing errors in NMR records	15
Records not in UKHO due to being Restricted data	2
Discrepancies due to independent update	2
Unknown	2
Total	**21**

Table 8: Summary of causes of NMR records containing old UKHO identifiers not in UKHO data

3.5.5 As stated in paragraph 2.5.2, the independent update of records by the NMR and UKHO can generate errors and inconsistencies between the databases if the equivalent records have not received the same update. Research into inconsistencies between the NMR and UKHO databases highlighted sites where inconsistencies were due to records being independently updated. These examples, described in table 8, clearly demonstrate the lack of effective communication between the UKHO and NMR with respect to updating records. The resolution of these conflicts in data should be considered as high priority. The integration of UKHO HOIDs within the NMR database would provide a valuable first step in trying to resolve this issue.

NMR ientification	**Correct UKHO equivalent record**
HMS Balfour	= Heathpool (HOID: 20458) A diver got a bell out of this wreck and UKHO updated this info in their records whilst hasn't been updated in NMR
UMBA	= Roadcliff (HOID: This is a restricted wreck, which was originally known as the Umba. Another example a site where a recorded updated by the UKHO hasn't been updated by the NMR

Table 9: Examples of sites where inconsistencies between UKHO and NMR databases are due to independent updates

3.5.6 Both UKHO and NMR databases contain large numbers of recorded obstructions (575/1891 in UKHO, approx. 594/1488 in NMR). Of 575 UKHO obstructions, 475 records have old UKHO identifiers. The NMR obstructions only contain 17 records with UKHO identifiers, suggesting that a substantial number of records have been added from a source which is not contained within the UKHO obstructions data. This is an issue which the UKHO need to address to ensure that they have a complete set of obstruction records. The UKHO wrecks and obstructions are now available as separate datasets as part of Seazone Hydrospatial.

3.5.7 The historical significance of obstructions within the NMR database is however not clear because the AMIE GIS depiction and associated tables provided for the AMAP1 project do not provide enough information to enable the assessment of 'historical significance' of obstructions to be undertaken.

3.5.8 The removal of sites with no recognized historical meaning from the AMIE records could facilitate matching of records in the future and reduce management requirements for the data.

3.5.9 All attribute fields containing similar types of data have the potential for conflicting contents. Records which have been identified as potential matches through attribute or spatial analysis will need to be reviewed to identify and resolve conflicting data where possible. Any conflicts identified during the AMAP1 data analysis will be reported to English Heritage. It is recommended that the UKHO should also be made aware of such conflicts.

3.5.10 Finally, during the investigation of inconsistencies between the UKHO and NMR datasets, an assessment was made of the way in which wreck sites designated under the Protection of Wrecks Act 1973 were recorded within UKHO and NMR database. Most sites were recorded in both databases although many of the sites were recorded in the NMR as polygons rather than points, probably to reflect their designation areas. Several sites were plotted in the UKHO database but were not named. The results of the assessment are outlined in table 10.

Designated Site as named by Receiver of Wreck	UKHO Name	UKHO HOID	NMR name	NMR HOB_UID	Notes
Mary Rose	Mary Rose	19160	Mary Rose	1121974	recorded in NMR as a polygon
Grace Dieu	Grace Dieu	19319	Grace Dieu	1082121	recorded in NMR as a polygon
Amsterdam	Amsterdam	20591	Amsterdam	1082114	recorded in NMR as a polygon
Pomone	HMS Pomone	19057	HMS Pomone	1082106 or 767332	Pomone recorded in two locations both as polygons in NMR
Assurance	HMS Assurance	19055	HMS Assurance	1082105	recorded in NMR as a polygon
Anne	HMS Anne	20613	Anne	1082120	
Langdon Bay	nil	13642	Langdon Bay	1082119	not named in UKHO. Match based on location
Brighton Marina	nil	20195	Brighton Marina	1082104	
Yarmouth Roads	nil	19505			UKHO record in approximate location of site with no name. No NMR point
Studland Bay	nil	19515	Studland Bay Wreck	1082101	recorded in NMR as a polygon
Hazardous	HMS Hazardous	20224	Hazardous	1082107	recorded in NMR as a polygon
A1	HMSM A1	20248	HMS A1	911782	recorded in NMR as a polygon
Swash Channel Wreck	nil	65434	Swash Channel Wreck	1408546	
Holland V	Holland V	65423	HMS Holland no 5	1397999	
Norman's Bay/Resolution	HMS Resolution (possibly)	67832	Normans Bay Wreck	1141075	
HMS Invincible	HMS Invincible	19370	HMS Invincible	1082111	recorded in NMR as a polygon

Table 10: Designated wrecks in AMAP1 study area as recorded in UKHO and NMR databases

3.6 Conclusions

3.6.1 The Shipwreck Data Review was successful in assessing the different aspects of digital data which determine its usability within a spatial context, such as the format it is delivered in, the challenges of using the datasets together and identified areas where inconsistencies may exit within these national datasets.

3.6.2 The results of the review will ensure that the use of wreck data during the spatial analysis phase of the project is optimized to produce a justified characterization of the potential for shipwreck remains to exist and survive within different types of marine environment.

3.6.3 The assessment of data format demonstrated the difficulties of converting large scale databases from a paper output to a digital and spatial output. Seazone Solutions and the UKHO have dedicated considerable time to making UKHO shipwreck data as well as other UKHO datasets available and accessible in a ready-to-use mapped format. As previously mentioned, the NMR are also planning a project to enhance the output of records from their AMIE database.

3.6.4 The attribute assessment showed that there are several fields in both datasets with equivalent data within the other database. These datasets are not within a format which allows them to be easily used together and contain numerous empty fields. There is however scope for the two databases to inform each other through an exchange of information between the two organizes in order to reconcile contradictory fields and populate empty ones in order to improve their coverage.

3.6.5 The assessment of coverage demonstrated that the UKHO conversion table was effective on matching a proportion of the records from the NMR and UKHO databases. There is considerable scope for matching further records, initially through the reconciliation of contradictory records identified within this review. However, to extend the matching of records beyond the use of known matching identifiers will require data enhancement of both of the databases to provide further indexable fields.

3.6.6 As demonstrated in Section 3.5, there is clear evidence of conflicting or mismatching information with regards to the old hydrographic IDs listed in the UKHO conversion table and those held by the NMR. The presence of UKHO old identifiers by the NMR which are not listed within the NMR table cannot currently be explained. This highlights the need for the data assessment to be carried out on a national basis in order to assess potential inconsistencies over a wider area.

3.6.7 In the context of the AMAP1 project, the results of this review have highlighted some major constraints within the shipwreck data. The presence of overlapping and potentially conflicting data highlights the need for spatial analysis of wreck data to be undertaken on the two databases separately rather

than attempting to summarise the data. The advantage of this may be that further spatial contrasts between the datasets may be highlighted by undertaking the queries twice.

3.6.8 For analysis of data within attributes such as condition assessments of site and circumstances of loss the data available in both databases will need to be extracted, compared and summarized within a separate set of fields within the GIS. This process will prove to be time consuming and less cost effective as sites will need to be assessed on an individual basis. This approach will however provide further feedback for the UKHO and NMR as part of the AMAP1 final report.

3.7 Recommendations for the English Heritage Enhancement of AMIE Shipwreck Data

3.7.1 The recommendations proposed during the assessment which may inform the enhancement of AMIE shipwreck records currently being proposed by English Heritage can be summarized as follows:

- Assess the contrast in coverage for shipwreck data for all UK territorial waters within the 12 mile limit.

- Incorporate HOIDs within the NMR dataset, crucial to making UKHO and NMR datasets interoperable and avoiding further data errors and inconsistencies

- Focus enhancement work on improving the number of matching records and the attribute data within them by:

    - Matching records via IDs where possible
    - Standardising the format for wreck names and dates to create queriable fields
    - Agreeing on a definitive set of co-ordinates for matching records
    - Matching sites by attributes using queriable fields to identify potential matches
    - Enhance data for matched records where empty or conflicting fields can be informed using data existing in other databases such as UKHO records and the ALSF Importance of Shipwrecks database

3.7.2 The application of a similar method of assessment to all shipwreck data within the 12 mile limit of UK waters would allow the scale of the conflicts between databases to be evaluated.

3.7.3 The standardization of the spelling of names for known wrecksites would enable further data to be queried out and records matched up although this will require the analysis of contents of supporting fields.

3.7.4 There is scope for enhancing the data by reducing the numbers of empty fields. Both datasets contain attributes which could be used to enhance the data provided in the other dataset. Both solutions rely on close association between the UKHO and NMR:

1. To undertake a joint or two individual enhancement projects, maintaining the two databases in their current structure. This would need to be based on a data exchange agreement between the two organizations. This will however not tackle the issues of overlaps between the datasets.

2. to split shipwreck data fields between the two repositories, based on their relevance, and distribute the enhancement work and long term data management between the two organizations

3.7.5 The project proposed by English Heritage to reconcile inconsistencies between the two datasets will no doubt provide further opportunity to illustrate the data issues raised here and to find long-term solutions to the issues raised

4 REFERENCES

Dellino-Musgrave, V., 2007, *Inconsistencies between the National Monument Record and the United Kingdom Hydrographic Office datasets*, Marine Data News, MDIP, July 2007.

Merritt et Al., 2007, "*Enhancing our Understanding of the Marine Historic Environment: Navigational Hazards Project - Final Report (Draft)*", English Heritage

Merritt, O., 2007, "*Refining Areas of Maritime Archaeological Potential for Shipwrecks - AMAP 1, Project Design*", English Heritage

APPENDIX 1: AMAP1 PROJECT MEETING MINUTES

Shipwreck Database Meeting 1
16th April 2007, English Heritage, Fort Cumberland

Attendees:
Olivia Merritt (OM), Bournemouth University
Mike Osborne (MO), Seazon Solutions Ltd.
Chris Pater (CP), English Heritage
Martin Newman (MN), English Heritage
Virginia Dellino-Musgrave (VDM), English Heritage

Minutes

Introduction

Attendee introductions

The baseline datasets used in maritime archaeology were discussed and bathymetry and BGS seabed sediment and offshore bedrock were identified as key datasets for impact assessments for use alongside archaeological, geophysical and geotechnical data, while research projects employ a more variable range of data.

CP: COWRIE have produced guidance for Environmental Impact Assessments (EIA) for windfarm developments. No other standards exist outlining baseline datasets

Shipwreck Database Issues

The value of linking the Maritime National Monuments Record (MNMR) and United Kingdom Hydrographic Office (UKHO) databases was discussed and all members agreed that the two databases would need to remains separate but could be linked using OIDs.

The reference number system in the UKHO database has changed, previously making the linking of data difficult.

SeaZone Solutions have provided the NMR with a transfer table enabling the UKHO records to be joined to the NMR records. The application of the table to the AMIE data will enable analysis of the numbers of matching and non-matching records between the two databases, using attribute queries to identify relationships between OIDs.

Action (MO): Send OM a copy of the shipwreck ID transfer table which enables the two databases to be linked

- Different locations

The wreck analysis carried out for the Shipwreck Importance project was described. Comparative analysis of the two wreck databases was carried out spatially by buffering the MNMR wrecks by 200m and applying a spatial join in order to identify points proximal to each other where the vessel identification also matched. Around 2000 known wreck have matching records and are mapped in approximately the same location (taking into account the MNMR data offset)

- Difference in names

The UKHO records for site name have been completed so that many features have "(probably)" written into the field next to the name. The contrasts in the way that site names have been entered in the database means that they cannot be compared through queries. The identification of matching records undertaken by Bournemouth University therefore had to bone manually. The separation of comments to a separate field would enable more effective queries. These changes and discrepancies between vessel name spellings will need to be addressed as part of the project to be run by English heritage to enhance the MNMR records.

- Projections

MNMR records do not all have the same projection. Some have been entered in WGS84 while others are in OSGB36.

- NMR Event Record

Monument records and events records in the NMR are gathered under PPG16 on land. There is no equivalent support for the marine zone. It would be possible to enforce for internal projects, but in for industrial investigations, this would be reliant on clients agreeing to a record being made. This is an issue which affects other aspects of the marine industry, such as the recording of hydrographic survey areas.

OASIS database enables digital records of events such as surveys and excavations to be made.

The MNMR shipwreck database was setup using the UKHO records as a basis alongside other data. The database has then been updated over time. The UKHO database has also continued to be updated since the transfer of data was made to the NMR. The two databases have therefore diverged.

The location, name and attribute issues need to be sorted out in order to reconcile differences between the datasets.

MNMR attributes

The AMIE records are distributed as excel spreadsheets. The application of these tables in GIS requires certain knowledge of GIS to enable the records to be effectively used.

The internal English Heritage GIS contains only some of the AMIE fields, limiting the ability for staff to query the data.

Action (MN): To get the internal EH GIS to be adapted to enable the key AMIE fields to be accessed.

The NMR coverage is up to the 12 nautical mile limit.

Local authorities often do not hold data below the mean high water line. When available, shipwreck data is provided by the NMR.

Droit records are provided by the Receiver of Wreck to the NMR. The RoW is however under no obligation to pass on information against the finder's will.

UKHO Attributes

SeaZone data provides a digital version of the UKHO shipwreck database. It also includes access by certain clients to restricted wreck sites.

The key fields for each database were discussed. It was suggested that the databases would have to each be responsible for the update of their own fields.

There may be some fields which will need to be made available to both databases, unless the core fields as available primarily via SeaZone and the NMR data would be available as an attachment. This would not enable the MNMR database to be distributed as a stand-alone product.

There may be scope for an exchange in useful fields. SeaZone have identified other organisations such as the MCA which would make use of cargo data, currently not available within the UKHO records. Some of the information on survey histories would be equally useful to archaeologists who do not have access to SeaZone data.

Shipwreck Enhancement Project

The Shipwreck Enhancement Proposal that VDM is currently writing up will be used as an example of linking different datasets. MO suggested that this should be done under the MDIP umbrella. The proposal will be circulated internally, then passed to SeaZone Solutions Ltd so that VDM and MO can identify work which may need to be delegated or sub-contracted to SeaZone.

Action (VDM): Circulate the project proposal first internally then to MO

AMAP1 project

A progress report on the project proposal was provided. A project design has been commissioned and comments were provided by English Heritage.

The data structure changes to be made to the UKHO database by SeaZone Solutions will be done based on a series of word lists categorising degree of scatter, vessel type and manner of loss. The word lists will be approved by the NMR before SeaZone extract the data into separate fields.

Contact for NMR wordlists: Kieran Byrn

Other shipwreck data sources were discussed. The NMR have approached Shipwreck UK and think there may be scope for integrating their data.

Action (OM): Circulate a copy of the AMAP1 proposal to MO

NMR Named Locations

The need for an official set of named location polygons for the NMR's reported losses to be better displayed was discussed.

Currently, reported losses for which the location of the site is unknown are allocated to a named location point relating to either a coastal reference point or sandbank.

It was proposed that SeaZone would be best place to produce NLO polygons as part of a digitisation project to design SEA areas which integrate the requirements for marine boundaries of other marine authorities. As a key marine data supplier, SeaZone can supply a set of polygons which will be widely recognised and applied by the maritime community.

To enable the work to be imminently undertaken, it was proposed that a pilot set of polygons be produced as part of the AMAP1 project. A project variation will be put forward for Bournemouth University to subcontract the development of NLO polygons to SeaZone Solutions Ltd so that results can be tested as part of the project.

Action (OM): send an email to Kath Buxton proposing a Variation Proposal to the AMAP1 project

Action (MN): Circulate the table of named location points and their co-ordinates to MO and OM

Action (All): Follow up meeting to be held in June following the AMAP1 Shipwreck Data Review, but before the first AMAP1 steering group meeting to report on developments stemming from actions

1st May 2007

Stakeholder Group Meeting
29th August 2007
Bournemouth University, Talbot Campus, Fern Barrow, Poole, BH12 6ED

Attendees:
Olivia Merritt – Bournemouth University
Virginia Dellino-Musgrave – English Heritage
Chris Pater - English Heritage
Alice Froggatt – English Heritage
Martin Newman - English Heritage
Mike Osborne - Seazone Solutions Ltd.
David Cotton – MDIP
Mike Cowling – Crown Estate
Mark Russell - BMAPA

Apologies:
Paul Leonard – DEFRA
Richard Newell - DEFRA

Minutes

1:00 – 1:30 Arrivals, Light lunch & refreshments

1:30 – 1:40 Aims and Objectives of Meeting
The aim of the meeting is to ensure that method development meets EH objectives and the needs of the aggregate industry along with those of other stakeholders
In order to do this, it is useful to identify data usage issues

The meeting was designed to encourage discussion, identify issues, and discuss ways of moving forward on these issues

The impact of the results of the data review for the rest of the AMAP1 project were discussed. The identification of extensive variations between the two wreck databases has meant that it would not be possible to marry up both datasets into a single layer of shipwrecks, for the purpose of spatial querying, as this would produce duplicates of sites which have not yet been identified as matching between the databases. The two databases will therefore be treated as separate datasets and queries will be reproduced for both sets of data. Any variations in result will highlight spatial differences that were not identifiable during the review.

The data format issues identified were unexpected and have created additional difficulties for the processing of AMIE record attributes for use in GIS.

1:40 – 2:00 Shipwreck Data Review and the AMAP1 project
Olivia Merritt gave a powerpoint presentation outlining the project progress and results of the shipwreck data review

Summary of AMAP 1 project
Characterisation of archaeological potential for archaeological remains (shipwrecks in particular)

Progress report:

- data gathering has been undertaken including:
    - ALSF navigational hazards,
    - Seazone Hydrospatial,
    - Boreholes,
    - Port activities (looking also at secondary sources),
    - ALSF England's Shipping, Hydrographic metadata

- UKHO shipwreck data restructure:
    - wreck data fields were adapted to extract information on circumstances of loss and wreck condition (Seazone extracted key terms out of these fields: loss cause1; secondary_act; condition, etc: key terms that were used to extract out these data)

- Data Review (key deliverable for this stage of the project):
    - was achieved by assessing format, coverage, attribute contents and data conflicts
    - NMR wrecks: ½ of them don't have UKHO wreck ID
    - NMR wrecks that didn't match were mainly because NMR wrecks didn't have UKHO old wreck ID to match it. In other words, ask why the query results are that way and explain it

    - Numbers held by NMR but not UKHO (around 29 NMR wrecks are not in UKHO database): OM couldn't explain why this is the case (she thinks its human error).

      ACTION: The need to understand the cause of mismatches in the records matched using HOIDs was agreed by the stakeholder group. Mike Osborne agreed to arrange a meeting with Bournemouth University (OM) and English Heritage (VDM) to work through issues highlighted by the review.

      Areas for investigation during the meeting with Seazone will include:
        - fields that can be compared and what data within fields that can be compared
        - records that match using wreck ID but the description of the site doesn't match
        - identifying a systematic reason for matches

      ACTION: OM to send shapefiles to MO & VDM/MN to try and find out why these issues are

    - spatial analysis: off set: queries: data was joined by location (in meters). This demonstrates that the distance varies hence this issue is not only due to projection as previously thought
        - AMIE: all the data is project in British National Grid
        - UKHO: WGS84

  Possible other causes:
        - different in location is due to development/resolution of technology work
        - NMR data records losses, aircrafts, etc and that info wouldn't be available in UKHO
        -

  Solution: NMR to ask for an export that includes the original position (this will have to go to development people at the NMR since GIS doesn't has the tools)

Solutions discussed via the AMAP1 project Shipwreck Data Review:

1 Matching by attributes: the old UKHO UID can't be used to match all equivalent records because is not present in all NMR datasets. It will therefore be necessary to use other fields that could be matched such as site name and date of loss. To do this it will e necessary to standardize the format used within the fields. E.g. HMS Hood and H.M.S Hood need to be the same

Comment: The NMR has a conversion table where alternative wreck names are listed (alternative name field)

Why is it important?

- To improve data quality and make the data more reliable;
- To give confidence of this to users;
- The UKHO & NMR data created for different purposes but they are complementary hence it's crucial that they become interoperable

- Look at the future to avoid these problems repeat again. Need for improved communication between UKHO and NMR to be put in place before we start looking dealing with improving interoperability

- Casualty (UKHO) and reported loss (NMR) datasets are important as there is scope for matching further sites through investigation of potential matches between these datasets and known wrecks

2 How are we going to link both datasets?

- We need appropriate communication structure between data supplier

Comment - MO: there is a form for reporting wrecks in UKHO and updating wrecks

- We need an enhancement in both datasets: 1) do it together? Or separate? Updating contradictions without collaboration may lead to duplication in effort

- Having same fields would make datasets interoperable as well as consistent making it more user friendly.

- A document accompanying the data defining each field would also be beneficial

- It was proposed by BU that a potential solution would be that in the future, UKHO holds the spatial element and NMR holds the archaeological addition to it (NMR data that is non-spatial and can be joined to UKHO). This would sort out the problem of duplication, etc

3 There are a lot of obstructions on the NMR database, most of which have little accompanying data within their attributes, making it difficult to identify sites of historical interest. MN thinks that this data is not of historic interest. If an obstruction is a wreck then it would have been recorded as a wreck in the NMR database

- **Comment: CP & VDM highlighted the importance that there are cases of obstructions that are considered of historic importance (e.g. case in Devon?)**

KEY ACTIONS:

OM - Make changes to the format to the database. First, understanding the nature of the problem; understand why these problems;

OM, MO, VDM: Arrange a meeting to discuss discrepancies

MN - input/export tool in AIME; first agree what we want from it

Re-structuring of both databases so they can work to be together is up to SeaZone/UKHO and NMR to sit together and assess what is the best way forwards on this. Develop overall philosophy first before we decide on how to re-structure them together

Application of project to Aggregate industry

MR: interested on predictive side of things: make assessment of data of what you've got and then say 'the potential of what you've got is limited'. Some areas come out with stuff that were considered of low archaeological potential. It'd be useful for MR to provide this info to OM to test her predictive tool (also link of OM to JKD project)

It's more a conceptual model and can be used to stop the license issue. A healthy caveat should go with this project 'evidence of absence is not absence of evidence'

Must be aware on how others may wish to apply the predictions of this project (may be do some testing issuing some aggregates dredging areas and how this project would inform in the licensing process)

Think of the word 'mobility'. May be this is not the best word to use since it suggest that things 'move'

Next meeting: see this prediction tool working and convince developers how useful it is

MC: said talk to them as far as resources is concerned

MC: look at behaviour of thick layers of sand that it may be useful for the AMAP1 project (**MENTION THIS TO JUSTIN**)

NOTE: Further discussion with MR, VDM and MC resulted in project developing towards production of a "justified characterization" of the seabed providing a basis for making better informed characterization of archaeological potential for shipwreck material, taking into account potential for survival, potential for scattering of material, potential for loss of vessels

****ACTION TO ALL**** Deadline for comments to send to VDM by **17th September**. Then VDM will compile comments and send them to OM

2:00 – 2:30 **Discussion 1: Spatial variations between wreck data**
What are the spatial issues surrounding the use of wreck data, how they impact on the AMAP1 project, marine planning and what are the possible solutions?

Spatial issue:

NMR data: one-to-many relations: difficult to match records. One to one relation is easier for matching purposes

ILLUSTRATIONS

AMAP1 project - Shipwreck Data Review

Bournemouth University

Figure 1: Map showing the AMAP1 project study area, the pilot area and the 12 mile territorial sea limit

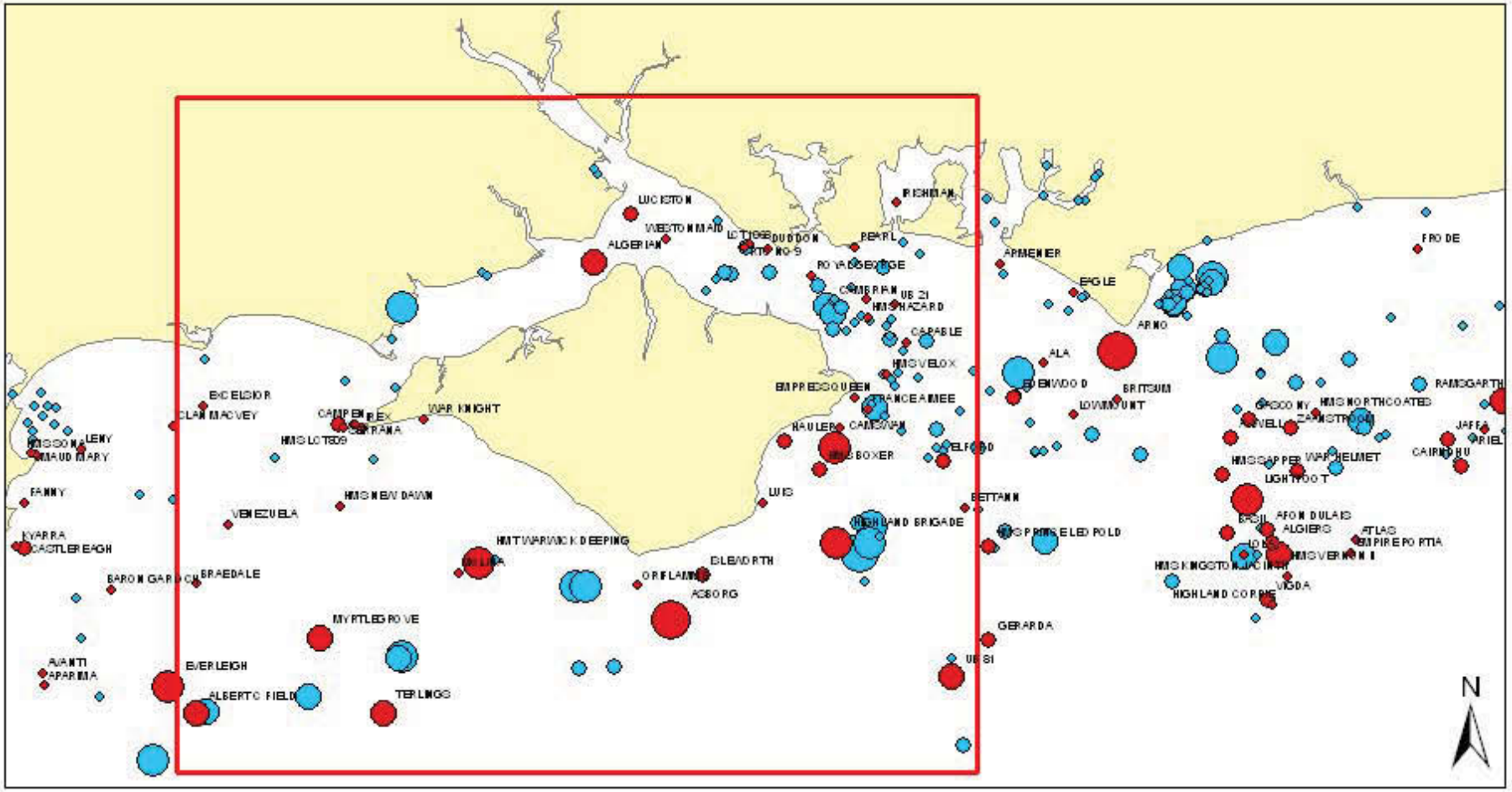
0 10 20 40 60 80 Kilometers

Legend

- AMAP1 Pilot Area
- AMAP1 Study Area
- Seazone - 12 mile territorial limit

Creator: Olula Merrill
Date: 23/08/07

AMAP1 Project - Shipwreck Data Review



Bournemouth University

Figure 2: Map showing the distances between known wrecks in the Solent matched by name and ID

0 2.5 5 10 15 20 Kilometers

Creator: OliviaMerrill Date: 23/08/07

UKHO to NMR - name & ID
0 - 20
21 - 50
51 - 100
101 - 300
301 - 700

UKHO to NMR - ID only
0 - 20
21 - 50
51 - 100
101 - 300
301 - 621