HISTORIC SEASCAPE CHARACTERISATION (HSC)

THE IRISH SEA (ENGLISH SECTOR)

SECTION ONE: BACKGROUND, METHODOLOGY AND RESULTS

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REPORT STRUCTURE

The Project Report for 'Historic Seascape Characterisation: Irish Sea (English sector)' is divided into three sections for ease of use. The first section outlines the project's method implementation, the second section outlines an applications review and case studies, and the third section contains printed versions of the Character Type text descriptions from national and regional perspectives.

This document comprises Section 1 of this Project Report: Background, Methodology and Results

EXECUTIVE SUMMARY

In 2009 English Heritage (EH) invited the Archaeology Unit of the School of Historical Studies at Newcastle University to tender for a project, funded through the Aggregate Levy Sustainability Fund (ALSF), to undertake the Historic Seascape Characterisation (HSC) of the Irish Sea (English Sector). The HSC methodology, published in a revised version in 2010, consolidates and builds on the method development undertaken between 2004 and 2008 by the *England's Historic Seascapes Programme*. HSC seeks to further the aims of the ALSF through the identification and characterisation of the historic landscape in key existing or potential areas of aggregate extraction while retaining a breadth of applications beyond that.

The national HSC Method was consolidated by the Historic Environment Service at Cornwall County Council in close consultation with English Heritage, bringing together and learning from the experience gained during earlier rounds of the *England's Historic Seascapes* Programme. Publication of the resulting national HSC Method completed that Programme, producing a robust method for applying the principles of Historic Landscape Characterisation (HLC) to England's coastal and marine zones, extending seaward to the limit of UK Controlled Waters. Some practical recommendations arising from the initial implementation of that Method across the coasts and seas of north east England (SeaZone Solutions Ltd 2009) were incorporated into a revision of the HSC Method Statement in 2010: that revision guided this project.

This is one of four projects commissioned towards the end of 2009 to implement England's national HSC Method across a range of areas in English and adjacent waters. Together with the initial implementation project in 2008-9, these projects' outputs form contributions towards an eventual national HSC database for England to be held by English Heritage.

This document constitutes a project report produced by Newcastle University detailing the execution of the different phases of the project. The report is divided into three sections; the first describes the practical implementation of the national HSC Methodology. The second part comprises an Applications Review and Case Studies. The third section contains the character type texts.

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1. INTRODUCTION

1.1 Project Background

In February 2010 the Archaeology Unit of the School of Historical Studies at Newcastle University was commissioned by English Heritage to undertake the Historic Seascape Characterisation (HSC) of the Irish Sea (English Sector). The project was funded by English Heritage through the Aggregates Levy Sustainability Fund (ALSF). It was undertaken over a period of 11 months in accordance with a Project Brief supplied by English Heritage and guided by a national HSC Method Statement which was designed to be applicable across all areas covered by the HSC projects (English Heritage and Cornwall County Council 2010). Historic Characterisation uses a suite of related, techniques to map interpretations of historic character in the past and present. The results are used to inform research, management and planning for the future, so Historic Characterisation looks both backwards and forwards in time (Turner 2006). This project undertook, using the national method for Historic Seascape Characterisation (HSC), a GIS-based characterisation of the English sector of the Irish Sea and adjacent waters and coastal zones, as defined in the project brief (Hooley 2009). It is part of a broader programme of HSC implementation which aims to build, through a series of projects, historic characterisation of the whole of England's coasts, seas and adjacent UK Controlled Waters, creating a national HSC database to inform coastal and marine management and spatial planning. The Method Statement developed from the results of five pilot projects undertaken between 2004 and 2007. The first of those pilot projects covered Liverpool Bay and waters off the Fylde (Wessex Archaeology, 2006a and 2006b). That area has now been subsumed within the area of this project, whose outputs also supersede those of that former pilot project.

2. AIMS AND OBJECTIVES

2.1 Project Aims

The overall aim of the project was to carry out, using the national method for historic seascape characterisation (HSC), a GIS-based characterisation of a specified area of England's coastal and marine zones and adjacent waters to the limit of UK Controlled Waters. Specifically, the project aimed:

- to follow the national HSC method to create a GIS-based characterisation of the historic and archaeological dimension of the present seascapes across the full extent of the project area, at a scale appropriate to national strategic level applications and in a manner that will contribute to a national HSC database and form an exemplar for future HSC projects
- to demonstrate how the application of HSC produces a framework of understanding which will structure and promote well-informed decision-making relating to the sustainable management of change and conservation planning affecting the historic environment in the coastal and marine zones, with particular reference to impacts from marine aggregates extraction
- to ensure that application of HSC produces a GIS-database fully compliant with the principles of HLC, with the present and anticipated user-needs of English Heritage and with available standards for data content, management, inter-operability and accessibility developed to meet the implications of the Marine and Coastal Access Act 2010

- to structure, inform and stimulate future research programmes and agendas relating to the coastal and marine historic environment
- to improve the awareness, understanding and appreciation of the historic dimension of the coastal and marine environment to its professional and non-professional users.

2.2 Project Objectives

The project objectives are:

- to produce a GIS-based characterisation of the historic and archaeological dimension of the present seascapes across the full extent of the specified project area, using the established national HSC method, adopting at least a national perspective for its descriptions, and coordinating its marine HSC with a national data framework to be advised by English Heritage
- to produce a database of referenced structured texts relating to Character Types assessed during the characterisation, supplemented by imagery from the Project Area
- to analyse and interpret the project's HSC database to identify contexts and applications in the project area typifying those which the HSC approach is designed to inform, as noted in the national HSC Method Statement (English Heritage and Cornwall County Council 2010), with particular reference to English Heritage's curatorial responsibilities and influences for the sustainable management of change, the provisions of the Marine and Coastal Access Act, and UK commitments arising from the European Landscape Convention
- to document those HSC contexts and applications in the project area by description, including scenario examples as appropriate. Those contexts will include the role of HSC in informing the marine aggregates extraction licensing process
- to document from the project area, by description and by case study, the close inter-relationships between historic and natural environment character and the advantages of inter-operability between historic and natural environment spatial datasets
- to document from the project area the potential of the HSC for raising public awareness and understanding of the coastal and marine historic environment
- to produce an Archive and a Project Report documenting all aspects of the project's application of the national HSC method. Included within the Project Report will be: a project method statement detailing the project's practical implementation of the national HSC methodology; documentation of the project area's contexts and applications, current and potential, which HSC can advantageously inform; the relationships between the project area's historic and natural environment character, and the potential of the project's HSC for raising public awareness and understanding of the coastal and marine historic environment
- to detail in the Project Report's method statement the specific tasks and aspects of implementing the national HSC methodology across the project area, including records of the sources and data-sets supporting each stage of the characterisation and noting the inter-relationship between HSC and HLC where the latter has been

undertaken within the project area, to meet the needs of transparency and to assist future updates against the initial benchmark characterisation

- to disseminate information on the progress and results of the project through the internet and through professional and popular publications and other media.

3. INTERFACES

The project was undertaken in consultation with staff from English Heritage's Characterisation and Maritime Archaeology Teams. Where required, advice was sought both from English Heritage and those contractors involved in the consolidation and initial implementation of the national HSC Method, and from those conducting the three other HSC projects running concurrently with this one. In further demonstrating practicalities of *implementing* the methodology, this project extended the process of *defining* the method, to complement the National HSC Method Statement in giving methodological and practical direction to future HSC practitioners. Close consultation with EH was at a level appropriate to ensuring this project met the EH's needs.

Beyond the consultation with English Heritage staff and others noted above, the project had inputs, guidance and advice from other parties within and beyond English Heritage at various points during the project, especially during the characterisation and development of application scenarios. These included:

- ALGAO North West
- Cheshire Historic Environment Service
- Cumbria Historic Environment Service
- Greater Manchester Historic Environment Service
- Lake District National Park Historic Environment Service
- Lancashire Historic Environment Service
- Merseyside Historic Environment Service
- SeaZone Solutions Ltd
- Environment Agency
- North West Coastal Forum
- Morecambe Bay Partnership
- Sea Fisheries Committee for Cumbria
- Sea Fisheries Committee for North West and Wales
- Solway Coast AONB
- Solway Haaf Netters Association
- Morecambe and Heysham Fishermen's Association

4. METHODOLOGY

4.1 Project Area

The area to which the national HSC Method has relevance comprises the whole of England's coastal zone (land and sea), England's share of UK territorial waters, and adjacent UK Controlled Waters. This project's area was limited to the English sector of the Irish Sea and adjacent waters and coastal zones; it also incorporates the area of the Liverpool Bay HSC pilot project carried out in 2004-6 (Wessex Archaeology 2006a and 2006b). This covered all licensed and application areas for marine aggregates dredging in the English part of the Crown Estate's North West Region (http://www.thecrownestate.co.uk/dredge_areas_statistics). The boundaries of this project

area reflect administrative and practical constraints, and do not reflect any division in the continuum of the historic environment.

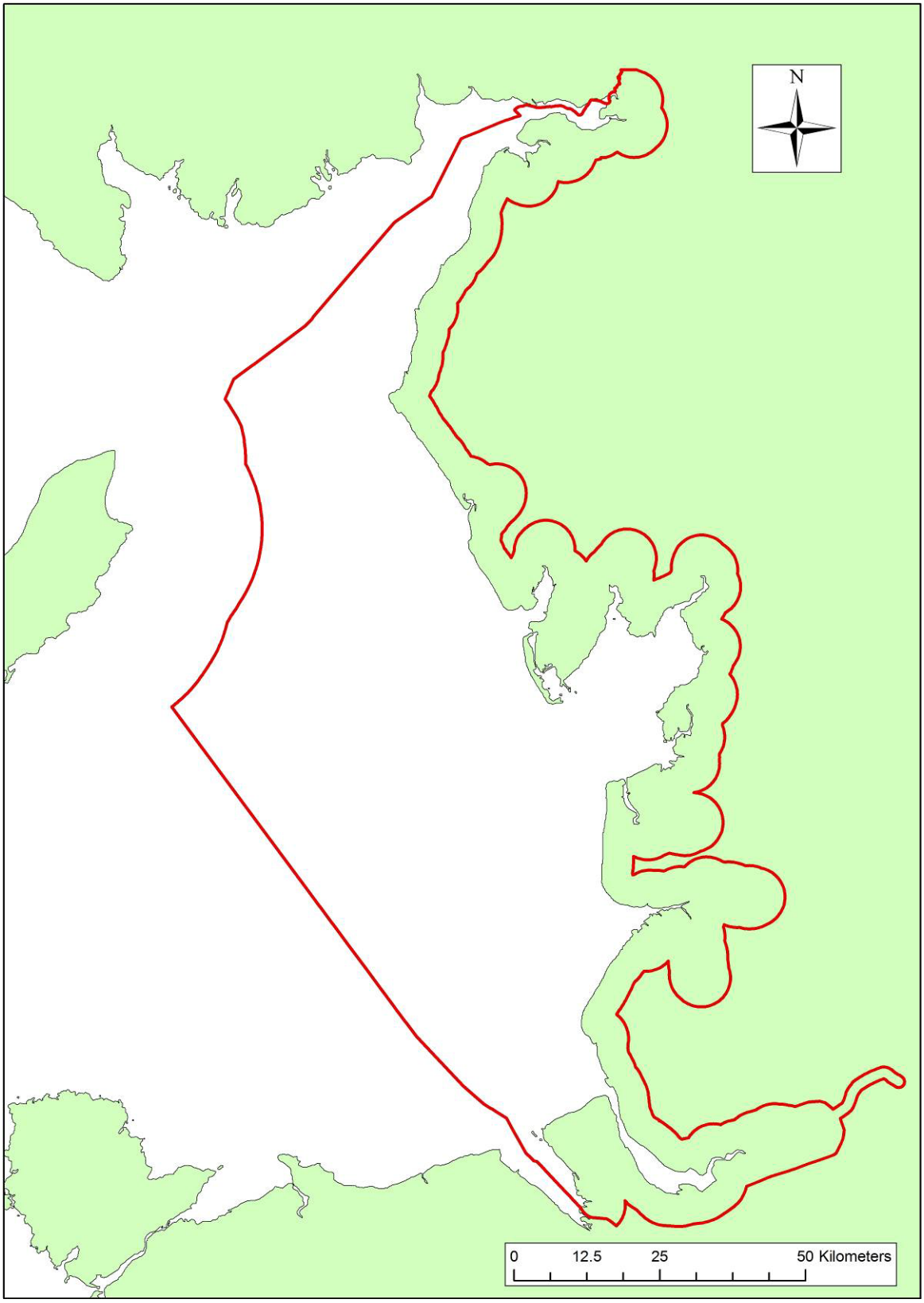


Figure 1.1: Project area, including 5km landward data-capture buffer

The south-western lateral extent was defined by the boundary with Welsh Assembly functions as defined in Schedule 3 of The National Assembly for Wales (Transfer of Functions) Order 1999. North-west from that Order's boundary limit, the project area was defined by a line extending due north-west to the point where it meets the 12nm limit of Manx waters. South-east from that Order's boundary limit, the project area was defined by the Anglo-Welsh national boundary, as mapped on OS MasterMap, as it passes along the Dee Estuary, across the inter-tidal zone and across the coastal land behind.

The north-western lateral extent of this project area was defined by the northern boundary of England's civil jurisdiction as defined by the Scottish border in the Irish Sea in the Civil Jurisdiction (Offshore Activities) Order 1987 **1** (2). South-west from that Order's boundary limit, the project area was defined by a line extending due south-west to the 12nm limit of Manx waters, which will themselves continue the definition of the project area to its south western limit. North-east from that Order's boundary limit, the project area was defined by the Anglo-Scottish national boundary, as mapped on OS MasterMap, as it passes along the Channels of the Rivers Eden and Esk, across the inter-tidal zone and across the coastal land behind.

The landward extent of the project area reaches the OS-mapped line of Mean High Water (MHW) but in accordance with the national HSC methodology, it continues landward beyond that line to avoid any arbitrary truncation of HSC polygons and to accommodate inland areas perceived, from a maritime perspective, to possess a distinctively maritime character. This results in the inclusion of some areas on land which are discontinuous with MHW, for example to accommodate prominent inland areas serving as navigational daymarks, producing HSC polygons separate from the main body of the characterisation. The landward extent of the project area was confined to areas lying within England.

Subject to accommodation of inland areas perceived as possessing distinctive maritime character and the extent that they lie within England, all estuaries within the project area were included to their rivers' and tributaries' Normal Tidal Limits.

4.2 Source Datasets

The national HSC Method Statement (Tapper 2010) was used as the basis for applying the national HSC Methodology to meet the requirements of English Heritage. The characterisation was been broken down into the following stages:

- Data Collation
- Data Preparation
- GIS Development
- Database Development
- Character Assessment
- Development of Character-type Text Descriptions

4.3 Data Collation

The emphasis was placed on datasets listed in the HSC Method Statement that currently have, or will have when completed, consistent national coverage. There was also an emphasis on available digital sources. More locally based or hard-copy sources were treated as supplementary data. Additional sources were sought in some cases to complement or increase the coverage of datasets proposed in the HSC Method Statement. The information gathered to produce text description for character types was based on desk-based research. The basic requirements were that:

- sources were relevant and consistent

- core dataset coverage was national (or at least regional)
- sources were treated in a consistent manner and even-handed way, following a clearly stated workflow; and were used where possible to reflect time-depth and past change
- standard terminologies were used to maintain clarity meeting MIDAS/INSCRIPTION requirements
- consistent assessment and capture of historic seascape character was deployed
- common 'perception scale(s)' were established – that is, the scale at which characterisation is expected to be read and applied

A list of core data sources was identified for the purpose of the project (Table 1), based on Tapper 2010 and Hooley 2009.

Table 1.1: Core Data Identified for the Project

Data Group	Format	Feature Types	Datasets	Supplier
Admiralty charts	Digital	Points, polygons, polylines	Bathymetry, navigational hazards, navigational channels	SeaZone Hydrospatial
Historical charts, views and sailing directions	Paper based/ digital	Raster images	Navigational features, offshore development, intertidal peat beds	UKHO archives, National Maritime Museum, local museums
Ordnance Survey maps	Digital	Points, polygons, polylines		English Heritage, Ordnance Survey
Historic maps	Digital	Raster images	1st Edition, 2nd Edition and modern Ordnance Survey maps	English Heritage, Landmark, Ordnance Survey
SeaZone Hydrospatial	Digital	Points, polygons, polylines	- Bathymetry & elevation (BE), - Natural & physical features (NP) - Structures & obstructions (SO) - Socio-economic & marine use (SE) - Conservation & environment (CE) - Climate & oceanography (CO) - Wrecks (W)	SeaZone Solutions Ltd
Adjacent County HLCs and **EUS**	Digital	Polygons		Local Authorities
Aerial photographs	Digital	Raster images		Local Authorities
Fisheries data	Digital	Points, polygons, raster images, paper charts	Fishing grounds, fishing snags	CEFAS (outside 6nm), Sea Fisheries Committees (within 6nm), JNCC, Kingfisher charts, NMR, Misc. fishing charts
Offshore Industry	Digital	Points, polygons, polylines	Aggregate extraction areas, oil and gas installations	UK Deal, JNCC, SeaZone Hydrospatial
Environmental data and land classifications	Digital			Natural England/JNCC/ MAGIC database, CEFAS, BGS (www.searchmesh.net/webGIS)

English Heritage supplied modern Ordnance Survey and historic Ordnance Survey Landmark data. Data on fisheries, offshore industry, and most environmental and land

classification data was obtained through SeaZone Solutions Ltd. Additional data gathered to supplement the sources recommended in the national HSC Method Statement (Tapper 2010) have been annotated in bold.

Supplementary datasets identified included local and regional datasets, point data and data which is not currently available in a digital format (Table 2). These are datasets which are not consistently available to inform all historic landscape and seascape characterisation, but in some cases they can help fine-tune the assessment, providing valuable information on regional character expression during the characterisation. HER data were requested from local authorities and Rapid Coastal Zone Assessment (RCZA) data were obtained with National Monuments Record (NMR) data. Additional data gathered to supplement the sources recommended in the HSC national Method (Tapper 2010) have been annotated in bold.

Table 1.2: Supplementary Data Identified for the Project

Data Group	Format	Feature Types	Datasets	Supplier
NMR	Digital	Points, polygons, polylines	Monument records, maritime records, RCZA	English Heritage
HER, SMR	Digital	Points, polygons, polylines	Monument records, maritime records	Local Authorities
Palaeoenvironmental data	Digital/ paper	Various	Peat beds, palaeochannels,	Birmingham University, HER/SMR, BGS
Geomorphology	Digital	Raster	Coastal geomorphology	FutureCoast (DEFRA)
Seabed sediments	Digital	Polygons	Sediment type	SeaZone Hydrospatial
Offshore solid geology	Digital	Polygons	Bedrock type	SeaZone Hydrospatial
Morphology	Digital	Raster	Coastal morphology	FutureCoast
Tidal range	Digital	Raster images	Sea level model	DTI
Sea level index points	Various	Various	Sea level model	Various
Tides & Currents	Digital	Points, polygons, polylines	Tides and currents	SeaZone Hydrospatial
Shipping Data and Navigational Hazards	Digital	Polygons, Raster	Navigational hazards, England's Shipping, ANATEC, **DfT**	Bournemouth University, English Heritage, ANATEC, **DfT**
Documentary sources	Hard copy, Digital	Various		Various: libraries, Record Offices, Museum libraries

The collation of documentary resources plays a key role in the contextualisation of the character assessment and the development of character-type text descriptions. A wide range of primary and secondary, online and paper-based documentary sources were assessed. Data gathering was streamlined using the design of the database structure to guide the assessor in the level of information required. Data was entered directly into the database from the source documents. The timescale required to collate such a broad range of resources was considerable and was started in the first stages of the project during the initial Set-up and Familiarisation phase.

4.4 Additional datasets deployed, not previously used in HSC

Data on haaf netting was obtained from local fishermen working in the Solway and Lune estuaries. Information on the extent of the fisheries was provided in the form of grid references and on landmarks used by the fishermen and the Environment Agency to mark the limits of fishing areas.

4.5 Data Preparation

Data preparation was undertaken as outlined in both the national HSC Methodology (Tapper 2010) and the project brief (Hooley 2009). A digital geographic dataset containing extent polygons was produced to define 'Location' areas for the coastal and intertidal, inshore and offshore zones, as specified by the UK Hydrographic Office (UKHO) for the intertidal and marine zone, and the Ordnance Survey (OS) for the coastal zone. They are defined as follows:

- the coastal zone extends inland from MHW for areas shown to possess a maritime character
- the intertidal zone is the area from Mean High Water (MHW) to Mean Low Water (MLW)
- inshore waters are defined between MLW and the 12nm limit
- offshore waters are the area beyond the 12nm limit to the outer extent of the project study area.

This was used to provide attributes for the location field [LCTN] of HSC polygons using their centroids, as specified in the HSC Method Statement. Although the representation of the intertidal zone is more detailed in UKHO chart data than it is for OS MasterMap, the inconsistencies between the definition of MHW and MLW between the two made the use of UKHO data above MLW impractical in the context of this project without the undertaking extensive feature deconfliction between two datasets.

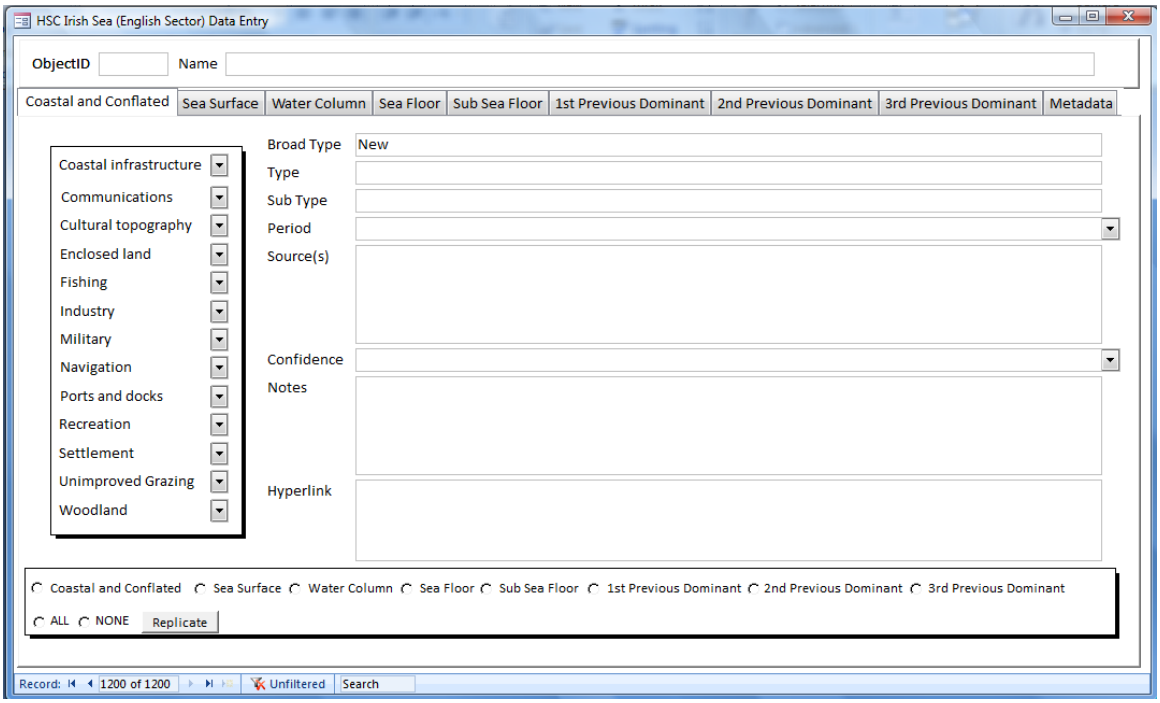
For projects based in terrestrial England, all data should be in the OSGB 1936 projection. For maritime projects GIS data can be in WGS84. UK reference datum for terrestrial datasets are typically in the Ordnance Survey British National Grid based on the Ordnance Survey Great Britain 1936 (OSGB36) datum which is intended to provide as little distortion as possible for the UK as a whole. However distortion increases the further one gets away from the centre of the UK, and for this reason, maritime datasets use the World Geodetic System 1984 datum (WGS84) which gives a better fit for the earth as a whole. Terrestrial sources were transformed into OSGB36 prior to inclusion in the character assessment. All marine source data were transformed into OSGB36 using conversion algorithms in ArcGIS. The data was collated to meet English Heritage standards of best practice. The resolution for data capture was determined by the scale at which the data is to be viewed and the scale at which it was originally displayed. All newly digitised data was captured at a scale of at least 1:25,000 as recommended in the "Guidelines for English Heritage Projects Involving GIS" (Froggatt, 2004) and the AHDS GIS guide to Good Practice (http://ads.ahds.ac.uk/project/goodguides/gis/). MIDAS Heritage complies with this data standard which is used by the GIgateway™ metadata service run by the Association for Geographic Information (AGI) and also to the UK e-Government Metadata Standard (e-GMS) which is based on Dublin Core. It is designed for use in GIgateway™, and for other metadata applications in the UK. All output GIS files will be documented using the UK GEMINI Discovery Metadata Standard, and is encoded according to ISO 19139.

4.6 GIS Development

A series of GIS tools was developed during the '*HSC: Demonstrating the Method*' project (SeaZone Solutions Ltd 2009), along with a strategy for ensuring continuity between the processing of all data collated. The Irish Sea (English Sector) project used a vector grid supplied by SeaZone Solutions Ltd, created to ensure that all grids produced for future HSC projects conform to the same grid structure, aligning themselves when viewed

alongside each other, thus encouraging coherence and interoperability between different project areas. The project used a 250m² grid referenced to British National Grid co-ordinates (OSGB36). The cells were then clipped using ArcGIS to remove unnecessary tiles to reflect the full extent of the study area below LAT.

The HSC database is a geodatabase created in ArcGIS 9 and running in Microsoft Access 2007 with compatibility mode set for Microsoft Access 2003. It utilises a series of tables, queries and data entry forms to feed data into a single main underlying data table (*HSC_data_structure*). The structure of this main table follows the naming conventions outlined in the national HSC Method Statement (see Table 3 below). Data types also follow the conventions outlined within this document but the width of each of the data strings were modified in line with its final contents to provide a more streamlined data set with less redundancy within the fixed length data fields. Character types were stored within a single Access table named *ALL_HSC_Types* to simplify additions and changes to the master list. Filtering of this list, for display during data entry, was achieved by the use of a number of static 'Broad Character Type' specific queries. 'Lookup Tables' were also included for 'Period' and 'Confidence' to enable more rapid and accurate data entry. Entry of the ObjectID for each record also differed in not being generated automatically within the GIS but was controlled manually within both Access and ArcGIS so that record numbering could be kept sequential even where deletions or additions may have been necessary.



All OS Mastermap vector data is stored within the main geodatabase as a series of feature classes. Raster-based historic mapping, for each of the available epochs, is stored as a

Figure 1.2: Data entry form

series of Raster Catalogues with a file geodatabase. Visibility of these datasets is controlled by parameters set within ArcGIS. HSC 250m and 500m grids and HSC polygons are also stored as feature classes within the database. HSC spatial polygon data and HSC character data are linked within ArcGIS using the ObjectID field.

Data entry is controlled by the use of a multi-tab data entry form (Fig. 2) that allows all fields within the main underlying data table to be accessible on the screen at any one time. In addition to the main tabbed pages, a number of additional features have been programmed into the main data entry form. Dropdown lists relating to the 'Broad Character Type' have been programmed to ensure that only relevant terms are available at the point of data entry. Colour tagging of the 'Broad Character Type' after data entry acts as a reminder of the character type chosen. The main data entry form provides for duplication of data across individual tabbed pages. A series of check boxes with a 'Replicate' button have been programmed to allow for easy duplication of data between underlying database fields. Check box choice and visibility are also programmed into this form. All coding is in Access Basic and has been designed to be easy to modify in the event of changes to the database structure.

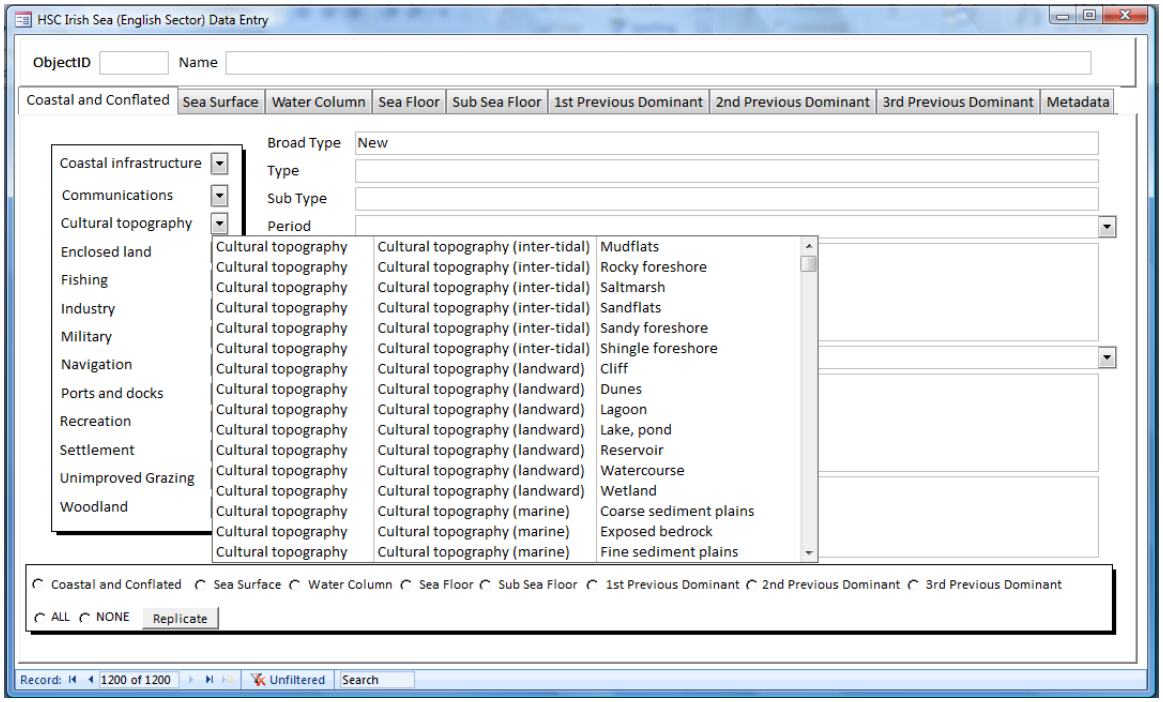


Figure 1.3: An example of a drop down list on the database entry form

4.7 Interpretative Character Assessment

4.7.1 Multi-Mode Characterisation

The need for a multi-mode approach to HSC was demonstrated during the development of the HSC Method and accords with normal practice on land in HLC (Aldred and Fairclough 2003). An HSC 'Character Type' hierarchy was developed using a multi-mode approach based on the character types produced during the five pilot projects. The hierarchy compiled using that approach forms the basis of the structure consolidated in the national HSC Method (Tapper 2010). The topological requirements for the project are as follows:

- polygons are to be discrete (No overlaps)
- polygons are to be contiguous (No gaps)
- all attributes are to be filled in where possible with 'null' used for empty entries as appropriate
- every feature (point, arc, polygon, region, etc) should have at least one attribute record.

- there should be no slivers, dangles, knots or cross-overs.
- multi-part polygons are acceptable; they should have one set of attributes associated with them.

During the first phase of the GIS development process, data was been combined into a single data layer using a combination of attribute-led descriptive characterisation, followed by a prescriptive phase of characterisation, once the data has been interpreted. The two approaches were used in combination across different parts of the project area. The approaches have however been described separately below for the sake of clarity. The characterisation for each marine level has thus been classified to reflect its dominant character to produce a set of continuous, discrete character polygons for each level. The character assessment was undertaken following the GIS workflow diagram published in the national HSC Method (English Heritage and Cornwall County Council 2010). The different phases of characterisation described in the national HSC Method have been applied and the results are described below:

4.7.2 Descriptive Attribution

The initial stage of characterisation involved the description and mapping of historic character at a Sub-character Type level, and the production of a series of intermediate source-based datasets/layers.

Each dataset was reviewed and assessed in the early stages of GIS development to determine the suitability of its contents based on its coverage, resolution, date of publication, comparison with other similar data sources and relationship to defining historic character. The same preliminary attribute structure was applied to all datasets upon their extraction from source data and was designed as follows:

- a temporary feature type field [SUB_CHAR]
- a source field [SOURCE]
- a period field [PERIOD]
- a notes field [NOTES]
- an internal unique identifier field [SSC_ID]

These fields were created alongside the baseline attributes required to populate core information on each feature or area. Where necessary, data was processed to produce a set of character polygons. The fields for each dataset in each data group were then populated as far as possible, reflecting the attribute-led stage of characterisation described in the national HSC Method, to produce a range of datasets with matching fields, enabling features from different sources to eventually be brought together in a cohesive single dataset and given a definitive sub-character type. During this stage, the field [SUB_CHAR] was populated in a way that most closely described the features, enabling a considered approach to classification of the final selection of areas of character expression produced from a selection of different sources.

Data collated from non-digital sources such as geo-referenced paper maps and charts were digitised during this phase using the same descriptive attribute structure, to enable the data collated manually to be conflated with digital sources. Duplicate records between datasets were removed during this stage of the GIS development.

The methodology described follows the thought processes employed to organise the data in the first instance to facilitate the description of features and areas, in preparation for the assigning of character sub-types during the classification of contiguous areas of shared

character. The approach to each group of data has been described below to inform English Heritage and future HSC projects;

4.7.2.1 Navigation

Data was collated from a range of sources including SeaZone Hydrospatial, historic maps and charts, OS MasterMap, sailing directions, the ALSF England's Shipping database (Wessex Archaeology, 2003). Data on modern navigational activities was provided by SeaZone Solutions Ltd covering Anatec, and DfT Shipping Density data.

Navigational features: Modern defined navigational channels are recorded under S-57 charting standards and are therefore provided as part of SeaZone Hydrospatial. All channel-related data including channel marker buoys, navigational lines, recommended route centrelines, and traffic separation zones were extracted from Hydrospatial so that they could be viewed as a group. The features defining the outlines of modern navigational channels and dredged channel areas were separated out, compiled into a single dataset and reattributed.

Historic charts were reviewed to identify areas where previous channels could be identified. Where possible, channel outlines were digitised from historic charts or extracted from Hydrospatial depth areas using historic data and documentary evidence as a guide in order to define their extent.

Navigation activity: The DfT shipping high density polygons were used as a base, along with data from Anatec and the historic shipping routes network from the England's Shipping database, as DfT data are limited to 12nm offshore. A line was drawn along the centre of the routes, and buffered to match the approximate breadth of routes represented in the DfT data. England's Shipping database was used on its own for previous character.

Ferry routes were recorded in SeaZone Hydrospatial, and were extracted, given a 200m buffer and reclassified. Those no longer in use were digitised from historic charts and OS maps using modern maps as a reference to accurately reflect the route. Historic records of ferry routes were used in the interpretation of previous historic seascape character.

Anchorages are recorded in modern and historic charts. The anchorage areas recorded in S-57 were extracted from SeaZone Hydrospatial while ALSF Navigational Hazards and historic charts were used as sources for gathering historical records of anchorages. The data gathered as point data in the first instance was given a 500m buffer, before those below MHW were fed through the grid.

Navigation hazards: Information on navigational hazards was sourced from a broad range of resources including SeaZone Hydrospatial, ALSF *Navigational Hazards* data (Merritt, 2007), historic charts and sailing directions, NMR wrecks and obstructions, HER data and OS MasterMap.

The UKHO and NMR both hold extensive wreck data repositories. SeaZone Hydrospatial holds the UKHO wrecks database, as well as a list of sites recorded in S-57. The NMR hold records of known wrecks, fishermen' fastenings, and reported losses. Duplicates exist between the S-57 records and UKHO records, as well as between SeaZone Hydrospatial and the NMR wrecks database. SeaZone Solutions Ltd assessed the existing data for the Irish Sea (English Sector) and manipulated it to provide a consistent dataset showing areas of wreck clusters. Duplicates between UKHO and S57 were removed, and then duplicates were removed from those results and NMR data. A density analysis was run using ArcGIS Spatial Analyst across all UK wrecks, using a search area of 200m and

an output cell size of 250m. The results were converted from raster to vector, removing the null value, into a single set of polygons.

Drying areas are defined by the fact that they lie above charted LAT and mapped MLW, these were identified by comparing rocky and sandy foreshore areas recorded in OS MasterMap and depth areas in SeaZone Hydrospatial. The ALSF *Navigational Hazards* project GIS contains a series of historically mapped hazards which have been related to their modern equivalents (Merritt, 2007). The project reviewed a broad range of historical charts for the entire English coast and was therefore considered to sufficiently comprehensive to cover historic records of navigational hazards for the purposes of this HSC project. The characterisation of navigational hazards and the original point data collated from geo-referenced historical maps and charts during the development of the project output were used to support the characterisation. Shoals and flats were drawn from depth areas in SeaZone Hydrospatial and historic charts. Rock outcrops, defined as areas within the intertidal zone which are permanently exposed or visible at low water are represented on Ordnance Survey maps and were therefore drawn from OS MasterMap.

Maritime Safety: This is an aspect which generates many examples where perception of character differs between land and maritime viewpoints. Features such as churches, distinctive hills and windmills, may also serve as navigational aids, daymarks, when interpreted from a maritime perspective, in contrast with their functions from a land-based perspective which are recorded by OS mapping. OS MasterMap, sailing directions and coastal views, historic charts and maps, and SeaZone Hydrospatial were used in combination to identify maritime safety features along the coast such as daymarks, lighthouses and beacons, coastguard and lifeguard stations. Features were digitised from the geo-referenced historic charts and maps and extracted from SeaZone Hydrospatial. The resulting datasets were then compared to remove duplicates and given descriptive attributes. Where necessary, points were buffered following the scale prescribed in the national HSC Method. Buoys and beacons offshore were extracted from SeaZone Hydrospatial and used in some cases to demarcate the features they marked such as the edges of navigational channels or navigational hazards.

4.7.2.2 Industry

Data was supplied by SeaZone Solutions Ltd and collated from a range of sources including UK Deal, SeaZone Hydrospatial and JNCC. As each dataset contains a range of industrial features, all features of potential relevance to the character of the coastal and marine landscape were extracted and buffered to produce polygons.

Extractive industries: Licensed aggregate dredging areas were defined by SeaZone Hydrospatial. Mines and quarries were mapped where a maritime character was identified, using OS MasterMap, supported by historical maps, HER and NMR records, documentary sources and HLC. The extents were guided by a review of historical mapping where the limits of inactive quarries needed to be defined.

Energy Industry: All marine features relating to hydrocarbon extraction, including well-heads, pipelines, and oil and gas fields was taken from data supplied by SeaZone Solutions Ltd. Hydrocarbon installations, recorded as points, were given a 500m buffer and pipelines, depicted as polylines, were given a 250m buffer. Hydrocarbon refineries and power stations were identified along the coastline using a combination of OS MasterMap and HLC. Their extent was defined using an HLC polygon, where available. Where necessary that extent was defined by extracting and dissolving OS MasterMap polygons, before giving them a set of preliminary attributes.

Processing Industry: Marine spoil dumping grounds were mapped by SeaZone Solutions Ltd. All industrial areas along the coastal zone, including chemical works, iron and steel works, nuclear reprocessing, sewage works, spoil and waste dumping, and other production sites, were identified using a combination of OS MasterMap, historic maps and HLC. Their extent was then defined using an HLC polygon. Where necessary that extent was defined by extracting and dissolving OS MasterMap polygons, before giving them a set of preliminary attributes. The same approach was used to define all industrial areas along the coastal zone, including chemical works, production areas and sewage works. Three new Sub-character Types were generated by HSC assessment of the Irish Sea (English Sector): 'iron and steel works', 'nuclear reprocessing' and 'salt production'.

Iron and steel works were included to cover the once-dominant industry on the west Cumbrian coast, which played a major role in the development of that coast in maritime activities and in the growth of ports. It is described as an industrial complex for large-scale production of iron and/or steel in the 19th and 20th centuries. Often located on the coast, and in or near ports, to take advantage of imported raw materials and for the exportation of finished goods. Sources are taken from HER, NMR, and historic and modern OS maps. Its expression is in coastal land.

Nuclear reprocessing was included as an addition sub-character type to cover the extensive area of Sellafield. It is described as an industrial area for the decommissioning of structures associated with the nuclear industry, reprocessing of nuclear materials, nuclear waste management and/or nuclear fuel manufacturing activities take place. Sources for this type are taken from documents, and historic and modern OS maps. Its expression is in the sub-sea floor, sea floor, inter-tidal zone and coastal land.

Salt production covers areas concerned with the production of salt for use primarily in food preparation and the preservation of foodstuffs, notably fish and meat. Before the 18th century, almost all salt used in England was produced by various methods of boiling brine, most derived directly or indirectly from seawater supplemented by inland brine wells in Cheshire and around Droitwich, Worcs. The resulting coastal bias in salt production was enhanced from the medieval period by extensive use of salt for preserving fish for inland markets or for export. Documented medieval coastal salt-making was widespread; field evidence from Cumbria and Lincolnshire includes saltworks boiling concentrated brine extracted from salt-encrusted silts, a process called 'sleeching', associated with extant mounds of waste and filter pits. From the late medieval period, coal-fuelled direct boiling of seawater dominated: associated coastal features include rock-cut cisterns, embanked 'saltpans' to trap quantities of seawater, especially along the Cumbria, Northumberland and Durham coasts using adjacent coal deposits, and workers' cottages. Mined Cheshire rock salt and cheap sea-salt imports from Brittany rendered most English coastal sea-salt production uneconomic in the 18th century. Its sources include documents, NMR, and historic and modern OS maps. Its expression is inter-tidal and coastal land

Shipping Industry: Boat yards and ship yards were identified using a combination of OS MasterMap, historic maps and HLC. Their extent was defined using an HLC polygon where available. Where necessary that extent was defined by extracting and dissolving OS MasterMap polygons, before giving them a set of preliminary attributes.

4.7.2.3 Fishing

Data on fishing activities was supplied by SeaZone Solutions Ltd, and was drawn from processed positional data for fishing vessels derived from EC vessel monitoring system

(VMS). As VMS data is unable to discriminate between different types of activity (e.g. fishing, steaming, in port) and vessel gear types were often not recorded, considerable analysis of the data was undertaken. It must be noted that the data used was the product of a research project and does not reflect an official Defra description of fishing activity.

The additional Sub-character Type of 'hand netting' was included to cover the long-established practice of haaf netting in the Solway and Lune Estuaries. Its description, which also includes other hand netting practices, is fir areas characterised by fishing using hand nets worked by an individual fisherman. Regional variations include haaf netting on the Solway, lave netting on the Severn, and dip netting on the Parrett. All consist of a rectangular frame from which a net is suspended. A haaf net has a middle leg which extends for carrying the frame (beam) and to tip it to trap fish. The haaf net is positioned in front of the fisherman, to face the run of the water. The most common method is to stand in shallow estuary waters during the ebb tide. The fisherman faces the outgoing tide holding the net to catch salmon. Haaf-netters sometimes fish in a line, in small numbers or alone depending on the ground. It includes local variants such as 'Flood Beam' or 'Marsh Haaf'. Sources include historic charts, documentary sources, local sea fisheries committees/IFCAs. Its expression is in the sea floor, water column, sea surface and inter-tidal.

4.7.2.4 Ports, Docks and Harbours

Formal 'harbour areas' reflect the water on the approaches to a harbour or dock and are essentially an administrative area whose regulations control the activities taking place within it. These are defined in SeaZone Hydrospatial under S-57 and were therefore extracted and reclassified.

Coastal features relating to the shipping industry, such as wet docks, dockyards, shipyards, boat yards, etc. were defined using a combination of modern and historic OS mapping to identify the extents and ages of different parts of ports and harbours.

'Wet docks' were defined as an additional Sub-character Type and defined as a built structure or group of structures enclosing an area of water which was impounded by lock gates to maintain water levels artificially, facilitating the loading, unloading, building or repair of ships. The earliest docks were built in Liverpool in the 18th century, and most docks are of 19th century or 20th century origin. Sources include NMR, historic and modern OS maps and documentary sources. It is expressed in inter-tidal and coastal land.

4.7.2.5 Coastal Infrastructure

Data on flood and erosion defences were supplied by SeaZone Solutions Ltd and taken from SeaZone Hydrospatial data. Other information was taken from OS MasterMap and historic maps. Where necessary that extent was defined by extracting and dissolving OS MasterMap polygons, before giving them a set of preliminary attributes.

4.7.2.6 Communications

Transport: Information on transport systems were extracted from OS MasterMap, and HLC, NMR and HER records, and documentary sources. Where possible, polygons were isolated. Data reflected as polylines were given a 50m buffer. Features relating to transport systems were extracted from NMR and HER records using "Like" queries. Railways were from buffered NMR polylines to provide a continuous representation of railways. Roads were defined where they were found to be key to the maritime character of an area, and were given a 100m buffer. The HLC databases within the project area

were used to inform the assessment of the dominance of major roads over their surrounding character types.

Telecommunications: Information on submarine telecommunications cables was extracted from SeaZone Hydrospatial, and supplied by SeaZone Solutions Ltd. It was supplied as polylines, and was given a 500m buffer, before being fed through the grid.

4.7.2.7 Military

Character areas relating to military activity were drawn from a wide range of sources including OS MasterMap, SeaZone Hydrospatial, historic maps and charts, NMR, HER and HLC data and documentary sources. Ordnance Dumping grounds and military practice areas in inshore and offshore areas were extracted from SeaZone Hydrospatial and supplied by SeaZone Solutions Ltd. Military practice areas were restricted to firing ranges for the Irish Sea (English Sector). Coastal and intertidal military areas such as airfields, military bases, military coastal defences, fortifications, firing ranges, etc. were defined using OS MasterMap, historic maps and HLC polygons. SeaZone Hydrospatial, HER and NMR data and historical maps were used to assess suitable extents reflecting both present and previous historic character.

4.7.2.8 Settlements

The extents of towns and villages were defined by taking the overall settlement perimeter as defined in OS MasterMap, HLC or EUS to provide context to the characterisation. The concentration in settlement around harbours, estuaries and industrial or recreational centres along the coast is a significant indicator of the scale of human activity activities within an area.

4.7.2.9 Recreation

Recreational areas on land such as golf courses, holiday parks, recreational open ground, or parks and gardens, etc. where a maritime character could be identified, were defined using OS MasterMap polygons as the primary resource, supported by SeaZone Hydrospatial, historical maps and HLC, HER and NMR data. EUS polygons were used, where available, in the extensive urban areas of much of the Irish Sea (English Sector) coastline, particularly in the large resorts which mark much of the coast of Lancashire and Merseyside. EUS and OS MasterMap polygons were used to define leisure beaches, promenades, areas of seaside entertainment, pleasure piers, etc.

An additional recreation Sub-character Type of ‘recreational open ground’ was included to cover areas characterised by a principal use for public access and recreation, where any agricultural management, for example, is secondary and used as a tool to maintain land for public recreation. Recreational use may include long distance footpaths, areas for the display and presentation of historic features, rural designed landscapes open to the public (but only where the design has a specifically maritime character), and areas of coastal land set aside for public enjoyment of the maritime and coastal landscape. The Irish Sea (English Sector) has several areas of recreational open ground, on land where there are industrial and other historic remains left for public display and land is open for public recreation such as walking and wildlife watching. Sources include historic and modern OS maps, and documentary sources. It is expressed in inter-tidal and coastal land.

4.7.2.10 Cultural Topography

Palaeolandscape component: data for palaeolandscape components, palaeochannels, submerged forests and peat deposits were drawn from HER and NMR records and from references in documentary sources. Information was available as point data, and was

given a 500m buffer. Research into palaeoenvironments is increasing and future reviews of HSC databases will need to be aware of the results of future research when updating..

Cultural topography (landward): in coastal areas, such areas as water bodies, cliffs, dunes, wetland etc. were identified using a range of sources including OS MasterMap, HLC, historic maps and charts, Natural England's GIS Digital Boundary Datasets, aerial photographs and documentary sources. Aerial photographs proved particularly useful in identifying areas of this Character Type, whose cultural dimension is brought out in the texts accompanying the GIS.

Cultural topography (inter-tidal): in intertidal areas, areas such as salt marsh, sandy or rocky foreshore, mudflats and sandflats, were identified using a range of sources including OS MasterMap, HLC, historic maps and charts, Natural England's GIS Digital Boundary Datasets, aerial photographs and documentary sources. Aerial photographs proved very useful for identifying the character of these areas too.

An additional inter-tidal Sub-character Type of 'shingle foreshore' was included, where the predominant cover is exposed rock sediments of a grain size generally perceived as 'shingle' or 'pebbles'. Human interventions have had a considerable effect on the current distributions of shingle foreshores, with the use of groynes. Many shingle foreshores are now visited unintensively for leisure (if intensively visited, they may better class as 'Leisure beach' (qv)) and they form one of the principal areas by which most people engage directly with the inter-tidal and marine zones. Some shingle foreshores form banks or spits, creating sheltered marine areas which become the focus for leisure activities. Many have the potential for attracting marine and bird life, and are the focus of wildlife watching. Sources include historic and modern OS maps, historic and modern charts, and documentary sources. Its expression is inter-tidal and coastal land.

Cultural topography (marine): locations of these inshore and offshore areas were provided by SeaZone Solutions Ltd, informed by data based primarily on BGS seabed sediments (SBS250) which is of a finer resolution than UK SeaMap. Data was queried using the UKSeaMap classification as a guide to produce a set of attributed polygons for each cultural topography character sub-type (fine sediment plains, exposed bedrock, coarse sediment plains, etc.).

4.7.2.11 Woodland

Data for woodland were drawn from HLC and OS MasterMap, historic maps and charts, Natural England's GIS Digital Boundary Datasets, aerial photographs and documentary sources. Only woodland which could be demonstrated to have a maritime character was recorded.

4.7.2.12 Reclaimed land

Data for reclamation from tidal marsh, the sea and from wetland were drawn from HLC and OS MasterMap, historic maps and charts, Natural England's GIS Digital Boundary Datasets, aerial photographs and documentary sources. The North West region has extensive areas of reclaimed land, and only land which could be demonstrated to have a maritime character was recorded.

4.7.2.13 Unimproved grazing

Data for rough grassland, scrub and heathland were drawn from HLC and OS MasterMap, historic maps and charts, Natural England's GIS Digital Boundary Datasets, aerial photographs and documentary sources.

4.7.3 Prescriptive Classification

From the descriptive assessment, data was reviewed in groups of related features and, based on the comparison and interpretation of the descriptive attributes, it was accorded a Sub-character Type, either from an appropriate term previously used in HSC or, if none was felt appropriate, a new term was created. This process combined descriptive and prescriptive classification. The higher level classifications in the hierarchy, Character Type and Broad Character Type, were assigned prescriptively and auto-populated in accordance with the HSC Method Statement. The characterisation process above LAT and below LAT required slightly different approaches because of the differences in data processing required. Both approaches were undertaken following the national HSC Method Statement and treatment of sources remained the same. Once grouped into Sub-character Types, the datasets were then divided between coastal and intertidal or inshore and offshore datasets for the following stages of characterisation. The results were then reunited following the characterisation of the inshore and offshore areas for each marine level.

Characterisation in the coastal and intertidal areas used OS MasterMap and HLC polygons as baseline data from which polygons were created, using a broad range of data sources to identify and interpret character and its extent. The HSC assessor worked along the coastal and intertidal areas, reviewing historic and modern mapping and charting in the same data frame, while referring to aerial photographs, HER and NMR records, and the sub-groups of features collated during the descriptive phase of characterisation. Data was selected to assess the character, time-depth and extent of each polygon. Once the boundary to a polygon had been defined, OS MasterMap polygons which made up the area were selected and dissolved into a single polygon and a Sub-character Type term was applied, whether from the existing HSC terminology or an entirely new term as most appropriately matched the polygon's collated features' character. Where features overlapped, an assessment of dominance was made for the intersecting areas. Where possible, areas identified as having a distinct marine or maritime character through the review of a wide range of sources were defined using MasterMap or HLC polygons. However, where features were not identifiable from these latter two sources, these Sub-character Types were defined by integrating features from other sources, such as historic maps and charts. Additional Sub-character Types were determined by the descriptive attributes and added to the list in line with the multi-mode approach to characterisation.

Once the data for the inshore and offshore waters had been digitised, it was consolidated into a single data layer and classified using Sub-character types. Data groups reflecting individual Sub-character types were consolidated into the levels reflecting the different principle layers of the marine landscape. The baseline data for inshore and offshore areas was very diverse but in many cases, the extent of areas was already relatively clearly defined and required interpretation to define the form and character for each area. First, the data for inshore and offshore areas, was grouped to reflect the level of the marine landscape (Coastal, Sea-surface, Water column, Sea-floor, Sub-sea floor) to which they relate. The data for each level was then combined using a vector grid. This approach uses the principles of a raster spatial data model while enabling the association of vector attributes with individual cells, allowing each cell to be characterised. The transfer of information to grid cells was undertaken as stipulated in the HSC Method. Following the removal of duplicates, consolidation of features of similar types into a single data layer and descriptive attribution, all inshore and offshore data was gridded using the vector cells produced using the SeaZone-created grid. The size of grid cells used was 250m². Where conflicts existed between data, a decision was made as to the dominance of one

feature over another. The datasets needed to be buffered in the first instance using the same value of the grid-cell size to ensure that the cells populated reflected the underlying polygons. In addition, features of the same Sub-character Type which shared a boundary therefore had to be dissolved to create a single area. This also restricted the integration of more than a single Sub-character Type at a time. Each data subgroup was processed separately in the first instance and gridded before being combined with other data. Once joined, the output cells were dissolved based on the recurring attributes of each dataset.

Once all datasets had been treated in this way, they were unioned bringing each layer in at a time, applying Sub-character Type attribution based on the descriptive attributes, and making an assessment of dominance wherever overlaps occurred. In instances where a Character Type or Sub-character Type was not recorded in the list provided in the national HSC Method, a proposal for an appropriate new Sub-character Type was circulated to EH Characterisation Team and the other concurrent HSC projects for comment and agreement before being added to the HSC MS 'Hierarchy of Character Types'. That approach was to ensure consistency across all projects contributing to the national HSC database. Where more than one polygon overlapped with a vector cell, a decision was made by the assessor with regard to which was predominant. The GIS tool developed to facilitate the gridding process deals with this issue by identifying the polygon(s) which overlaps with the centroid of each cell. The use of centroids to identify overlaps resolves the problem as the cells overlapping two adjoining polygons will adopt the attributes of the one which intersects with its centre point. If a cell's centroid overlaps with more than one polygon, then the HSC assessor made an assessment of dominance.

All data relating to a marine level was unioned and interpreted to create a single set of discrete polygons. Data reflecting the historic character of areas within each marine level was then integrated through a combination of spatial joins, unions and spatial queries (where the boundaries of areas of distinct historic character had already been defined). Time depth is reflected in the character assessment through the differentiation between present HSC and previous HSC within the attributes, and the recording of a benchmark period reflecting the origin of the activity represented for each of the levels and the conflated character groups. The fields were populated using a series of unions of historic character polygons with the completed characterisation of present character sub-types. Once the interpretation for each marine level was completed, HSC polygons for the intertidal and coastal areas were unioned with the inshore and offshore character polygons to produce a single layer of HSC character types for each level.

To ensure that the geometries produced were as clean as possible, slivers were removed and the polygons for each marine level were dissolved by HSC attribute fields to ensure that all polygons with identical attributes were brought together in a single polygon. During Stage 4, the four marine levels were brought together as a single set of polygons for the conflated characterisation, using the same process of unions used to construct each level. The HSC assessor identified the dominant character between the different marine levels in order to populate the Present Sub-Character Type. A prescriptive attribution process was then applied to automatically populate the Character Type and Broad Character Type based on the classification hierarchy structured around the Sub-character Types. Historic character was then ascribed based on the attributes within the marine levels. The output of this phase is a single layer of discrete polygons for each marine level, which have been reclassified to reflect a single layer of Sub-character Type expressions. The attributes collated during the descriptive phase of the method were used to populate the field structures drawn for each marine level. The final attribute structure for the HSC was drawn from the national Method Statement (Tapper 2010). Each level

contains the attributes relevant to that level in order to reduce the number of empty fields where possible, while the conflated level contains the full set of fields as shown in Table 3.

Table 1.3: Attribute field structure outlined in the National HSC Method Statement

Attribute Name	Description and guidance, terminology	GIS database alias	Population Method	Format	Width
ObjectID	Unique reference number for HSC polygon/grid cell	FID	automated	numeric	10
Name	Name of area or topographic identifier, local or popular name	NAME	manual	string	100
Coastal and Conflated Broad Character Type	Broad Character Type (present, dominant; national strategic level). Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	CC_BDTY, CONF_BDTY	automated	string	100
Coastal and Conflated Character Type	Character type (present, dominant; regional level). Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	CC_TY, CONF-TY	automated	string	100
Coastal and Conflated Sub Character Type	Sub-character type (present, dominant; local level). Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	CC_SBTY, CONF_SBTY	manual	string	100
Coastal and Conflated HSC Period	Benchmark period of origin of the area represented in the polygon or cell. Recorded for present historic character. Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	CC_PRD, CONF_PRD	manual	string	50
Coastal and Conflated HSC Source	Sources used to identify present and previous historic character. Attribute values to record supplier, date, precise GIS file name. To include reference to the scale of original data used. Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	CC_SRC, CONF_SRC	manual	string	250
Coastal and Conflated HSC Confidence	Degree of certainty/confidence of HSC interpretation of present historic character. Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	CC_CNF, CONF_CNF	manual	string	25
Coastal and Conflated HSC Notes	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	CC_NTS, CONF_NTS	manual	string	250

Attribute Name	Description and guidance, terminology	GIS database alias	Population Method	Format	Width
Coastal and Conflated HSC Link	URL hyperlink to Character Type texts and multi-media. Landward (above MHW) this will record coastal land HSC, whereas seaward it will record the 'conflated' HSC as derived from the marine levels.	CC_LINK, CONF_LINK	manual	string	250
Sea-surface HSC sub- type	Present and dominant historic character of the sea- surface (recorded at sub-character, character and broad character levels)	SSRFC_SBTY	manual	string	100
Sea-surface HSC type		SSRFC_TY	automated	string	100
Sea-surface HSC broad-type		SSRFC_BDTY	automated	string	100
Sea-surface HSC Period	Benchmark period of origin of the area represented in the polygon. Recorded for present historic character levels and previous historic character	SSRFC_PRD	manual	string	50
Sea-surface HSC Source	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	SSRFC_SRC	manual	string	250
Sea-surface HSC Confidence	Degree of certainty/confidence of HSC interpretation of present historic character.	SSRFC_CNF	manual	string	25
Sea-surface HSC Notes	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	SSRFC_NTS	manual	string	250
Sea-surface HSC Link	URL hyperlink to Character Type texts and multi-media	SSRFC_LINK	manual	string	250
Water Column HSC sub- type	Present and dominant historic character of the water- column (recorded at sub-character, character and broad character levels)	WTRCL_SBTY	manual	string	100
Water Column HSC type		WTRCL_TY	automated	string	100
Water Column HSC broad-type		WTRCL_BDTY	automated	string	100
Water Column HSC Period	Benchmark period of origin of the area represented in the polygon cell.	WTRCL_PRD	manual	string	50
Water Column HSC Source	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	WTRCL_SRC	manual	string	250
Water Column HSC Confidence	Degree of certainty/confidence of HSC interpretation of present historic character.	WTRCL_CNF	manual	string	25
Water Column HSC Notes	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	WTRCL_NTS	manual	string	250
Water Column	URL hyperlink to Character Type	WTRCL_LINK	manual	string	250

Attribute Name	Description and guidance, terminology	GIS database alias	Population Method	Format	Width
HSC Link	texts and multi-media				
Sea-floor HSC sub- type	Present and dominant historic character of the sea- floor (recorded at sub-character, character and broad character levels	SFLR_SBTY	manual	string	100
Sea-floor HSC type		SFLR_TY	automated	string	100
Sea-floor HSC broad- type		SFLR_BDTY	automated	string	100
Sea-floor HSC Period	Benchmark period of origin of the area represented in the polygon cell.	SFLR_PRD	manual	string	50
Sea-floor HSC source	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	SFLR_SRC	manual	string	250
Sea-floor HSC Confidence	Degree of certainty/confidence of HSC interpretation of present historic character.	SFLR_CNF	manual	string	25
Sea-floor HSC Notes	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	SFLR_NTS	manual	string	250
Sea-floor HSC Link	URL hyperlink to Character Type texts and multi-media	SFLR_LINK	manual	string	250
Sub sea-floor HSC sub- type	Present and dominant historic character of the sea- bed (recorded at sub-character, character and broad character levels)	SBFLR_SBTY	manual	string	100
Sub sea-floor HSC type		SBFLR_TY	automated	string	100
Sub sea-floor HSC broad-type		SBFLR_BDTY	automated	string	100
Sub-sea floor HSC Period	Benchmark period of origin of the area represented in the polygon cell.	SBFLR_PRD	manual	string	50
Sub-sea floor HSC Source	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	SBFLR_SRC	manual	string	250
Sub-sea floor HSC Confidence	Degree of certainty/confidence of HSC interpretation of present historic character.	SBFLR_CNF	manual	string	25
Sub-sea floor HSC Notes	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	SBFLR_NTS	manual	string	250
Sub-sea floor HSC Link	URL hyperlink to Character Type texts and multi-media	SBFLR_LINK	manual	string	250
Previous HSC Type	Previous historic character for which evidence is available. Recorded for multiple time-slices on basis of source dataset.	PRVS_SBTY1, 2 etc	manual	string	100
Previous HSC Period	Benchmark period of origin of the area represented in the polygon. Recorded for present historic	PRVS_PRD1, 2 etc	manual	string	50

Attribute Name	Description and guidance, terminology	GIS database alias	Population Method	Format	Width
	character levels and previous historic character				
Previous HSC Source	Sources used to identify previous historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	PRVS_SRC1, 2 etc	manual	string	250
Previous HSC Confidence	Degree of certainty/confidence of HSC interpretation of previous historic character.	PRVS_CNF1, 2 etc	manual	string	25
Previous HSC Notes	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	PRVS_NTS1, 2 etc	manual	string	250
Previous HSC Link	URL hyperlink to Character Type texts and multi-media	PRVS_LINK1, 2 etc	manual	string	250
Character Area	Unique character area	CA1, CA2 etc	manual	string	100
Location	General location (e.g. Offshore marine, inshore marine, estuary, coast etc)	LCTN	manual	string	50
Shape_Area	Area in map units (usually metres square) covered by polygon.	AREA	automated	string	9.9
Cell/grid size	Size of grid used for marine zone (e.g. 100mx100m, 500mx500m etc)	CELL_SZ	manual	numeric	5
Creation Date	Date of dataset /polygon creation/completion	CRT_DT	manual	string	10
Creator	Name of the person/organisation who compiled the HSC	CRTR	automated	string	250

4.7.4 Development of Character Type Text Descriptions

Brief structured summary texts were written relating to the character type hierarchy to inform users of all levels of the HSC GIS database. In particular, they are designed to provide a connection and initial stimulus for various future applications of the database, as noted in the national HSC Method Statement. The characterisation of shared trends in the definition, distribution and regional significance of feature types, and their relationships with the natural environment are a fundamental output of HSC. The analysis and interpretation of these trends is fundamentally a perceptual process, informed from a combination of baseline information and documentary resources.

A text-based description was developed for each Character Type using the structure proposed in the national HSC Method (Tapper 2010) under the following headings:

- Introduction: defining/distinguishing attributes and principal locations
- Historical processes; components, features and variability
- Values and perceptions.
- Research, amenity and education
- Condition and forces for change
- Rarity and vulnerability
- Sources

For each Character Type, text descriptions encompassed both a national and a regional perspective. The text descriptions have a hyperlink to the individual character types within the GIS and provide a basis from which a stand-alone interactive multimedia resource may be produced in the future. The texts have been designed to inform users on

the character of the historic landscape at a range of scales and can be used as a resource to inform the generation of both as an outreach tool as well as being designed for use in GIS alongside other marine and coastal datasets to inform a broad range of applications. The text descriptions for each character type are contained within section 3 of this Project Report.

5. PROJECT PRODUCTS AND DISSEMINATION

5.1 Project Outputs

The outputs of the project include a leaflet and webpage (http://www.ncl.ac.uk/historical/research/project/3537) providing background information on the project, this report and a mapped GIS project database with linked texts. This report is divided into three sections, this first section documenting the project's implementation, the second outlining the System's application review and case-studies, and the third containing the Appendices with character text descriptions.

The project archive comprises the project leaflet, the webpage, Project Brief, Project Design, Project Report, the GIS and associated structure, and relevant correspondence. All digital reports will be sent by English Heritage to the Archaeological Data Service (ADS) for dissemination online after the close of the project.

5.2 Project GIS

The HSC GIS generated by this project covers many Character Types, Sub-types and their attributes, expressed across a large physical area. A series of images have been included below to illustrate the expression of Character Types at each marine level and in a conflated map. However, as for any GIS, the database can be queried on a multiplicity of combinations of the attributes and generate a range of mapping tailored to suit the needs of the enquirer. The mapping below cannot convey that flexibility or the use of the mapping in conjunction with the linked text descriptions produced by the project.

The GIS and its associated database are in the form of an ESRI Personal Geodatabase alongside linked character text descriptions. Data is designed to be viewed at 1:50,000. All data is compliant with MIDAS standards, and all metadata is UK Gemini compliant, and encoded according to ISO 19139.

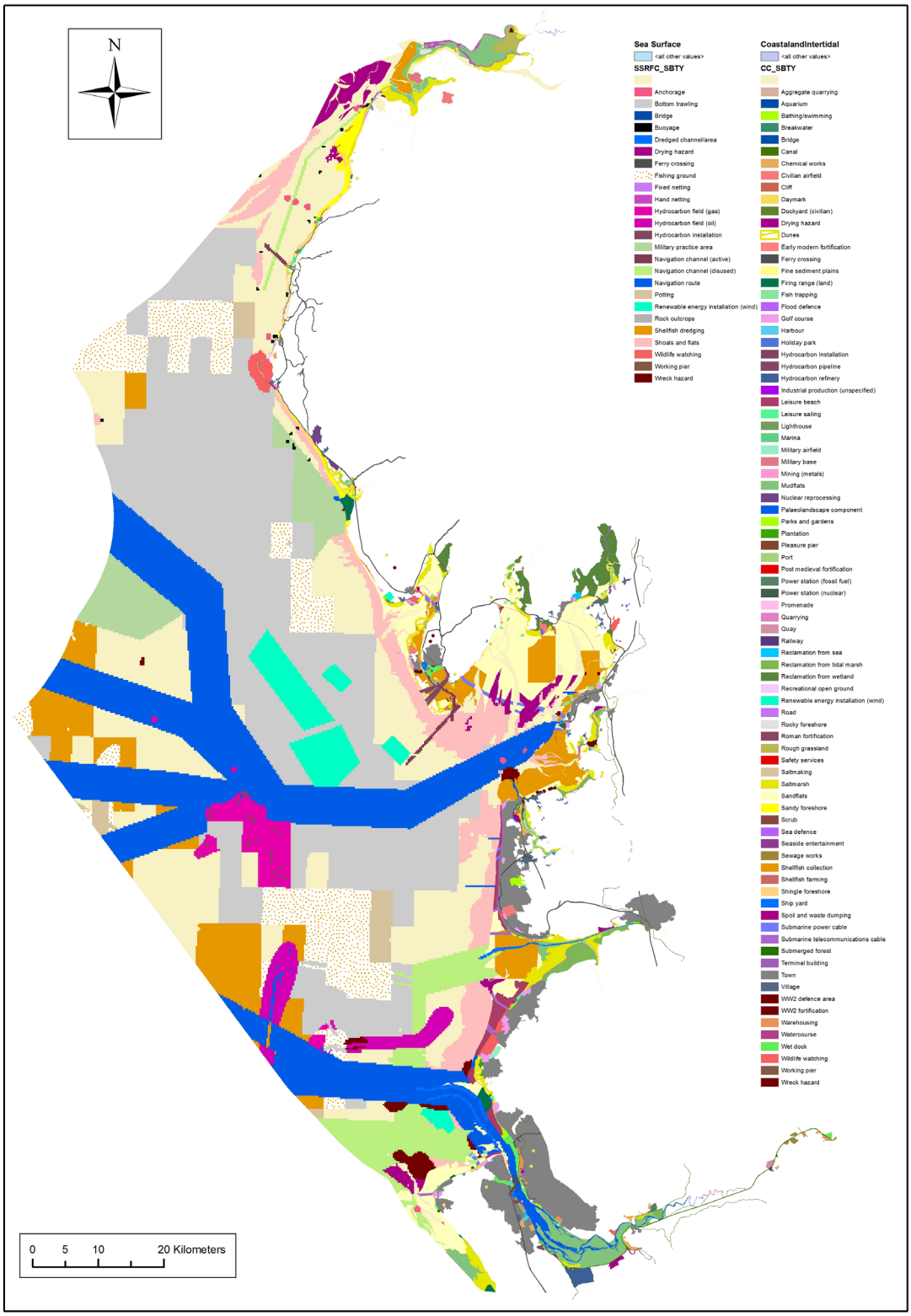


Figure 1.4: Historic Seascape Characterisation: Sea Surface Sub-character Types

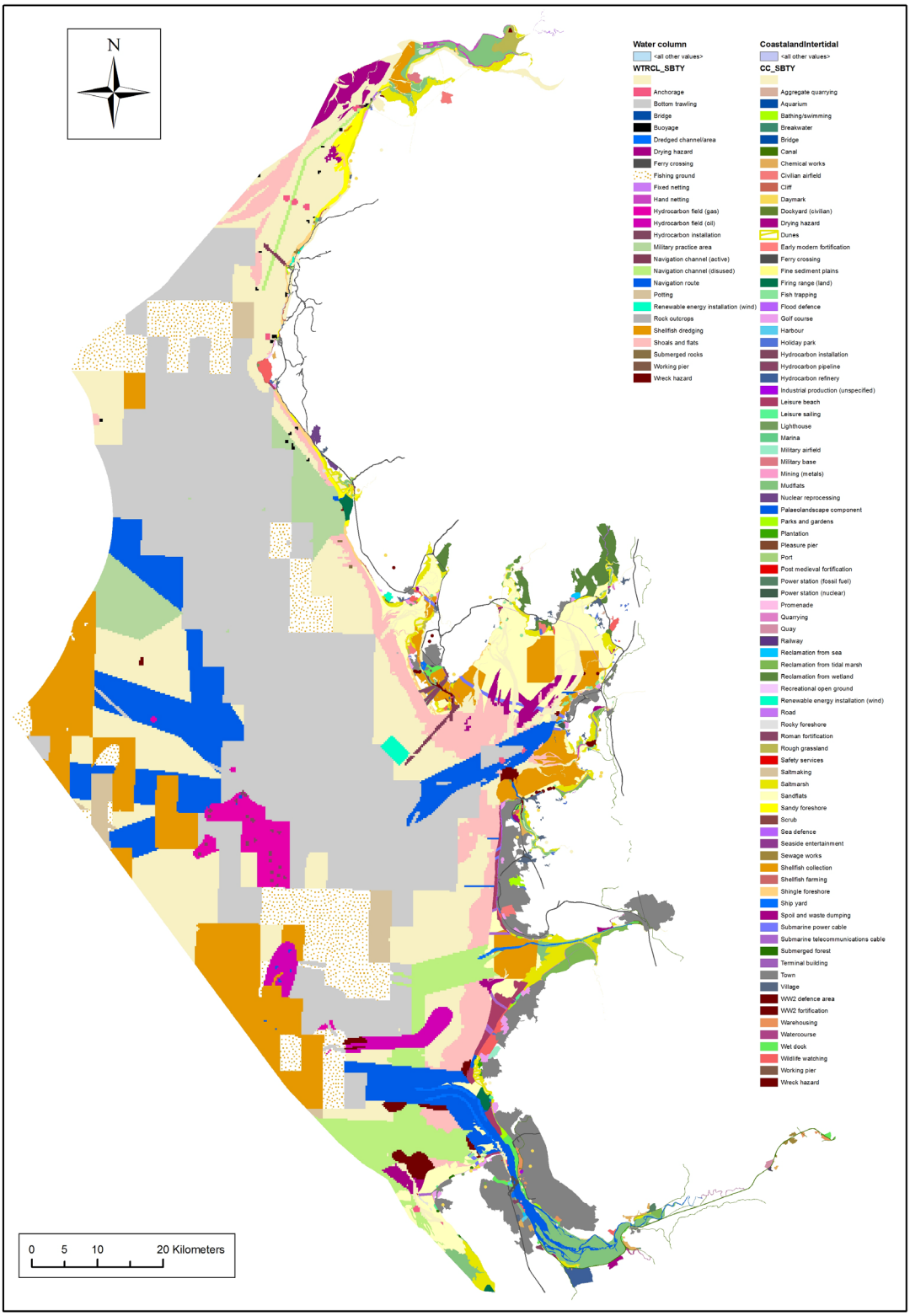


Figure 1.5: Historic Seascape Characterisation: Water Column Sub-character Types

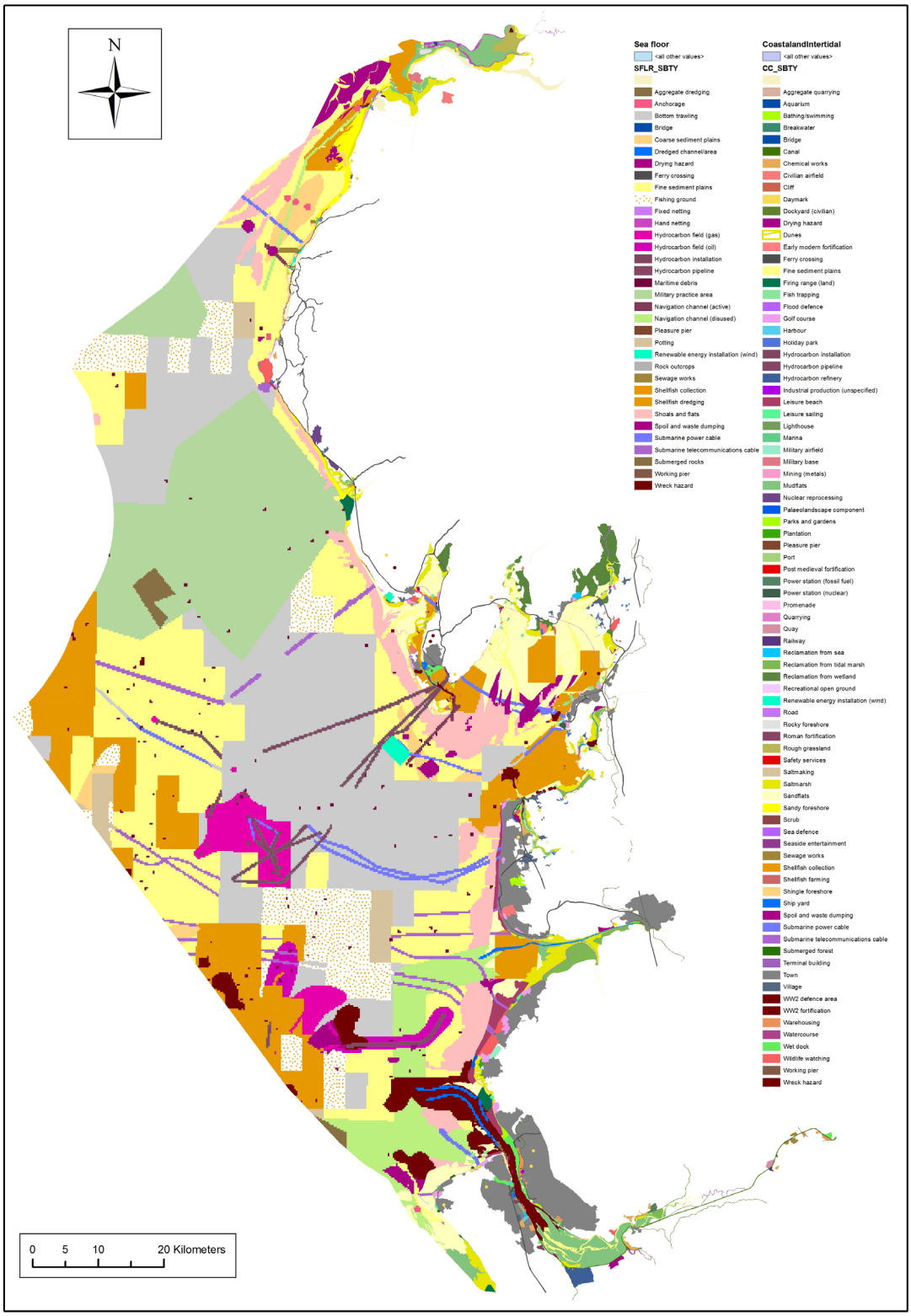


Figure 1.6: Historic Seascape Characterisation: Sea Floor Sub-character Types

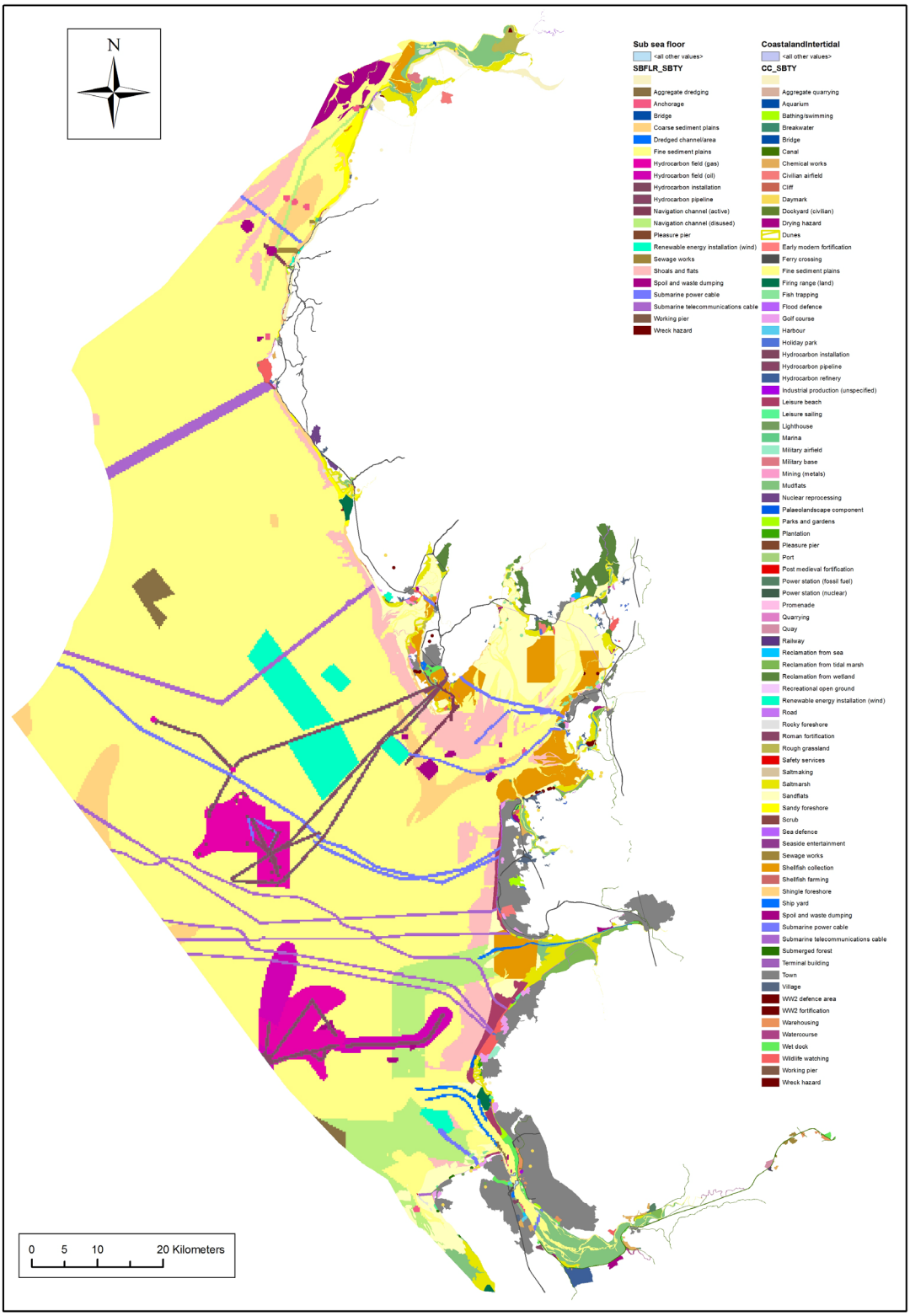


Figure 1.7: Historic Seascape Characterisation: Sub-Sea Floor Sub-character Types

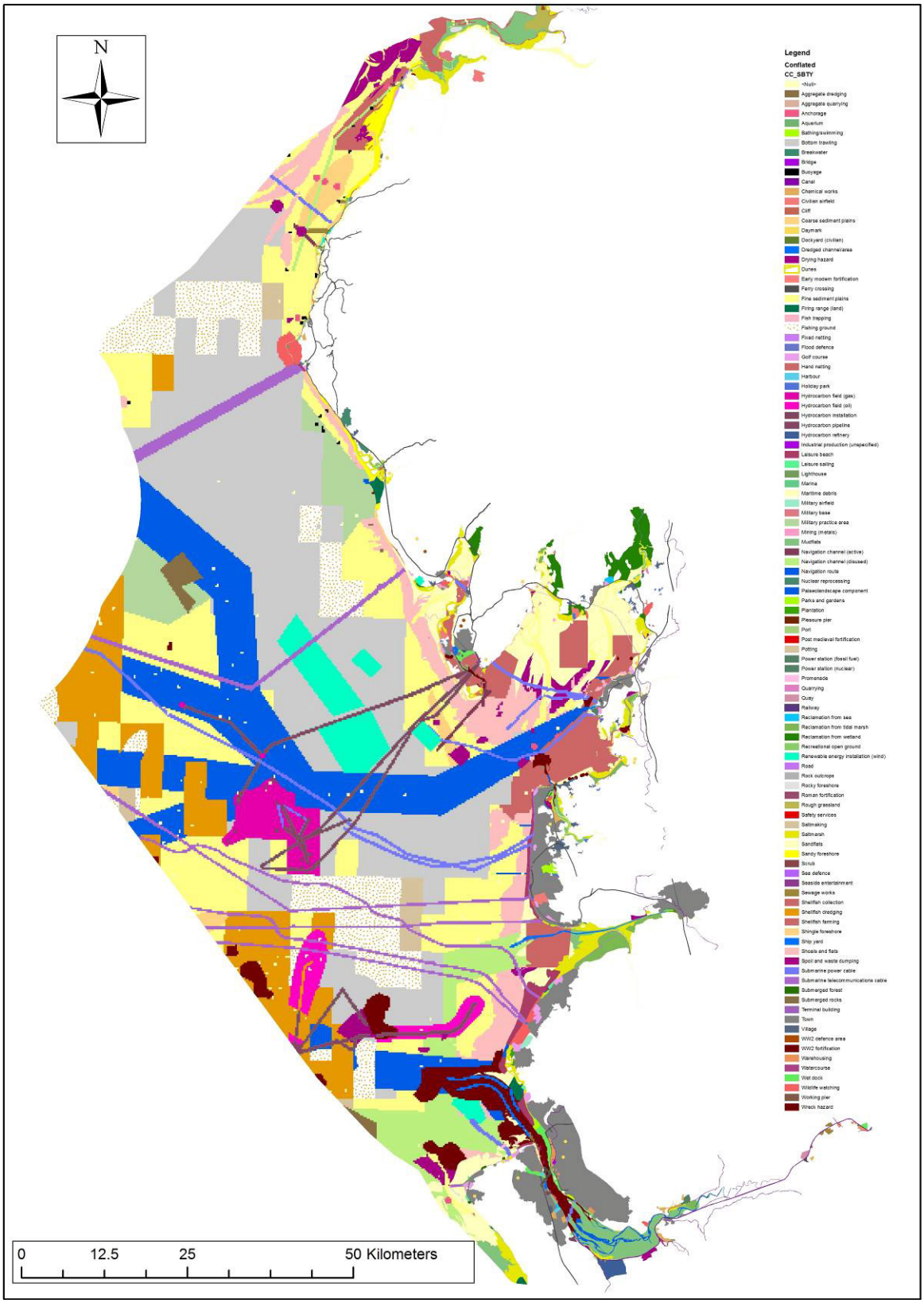


Figure 1.8: Historic Seascape Characterisation: Coastal and Conflated Sub-character Types

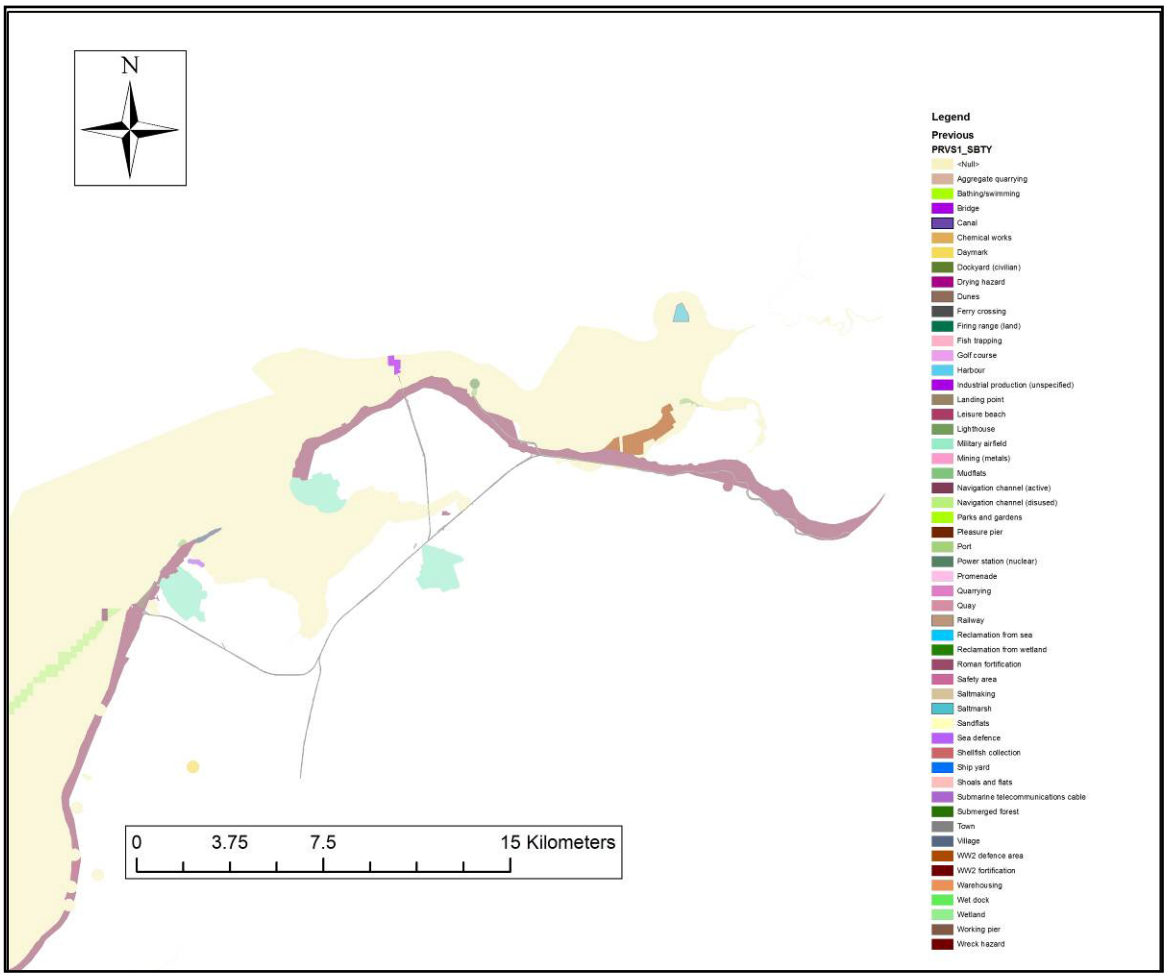


Figure 1.9: Historic Seascape Characterisation: previous HSC character in north Cumbria, showing the Hadrian's Wall Military Zone and World War II airfields and defences

5.3 Text Descriptions

Text based descriptions were developed for each Character Type, written in non-technical language and consistently structured according to interpretation of the following aspects, as defined in the national HSC Method:

- Introduction: defining/distinguishing attributes and principal locations
- Historical processes; components, features and variability
- Values and perceptions.
- Research, amenity and education
- Condition and forces for change
- Rarity and vulnerability
- Sources

The text descriptions present each Character Type in terms both of a national perspective and a regional scale. The term 'national' here refers to a 'whole nation' perspective, including England and adjacent waters out to the limit of UK Controlled Waters. The 'regional' perspective equates in this instance also with this project's area as defined earlier: the English sector of the Irish Sea, with adjacent UK Controlled Waters and the coastal land with a maritime character in north west England.

The text descriptions have been compiled as Word documents which allows the information to be exported as .html files. The texts are available in section 3 of the report.

5.4 Dissemination and Outreach

The project has been promoted via the Newcastle University website through the development of an HSC project page. A flyer was developed for distribution at appropriate events. Opportunities were taken where appropriate to disseminate the progress and results of the project at seminars or conferences, primarily through the distribution of project fliers. Events attended included North West Landscape Character Assessment seminars, hosted by Natural England, the UK Landscape Conference, in Liverpool, North West Coastal Forum Conference in Liverpool, Solway Coast AONB Annual Meeting in Silloth, and the Morecambe Bay Partnership conference in Lancaster.

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