DTI STRATEGIC ENVIRONMENTAL ASSESSMENT AREA 8 (SEA8)

Geology and Sediment Processes

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1 Introduction

This report describes work commissioned by the Department of Trade and Industry (DTI) to prepare an inventory of geology and sediment process metadata for the Strategic Environmental Assessment area 8 (SEA8) in terms of data type, location, quality and availability.

The SEA8 region lies between 48° to 52°N and 2°E to 10°W and is presented in Figure 1. The area includes the DTI UK Continental Shelf Designated Area from Dover through the English Channel to the edge of the continental shelf in the Celtic Sea; the southern Irish Sea south of Milford Haven; and the Bristol Channel.

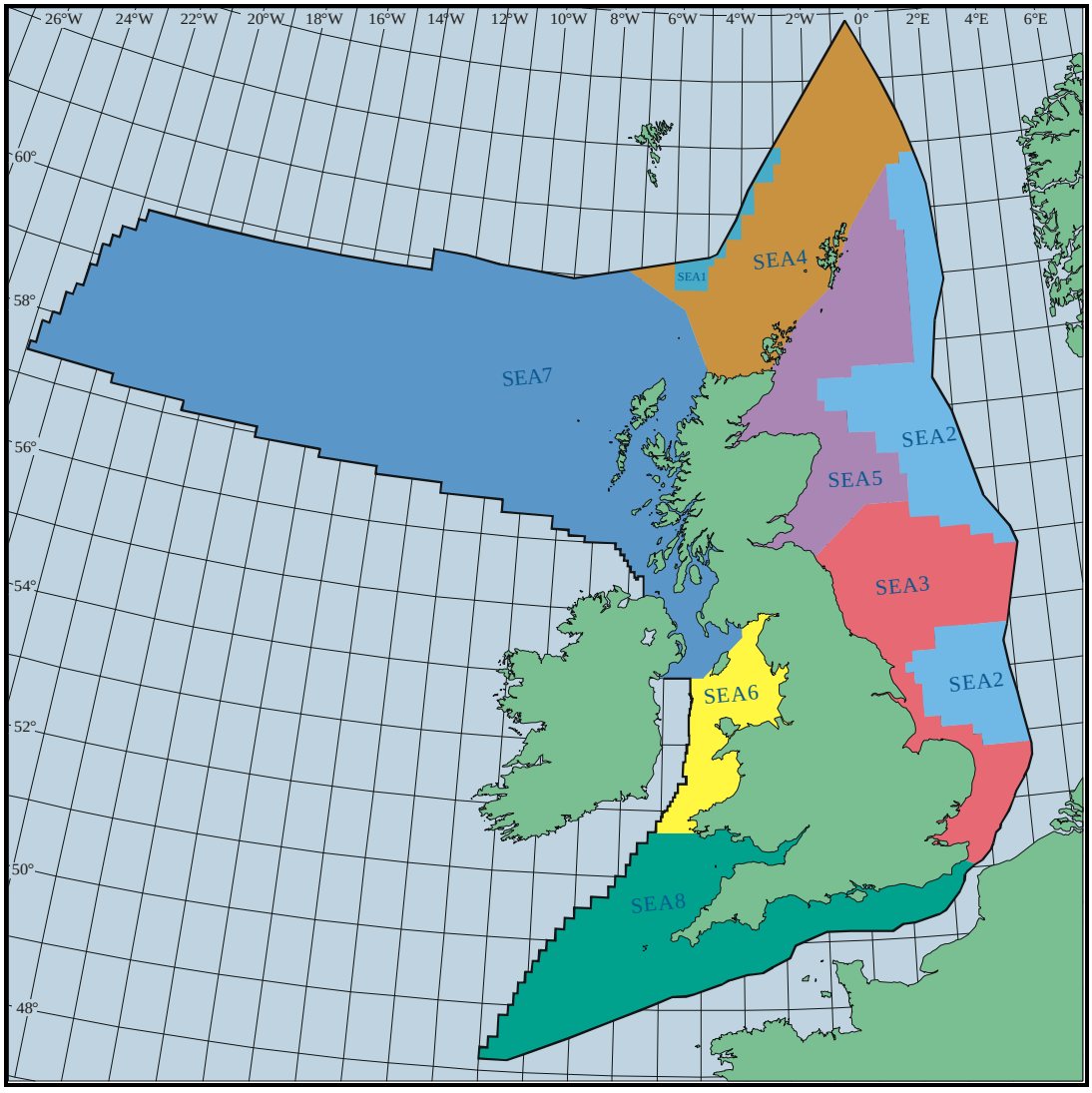

Figure 1 Strategic Environmental Assessment Areas

In accordance with the scope of work the report includes:

- A description of the study area with a synopsis of the geology and recent sedimentary processes;
- A listing of international, national and local organisations and contacts who are active in the subject area or hold information and associated initiatives and data sets.
- The meta-data inventory, comprising a comprehensive list of references and other sources of information including:
    i. whether published (white and grey), unpublished, public domain, private etc.
    ii. notes and graphics showing spatial and temporal extent;
    iii. format (book chapter, paper, dataset etc);
    iv. location;
    v. accessibility.

The main body of the inventory was compiled in June 2003. The database has been produced in an Endnote® database which contains 1185 entries and is provided on compact disk in Appendix 4.

2 Geological Processes

This account is mostly based on a review of the BGS United Kingdom regional offshore geological reports. These are highlighted by bold print in the references in Section5. The reports contain a comprehensive list of references that are not repeated in the following text.

The SEA 8 area encompasses the coastlines and continental shelf including the Celtic Sea, Bristol Channel, Severn Estuary, and parts of the English Channel and Dover Strait (Figure1).

The mainland British Isles and the modern submarine continental shelf connecting the British Isles to continental Europe have been cyclically exposed as land and then inundated by the sea since at least 25million years ago. Historical coastline shifts have occurred with large-scale (more than 500m) vertical movements of the earth's crust, the latest around 5 million years ago (Japsen, 1997). On these were imprinted the global

sea level changes that originated from the periodical changes of polar ice volumes. Post-dating approximately 760,000 years ago there was a shift to overall larger polar ice volumes (Funnel, 1995). During these times large-scale glaciations were nucleated, the glaciations were relatively stable, and the regional ice sheets extended to encompass large areas of the northern and middle British mainland and offshore areas. This period included 7 major glacial periods that were approximately 80,000 to 120,000 years long. These were followed by interglacial periods of approximately 10,000 to 15,000 years duration (Raymo, 1997). During the maximum of the glacial period, approximately 21,000 to 17,000 years ago, sea level in SEA8 was possibly 135m below present (Boussey et al, 1976) and an ice sheet may have surged from the direction of the Celtic Sea as far south as the Scilly Isles. By the early part of the present interglacial period, approximately 8,300 years ago, the sea had risen again to inundate most of SEA8 and a fully marine connection had been re-established between the North Sea and the English Channel (Jelgersma, 1979). During and between the major glacial and interglacial periods there were other significant periodical climate and sea level changes of 1,000 to 3,000, sometimes 5,000 years or more average periodicity (e.g. Clapperton, 1997). During these periods, sea level fluctuated over a range of less than 10m to possibly 50m or more. In this context a relatively unchanged sealevel over approximately the last 4,000 years is consistent with the range of sea level variation that may be expected from the historical records. A longer-term perspective is that the coastal and seabed topography and the modern seabed sediment compositions have evolved under the influence of profoundly different processes in relatively short periods of geological time. As a result, the seabed topography and seabed sediment composition show some features that have been inherited from previous environments and processes and other features that are characteristic of modern environments and submarine processes. For example, sandy and gravelly seabed sediments on the open continental shelf are typically reworked from solid rock, silica-rich glacial and fluvial sediments but the modern marine sediments with these constituents are typically mixed with 5 to 20 weight % or more shell carbonate debris in the sand fraction.

The coast and adjacent continental shelf extending from the southern St George's Channel to the Scilly Isles, but excluding the English Channel, were probably connected to the land by a regional ice sheet during the last glaciation. Processes of sub-ice erosion associated with meltwater resulted in the transfer of large volumes of glacial outwash to the ice sheet margin. After the ice sheet retreated the glacial outwash

sediments were reworked and were probably a significant source for the silty and muddy modern seabed sediments found in the western SEA8.

The effect of erosion and sediment transport by waves in non-storm conditions is mainly confined to a zone to just above the high water mark to about 15m below low water. The rates of historical and modern coastal, near-shore and open shelf seabed erosion have varied greatly. The hardest and oldest rocks (more than approximately 290 million years old), for example, around Devon and Cornwall, are some of the least susceptible to erosion by waves and tidal currents. Conversely, most modern coastal instability and the areas with increased susceptibility of the seabed to wave and tidal erosion occur where the outcrops of the softer and younger rocks (less than approximately 65 million years old) cross the modern coastlines. Such localities, for example, occur between Portsmouth and Bournemouth, and on the northern margin of the Isle of Wight. In these areas the modern coastal erosion locally exceeds several metres per year and significant volumes of reworked sediments have been transported then deposited offshore, sometimes into relatively protected embayments with typically sandy and muddy seabed sediments. The largest embayments are in the Severn Estuary, which also contains the largest area of inter-tidal flats and where there is significant sediment input into the estuary from the Severn River.

Seabed bedforms can be broadly classified into immobile and mobile types and have been systematically mapped over the whole of SEA8. Immobile bedforms include outcrops of rock, former (drowned) coastlines and glacigenic features formed during glacial periods. Glacigenic features include those formed in peri-glacial conditions on former ice-wedge polygons, 15-80m diameter, and mounds of boulders that were deposited when the water was sufficiently deep to allow the ingress of debris-laden floating ice. An immobile submarine topography has also formed over drowned braided, branched, single and locally infilled former river channels. Some of these connect through the modern coastline to the onshore river systems. They join with the main direction of palaeo-river flow, which was from east to west and then south to the Atlantic margin. Most of the former river channels are now buried but where partly filled they are associated with a seabed topography composed of channels, basins and their intervening highs. Subsequently, marine inundation allowed wave and tidal currents to rework fluvial and other sediments, so exposing or drowning the former landforms and winnowing and redistributing the finer sediments. These sediments are

mainly in the fine sand (minimum 0.125mm diameter) to granular gravel (minimum 2mm diameter) and are shaped into mobile bedforms by the tidal currents and to a lesser extent by the sea-wave currents.

Sediment erosion, transport and the shaping and movement of the mobile bedforms are controlled by the near-seabed stress, which is a function of tidal velocity, wave entrainment, water depth and the sea bed roughness (Pingree 1980). Mobile sediments and intervening or underlying spreads of gravel lag commonly occur in distinctive large fields that include gravel furrows, sand ribbons, sand patches, ripples and sand waves. The crests of the ripples and sandwaves typically align transversely to tidal currents, the distances separating the crests vary from less than 10cm to more than 200m and heights separating the crests from adjacent troughs typically vary from a few centimeters to more than 5m. A lack of correlation of the water depth with sediment sorting on the open continental shelf suggests that the bottom stress induced by wave entrainment is not as important as that induced by the tidal currents. The largest sand banks and sand ridges are generally formed parallel or sub-parallel to the dominant tidal currents and are less mobile than the transverse sandy bedforms. For example, those on the outer shelf are spaced 20km or more apart and their crests are some 20m to 40m or more above the surrounding seabed. These sand banks and ridges were formed during periods of lower sealevel so that they are thought to be essentially relict and stable in the modern tidal regime. In contrast, the tidal sand banks and ridges in the Dover Straits interact with the modern tidal currents and are demonstrably less stable.

Important characteristics of the main bedforms are that all are rich in carbonate (bioclastic) grains and that the remains of distinctive bioclastic faunal assemblages occur with each of the main bedform types. The proportion of carbonate grains in the sand fraction of the seabed sediments generally increases with the mean grain size of seabed sediments and is generally highest in the sand fractions of gravel and sandy gravel. Medium to coarse sands typically contain 50-75% carbonate grains although some sand and gravel sedimentary deposits are entirely composed of carbonate.

The exposed shallow-water zones, especially around headlands and on shoals, are characterized by rock outcrops, or thin (<5m) gravelly and sandy seabed sediment cover and are associated with mean peak spring (depth-averaged) currents of more than approximately 0.5 m/sec. Lags of gravelly and sandy seabed sediments also extend to

water depths of more than 100m where the mean peak spring (depth-averaged) currents are more than 0.5 m/sec. These areas of very strong tidal currents are also characterized by mobile transverse and longitudinal bedforms. Oceanwards, the western approaches to the Bristol Channel and English Channel include the Celtic Deep, Nymphe Bank, and the Celtic Sea. Where these areas occur in 80m water depth or more and mean peak spring (depth-averaged) currents less than approximately 0.5 metres per second, the composition of the seabed sediments is characterized by relatively fine sandy and muddy sediments.

On the outer continental shelf an area of tidal sand ridges includes the Great Sole Bank, Cockburn Bank, Little Sole Bank, Melville Bank and Haddock Bank. A transition of regional seabed gradient of less than 0.1° on the outermost continental shelf to more than 4°on the continental slope occurs in approximately 180 to 200m water depth at the shelf break. The shelf break has an irregular plan shape because the headwalls and sidewalls of many of the submarine canyons have eroded into the outermost margins of the continental shelf. Oceanwards the canyons lead to deep-water channels and submarine fans in more than 1000m water depth. The canyons were likely to have been most active in carrying sediments downslope to the fans during the periods of cold climate and lower global sealevel. The upper slope is presently dominated by processes of along-slope sediment erosion, movement and deposition that are driven by contour-following near-bottom currents.

Richard Holmes BGS 10/03/04

3 Methodology

In order to avoid duplication of effort, the majority of the bibliographic data sets for SEA8 were compiled concurrently by the contractors who carried out the geology searches for SEA6 and SEA7. The retrievals from these searches were kindly supplied by Richard Holmes (British Geological Survey, Edinburgh); Colin Jacobs and Vikki Gunn (Southampton Oceanography Centre). The methodologies used by BGS and SOC have been summarised and are presented here

In order to compile the inventory, the contractors carried out searches for journal, thesis and other references using geographical and subject matter keywords (see Appendix 1)

input in each of five online bibliographic databases: Web of Science; Georef; GeoArchive; Zetoc; and Aslib.

In addition, searches were carried out (see Table 1)

General Geographic and Subject Keywords		
English Channel	Straits of Dover	The Solent
Southampton Water	Poole Bay	Lyme Bay
Tamar	Falmouth Bay	Scilly Isles
South West Approaches	Celtic Sea	St Georges Channel
Bristol Channel	Severn Estuary	Melville Basin
Haig Fras Basin	Deposition	Sediments
Stratigraphy	Geology	Petroleum
Quaternary	Holocene	Seismic
Tectonics	Hydrocarbon	Sea floor
Continental Shelf		
From Admiralty Chart 2649		
Nymphe Bank	Celtic Deep	Cockburn Bank
Great Sole Bank	Haddock Bank	Melville Knoll
Jones Bank	Whittard Canyon	King Arthur Canyon
Goban Spur	Labadie Bank	
From Admiralty Chart 2451		
Bullock Bank		
From Admiralty Chart 323		
Goodwin Sands	South Falls	North Sand Head
South Sand Head		

Table 1 Keywords used in searching the bibliographic databases

A number of additional data searches were conducted to supplement the information retrieved from the online literature searches. Specific organisations and individuals were contacted by a combination of visits, telephone calls, and emails. A list of contacts is presented in Section 4.

4 Sources of Metadata

4.1 Principal Contributors

British Geological Society (BGS): The majority of the metadata is referenced from collections of reports, papers and other databases held at the BGS, together with information from the literature searches outlined above. Published BGS and University College, Cork reports and grey literature identified in the database will normally be available from BGS and Cork. www.bgs.ac.uk. The datasets held by BGS comprise:

- Regional Offshore Reports available at cost
- Non-confidential BGS reports likely to be released without charge into the public domain (grey literature).
- Geophysical Survey data (data source from ORACLE database) including:
  - i. Regional surveys - sub-seabed (Profile/sub seabed/seabed; Air gun; Sparker; Boomer; Pinger)
  - ii. Regional surveys - Seabed only (Sidescan sonar; Swath bathymetry; Swath back scatter; 3D seabed returns)
- Sampling surveys
  - i. Regional surveys - Sub-seabed (seabed secondary objectives): Gravity core or similar; Vibrocore; Drill.
  - ii. Regional surveys - Seabed (sub-seabed secondary objective): Grab; Seabed photographs.
- Published maps (available at cost)

  Solid 1:250 000 hard copy

  Quaternary 1:250 000 hard copy

  Seabed sediments and bathymetry hard copy

  Solid 1:1000 000 hard copy

  Quaternary 1:1000 000 hard copy

  Seabed sediments and bathymetry 1:1000 000 hard copy
- Digital interpreted data

  Seabed sediments texture and mineralogy

  Bathymetry

Geochemistry (principally inorganic) but note the overlap with the contamination of seawater and seabed sediment components of the SEA programme of work

BGS GEOLIB: Access to the collections is via a range of indexes both printed and digital, including the free on-line public access catalogue. The library of the BGS maintains this catalogue using OLIB software. It lists the libraries holdings, including BGS publications, external publications by BGS staff, and many unpublished open-file reports and maps. It is on open access and is easy to use. In order to query the catalogue you are required to identify yourself. If you do not have your own barcode just type OPAC. geolib.bgs.ac.uk

BGS metadata www.bgs.ac.uk/discoverymetadata/home.html

The non-BGS datasets comprise:

- Non-confidential non-BGS reports are likely to be released without charge into the public domain (grey literature). These include:
  i. Commercial site investigation reports. For well sites these would typically consist of 3x3 or 1x1km area surveyed with single- or multi-channel mini-sleeve/air gun, sparker, pinger/boomer/echosounder, sidescan sonar, with some interpretation calibrated by core. More problematic sites may have employed seabed photography, some with AUVs.
  ii. Aggregate surveys.
  iii. University survey reports
  iv. Hydrographic Office Series (Sidescan sonar interpretation; Single-beam echosounder (close survey); Sea bed samples of various types and qualities of interpretation)
- **University College Cork**, Department of Geology and Environmental Research data - Classes may be subdivided as above, with data sourced from Andy Wheeler.
- **United Kingdom and European metadata** (Section 4)
  Metadata data sources on network are from BGS (Alan Stevenson). Sources are listed below with HURL sites. There is likely to be a huge dataset some of

which may be too limited and time consuming (costly) to be of use for environmental surveys.

Southampton Oceanography Centre (SOC): The SeaDOG Database

This is a Deep Ocean Geophysics metadata database, and holds information on the data available within the archive. Requests for data are made via e-mail and data sent to users via CD-ROM. Use the search criteria pull-down menus and text boxes below to start the choice of data and then hit 'Submit Search' .www.soc.soton.ac.uk/cgi-bin/seadog/seadog.pl).

British Ocean Sediment COre Repository (BOSCOR): NERC set up BOSCOR at at the Southampton Oceanography Centre in April 1997. This repository provides long-term storage of sediment collected by NERC ships and NERC-funded researchers, under controlled conditions to ensure optimum preservation BOSCOR currently holds 621 sediment cores, although exclusive data on 1210 sample stations are held in it's database. It is also co-ordinating the EU-funded EUROCORE Concerted Action which aims to set up a central-access searchable Internet database of metadata on seafloor samples from the ocean basins held at European institutions

www.soc.soton.ac.uk/CHD/BOSCOR

The results from the BOSCOR search in the SEA8 area are summarised in Table 2 below:

Sample ID	Cruise Date	Depth (m)	Sampling Device	Latitude	Longitude	Core length (cm)
D3137	03/07/1954	139	Gravity core	48.2833	-6.3667	
D3138	03/07/1954	152	Gravity core	48.5333	-6.6417	
D3139	03/07/1954	134	Gravity core	48.8333	-6.75	
D3140	04/07/1954	40	Gravity core	49.9666	-5.65	
D3467	29/08/1956	110	Gravity core	49.1833	-5.7333	

Table 2 BOSCOR Results of lat long search

Electronic Marketplace for Information on Decommissioning of Offshore Installations – (EMIDOI). The EMIDOI project has been designed to provide an electronic marketplace and portal site where users and providers of information & data of relevance to decommissioning of offshore installations, can meet, exchange data & information and develop business relationships. A metadatabase system is defined and

developed to index references to information such as baseline geochemical samples and analyses of the seabed around installations and documents that are of relevance as input for Environmental Impact Assessments. www.decomplatform.com/

4.1 General Web Searches

There are other metadata bases identified as potentially providing additional material, although there have been no exhaustive searches made of these. These are as follows:

British Oceanographic Data Centre (BODC). The BODC is located at Bidston, Merseyside and houses the largest and most comprehensive oceanographic dataset in the UK (BODC Directory of Marine Environmental Data Sets). All data is available to the public without cost and can be downloaded or ordered from the website www.bodc.ac.uk/frames/index4.html?../services/edmed/index.html&2

National Geophysical Data Centre www.ngdc.noaa.gov

Geological Information Exchange System (GEIXS) geixs.brgm.fr/

SEASEARCH (Gateway to Oceanographic and Marine Data & Information in Europe) www.sea-search.net. Includes:

- EDMED (European Directory of Marine Environmental Datasets),

Joint Nature Conservancy Council: www.jncc.gov.uk With particular site: www.jncc.gov.uk/Marine/irishsea_pilot/default.htm for the new initiative 'Irish pilot project'. www.jncc.gov.uk/gcr/gcrweb/geolinks.htm

Countryside Council for Wales: www.ccw.gov.uk

Environment and Heritage Service: www.ehsni.gov.uk

National Geospatial Data Framework (NGDF) (includes 'ask giraffe') www.ngdf.org.uk

UK Marine Information Council (UKMIC) www.ukmarine.org

The Inter-Agency Committee on Marine Science and Technology (IACMST) . www.marine.gov.uk/. IACMST is a UK Government Committee reporting to the Office of Science and Technology. IACMST is responsible for the Marine Environmental Data Action Group (MEDAG), which, together with the Marine Environmental Data Co-ordinator, forms the UK Marine Environmental Data (UKMED) Network. The network has set up the OceanNET (www.oceannet.org/) web site as a portal to data and information about the marine environment. OceanNET also contains a new UK Directory of Coastal Data Sets.

Marine equivalent of MAGIC needed www.magic.gov.uk, with possible start provided by www.cefas.co.uk

Natural Environmental Research Council (NERC) www.NERC.ac.uk/data/

EU-SEASED www.eu-seased.net. The EU-SEASED website consists of metadata from the following EC 4th and 5th Framework projects:

- EUMARSIN (European Marine Sediment Information Network);
- EUROSEISMIC (European Marine Seismic Metadata and Information Centre);
- EUROCORE (A searchable Internet database of seabed samples from the Ocean Basins held at European Institutions)

PANGAEA is a public data library on the Internet aimed at archiving, publishing and distributing geocoded data with special emphasis on environmental, marine and geological research. It is operated by the Alfred Wegener Institute for Polar and Marine Research and the Centre for Marine Environmental Sciences at the University of Bremen. www.pangaea.de/. The World Data Center for Marine Environmental Sciences (WDC-MARE) uses PANGAEA as its data archive and distribution system.
The PANGAEA web server operates the Mirror Site for the Ocean Drilling Program (ODP) in Europe

'**Neptune'** is a geo-referenced meta-database of marine environmental research around the British Isles. Much of the database contains surveys relating to water quality and benthic environment, however, there a small number of geological surveys. The database was prepared by CEFAS and BGS in the late 1990s for DETR (now DEFRA) and is described in Rowlatt *et al*. (1999). www.cefas.co.uk

Titan Environmental Surveys hold a large amount of geophysical data relating to marine studies conducted along the southern Welsh coast and the Bristol Channel. For a small administration fee, the data is available from Titan provided permission has been granted from the client who commissioned the work.
www.titansurveys.com/

4.2 Addresses of Relevant Contacts and Organisations

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6 Appendices

Appendix 1

Keywords used in searching the bibliographic databases for SEA6, SEA7, and SEA8 by BGS and CEFAS

Irish Sea
Liverpool Bay
Solway Firth
North Channel
Mersey Estuary
Ribble Estuary
Sellafield
Straits of Dover
Scilly Isles
Fal
Tamar
Falmouth Bay
Cardigan Bay
St Georges Channel
Tremadoc Bay
Menai Straits
Morecambe Bay
South-West Approaches
Celtic Sea
Bristol Channel
English Channel
Severn Estuary
Lyme Bay
Poole Bay
Southampton Water
The Solent
Malin Sea
N.E. Atlantic Ocean
Rockall Trough
Northern Rockall Trough
N E Rockall Basin
Maury Channel
Endymion Spur
Hatton Bank
Hatton-Rockall Basin
Rockall Plateau
Rockall
George Bligh Bank
Bill Bailey Bank
North Feni Ridge
Feni Ridge
Rosemary Bank
Wyville
Thomson Ridge
Anton Dohrn Seamount
St Kilda
Hebrides Shelf
Hebridean Shelf
Barra Fan
Donegal Fan
Sula Sgeir Fan
Sula Sgeir
Malin Shelf
North Rona
Butt of Lewis
Outer Hebrides
Inner Hebrides
Scottish Mainland
Lewis
South Harris
Benbecula
North Uist
South Uist
Barra
Barra Head
Malin Sea
North Minch
South Minch
The Little Minch
Sound of Ramsay
Inner Sound
Raasay
Rona
Skye
Monach Island
Rhum
Eigg
Muck
Tiree
Coll
Mull
Staffa
Treshnish Islands
Skerrymore
Blackstones Bank
Mull of Kintyre
Rathlin Island
North Channel
Ailsa Craig
Firth of Clyde
Beauforts Dyke
Luce Bay
Isle of Man
Dundalk Bay
Belfast
Belfast Loch
Clyde
Ailsa Craig
Bute
Great Cumbrae
Little Cumbrae
Inner Clyde, Clyde
Enard Bay
Rubha Coiseach
Edrochillin Bay
Cape Wrath
Solan Bank
Glasgow
Stanton Bank(s)
Geikie Bulge
Darwin Mounds
Flannan Trough
Geikie Escarpment
Larne
Kishorn
Ronan Basin
Hatton Drift
Iceland Basin
Peach Slide
Summer Islands
Priest Island
Finnan Islands
Western Island
Shiant Islands
Loch Roag
W. Loch Tarbet
Dabbay
Monach Islands
Sound of Barra
Vatersay Sound
Loch Resort
The Narrows
Loch Maddy
Loch Uskavagh
Loch Carman
Loch Skiport
Loch Eynort
Loch Boisdale
Castle Bay
Loch Vatersay Sound
Red Point
Berneray Sound
Shillay Sound
Stornoway

Loch Grimashadur
Loch Luirbost
Sound of Harris
Village Bay
Loch Bracadale
Ardnamuchan Point
Tiree Passage
Loch Soridain
Jura Sound
Firth of Lorne
Oban
Loch Fyne
Loch Long
Loch Linnhe
Loch Faslane
Greenock
Dumbarton
Sound of Mull
Loch Sunart
Sound of Sleat
Loch Hourne
Loch Alsh
Loch Carron
Loch Torridon
Loch Garloch
Loch Eive
Gruinard Bay
Loch Broom
Loch Kanaird
Loch Inver
Point of Stoer
Eddrachillis Bay
Loch Lauford
Loch Inchard
Kilbrannan Sound
Ailsa Craig
Loch Ryan
Stranraer
Mull of Galloway
Burrow Head
Peel
Isle of Man
Port Erin
Calk Sound
Port St Mary
Castletown Bay
Loch Carlingford
Strangford Loch
Donaghadee Sound
Ardglass Harbour
Killough Harbour
Larne Harbour
The Maidens
Portrush
Kilbrannon Sound
Campbleton Loch
Sanda Island
Holy Loch
Ardrossan
Greenock
Gourroch
Gareloch
Rhu Marrows
Faslane
Loch Goil
Loch Striven
Dunoon
Inchmarnock Water
Loch Gilp
Loch Tarbet
Gigha
Sound of Gigha
Corryvrechan
Loch Crinan
Loch Etive
Loch Crenan
Loch Leven
Loch Eil
Ballachulish Bay
Lismore Island
Linn of Morven
Lynn of Lorne
Loch Ailine
L. A'Choire
N. Nevis
Loch Tudth
Sound of Iona
Treshnish
Gott Bay
Gunna Sound
Loch Eathama
Mallaig
Kyle Rhea
Loch Euich
Loch Alsh
Kyle Akin
Strome Narrows
Broadford Bay
Loch Kishorn
Caol Moire
Loch Sheldaig
Ayr Bay
Brodick Bay
Irvine Harbour
Troon Harbour
Ayr Harbour
Ullapool
Firth of Lorne

Organic contamination
Sediments
Contaminants
Contamination
Stratigraphy
Geology
Petroleum
Quaternary
Holocene
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Appendix 2

Index of Geological Maps held by Department of Geology, Southampton Oceanography Centre

Chart No.	Chart Title	Area	Scale	Cruise	Date	Notes
	Solid geology of the Bristol Channel floor	Bristol Channel	?			Lloyd, Savage, Stride & Donovan
	Details of structures plotted from Thumper cruise				1961	
1179	Positions of all solid cores	Bristol Channel	1:150 000		Jan-64	
	Bristol Channel Sample Stations	Bristol Channel				
	Rock outcrops, Worms Head to Watchett	Bristol Channel		RRS Discovery Bristol Channel Survey	1960	
1178	Details of Thumper records	Bristol Channel			1962	
1165	Basis for structural geology map plotted from chart 1165	Bristol Channel			May-64	
1179	Details of strikes of rocks onland continued into the Bristol Channel	Bristol Channel				
1165	Bottom features of the Bristol Channel, Worms Head to Watchett	Bristol Channel				
1164	Sand ribbons: Ilfracombe to Knap Head	Bristol Channel		Bristol Channel and Celtic Sea cruises		
	Asdic record data, including sand waves	Bristol Channel				
1178	Sandwaves	Approaches to Bristol Channel				
1179	Details of courses run by Discovery II			Thumper cruise	Mar-61	
	Sand waves and rock areas	English Channel				
	South of Plymouth facieszones	English Channel			1961	Fleming & Stride
	Coastal geology of south Cornwall	English Channel				
	Sample stations in the vicinity of Plymouth	English Channel				
2255	Positions of cores and divers samples, Weymouth – Ringstead	English Channel				
	RRS Discovery courses near Plymouth: rock data from asdic records	English Channel				
2649	Middle English Channel sand ribbons and Discovery II track chart	English Channel			1958-1960	
2649	Western English Channel asdic data, Gibraltar – Plymouth	English Channel			1960	

Chart No.	Chart Title	Area	Scale	Cruise	Date	Notes
	Asdic analysis	English Channel		Cruise 19	Sep-67	
	Asdic interpretation west of The Lizard	English Channel				
	Asdic interpretation, western English Channel	English Channel		Cruise 67		
	Asdic analysis	English Channel		RRS Discovery Cruise 27		
	Sediment transport from asdic records	English Channel		Dorset survey 1959/ Fisheries II 1958	1958-1959	
2649	Details of sediments	Western English Channel				
	Seabed quality and sample sites	SW Approaches				
	Bottom sediments south of 10°W	English Channel	1:150 000			
	Sample stations in the vicinity of Plymouth	English Channel				
536	Sediments Beachy Head – Dungeness	English Channel				
	Sediments	English Channel			1951	Admiralty Hydrographic Dept,
	Median diameters of sediments south of Plymouth	English Channel			1967	Fleming & Stride
2615	Sample stations, Portland to Christchurch	English Channel				
2610	Sample stations, Portland to St Albans Head	English Channel		Discovery II	March-April 1959	
1828	Occurrence of gravelm stones and shingle	English Channel				
	Contours and core stations, Hurd Deep	English Channel				
	Power cable survey tracks	English Channel			1960	
	South of IOW track chart	English Channel	1:150 000			
	South of IOW thumper and asdic tracks	English Channel	1:150 000			
	South of IOW geological boundaries	English Channel	1:150 000			
	South of IOW Geology	English Channel	1:150 000			
	South of IOW Sample positions	English Channel	1:150 000			
	South of IOW structural geology	English Channel	1:150 000			
	South of IOW dip directions	English Channel	1:150 000			
	Interpretation of relief, Kings Inlier	English Channel		Survey K1247		
2450	Sediments of Kings Inlier	English Channel				
2610	Lulworth Bank rock	English Channel				
	Asdic lines, Portland to St Albans Head	English Channel				

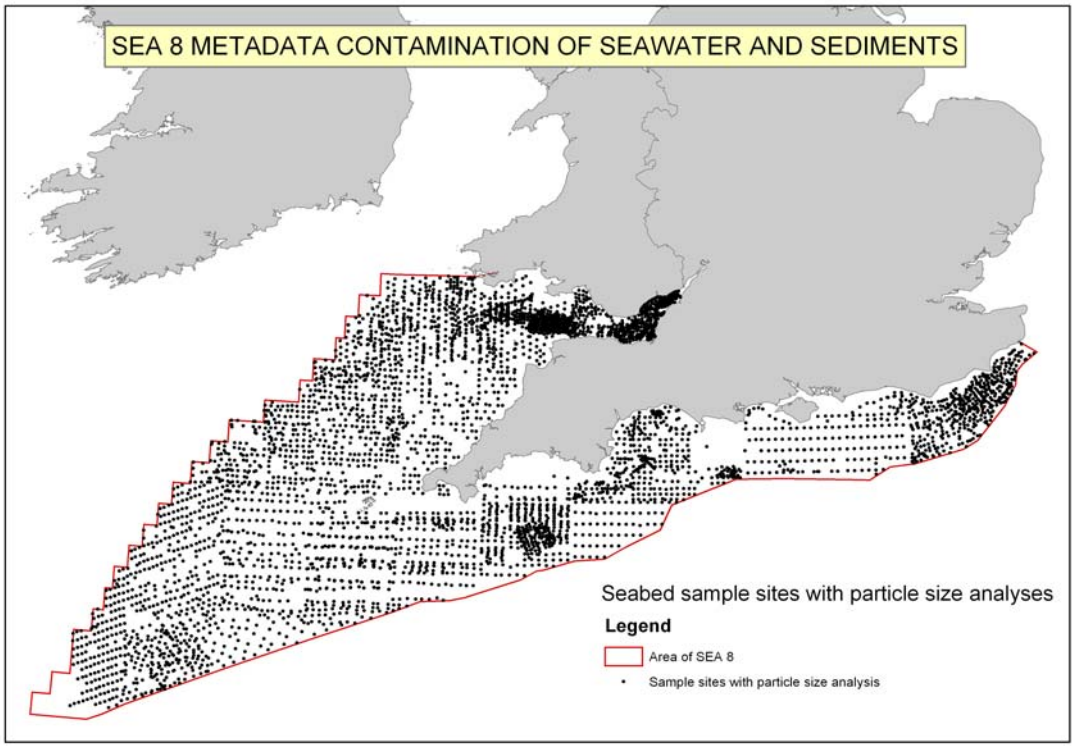
Chart No.	Chart Title	Area	Scale	Cruise	Date	Notes
2255	Weymouth Bay	English Channel				
	Rock, Weymouth – Swanage	English Channel				
2610	Lulworth Bank Dome: Preliminary geological map	English Channel				
2615	Portland to Christchurch	English Channel		Discovery II	1959	
	Dorset: rock	English Channel				
		English Channel & Western Approaches	1:768 600	Discovery II Cruise 24	1968	
	Geological summary of the bottom near Plymouth	English Channel				
	Track chart with asdic data	English Channel		Patch cruise	Jun-66	
	Sand ribbon data south of IOW	English Channel				
	Sediment transport and rock outcrops from asdic data	English Channel		Patch cruise	1966	
		Western English Channel		Cruise 67		
	Seabed features (sand waves), Dodman's Point to Start Point	Western English Channel				
		Celtic Sea		Discovery Cruise 15	1966	
	Asdic tracks, Straits of Dover	English Channel				
	Rock and sand wave data in the straits of Dover	English Channel		Patch cruise	1966	
2675	Sand waves and streaks	Eastern English Channel				
	Sand waves in Rye Bay	English Channel				
	Rock and sediment transport from asdic data	Eastern English Channel		Patch cruise	1966	
	Sand ribbons off the Sussex coast	English Channel		Discovery II	1958	
	Sand banks	Celtic Sea				
	Asdic sampling data, Cockburn Bank	Celtic Sea				
1165	Asdic records showing rock				May-62	
1165	Thumper records	Bristol Channel		Celtic Sea cruise	1962	
	Boomer penetration: superficials	Celtic Sea		Celtic Sea cruise	1962	
1164	Bottom features, Ilfracombe to Knap Head	Celtic Sea		Bristol Channel cruise	1960	
1164	Rocks around Lundy Island	Celtic Sea				

Chart No.	Chart Title	Area	Scale	Cruise	Date	Notes
1598	Banks and superficial deposits south and west of Britain	Celtic Sea/English Channel				
	Continental slope	Celtic Sea				
	Bathymetry and sediment transport, continental slope	Celtic Sea				
	Celtic Sea sediment transport, including Patch cruise data (1966)	Celtic Sea				
	Track chart	Celtic Sea		Celtic Sea Canyon cruise		
	Sand wave data	Celtic Sea and western English Channel				
	Limit of rock outcrop	Celtic Sea	1:1000000			
	Uniform cover of fine sediments	West of Europe				
		Celtic Sea		RRS Discovery Cruise 19	1967	
	Pre-Pleistocene geology of the Celtic Sea from boomer records etc.	Celtic Sea				
	Asdic record interpretation	Celtic Sea				
1178		Approaches to Bristol Channel			1960	
	Bottom features of the Celtic Sea	Celtic Sea				
	Asdic record analysis	Celtic Sea		RRS Discovery Cruise 14	1966	
	Sediment transport			Discovery Kerry cruise	1962	
	Celtic Sea banks	Celtic Sea				
	Sidescan sonar tracks	Celtic Sea		Cruise 47	1972	
1123	Tracks run by Discovery II	Celtic Sea			May-62	
		Celtic Sea		RRS Discovery Cruise 17	1967	
	Sediment transport and bottom type divisions	Celtic Sea				
1598	Sediment transport, Great Sole Bank – Plymouth	Celtic Sea	1:768 600	RRS Discovery Continental margin cruise	Jul-Aug 1965	
1598	Celtic Sea track chart	CelticSea	1:768 600	Discovery cruise 21	Jan-68	
1123	Sub-bottom features	Celtic Sea		Thumper Cruise	1961	
1123	Sediment thickness	Celtic Sea		Thumper cruise	1961	
1123	Sediment transport, Cork to continental margin	Irish Sea		Irish Sea survey	Mar-59	
1178	Sediments in the Bristol Channel Approaches	Bristol Channel/Celtic Sea		HMS Shackleton	Aug-61	

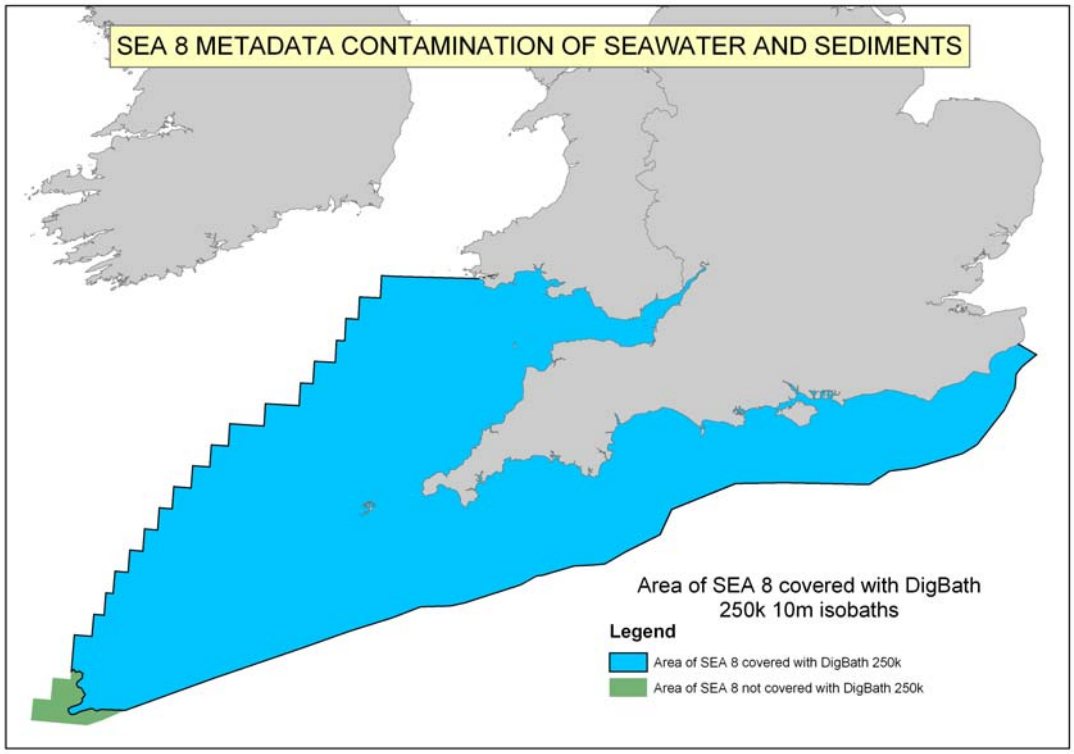
Chart No.	Chart Title	Area	Scale	Cruise	Date	Notes
1123	St Georges Channel sub-bottom features	Celtic Sea		ICES Expedition	Jul-61	
	Inner CelticSea bottom type divisions	Celtic Sea				
1178	Tracks run by Discovery II	Approaches to Bristol Channel		Celtic Sea cruise	1962	
1149	Detail of streaky floor, St Ives to Trevose Head			Bristol Channel Cruise	May-60	
	Asdic records and tracks	Irish Sea		Discovery II Kerry cruise	Sep-62	
	Sediment transport zones	Northern Celtic Sea				
1149	Asdic tracks, St Ives – Trevose Head			Bristol Channel cruise	May-60	
1193	Sediment transport, Lands End to Irish Sea			Discovery II	Feb-March 1959	
	Seafloor roughness	Celtic Sea				
1598	Ships courses S and W of Britain + echosounder					
	Bottom appearance from Admiralty Charts and sidescan data	Celtic Sea				
1598	Sediment distribution to the S and W of Britain					
	Sediment type and distribution	Celtic Sea				
	Sediment data	European continental margin				
	Asdic data	Celtic Sea				
Survey sheet B3013, No. IV	Sediment distribution: Yellow and speckled sand	S and W of Britain				
Survey sheet B3013,	Sediment distribution: Mud/grey sand	S and W of Britain				
No. II						
1123	Coring station positions	Celtic Sea		Celtic Sea cruise	May-62	
	Sediment types	SW Ireland				
	Asdic tracks and interpretation	SW Approaches		MBA Challenger	1975	
1598	Sediments	Celtic Sea				
1178	Bottom sediments and tracks run by Shackleton				Aug-61	

Appendix 3

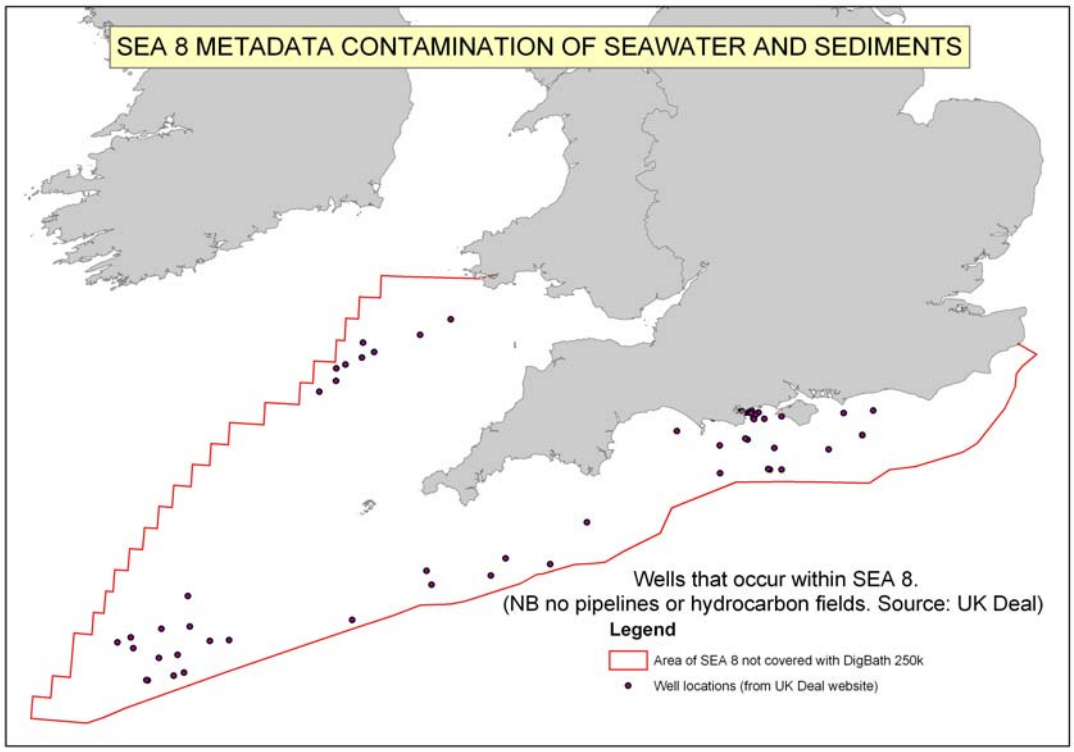
BGS Maps



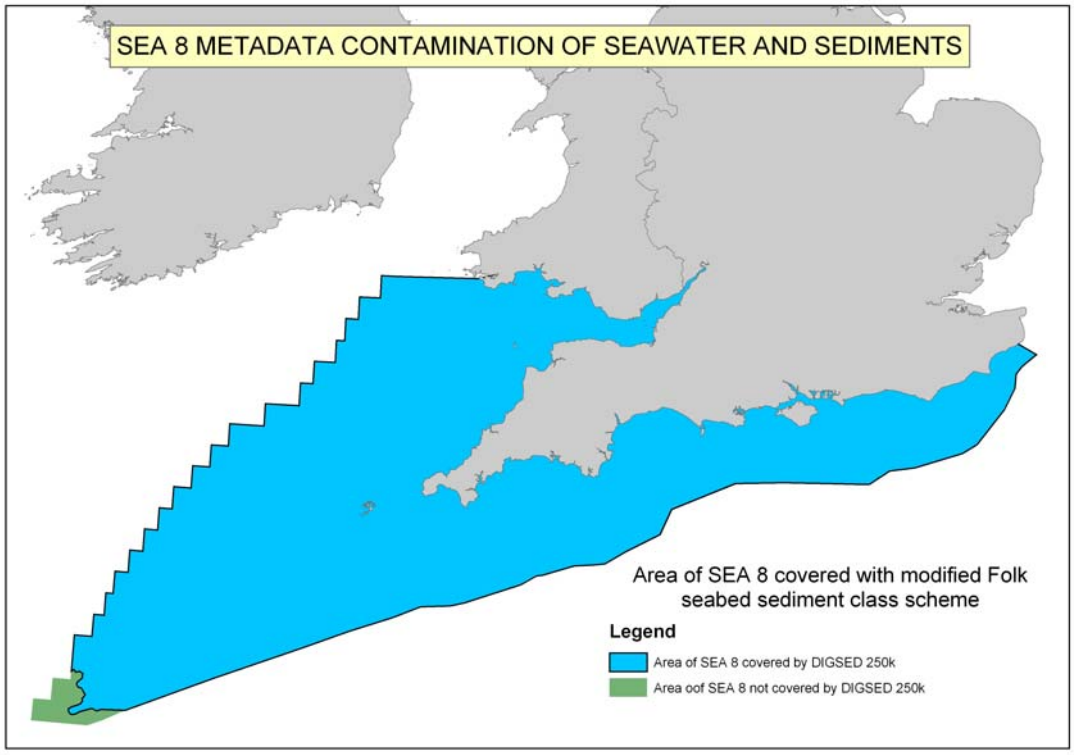
Map 3a. Seabed Sample Sites with Particle Size Analysis(map supplied by BGS, data held at BGS)



Map 3b. Area of SEA8 covered with DigBath 250k 10m isobaths Analysis (map supplied by BGS, data held at BGS)



Map 3c. Wells that occur within SEA8 (map supplied by BGS, data held at BGS)



Map 3d. Area of SEA8 covered with modified Folk seabed sediment class scheme (map supplied by BGS, data held at BGS)

Appendix 4

Endnote© file (on compact disk)

"RV Edwards Forbes cruise 16/17 26 September-4 October 1977 investigation of turbidity structures in the Severn Estuary and inner Bristol Channel." I.O.S. CRUISE REP; Issue 93; 4 Pages; Year 1977.
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"UK Digital Marine Atlas." Ocean Challenge, 4 [1/2] , p.12. 1993.
"Study of coastal waters from space." Dock and Harbour Authority, 74 [846] , p.153. 1993.
Kingfisher cable chart showing in use and out of use cables: SW Approaches. Source: ; Hull: Kingfisher Charts, Sea Fish Industry Authority. 1991.
BIRPS deep seismic packages from the UK and north-west European continental shelf (1981-1992). B. Datasets.
BOSCO national data base for monitoring the shore line erosion. B. Datasets.
Burial Assessment Survey: Celtic Cable Route (1993). B. Datasets.
Burial Assessment Survey: Transatlantic 12 Cable Route (1994). B. Datasets.
Burial Assessment Survey: Transatlantic 9 Cable Route (1992). B. Datasets.
Burial Assessment Survey: United Kingdom to France 3 Cable Route (1988). B. Datasets.
Burial Assessment Survey: United Kingdom to Spain 4 Cable Route (1990). B. Datasets.
Coastal Studies of 3-Dimensional Sand Transport Processes and Morphodynamics (1997-2001). B. Datasets.
Commercial gravity surveys offshore Ireland (1971-1988). B. Datasets.
Commercial magnetic surveys offshore Ireland (1971-1988). B. Datasets.
Commercial seismic surveys offshore Ireland (1965-1988). B. Datasets.
Digital gravity and magnetic data from the UK continental shelf (1950-). B. Datasets.
Eddystone (English Channel) Gravity Range (1986-1988). B. Datasets.
Geological mapping of Irish continental shelf. B. Datasets.
Geophysical data from the continental margin to the west of the British Isles (1976, 1977, 1979, 1980, 1984). B. Datasets.
Gravity and magnetic data on the continental shelf southwest and west of Ireland. B. Datasets.
Gravity and magnetics data in the Porcupine Basin, west of Ireland. B. Datasets.
Hydrographic, geophysical and environmental data sets from the North West European Continental Shelf and the east coast of S America. B. Datasets.
Inshore seismic profiling around the coastline of Britain (1974-). B. Datasets.
Irish marine mineral resources. B. Datasets.
Marine borehole logs and data from the UK continental shelf and adjacent slopes (1969-). B. Datasets.
Marine geological samples from the UK continental shelf and adjacent slopes (1966-). B. Datasets.
Marine geophysical and seismic records from the UK continental shelf and adjacent slopes (1966-1991). B. Datasets.
Marine geotechnical data from the UK continental shelf and adjacent slopes (1975-). B. Datasets.
Radiocarbon dates on sea-level position and change indicators (0-10,000 yrs B.P.). B. Datasets.
Sea bed characteristics and depths in Irish waters. B. Datasets.
Sediment levels at 30 sites in the Tamar estuary, south west England, between

December 1981 and January 1983. B. Datasets.
Sediment mobility and trace metal recycling in the Tamar estuary, south west England (1979-1980). B. Datasets.
Seismic reflection profiles and exploratory well data from Irish offshore basins. B. Datasets.
Seismic reflection profiles, gravity data, magnetic data, exploratory wells and appraisal wells around Great Britain (1984-). B. Datasets.
Seismic refraction profiles over Rockall Plateau, Rockall Trough, Porcupine Seabight and the Celtic Sea. B. Datasets.
Shelf break sediment samples from the Gulf of Biscay and the English Channel (1988-90). B. Datasets.
STARFISH/SEDIMANCHE geomorphological and geophysical data collected on the Channel and the Celtic Sea (Manche River, sand banks, armorican margin) to study the. B. Datasets.
University of Cambridge marine geophysics data set (1956-). B. Datasets.
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