Inshore Special Area of Conservation (SAC): Margate and Long Sands

SAC Selection Assessment

Version 2.5

Version Control

Version date	Amendments made	Issued to and date
2.5 06/08/2010	Text amendment for pSAC to cSAC status	Submission to Europe (9th August 2010).
2.4 14th May 2010	Minor text amendments	Natural England Executive Board 14th May 2010
2.3 29th April 2010	New map and text amendments	Director of Marine and Director of External Affairs; 10 May 2010
2.2 27th April 2010	Text Amendments	Internal review
2.1 26th April 2010	Text amendments	Internal review
2.0 April 2010	Text amendments following consultation	Internal review
1.0 December 2009	Drafted for Exec Board and submission to Defra for approval for formal consultation.	Publically available at start of informal dialogue July 2009; formal consultation November 2009.

1. Introduction

This document provides detailed information about the Margate and Long Sands candidate SAC (cSAC) and evaluates its interest features according to the Habitats Directive selection criteria and guiding principles.

The advice contained within this document is produced to fulfil requirements of Natural England under the Conservation of Habitats and Species Regulations 2010, relating to the conservation of natural habitat types and species through identification of Special Areas of Conservation (SACs) in UK waters. Under these Regulations, Natural England is required to provide advice to Defra to enable the Secretary of State and Competent Authorities to fulfil their obligations under the Regulations.

Sites eligible for designation as Special Areas of Conservation (SACs) are selected on the basis of the criteria set out in Annex III (Stage 1) to the Habitats Directive and relevant scientific information. SACs are considered only if they host a Habitats Directive Annex I habitat or Annex II species. Socio-economic factors are not taken into account in the identification of sites to be proposed to the European Commission[1].

In addition to information on the Annex I habitats, this document contains i) a chart of the site, ii) its name, location and extent, iii) the data resulting from application of the criteria specified in Annex III (Stage 1) to the Habitats Directive and iv) a glossary of terms mentioned in the text. Natural England has adhered to the format established by the Commission for providing site information. This format is set out in the 'Natura 2000 Standard data form' (Commission of the European Community, 1995) (prepared by the European Topic Centre for Biodiversity and Nature Conservation on behalf of the European Commission to collect standardised information on SACs throughout Europe).

[1] Following European Court of Justice 'First Corporate Shipping' judgement C-371/98 (7 November 2000)

2. Margate and Long Sands: SAC Selection Assessment

1. Site name Margate and Long Sands	**2. Site centre location** Degrees and minutes **1° 22' 12"E 51° 33' 55"N** Decimal degrees **1.37011 ° E 51.56536°N** (Datum: WGS84)
3. Site surface area **64914 ha; 649 sq km** (UTM Zone 31 Northern hemisphere WGS84)	**4. Biogeographic region** Atlantic

3. Interest feature(s) under the EU Habitats Directive

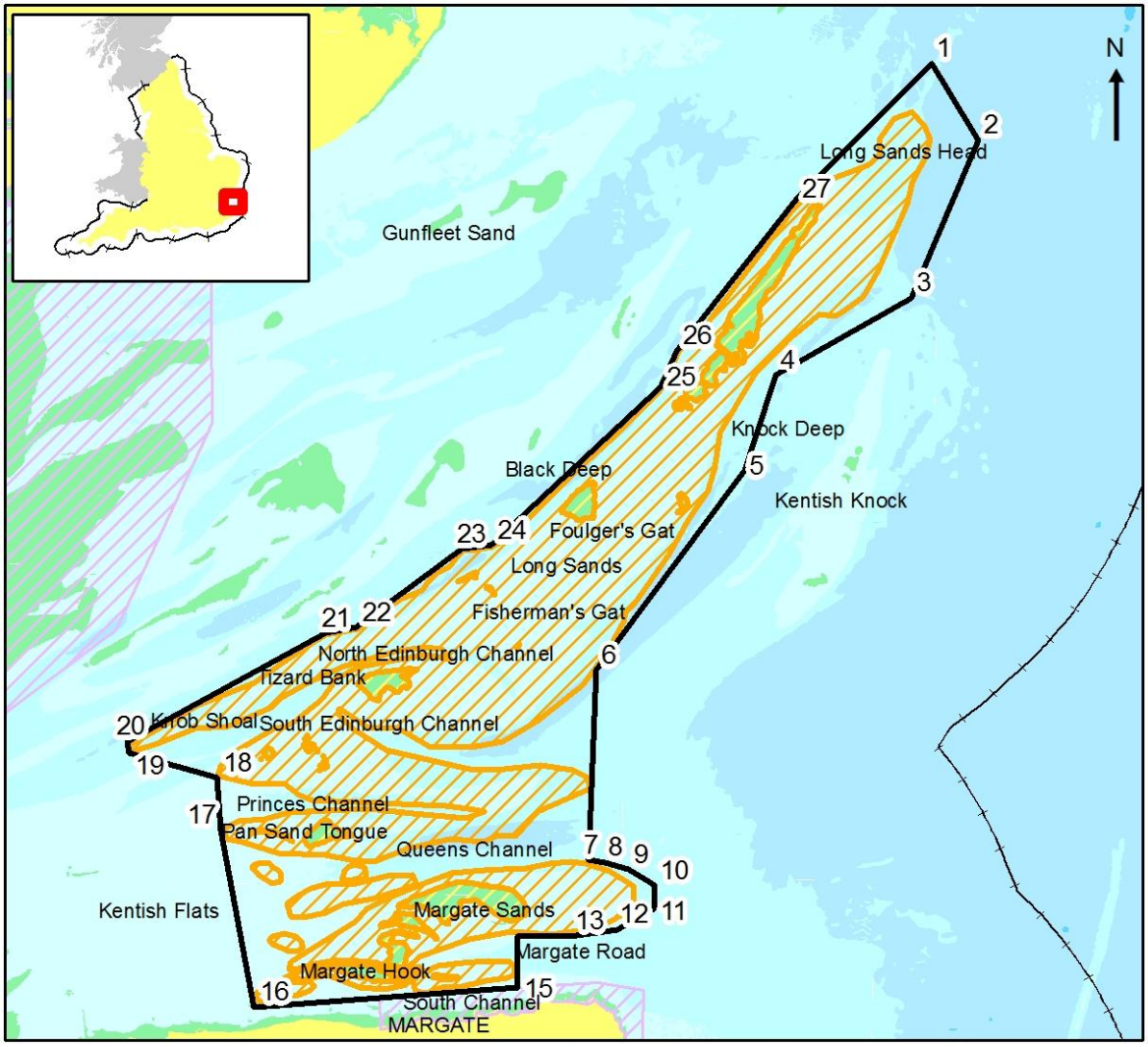
This site is listed for the features set out below. For further information please see European Commission, DG Environment, (2007): Interpretation Manual of European Union Habitats. EUR 27, July 2007:

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf

1110 Sandbanks which are slightly covered by sea water all the time

1140 Mudflats and sandflats not covered by seawater at low tide (non qualifying).

4. Map of candidate SAC boundary[2]



candidate Special Area of Conservation
Margate and Long Sands

- candidate Special Area of Conservation
- Sandbanks that are slightly covered by sea water all the time
- Mudflats and Sandflats not covered by sea water at low tide
- Special Areas of Conservation
- England 12nM Territorial Seas Limit

Depth Areas

- Drying
- <=10m
- <=20m
- <=50m
- <=100m
- Land

EU Site Code: UK0030371
Version number: 1.3
Longitude: 1° 22' 12" E
Latitude: 51° 33' 55"N
Projection: UTM 31N (WGS84)
Area of SAC: 649.14 sq km 64913.66 ha

Theme ID: 1452090
Grid Ref: TR341866
Version: 7
Plotted: 22/07/2010
Plot ID: 5

Scale 1:400,000 Map 1 of 1
0 2 4 8 Kilometers

Candidate Special Area of Conservation Directive 92/43/EEC
Submitted to the EC by the Secretary of State for Environment, Food and Rural Affairs. Date: 20/08/2010

NATURAL ENGLAND

[2] Larger copies of maps are available on request from Natural England, Regulatory Services, Floor 1 West, Northminster House, Peterborough. PE1 1UA

Point No	Lat	Long
1	51º 50' 55"	1º 40' 24"
2	51º 48' 42"	1º 42' 40"
3	51º 44' 6"	1º 39' 40"
4	51º 41' 48"	1º 33' 23"
5	51º 39' 1"	1º 32' 2"
6	51º 33' 8"	1º 25' 20"
7	51º 27' 37"	1º 25' 11"
8	51º 27' 34"	1º 25' 56"
9	51º 27' 22"	1º 27' 2"
10	51º 26' 56"	1º 28' 15"
11	51º 26' 15"	1º 28' 15"
12	51º 25' 38"	1º 26' 33"
13	51º 25' 24"	1º 24' 21"
14	51º 25' 22"	1º 21' 58"
15	51º 23' 53"	1º 22' 2"
16	51º 23' 8"	1º 9' 49"
17	51º 28' 14"	1º 8' 6"
18	51º 29' 45"	1º 7' 50"
19	51º 30' 24"	1º 3' 44"
20	51º 30' 44"	1º 3' 37"
21	51º 34' 1"	1º 12' 43"
22	51º 34' 12"	1º 14' 8"
23	51º 36' 33"	1º 18' 57"
24	51º 36' 41"	1º 20' 20"
25	51º 41' 23"	1º 28' 4"
26	51º 42' 26"	1º 28' 46"
27	51º 46' 53"	1º 34' 11"

5. Site summary

Margate and Long Sands starts to the north of the Thanet coast of Kent and proceeds in a north-easterly direction to the outer reaches of the Thames Estuary. It contains a number of Annex I Sandbanks slightly covered by seawater at all times, the largest of which is Long Sands itself. The sandbanks are composed of well-sorted sandy sediments, with muddier and more gravelly sediments in the troughs between banks, and the upper crests of some of the larger banks dry out at low tide (see section 7.2). The banks are tidally-influenced estuary mouth sandbanks, the southern banks aligned approximately east-west in the direction of tidal currents entering the Thames Estuary from the English Channel whereas Long Sand is aligned in a north east - south west orientation with influence from the North Sea. In common with all sandbanks the structure of the banks is dynamic and there have been significant movements of the bank edges over time.

The fauna of the bank crests is characteristic of species-poor, mobile sand environments, and is dominated by polychaete worms and amphipods. Within the troughs and on the bank slopes a higher diversity of polychaetes, crustacea, molluscs and echinoderms are found. Mobile epifauna includes crabs and brown shrimp, along with squid and commercially important fish species such as sole and herring. Although this site is being put forward for designation on the basis of the presence of Sandbank Annex I interest feature, there is a significant amount of the reef-forming ross worm (*Sabellaria spinulosa*) at this site, which when formed as a reef qualifies as an Annex I habitat (biogenic reef). However, the available data indicate that the distribution of *S. spinulosa* is patchy, or that the aggregations form crusts rather than reefs. Areas of high *S. spinulosa* density support a diverse attached epifauna of bryozoans, hydroids, sponges and tunicates, and additional fauna including polychaetes, bivalves, amphipods, crabs and lobsters. These diverse communities are usually found on the flanks of the sandbanks and towards the troughs.

5.1 Margate and Long Sands cSAC Annex I Habitat Comparison

This site is located within the Southern North Sea Regional Sea (Defra, 2004). Listed below (Table 5.1) are existing SACs and cSACs within the same area that also contain sandbanks as a qualifying Annex I habitat. A brief summary of the type of sandbank at each location is included. A number of sites for sandbanks in the Southern North Sea Regional Sea are proposed for designation in order to ensure sufficient sandbank habitat is represented with the Natura 2000 network of sites for the UK, and because sandbank habitat in UK waters is located primarily in the southern North Sea and Irish Sea. Several sites are proposed also to ensure representation of the range of sub-types of this habitat within the SAC network. The different sites represent different sub-types of sandbank habitat, from sheltered estuarine and sandbanks, vegetated sandbanks, to different physiographic types associated with headlands, and offshore shelf sandbanks. Each has a slightly different range of sediment types, salinity and exposure to tides and wave action which results in different ranges of associated biological communities.

Table 5.1 Regional SACs comprising sandbank habitat

Site	Description of relevant qualifying features
The Wash and North Norfolk Coast SAC	One of the largest expanses of inshore sublittoral sandbanks in the UK, and representative example of this habitat type on the more sheltered east coast of England. Headland associated, estuary mouth sandbanks and sandy mounds are all found at this site. The sandbanks vary in composition from coarse gravely sand to muddy sand, and some support eelgrass beds. Salinity is variable/reduced and coastal influence is strong. Benthic communities on sandflats in the deeper, central part of the Wash are particularly diverse (brittlestar beds, polychaete *Lanice conchilega*, and the bivalve *Angulus tenuis* are present). The banks also provide nursery grounds for commercial fish species.
Essex Estuaries SAC	Estuary mouth sandbanks in variable/reduced salinity and subject to strong coastal influence. These subtidal sandbanks are unvegetated and composed of gravely and muddy sand.
Humber Estuary SAC	Estuary mouth sandbanks in variable/reduced salinity and subject to strong coastal influence. These subtidal sandbanks are unvegetated and composed of muddy sand.
North Norfolk sandbanks and Saturn reef cSAC	The North Norfolk Sandbanks are the most extensive example of the offshore linear ridge sandbank type in UK waters (Graham *et al*, 2001). They are subject to a range of current strengths which are strongest on the banks closest to shore and which reduce offshore (Collins *et al*, 1995). The outer banks are the best example of open sea, tidal sandbanks in a moderate current strength in UK waters. The banks support communities of invertebrates which are typical of sandy sediments in the southern North Sea.
Dogger Bank pSAC	The Dogger Bank is the largest single continuous expanse of shallow sandbank in UK waters and was formed through glacial processes and submergence through sea-level rise. Its location in open sea exposes the bank to substantial wave energy and prevents colonisation of the sand by vegetation. Sediments range from fine sands containing many shell fragments on top of the bank to muddy sands at greater depths supporting invertebrate communities characterised by polychaete worms. Sand eels are an important prey resource found at the bank supporting a variety of species including fish, seabirds and cetacean.

Inner Dowsing, Race Bank and North Ridge sandbanks cSAC	The site contains a number of alternating ridge headland associated sandbanks. Inner Dowsing to the west of the site is a single large sandbank whereas the Race Bank/North Ridge to the east forms a series of sinuous sandbanks. A significant amount of *Sabellaria spinulosa*is found in the troughs of these sandbanks along with a high diversity of attached epifauna such as bryozoans, hydroids, sponges and tunicates. This site is also being recommended for biogenic reef (*Sabellaria spinulosa*) interest feature.
Haisborough, Hammond and Winterton cSAC	The main sandbank ridge is composed of alternating ridge headland associated sandbanks in a characteristic S-formation. The sandy sediments within the site are very mobile in the strong tidal currents. Infauna of the sandy bank tops are consequently impoverished, and made up of communities which are able to withstand dynamic sediment environments. On the flanks of the banks, and towards the troughs, sediments tend to be slightly more stable and gravelly and are dominated by diverse infaunal and epifaunal communities.

6. Site boundary and feature characterisation

6.1. Sandbanks

The Margate and Long Sands sandbanks were mapped initially based on work carried out for Natural England by Entec (Entec UK LTD, 2008a) based on data obtained from sources such as windfarm and aggregate surveys, some dedicated survey, and modelling.

After this work new data become available from SeaZone Digital Survey Bathymetry (DSB), digitised through funding from the Marine Aggregate Levy Sustainability Fund (MALSF) Regional Environmental Characterisation (REC) studies (SeaZone Solutions Ltd, 2009). Other new sources of information included surveys from aggregate licence areas.

The DSB datasets from SeaZone provided good spatial coverage of Margate and Long Sands cSAC. From this data, a more accurate delineation of Annex I sandbank features was possible by undertaking a slope analysis in GIS. Guidance by Klein (2006) on delineating sandbanks was followed (the 'Klein methodology' was also used by Germany and the JNCC to identify sandbank in the Dogger Bank). This involved using a slope angle of 0.5° for delineating the edges of the bank features. The main bank structures themselves were easily identifiable by viewing the 1° slope layer alongside the 0.5° slope layer. Once identified, these sandbank features were cross-referenced with sedimentological data to confirm that they consisted of sandy sediment, as defined in the Annex I sandbank definition (Commission of the European Community, 2007).

The slope analysis for this site showed that Long Sands Head extends out further north east than previously modelled (Entec UK LTD, 2008a). The eastern side of Long Sands bank was better delineated after reference to the DSB data. Tizard Bank and Knob Shoal were found to be part of the main Long Sands bank and have extended the site boundary further inshore. The banks either side of Princes Channel were better defined using the slope analysis showing them joining up to the east and extending further east than previously modelled. Margate Sands was also better delineated and was shown to extend further east than previously modelled. The crescent shaped bank that was previously modelled by Entec UK LTD (2008a) to the east of Margate Sands was not mapped with the slope analysis, nor were a number of small banks previously modelled by Entec on Kentish Flats. The new data showed that these were not topographically distinct from the seabed and therefore not sandbanks.

6.2. Mapping the site boundary

The site boundary was delineated by following the JNCC guidance for boundary setting (JNCC, 2008, Appendix 1). The key parts of this guidance are that the site boundary should be defined as

simply as possible with a minimum number of straight lines, and should include the minimum area necessary to ensure protection for the Annex I habitat of interest. More complex shapes drawn more tightly around feature of interest are favoured over simple square/rectangular boundaries, to reduce the area of 'non-interest-feature' included within the site boundary. Where it is justified to protect the features of the site from the effects of mobile gear on the seabed at some distance from a vessel on the surface, a margin in proportion to the water depth may be added to the extent of the feature when defining the site boundary. The cSAC contains Annex I sandbanks at depths of predominantly <25m BCD. Therefore, a margin of 100m was used around each sandbank feature except where a straight line between two points was the more sensible option to avoid an overcomplicated boundary following the guidance.

In the Margate and Long Sands site, the boundary line has been drawn to include the flanks of the banks and the intervening troughs as well as the area of Annex I habitat sandbank. The flanks and troughs have been included as they are important for the structure and function of the section of sandbank. The boundary encloses the main Margate Sand and Long Sand sandbank as well as a number of smaller Annex I sandbanks in the vicinity. Princes Channel has been included within the site boundary as it forms a narrow divide between the southern banks and Long Sand, but is not considered to be of qualifying interest, but important in terms of maintaining structure of the sandbanks.

Further information on the mobility of Long Sands Head was contained in recent reports from the Crown Estate and the United Kingdom Hydrographic Office (Burningham & French, 2009; UKHO 2009, 2010). These indicated that the northern extent of Long Sands Head had increased by 4.5 km over 180 years up to 2003 and, most recently, the rate of increase has been much higher; a 550m extension in the four years between 2005 and 2009.

To account for this, the current rate of extension has been assumed to continue for the next ten years, after which it is assumed that the historical rate will resume. The boundary margin in the region of Long Sands Head has, therefore, been set at 2.5km. Margate Sands is also moving east (Burningham & French, 2009) and the boundary has been drawn to allow for this movement. It is, therefore, considered that the sandbanks are sufficiently stable to remain within the defined boundary line for the foreseeable future.

7. Assessment of interest feature(s) against selection criteria

A full explanation of the application of the site selection criteria can be found on JNCC's website at www.jncc.gov.uk/page-4165.

7.1 Sandbanks which are slightly covered by sea water all the time

Annex III selection criteria (Stage 1A):

7.1.1 Representativity (a)

Margate and Long Sands encompasses a number of non-vegetated sublittoral estuary mouth sandbanks which lie broadly parallel to the north coast of Kent (Dyer & Huntley, 1999). The structure of the banks are influenced by North Sea and English Channel tides entering the Thames estuary, although are likely to receive inputs from the north Kent coast. The banks are predominantly composed of sand, with more gravelly and silty sediments towards the edges and in the troughs. The banks are in full salinity water. Trough areas between the sandbanks lie in approximately 10-20m depth of water, and some crest areas are exposed above chart datum. The position of the sandbanks appears to be relatively stable over time (UKHO, 2007; Burningham & French 2009); although Long Sand demonstrates a more dynamic sediment environment with sediment moving in a clockwise direction around the bank with ripples and sandwaves present (UKHO, 2006).

The fauna of the sandbanks is generally low diversity polychaete-amphipod communities which are typical of mobile sandy sediments. This is particularly true of the shallower sections of bank crests, although slightly higher diversity communities are found on the deeper sections of the banks. In the gravelly substrates in the troughs, more diverse communities of infauna and epifauna are present. Troughs between sandbanks, particularly the Queens Channel, support richer communities of echinoderms, crustacea and bivalve molluscs, as well as abundant infauna and aggregations of ross worm (*Sabellaria spinulosa*). These aggregations do not appear to form distinct reef structures. The area is known to be a spawning and nursery ground for a number of species of fish, including sole (*Solea solea*) and herring (*Clupea harengus*).

The sandbanks present in the Wash and North Norfolk Coast SAC are the only other representatives of estuary mouth associated sandbanks in English territorial waters within this region of the Southern North Sea. The Outer Thames Estuary associated sandbanks such as Margate and Long Sands differ from the Wash sandbanks as a result of being weakly influenced by coastal erosional-based inputs. They are also comprised of more mobile, sandy sediments than those within The Wash and its approaches. These considerations mean that the Margate and Long Sand demonstrate high representativity of this sub-type of sandbank, estuary mouth associated banks.

The Margate and Long Sands site is graded A (excellent representativity)

7.1.2 Area of habitat (b)

The area of Margate and Long Sands Annex I sandbank habitat within the site, based on slope analysis, occupies 41,017 ha. The majority of this habitat area is in waters shallower than 20m.

The evaluation of relative surface area is approximate as it is not possible to calculate an accurate total extent figure for Annex I shallow sandbank habitat for UK waters. A best minimum estimate, based on the mapped area of sandy sediments in less than 20m water depth, of 1,720,000 hectares has been used to assess area of habitat, as these areas will always be part of the Annex I habitat. This figure gives the following thresholds for the grades of this criterion (CEC, 1995):

A – extents between 258,000 and 1,720,000 ha (15-100% of total resource)
B – extents between 34,400 and 258,000 ha (2-15% of total resource)
C – extents less than 34,400 ha (0-2% of total resource)

Margate and Long Sands Annex I sandbank habitat occupies a minimum area of 40,008 ha (based on the area of sandy sediments within the 20m contour, Chart Datum). This value is equivalent to 2.32% of the UK total resource (based on the area of sandy sediments within the 20m contour, CD) and is graded B.

The actual area of sandbank feature can extend below the 20m depth contour (CEC, 2007). Therefore an additional maximum estimate of UK sandbank resource has been calculated based on the mapped area of sandy sediments in less than 50m water depth that adjoin areas of sandy sediment in less than 20m water depth. This figure of 8,010,000 hectares is an over-estimate used to provide an additional assessment of area of habitat, and is under review. This figure gives the following thresholds for the grades of this criterion (CEC, 1995):

A – extents between 1,201,500 and 8,010,000 ha (15-100% of total resource)
B – extents between 160,200 and 1,201,500 ha (2-15% of total resource)
C – extents less than 160,200 ha (0-2% of total resource)

Margate and Long Sands Annex I sandbank habitat occupies a maximum area of 41,017 ha (based on the actual area of Annex I sandbank habitat, which extends deeper than 20m). This value is equivalent to 0.51% of the UK total resource (based on the area of sandy sediments within the 50m contour, CD) and is graded C.

As the majority (98%) of the Margate and Long Sands Annex I sandbank habitat is present within the 20m depth contour then it is deemed appropriate to use the minimum UK total resource figure for the site selection assessment.

The site therefore contains between 2-15% of the national Annex I sandbank resource, and is graded B.

7.1.3 Conservation of structure and functions (c)

Degree of conservation structure
There are a number of activities occurring in the area which may affect the physical and biological structure of sandbanks within the site boundary. These activities are described further in Entec (2008b).

One of the primary anthropogenic modifications to the physical structure of these sandbanks is dredging activity conducted to keep channels navigable. Princes Channel was deepened in two phases between 2003 and 2006 (Port of London Authority, 2007), and is one of the main approach channels to the Port of London from the south. This operation was found to cause localised changes to hydrodynamic properties of the areas immediately adjacent to the Channel, but will not affect areas outside (Port of London Authority, 2004). Around 60% of vessel movements related to the Port of London travel through this channel, including cargo vessels, aggregate dredgers, cross-channel ferries and small tankers (Port of London Authority, 2004). There may be a requirement for ongoing maintenance dredging in Princes Channel, the impact of which is unknown, but is envisaged to be localised. There is also a sand placement site in the deeper water of North Edinburgh Channel where dredged material from Princes channel was placed in 2006 and 2008.

An offshore windfarm has planning consent for construction on part of Long Sands. The installation and operation of this wind farm could possibly result in modification to the structure of the sandbank as a result of the piling of turbine bases and the installation of cabling. The onshore cable route would run through the Queens Channel and Knock Deep. The area of sandbank occupied by the windfarm compared to the entire extent of the sandbanks will be very small (0.001% of Long Sand area in total (RPS Group PLC, 2005)) and the Environmental Statement deemed construction activities not to have a significant impact on the sandbank habitat (RPS Group PLC, 2005).

Licensed aggregate extraction areas are located off the northern tip of the site outside of the boundary and partially within the site at the north east. The area of coincidence between the licence area and sandbank could result in a direct impact associated with extraction. However the aggregate dredging activity is focussed on gravel extraction and any migration of sandbank across the gravel resource will exclude the extraction operations (this can be verified via observations of dredging activity using electronic vessel monitoring system). The nature of the extraction may cause a sediment plume on to the site, creating turbidity increases on benthic communities within the site. However the sandbank communities are adapted to frequent erosion and accretion of sediment, and their sensitivity to such turbidity changes is considered to be low and the turbidity is unlikely to exceed natural background suspended sediment concentrations (Hitchcock & Drucker,1996; Newell *et al,* 1998; CIRIA, 2000; Newell *et al*, 2002).

Fishing activity within the Margate and Long Sands boundary includes set and drift-net trammelling, drift gill netting, and a limited amount of beam trawling for sole (primarily carried out at in the troughs between banks and on the slopes of banks, as the bank crests are generally too shallow to allow trawling) (RPS Group PLC, 2005, Wiggins & Griffiths, 2006). Suction dredging for cockles is carried out on mudflats off the Kent coast and is not considered to have a long term impact on the structure of the sandbanks and the communities which they support due to the mobile nature of the sandbanks, being resilient to the re-suspension of sediment (Bell & Walker,

2005; Elliott *et al,* 1998). Trawling intensity within the Margate Sands area is considered to be medium to low (BMT Cordah, 2003), and much of the Long Sands area is too shallow to allow trawling, although it is known to occur in the deeper channels (RPS Group PLC, 2005).

The Margate and Long Sands site is graded III (average or partly degraded structure).

Degree of conservation of functions
Apart from the north east extension of long sands head (Burningham & French 2009, UKHO 2009, 2010) there is no evidence for the migration of the sandbanks within the Margate and Long Sands site in any one particular direction over time (RPS Group PLC, 2005). In the absence of anthropogenic disturbance the physical structure of the sandbank system is likely to change slightly, but it is not likely that the sandbank will lose its Annex I characteristics. The biological communities on the sandbank are adapted to a highly mobile sediment environment, and are therefore not likely to be affected by long-term natural changes in the sandbank structure. The functioning of the site may be affected by maintenance dredging of Princes Channel. Maintenance dredging is recognised as essential to the safety and continued operation of ports, harbours and marinas, and has been going on for many years in most locations and European sites were, in many cases, designated with these operations already taking place (Defra, 2007). The prospects of this feature to maintain its structure in the future, taking into account known pressures and management of activities through appropriate mechanisms, are good (e.g. Defra, 2007).

The Margate and Long Sands site is graded II (good prospects).

Restoration possibilities
Margate Sand has not been damaged according to the assessment criteria. The Long Sands sandbank has not been demonstrated to be excessively damaged. Restoration methods on Long Sands would be likely to focus on appropriate management of activities assessed to be causing damage to the sandbanks structure and function. Overall it is considered that the prospects of habitat restoration are good. Given that Long Sands is influenced by tidal currents from the North Sea, and acts as a sink for tidally-carried sediments, the possibility of renewing the physical structure of the banks, and associated benthic communities is good.

The site is graded II (restoration possible with average effort).

Overall (synthesis) grade
Margate and Long Sands has been graded a score of III for the conservation of structure sub-criterion, a score of II for the conservation of function sub-criterion and a score of II for the restoration possibilities sub-criterion.

The overall grade for the conservation of structure and function criterion is grade C (average or reduced conservation).

7.1.4 Global assessment (d)

Overall the site has intermediate grades for criteria 1A (a), 1A (b) and 1A(c). It represents an area of sandbank area which is of good and high quality, and representative of a highly dynamic tidally-influenced estuary mouth sandbank. It is also representative of sandbanks within the Thames Estuary which are influenced by currents from the North Sea (this group includes Sunk Sand, Gunfleet Sand and Kentish Knock). The biological communities on the bank are representative both of the North Sea and of the greater Thames Estuary sandbank system. The site is currently modified by human activity, and with construction of the London Array offshore wind farm (planned to commence in 2011) this activity is likely to increase.

The site is graded B for the global assessment criterion (site holds excellent stands of Annex I habitat, but of somewhat lower value than grade A sites).

7.2 Summary of scores for Stage 1A criteria

	Representativity (a)	Relative surface (b)	Structure and function (c)	Global assessment (d)
Margate and Long Sands	**A**	**B**	**C**	**B**

7.3 Mudflats and sandflats not covered by seawater at low tide

Non-qualifying Annex I habitats

Mudflats and sandflats not covered by seawater at low tide

This habitat has been included within the boundary as a non-qualifying feature simply because it describes the tops of the sandbanks which are uncovered at low tide, and these areas are not considered to be particularly representative of this habitat type. For this reason these sections of Annex I habitat have been graded D (non-significant presence) for the Stage 1A representativity criterion. Current guidance states that no further assessment of these features against site selection criteria is required (Commission of the European Community, 1995).

Mudflats and sandflats not covered by seawater at low tide cover 3215 ha, which is approximately 5% of the total site area.

8. Sites to which this site is related

The site boundary overlaps with the Outer Thames potential Special Protection Area for the Annex 1 species red throated diver.

9. Supporting scientific documentation

Scientific information on the topography, habitats and species present within the Margate and Long Sands site boundary is available from a number of sources (Table 9.1).
Table 9.1 Sources of data within the Margate and Long Sands cSAC boundary.

Reference	Description
BURNINGHAM H & FRENCH J, 2009. Seabed mobility in the greater Thames Estuary. The Crown Estate.	Historical data on the movements of sandbanks.
EMU LTD, 2004. Edinburgh Channel Development: Marine Biological Survey. Report No. 04/J/1/03/0609/0521.	Benthic survey for Port of London Authority trawl sampling.
EMU LTD, 2006a. Benthic Survey of the Outer Thames Estuary Sandbank System. Final Report. Report 06/J/1/03/0837/0572 for English Nature.	Investigative benthic survey grabs, trawl & dredge sampling.
EMU LTD, 2006b. Kentish Flats Windfarm Development Macrobenthic Ecology Study – 2005. Final Report June 2006 Report No. 05/J/1/03/0772/0510.	Survey for windfarm EIA including grab sampling.
ENTEC UK PLC, 2008. SAC Selection Assessment: Greater Thames Estuary.	Survey to specifically identify Annex I interest features grab sampling, drop-down video.
MARINE ECOLOGICAL SURVEYS Ltd, 2002. Fish and Epibenthic Invertebrate Resources, Princes Channel, Outer Thames Estuary. Vols 1-2.	Biological survey for Port of London Authority trawl sampling.
RPS GROUP PLC, 2005. Environmental Statement. Volume 1: Offshore Works. London Array Ltd.	Survey for windfarm EIA including grab sampling.

Reference	Description
SEAZONE SOLUTIONS LTD, 2009. Digital Survey Bathymetry for the Thames REC study area.	SeaZone Digital Survey Bathymetry (DSB), digitised through funding from the Marine Aggregate Levy Sustainability Fund (MALSF) Regional Environmental Characterisation (REC) studies.
UKHO, 2009. Thames Estuary Long Sands Head: Assessment on the analysis of routine resurvey area TE5A from the 2008 survey.	Acoustic survey of the movement around Long Sands Head.
UKHO, 2010. Thames Estuary Long Sands Head: Summary assessment on the analysis of routine resurvey area TE5A from the 2009 survey.	Acoustic survey of the movement around Long Sands Head.

10. Site overview and conservation interest

10.1 Sediment Conditions and Bathymetry

Margate and Long Sands contains a series of sandbanks, the largest of which is Long Sand itself. Long Sand is the largest of the linear banks in the outer Thames estuary, lying in a north east - south west orientation along the line of the tidal flows entering the estuary from the North Sea. The bank stretches approximately 45km from Long Sand Head at the northern end to Prince's Channel at the southern end. The bank is bordered on the east by Knock Deep, and on the West by Black Deep and is asymmetric; the western edge is much steeper than the gently-sloping eastern face. The bank extends at its south west tip to include Tizard Bank and Knob Shoal. The bank varies in width from 2.5km to 8km, with crest depths varying from +1.7m to -3.6m CD (RPS, 2005). The 'Margate' sandbanks within the boundary include Margate Sand, Margate Hook and Tongue Sands. These banks are mainly orientated east-west, approximately along the line of the predominant tidal flow in the southern part of the estuary which comes from the English Channel. All of the sandbanks have sections which are uncovered at low tide.

A number of channels cross the banks, some of which are naturally formed. Of these, the most important is Fisherman's Gat, which is the main shipping route through Long Sand. Shallower channels include Foulger's Gat and the South Edinburgh Channel. Princes Channel runs east to west at the southern tip of Long Sands and, Queens Channel runs between Margate Sand and the Tongue Sands/Pan Sand banks. These channels are two of the main approach routes into the Port of London, yet only Princes Channel has been dredged for the first time between 2003 and 2006. It has been suggested that Long Sands forms a barrier between the influences of tides from the North Sea and the English Channel. As the timing of these tides is slightly different, the channels may play an important role in balancing out the water flows across the bank (RPS Group PLC, 2005).

In common with the majority of the Outer Thames area, Margate Sands is characterised by shallow water, high tidal current streams and mobile substrates. The site contains shallow sandbanks arranged in a linear formation and aligned along the axis of the principal tidal flow. There is little evidence of sandwave fields but isolated sandwaves are present around the edges of banks (UKHO, 2007).

Net sediment transport around the banks is predominantly in a clockwise direction (HR Wallingford *et al,* 2002, UKHO, 2006), and the banks are largely fed with sediment arriving from the east, which is carried into the Thames Estuary from the North Sea along a pathway to the south of Kentish Knock. Long Sands, Margate Sand and Tongue Sand are considered to be sediment sinks within the greater Thames estuary for sediments arriving from the English Channel (H R Wallingford *et al*, 2002; RPS Group PLC, 2005). Routine resurvey work by the UK Hydrographic Office in the area of Margate Road between 1998 and 2006 (UKHO, 2007) gives an indication of

the stability of the sandbank system around Margate Sand itself. These data show that in this 9 year period there has been little change to the limits of Margate Road, and that Margate Sand has retained its position (although the indentation in the south side of the bank has moved approximately 500m westwards). However, the un-named narrow bank to the north of South Channel has moved approximately 100m south and extended eastwards. This eastwards extension is considered to be a long term trend caused by the westward flow of sediment along the south of the bank, and there is evidence of a 1.3km movement in the 60 year period between 1947 and 2006 Entec, 2008a). The northernmost end of the Long Sand shows the most movement: Long Sand Head has extended north eastwards by 4.5km over the last 180 years up to 2005 (Burningham & French, 2009). More recently, this head extension has increased to a rate of around 550m in the last 4 years (UKHO, 2009, 2010). Along the eastern margin of Long Sands, the northern section has advanced eastwards towards Knock Deep at a rate of approximately 12m/yr between 1978 and 2002, while the southern section has receded by up to 25m/yr (Entec, 2008a). The bank is encroaching on Foulger's Gat from the south west, and this channel may close in the future. Similarly the Edinburgh Channel is getting shallower, and there is evidence that the Fisherman's Gat is taking over the role of balancing water flows; recently the South Edinburgh Channel has 'sealed' and the Fisherman's Gat has opened further in response (Entec, 2008a).

Sediments within the site boundary are predominantly sand, with some areas of muddy sand and gravelly sand. In shallower areas at the top of the banks, sediments are mainly well-sorted sand with low silt content. In the troughs the sediments contain more silt and gravel, and there are patchy areas covered in dead bivalve shells. In the Queens Channel there is some visual evidence of patchy anoxic sediment, characteristic of increasing silt, sediment stability, and organic content (Entec, 2008a; Emu, 2006a). At the edge of the Kentish Flats, on the western part of the boundary area, the sediment is mainly sand with some gravelly sand (Emu 2006a). Long Sand exhibits tidal current induced sediment bedforms such as sand ripples, megaripples and sand waves occur throughout the area, reaching heights of up to 5m in some areas. The ripples are generally orientated north-west to south-east and occur primarily on the slopes and crests of the sandbanks. Sediments at Foulger's Gat and Fisherman's Gat consist of sand, blending to sandy gravel towards the bank margins. (RPS Group PLC, 2005). The South Edinburgh channel comprises mainly poorly sorted sandy silt with some anoxic clay and patches of dead oyster shells (*Crassostrea gigas*) (Emu, 2006a). Long Sands Head is composed of gravelly sand, which becomes muddier to the north (RPS Group PLC, 2005).

10.2 Benthic Invertebrate Communities

The benthic fauna of the Margate and Long Sands area is typical of a stressed, mobile sediment environment, a habitat typically found in this area of the North Sea. Mobile sediment is a continually disturbed environment where the substrate is subjected to tidal or wave driven movement. The number of invertebrate species recorded at each site is highly variable across the survey area reflecting the variability in the substrate type. In areas where well-sorted sand predominates, namely the crests of sandbanks, species diversity and abundance are low. This increases between the sandbanks, where silt content increases and the sediment is less well-sorted.

The *Nepthys cirrosa* and *Bathyporeia* spp. in infralittoral sand biotope (SS.SSa.IFiSa.NcirBat Connor *et al*, 2004) is the most widespread biotope within the boundary site, occurring on most of the shallower sandbanks and extending into 10 – 20 m depth. This can be species-poor in some areas, especially in the shallower parts of Long Sand. These areas resemble the relatively barren biotope 'Infralittoral Mobile Clean Sand with Sparse Fauna' (SS.SSa.IFiSa.IMoSa), which occurs on most mobile sands, but overall there is sufficient fauna to justify retaining most of these areas within the NcirBat biotope (RPS Group PLC, 2005; Emu, 2006a).

At the edge of the Kentish Flats and Long Sand, annelid worms account for the largest number of species and biomass, followed by crustaceans. The Spionid bristleworms *Magelona johnstoni*, and *Spiophanes bombyx* are the dominant species found. The trumpet worm, *Lagis koreni*, is also

widely recorded throughout the site. Crustaceans also account for a considerable amount of biomass. Other abundant species are the sea spider *Nymphon brevirostre*, and various ribbon worms (nemerteans) (Emu, 2006a).

Species richness and abundance is higher in the Queens Channel compared to the other sandbanks. The reef building ross worm *Sabellaria spinulosa* accounts for the majority of the polychaete abundance. *S. spinulosa* is found in areas predominantly with gravelly muddy sand, although it is even found in muddy sandy gravel and muddy sand. However, even though *S. spinulosa* abundances are high, the worm was found in patches rather than a definable reef. Other abundant polychaetes are the tube worm *Owenia fusiformis*, the bristleworm *Spiophanes bombyx,* the trumpet worm, *Lagis koreni*, and the sand mason worm *Lanice conchilega* (Entec, 2008a) Molluscs are also widely distributed on the slopes, and have the second highest abundance after polychaetes. Species identified included those typically associated with sands and sandy gravels. These included, but were not limited to, burrowing bivalves, such as *Abra alba* and *Ensis arcuatus*, sessile epibenthic bivalves, such as blue mussel *Mytilus edulis*, and sediment dwelling gastropods. In the deeper parts of the Queens Channel there are many molluscs that live on the surface of the sea bed (epifauna). These include the mobile Queen Scallop *Aequipecten opercularis*, sea slug *Acanthodoris pilosa*, and mobile scavenging gastropods, such as the common whelk *Buccinum undatum*. Overall, the abundance of epifaunal species is considered to be low compared to more sheltered, coastal areas (Emu, 2006a).

Crustaceans are also widespread across the site. The most common crustacean is the brown shrimp *Crangon crangon* with the common hermit crab *Pagurus bernhardus* as the next most common species found. Other species widely recorded were the crabs *Macropodia rostrata* and *Liocarcinus holstatus*, and the pink shrimp *Pandalus montagui* (Emu, 2006a). Echinoderm species are widespread across the Long Sands but with a relatively low diversity of species and abundance. Species include the common starfish *Asterias rubens*, the green sea-urchin *Psammechinus miliaris*, and the brittlestars *Ophiura albida* and *O. ophiura*. Other species recorded are the encrusting bryozoans (e.g. *Conopeum reticulum*) and hydroids (e.g. *Vesicularia spinosa* and *Hydractinia echinata* living on the shells of hermit crab), (RPS Group PLC, Emu, 2006a). The European common squid *Loligo vulgaris* was also frequently recorded.

10.3 Fish

Long Sands is a nursery ground for a wide variety of fish, such as sole *Solea solea*, plaice *Pleuronectes platessa*, dab *Limanda limanda*, herring *Clupea harengus*, whiting *Merlangius merlangus*, pout *Trisopterus luscus*, pogge *Agonus cataphractus*, horse mackerel *Trachurus trachurus,* sprats *Sprattus sprattus*, sea bass *Dicentrarchus labrax* and a variety of rays. Fish of high importance as food items for other fish and birds include sprats and herrings, gobies (mainly sand gobies *Pomatoschistus minutus* and transparent gobies *Aphia minuta*), sand eels, *Ammodytes* spp., and flatfish of various species (RPS Group PLC, 2005; Emu, 2006a). Margate Sands site is likely to be of particular importance as a spawning area for herring, and possibly for sandeel (BMT Cordah, 2003).

The Long Sands area is fished using set and drift net trammelling, drift gill netting and beam trawling, although the beam trawling only occurs on the deeper slopes and troughs as the tops of the banks are too shallow for trawling (RPS Group PLC, 2005).

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12. Glossary

Abiotic Devoid of life

Amphipods are shrimp-like crustaceans ranging from 1 mm to 140mm in length Marine amphipods may be pelagic (living in the water column) or benthic (living on the seabed). Pelagic amphipods are eaten by seabirds, fish, and marine mammals.

Banner Banks are generally only a few kilometres in length with an elongated pear-shaped form (Dyer and Huntley, 1999). They commonly lie in the lee of fixed obstacles such as headlands, islands, submerged rock shoals and gaps in rock ridges. They are sometimes paired on either side of the obstacle, with one larger than the other indicating a net direction of sand transport (Stride, 1982). Banner banks may also occur in areas with rapid deepening of water away from the coast and are less evident off coasts with a low offshore slope (Dyer and Huntley, 1999). Examples occur in the English Channel, Irish Sea and North Sea.

Bedforms Ripples moulded by a flow of water. Bedforms range in size from ripples in the sand, a few centimetres apart, to 'dunes' tens of metres in length.

Benthos Those organisms attached to, or living on, in or near the seabed.

Biotic Relating to, produced by, or caused by living organisms.

Biotope The physical habitat with its biological community; a term which refers to the combination of physical environment and its distinctive assemblage of conspicuous species.

Bivalves A class of molluscs which are laterally flattened and have a shell made of two hinged valves.

Bryozoans are tiny colonial animals that generally build stony skeletons of calcium carbonate, superficially similar to coral (although some species lack any calcification in the colony and instead have a mucilaginous structure).

Crinoids A class of echinoderms having a cup-shaped body with feathery arms, attached to the substratum, sometimes by a stalk.

Crustaceans A class of invertebrates which includes crabs, shrimps and barnacles.

Crustose Forming a thin crust on the substratum**.**

Dredging plumes

- **Fishing** Dredging stirs up the sediment at the bottom of the sea. The suspended solid plumes can drift with the current for tens of kilometres from the source of the trawling. These plumes introduce turbidity which decreases light levels through the water column.

- **Aggregate dredge plumes** Marine aggregate extraction can result in increased sediment concentrations in the water column – dredge plumes - either from the disturbance of the seabed by or through the return of excess water and associated suspended sediment from the dredging vessel itself through either overspill returns or screening. The most significant input will result from overspill/screening returns, however because the sediments being dredged are relatively coarse the majority of suspended sediment concentration will settle out relatively quickly – typically within 200m of the point of return. The remaining fine sediment component, along with associated organic matter, can extend considerably further, however the concentrations of these will also dissipate over time and distance.

Epifauna Animals living on the surface of the seabed.

Estuary mouth Dyer and Huntley (1999): "…in general linear sand ridges are associated with the mouths of macro-tidal estuaries (wide mouth), and tidal deltas are associated with meso-tidal or micro-tidal estuaries (narrow mouth)." The banks are generally "aligned with the tidal current flow and migrate away from their steeper face." Examples include Long Sand and Gunfleet Sand (in the Thames Estuary) and banks in The Wash.

Foliose Bearing leaves or leaf-like structures.

Fauna Animal life in an area.

GIS Geographic Information System.

Habitat The place in which a plant or animal lives.

Headland associated sandbanks Dyer and Huntley (1999): "Tidal eddies produced by headlands can create 'banner banks, but when the headland is retreating 'alternating ridges' can be formed which can become isolated from the coast as it recedes." "With very slow retreat the surplus sand will accumulate as a banner bank in a position of convergence. With coastline retreat, a series of alternating banks will result with each successive one more distant from the shoreline." Banner banks are only a few km in size and have an elongated pear-shaped form with the broad end being orientated towards the tip of the headland. Alternating ridges may be linear or V or S shaped.

Hydroids Solitary and colonial animals with a cylindrical; body which is closed at one end with a mouth surrounded by tentacles at the other.

Infauna Bethic animals which live within the seabed.

Linear Sandbanks are elongated banks which can be up to tens of kilometres long and less than ten kilometres wide. They lie generally parallel or at a slight angle to peak tidal currents. They can be found in open seas but are also common in large estuaries such as the Thames Estuary.

Long lining A commercial fishing technique that uses hundreds or even thousands of baited hooks hanging from a single line.

Maerl Twig-like unattached (free living) calcareous red algae, often a mixture of species and including species which form a spiky cover on loose small stones.

Maintenance dredging Required to maintain water depths in areas where sedimentation occurs, particularly shipping channels to maintain a safe depth for the passage of vessels. It involves the removal of recent unconsolidated sediments, such as mud, sand and silt.

Megaripple Mounds or ridges of sand which are asymmetrical, and are produced under water by flowing water. The external morphology is similar to the smaller 'ripple' and larger 'sandwave, with a gently sloping, upstream side, and a steeper downstream side.

Nemerteans A phylum of invertebrate animals also known as *ribbon worms* or *proboscis worms*.

Open shelf ridge - Dyer and Huntley (1999): 'Nearly all shallow tidal seas, where currents exceed about 05m s-1 and where sand is present, have ridges. These can be up to 80km long, and typically average 13km width and tens of metres in height. Their spacing tends to be proportional

to their width. The bank crests are flat in shallow water, but are sharp when water depth is large enough to limit wave effects.' Examples include South Falls and Indefatigables.

Polychaete A class of marine annelid worms.

Potting The setting of traps (pots) on the seabed to fish for lobsters, crabs etc.

Sand wave A large, ridge-like structure resembling a water wave on the upper surface of a sedimentary bed that is formed by water currents. Also known as sand ridge.

Sandy mounds Distinct sandbanks (i.e. elongated, rounded or irregular 'mound' shapes) which cannot be categorised as any of the other types.

Seagrass(es) Higher plants (angiosperms) that are adapted to living submerged in seawater.

Shoaling localized shallowing of water.

Sinuous Banks are 'S' or 'V' shaped sandbanks and are common off the Norfolk coast and in the southern North Sea. They are large scale features and may occur in extensive groups which can include linear banks.

Sinusoidal having a succession of waves or curves .

Static gear Any gear which is set in position and not moved during the fishing process. Examples include:

- Gill nets which are set at or below the surface, on the seabed, or at any depth in-between.
- Setting pots on the seabed to capture lobsters and crabs.
- Long lining when a single line is set to capture cod, skate, bass and whiting.

Submarine cables Cables which are laid beneath the seabed to carry telecommunications or power to offshore installations or different countries.

Trawling Towing equipment behind a vessel for commercial fishing principally for cod, plaice and sole. Bottom trawls collect demersal (living on or near the seabed) species and mid-water trawls collect pelagic (living in the water column) species. Examples of towed gears include beam trawls, dredges and trawl nets.

Turbidity This is a measure of the attenuation of light in the water column and can be caused by the light adsorption properties of the water, plankton, suspended particulate organic matter and dissolved colour.

Appendix 1

Guidelines on drawing boundaries (taken from JNCC, 2008)

1 Introduction

Previous UK guidance on defining SAC boundaries states that "as a general principle, site boundaries have been drawn closely around the qualifying habitat types … for which the sites have been selected, taking into account the need to ensure that the site operates as a functional whole for the conservation of the habitat type… and to maintain sensible management units". Further "the seaward boundaries of the sites have been drawn as straight lines, to ensure ease of identification on charts and at sea" (Brown *et al,* 1997; McLeod *et al,* 2005). The guidance presented below is an expansion of previous guidance on defining boundaries for marine SACs, specifically for sites which are not connected to the coastline, and which may be in deep water (200m to more than 1000m).

2 Guidance

Actual site boundaries will be determined on a site specific basis, following the general guidance set out below.

2.1. The habitat area of interest will be identified and mapped. In many cases in waters away from the coast, this will involve some form of modelling, such as use of seabed geological data (interpolated from seismic tracks and samples), interpreted sidescan sonar, acoustic and/or bathymetric data.

2.2 The minimum area necessary in order to ensure the essential level of protection for the Annex I habitat of interest will be defined. More complex site shapes drawn more tightly around feature of interest are favoured over simple square/rectangular boundaries (to reduce the area of 'non-interest-feature' included within the site boundary). However, boundaries should still be as simple as possible, using a minimum number of straight lines and vertices. Contrary to previous JNCC boundary guidance (JNCC, 2004) site boundary co-ordinates do not have to be defined by whole degrees and minutes. It is recommended that site boundary coordinates will be provided in degrees, minutes, seconds.

2.3 Where habitat of interest occurs in a number of separate 'pieces' with 'non-interest-feature' habitat between, the preference is to include all 'pieces' within a site boundary to enable effective conservation of the feature of the site and to maintain its ecological function. However, where small, isolated instances of habitat occur at some distance from the main location of the habitat, these may be excluded from the site if their inclusion would result in large areas of 'non-interest-feature' being included within the site boundary.

2.4 The area defined under 2 above may then be extended if necessary in the following circumstances:

i). to ensure an essential level of protection from potentially damaging activities at the site, taking into account water depth at the site and possible location of mobile gear on the seabed in relation to location of a vessel at the sea surface. Activities which are location specific, always subject to prior consent and have clear reliable methods of enforcement are already controlled under existing procedures such as licensing of these activities. Mobile activities which may affect seabed habitats, such as fishing and anchoring, are not subject to prior consent procedures and therefore need special consideration. The length of warp used by boats when trawling is largely determined by water depth. The following table gives the appropriate distance beyond the seabed extent of the habitat by which the site boundary at the sea surface may be extended (based on generalised trawl warp lengths, SERAD, 2001):

Water Depth	Ratio warp length: depth	Approx. length of trawl warp	Boundary extension to be added to the habitat area of interest
Shallow waters (≤ 25m)	4:1	100m at 25m depth	4 * actual depth
Continental shelf (50-200m)	3:1	600m at 200m depth	3 * actual depth
Deep waters (200 to over 1000m)	2:1	2000m at 1000m depth	2 * actual depth

Note that the margin is incorporated as a minimum measure to reduce the likelihood of habitat damage from demersal fishing. However, these boundaries are SAC boundaries, not management boundaries. Ultimately Competent Authorities are responsible for considering which management actions might need to be taken under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations to reduce the risk of damage to the features associated with human activities, whether within or outside the site boundary. As a consequence, future management measure may have different boundaries to the SAC site boundary.

ii). For mobile habitats (for example, sandbanks), to ensure the minimum area necessary to allow conservation of the structure and functions of the habitat. Such extension will be determined on scientific understanding of the structure and functions of the habitat.