

Offshore Oil & Gas Licensing

26th Seaward Round

Southern North Sea

Blocks 41/18, 41/19, 41/20, 41/24, 41/25, 42/27, 43/15a, 43/20a, 43/20c, 44/01, 44/02, 44/03, 44/04, 44/05, 44/14, 44/15, 44/16a, 44/17d, 44/17e, 44/17f, 44/18c, 44/23c, 44/23d, 44/24c, 44/30, 45/01, 47/02b, 47/03g, 47/06, 47/07, 47/13b, 47/18, 47/19b, 48/08d, 48/09b, 48/14c, 48/18e, 48/19d, 48/20b, 48/25a, 48/30c, 49/14a, 49/17d, 49/18b, 49/19b, 49/21c, 49/22b, 49/23b, 49/23c, 49/24d, 49/26b, 49/27c, 49/28c, 52/05c, 53/01b and 53/02c

Appropriate Assessment

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1 Introduction

1.1 Background and purpose

On 27th January 2010, the Secretary of State for the Department of Energy and Climate Change (DECC) invited applications for licences in the 26th Seaward Licensing Round.

To comply with obligations under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) (OPAR 2001), in summer 2010, the Secretary of State undertook a screening assessment to determine whether the award of any of the Blocks applied for would be likely to have a significant effect on a relevant European conservation site, either individually or in combination with other plans or projects (DECC 2010).

In so doing, the amplification of the Habitats Directive test provided by the European Court of Justice in the Waddenzee case (Case C-127/02) was used, as follows:

Any plan or project not directly connected with or necessary to the management of a site must be subject to an Appropriate Assessment if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects.

Where a plan or project not directly connected with or necessary to the management of the site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light, inter alia, of the characteristics and specific environmental conditions of the site concerned by such a plan or project.

An initial screening assessment (including consultation with the statutory agencies/bodies), identified 99 whole or part Blocks as requiring further assessment prior to decisions on whether to grant licences. Because of the wide distribution of these Blocks around the UKCS, the Appropriate Assessments (AA) in respect of each potential licence award, are contained in seven regional reports as follows:

- Southern North Sea
- Outer Moray Firth
- Central North Sea
- Fair Isle Channel
- Northern Ireland
- Eastern Irish Sea
- Central English Channel

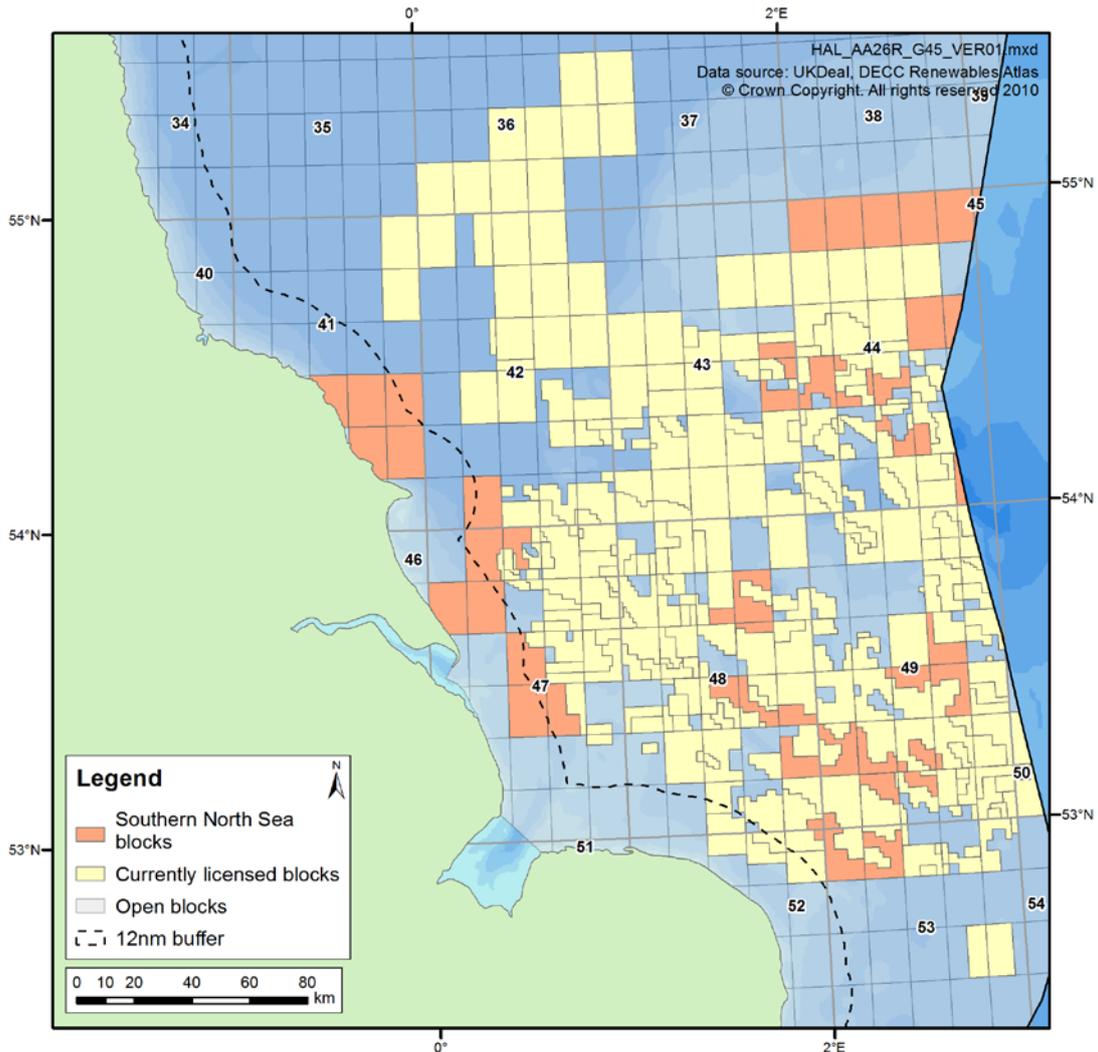
This report documents the further assessment in relation to 56 Blocks in the southern North Sea (see Section 1.2).

1.2 Southern North Sea Blocks

The southern North Sea Blocks applied for in the 26th Round considered in this document are listed below and shown in dark orange in Figure 1.1.

41/18	44/02	44/18c	47/13b	48/30c	49/26b
41/19	44/03	44/23c	47/18	49/14a	49/27c
41/20	44/04	44/23d	47/19b	49/17d	49/28c
41/24	44/05	44/24c	48/08d	49/18b	52/05c
41/25	44/14	44/30	48/09b	49/19b	53/01b
42/27	44/15	45/01	48/14c	49/21c	53/02c
43/15a	44/16a	47/02b	48/18e	49/22b	
43/20a	44/17d	47/03g	48/19d	49/23b	
43/20c	44/17e	47/06	48/20b	49/23c	
44/01	44/17f	47/07	48/25a	49/24d	

Figure 1.1: Location of southern North Sea Blocks



2 Licensing and activity

2.1 Licensing

The exclusive rights to search and bore for and get petroleum in Great Britain, the territorial sea adjacent to the United Kingdom and on the UK Continental Shelf (UKCS) are vested in the Crown and the *Petroleum Act 1998* (as amended) gives the Secretary of State the power to grant licences to explore for and exploit these resources. The main type of offshore Licence is the Seaward Production Licence. Offshore licensing for oil and gas exploration and production commenced in 1964 and has progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence may cover the whole or part of a specified Block or a group of Blocks. A Licence grants exclusive rights to the holders “to search and bore for, and get, petroleum” in the area covered by the Licence. A Licence does not confer any exemption from other legal/regulatory/fiscal requirements.

There are three types of Seaward Production Licences:

- Traditional Production Licences are the standard type of Seaward Production Licences and run for three successive periods or Terms. Each Licence expires automatically at the end of each Term, unless the licensee has made enough progress to earn the chance to move into the next Term. The Initial Term lasts for four years and the Licence will only continue into a Second Term of four years if the agreed Work Programme has been completed and if 50% of the acreage has been relinquished. The Licence will only continue into a Third Term of 18 years if a development plan has been approved, and all the acreage outside that development has been relinquished.
- Frontier Production Licences are a variation of the Traditional Production Licence with longer terms. A Frontier Production Licence has a longer Initial Term (six years as opposed to four) with the objective of allowing companies to screen larger areas. After 3 years, the licensee must relinquish 75% of the licensed acreage. At the end of the Initial Term, the exploration Work Programme must have been completed and the licensee must relinquish 50% of what is left (i.e. leaving one eighth of the original licensed area).
- In the 21st Round (2002) the Department introduced Promote Licences. The general concept of the Promote Licence is that the licensee is given two years after award to attract the technical, environmental and financial capacity to complete an agreed Work Programme. In effect, DECC will defer (not waive) its financial, technical and environmental checks until the preset Check Point. Promote licensees are not allowed to carry out field operations until they have met the full competence criteria. The way this is implemented is that each Promote Licence carries a "Drill-or-Drop" Initial Term Work Programme. The Licence will therefore expire after two years if the licensee has not made a firm commitment to DECC to complete the Work Programme (e.g. to drill a well). By the same point, it must also have satisfied DECC of its technical, environmental and financial capacity to do so.

The model clauses and terms and conditions which are attached to Licences are contained in Regulations.

It is noted that the environmental management capacity and track record of applicants is considered by DECC, through written submissions and interviews, before licences are awarded.

2.2 Activity

As part of the licence application process, applicant companies provide DECC with details of work programmes they propose in the first term to further the understanding or exploration of the Block(s) in question. These work programmes are considered with a range of other factors in DECC's decision on whether to license the Blocks and to whom. There are three levels of drilling commitment:

- A **Firm Drilling Commitment** is a commitment to the Secretary of State to drill a well. Applicants are required to make firm drilling commitments on the basis that, if there were no such commitment, the Secretary of State could not be certain that potential licensees would make full use of their licences. However, the fact that a licensee has been awarded a licence on the basis of a "firm commitment" to undertake a specific activity should not be taken as meaning that the licensee will actually be able to carry out that activity. This will depend upon the outcome of all relevant environmental assessments.
- A **Contingent Drilling Commitment** is also a commitment to the Secretary of State to drill a well, but it includes specific provision for DECC to waive the commitment in light of further technical information.
- A **Drill or Drop (D/D) Drilling Commitment** is a conditional commitment with the proviso, discussed above, that the licence is relinquished if a well is not drilled.

Note that Drill-or-Drop and Contingent work programmes (subject to further studies by the licensees) will probably result in a well being drilled in less than 50% of the cases.

It is made clear in the application guidance that a Production Licence does not allow a licensee to carry out all petroleum-related activities from then on. Field activities, such as seismic survey or drilling, are subject to further individual controls by DECC, and a licensee also remains subject to controls by other bodies such as the Health and Safety Executive. It is the licensee's responsibility to be aware of, and comply with, all regulatory controls and legal requirements.

The proposed work programmes for the first four-year period (six years in the case of Frontier licences) are detailed in the licence applications. For some activities, such as seismic survey noise and oil spills, the impacts can occur some distance from the licensed Blocks and the degree of activity is not necessarily proportional to the size or number of Blocks in an area. For the case of direct physical disturbance, the licence Blocks being applied for are relevant, although there may still be pipelines that cross unlicensed Blocks should any significant development ensue after the initial four-year exploratory period.

The approach used here has been to take the proposed activity for a given Block as being the maximum of any application for that Block, and to assume that all activity takes place as a result of the structuring of licences. The Blocks comprising individual licences and estimates of work commitments for the Blocks derived by DECC from the range of applications received are listed below and grouped geographically:

Nearshore Area

- 41/18, 41/19 – Contingent well, to be drilled from land
- 41/20, 41/24, 41/25 - Drill or drop well
- 42/27 - Drill or drop well

- 47/02b, 47/03g - Drill or drop well and 160 sq km new shoot 3D seismic
- 47/06, 47/07 - Drill or drop well
- 47/13b, 47/18, 47/19b – Contingent well on 47/13b

Dogger Bank Area

- 43/15a, 43/20a - Drill or drop well and 100 sq km new shoot 3D seismic
- 43/20c - Drill or drop well
- 44/01, 44/02, 44/03 - Drill or drop well
- 44/04, 44/05, 45/01 - Drill or drop well and 312 sq km new shoot 2D seismic
- 44/14, 44/15 - Drill or drop well
- 44/16a, 44/17d, 44/17f – Firm well
- 44/17e - Drill or drop well
- 44/18c - Drill or drop well
- 44/23c - Drill or drop well
- 44/23d, 44/24c - Drill or drop well
- 44/30 – Two drill or drop wells

Southern Area

- 48/08d, 48/09b, 48/14c - Drill or drop well
- 48/18e, 48/19d – Drill or drop well
- 48/20b - Drill or drop well
- 48/25a - Drill or drop well
- 48/30c, 49/26b, 52/05c, 53/01b - Drill or drop well
- 53/02c - Drill or drop well
- 49/14a - Drill or drop well
- 49/17d - Drill or drop well
- 49/18b, 49/19b – Firm well and contingent well
- 49/21c - Drill or drop well
- 49/22b, 49/23c, 49/27c, 49/28c - Drill or drop well
- 49/23b, 49/24d - Drill or drop well

On past experience, less activity actually takes place than is bid at the licence application stage. A proportion of Blocks awarded may be relinquished without any field activities occurring.

Activity after the initial term is much harder to predict, as this depends on the results of the initial phase, which is, by definition, exploratory. Typically less than half the wells drilled reveal hydrocarbons, and of that half, less than half again will yield an amount significant enough to warrant development. Depending on the expected size of finds, there may be further drilling to appraise the hydrocarbons (appraisal wells). Discoveries that are developed may require further drilling, wellhead infrastructure, pipelines and possibly production facilities such as platforms, although most recent developments are tiebacks to existing production facilities rather than stand alone developments.

The extent and timescale of development, if any, which may ultimately result from the licensing of these Blocks is therefore uncertain and would be subject to further, project level assessment (incorporating Habitats Regulations Assessment (HRA) where appropriate) prior to any consent being issued.

DECC has issued guidance on Block specific issues and concerns and these concerns will affect DECC's decision whether or not to approve particular activities. Seasonal concerns

have been identified for the majority of Blocks on offer in addition to a number requiring seabed surveys prior to drilling activity taking place due to the potential presence of herring spawning sites (Table 2.1 and Section 7.1).

Table 2.1: Seasonal and other concerns related to Blocks considered in this Appropriate Assessment

Block	Period of concern for seismic surveys	Period of concern for drilling	Spawning sites*	Special Condition†
41/18, 41/19, 41/20, 41/24, 41/25, 42/27	August to October (Defra)	January to February & June to December (JNCC) August to October (Defra)	✓	✓
43/15a	-	January to April and September to October (JNCC)	-	-
43/20a, 43/20c	January to May (Defra)	January to April and September to December (JNCC)	-	-
44/01, 44/02, 44/03, 44/04, 44/05	-	October to November (JNCC)	-	-
44/18c, 44/23c, 44/23d, 44/24c	January to May (Defra)	October to December (JNCC)	-	-
44/30	-	October to December (JNCC)	-	-
47/02b	August to October (Defra)	January to February & June to December (JNCC) August to October (Defra)	✓	✓
47/03g	January to May and August to October (Defra)	January to February & June to December (JNCC) August to October (Defra)	✓	✓
47/06, 47/07, 47/13b	January to May (Defra) and August to October (Defra)	January to February & July to December (JNCC) August to October (Defra)	✓	✓
47/18	January to May (Defra)	November to December (JNCC) August-October (CEFAS)	-	✓
47/19b	January to May (Defra) and August to October (Defra)	November to December (JNCC) August to October (Defra)	✓	✓
48/08d	August to October (Defra)	August to October (Defra), January to May, August to December (JNCC)	✓	-
48/09b				
48/14c	-	August to October (CEFAS)	-	-
44/16a, 44/17d, 44/17e, 44/17f, 48/20b, 48/30c, 49/14a, 53/01b	January to May (Defra)	-	-	-
52/05c	January to May (Defra)	-	-	✓

Note: * seabed surveys should be undertaken before any drilling activity to confirm whether there are any herring spawning sites within a three-nautical mile radius of the proposed drilling location, † Activity is of concern to the MoD because the Block lies within training ranges. For further information see: [Other regulatory issues \(DECC 26th Seaward Licensing Round website\)](#).

3 Relevant Natura 2000 Sites

The Natura 2000 sites to be considered in this assessment were identified based on their location in relation to the 56 Blocks (see Section 1.2 above) which are the subject of licence applications and in terms of the foreseeable possibility of interactions. Sites considered include designated Natura 2000 sites (also referred to as ‘European Sites’) and potential sites for which there is adequate information on which to base an assessment.

The sites considered are listed and mapped in Appendix A and Appendix B presents the results of a screening exercise of these sites to identify the potential effects of activities that could follow the licensing of the 56 Blocks in question. In accordance with Government policy (as set out in Planning Policy Statement 9 (ODPM 2005a¹)), the relevant sites considered include classified and potential SPAs, designated and candidate SACs and Sites of Community Importance² (SCIs). Guidance in relation to sites which have not yet been submitted to the European Commission is given by Circular 06/2005 (ODPM 2005a) which states that: *“Prior to its submission to the European Commission as a cSAC, a proposed SAC (pSAC) is subject to wide consultation. At that stage it is not a European site and the Habitats Regulations do not apply as a matter of law or as a matter of policy. Nevertheless, planning authorities should take note of this potential designation in their consideration of any planning applications that may affect the site.”*

The relevant sites are detailed in Appendix A and include:

- Coastal and marine Natura 2000 sites along the east coast of England from the Northumbria coast to the Deben Estuary
- Offshore Natura 2000 sites in the southern North Sea
- Riverine SACs within the area for migratory fish.

In Dutch and German offshore waters, several SACs have been identified and are sufficiently progressed in the designation process to be considered as relevant sites in the context of AA.

Information gathering is in progress to inform the potential designation of further Natura 2000 sites, for instance the work of Kober *et al.* (2010). Should further sites be established in the future, these would be considered as necessary in subsequent project specific assessments.

Summaries of sites, together with their features of interest, and location maps are given in Appendix A (Maps A.1 to A.3 and Tables A.1 to A.4). This information is summarised in Figures 3.1-3.2 and Tables 3.1-3.2, below.

¹ Which states that “Listed Ramsar sites, also as a matter of policy, should receive the same protection as designated SPAs and SACs”. UK coastal Ramsar sites are typically coincident with SACs and/or SPAs.

² Sites of Community Importance (SCIs) are more advanced in designation than cSACs in that they have been adopted by the European Commission but not yet formally designated by the government of the relevant country.

Figure 3.1: SPAs Relevant to this Appropriate Assessment

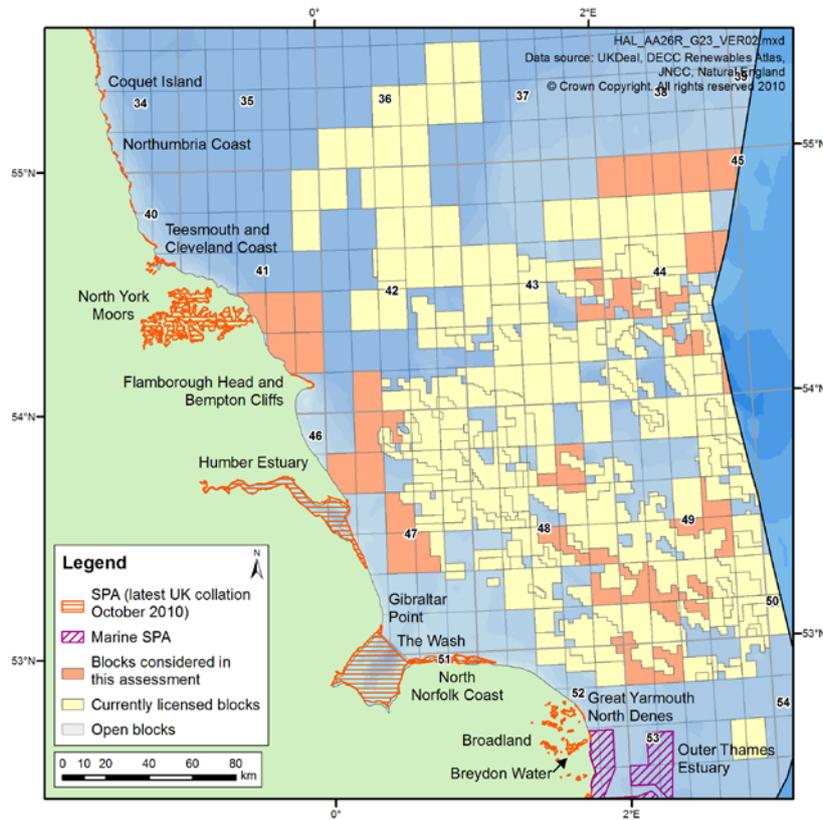


Figure 3.2: SACs Relevant to this Appropriate Assessment

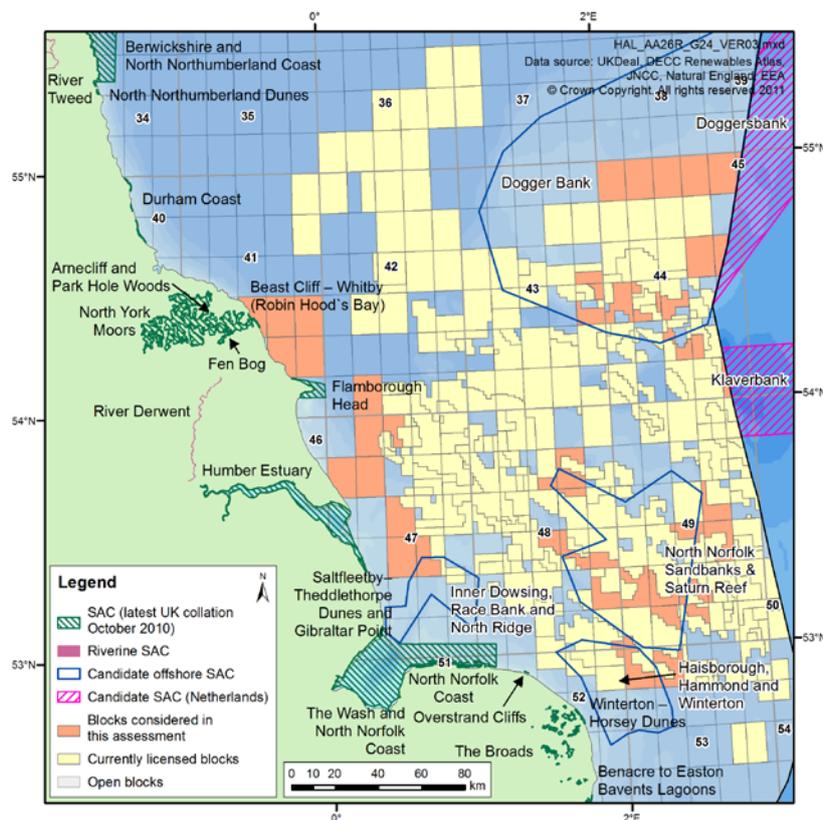


Table 3.1: SPA sites and qualifying features under Article 4.1 and 4.2, relevant to this Appropriate Assessment

	Lindisfarne	Farne Islands	Northumbria Coast	Coquet Island	Teesmouth and Cleveland Coast	North York Moors	Flamborough Head and Bempton Cliffs	Humber Flats, Marshes and Coast (Phases 1 and 2)	Gibraltar Point	The Wash	North Norfolk Coast	Broadland	Great Yarmouth North Denes	Breydon Water	Benacre to Easton Bavents	Minsmere-Walberswick	Aide-Ore Estuary	Deben Estuary	Outer Thames Estuary
Red-throated diver																			W
Puffin		B		B															
Mediterranean gull											B								
Lesser black-backed gull																	B		
Kittiwake							B												
Guillemot		B																	
Sandwich tern		B		B	P						B						B		
Roseate tern		B		B							B								
Common tern		B		B						B	B			B					
Arctic tern		B		B															
Little tern	B		B		B		B	B	B	B	B		B		B	B	B		
Marsh harrier							B		B	B	B	B		B	B	B			
Hen harrier							W				W					W			
Merlin						B													
Nightjar																B			
Woodlark																B			
Oystercatcher										W									
Avocet										W	B, W			W		B, W	B, W	W	
Ringed plover	P				P					P	B, P								
Dotterel																			
Golden plover	W					B		W		W	W			W					
Grey plover	W								W	W									
Knot	W				W			W	W	W	W								
Sanderling								P		P									
Purple sandpiper			W																
Dunlin								W		W									

	Lindisfarne	Farne Islands	Northumbria Coast	Coquet Island	Teesmouth and Cleveland Coast	North York Moors	Flamborough Head and Bempton Cliffs	Humber Flats, Marshes and Coast (Phases 1 and 2)	Gibraltar Point	The Wash	North Norfolk Coast	Broadland	Great Yarmouth North Denes	Breydon Water	Benacre to Easton Bavents	Minsmere-Walberswick	Alde-Ore Estuary	Deben Estuary	Outer Thames Estuary
Ruff											W	W							
Black-tailed godwit										W									
Bar-tailed godwit	W							W	W	W	W								
Curlew										W									
Redshank					W			P,W		W	B, W						W		
Turnstone			W							W									
Bewick's swan												W		W					
Whooper swan	W									W		W							
Pink-footed goose										W	W	W							
Dark-bellied brent goose										W	W								
Light-bellied Brent Goose	W																		
Greylag goose	W																		
Shelduck								W		W									
Wigeon	W										W								
Gadwall												W							
Pintail										W	W								
Shoveler												W							
Bittern								W			B, W	B, W			B, W	B, W			
Assemblage	W	B		B	W		B	W	W	W	W	W		W			B, W		

Note: B = Breeding, W = Over Wintering, P = On Passage, see Appendix C for more details.

Table 3.2: SAC sites and qualifying features under Annex 1 and Annex 2, relevant to this Appropriate Assessment

Annex 1 Habitats	Coastal and Riverine SACs														Offshore SACs									
	Berwickshire and North Northumberland Coast	North Northumberland Dunes	Durham Coast	North York Moors	Fen Bog	Beast Cliff-Whitby (Robin Hood's Bay)	Flamborough Head	Humber Estuary	Saltfleetby - Theddlethorpe Dunes and Gibraltar Point	The Wash and North Norfolk Coast	North Norfolk Coast	Overstrand Cliffs	The Broads	Winterton-Horsey Dunes	Benacre to Easton Barents Lagoons	Minsmere to Walberswick Heaths and Marshes	Alde, Ore and Butley Estuaries	Orfordness-Shingle Street	River Derwent	Dogger Bank cSAC	North Norfolk Sandbanks and Saturn Reef cSAC	Inner Dowsing, Race Bank and North Ridge cSAC	Haisborough, Hammond and Winterton cSAC	
Bogs				Q	P							P												
Coastal dunes		P					Q	P, Q		P				P, Q										
Coastal lagoons							Q		Q	P					P			P						
Estuaries							P										P							
Fens													P											
Forest													P											
Grasslands													Q											
Heaths				P												P								
Inlets and bays	P									P														
Limestone pavements																								
Machairs																								
Mudflats and sandflats	P						P			P							Q							
Reefs	P						P			P											P	P	P	
Rocky slopes																								
Running freshwater																			Q					
Salt marshes and salt meadows							Q			P	P						Q							
Sandbanks							Q			P										P	P	P	P	
Scree																								
Scrub (matorral)																								
Sea caves	P						P																	
Sea cliffs			P			P	P					P												
Standing freshwater													P											
Vegetation of drift lines															P			P						
Vegetation of stony banks										P					Q			P						

Table 3.2: SAC sites and qualifying features under Annex 1 and Annex 2, relevant to this Appropriate Assessment (contd.)

Annex 2 Species	Coastal and Riverine SACs														Offshore SACs									
	Berwickshire and North Northumberland Coast	North Northumberland Dunes	Durham Coast	North York Moors	Fen Bog	Beast Cliff-Whitby (Robin Hood's Bay)	Flamborough Head	Humber Estuary	Saltfleetby - Theddlethorpe Dunes and Gibraltar Point	The Wash and North Norfolk Coast	North Norfolk Coast	Overstrand Cliffs	The Broads	Winterton-Horseley Dunes	Benacre to Easton Bayvents Lagoons	Minsmere to Walberswick Heaths and Marshes	Alde, Ore and Butley Estuaries	Orfordness-Shingle Street	River Derwent	Dogger Bank cSAC	North Norfolk Sandbanks and Saturn Reef cSAC	Inner Dowsing, Race Bank and North Ridge cSAC	Haisborough, Hammond and Winterton cSAC	
Grey seal	P							Q																
Otter									Q	Q		Q							Q					
Sea lamprey								Q											Q					
River lamprey								Q											P					

Note: P = Primary feature, Q = Qualifying feature, see Appendix C for more details – note that primary and qualifying (secondary) features are treated equally within this assessment. Annex 1 habitats follow nomenclature shown in Box A.2 (AppendixA2).

4 Assessment of the effects of the plan on site integrity

4.1 Process

In carrying out this AA so as to determine whether it is possible to grant licences in accordance with Regulation 5(1) of OPAR 2001 (as amended), DECC has:

- Considered, on the basis of the precautionary principle, whether it could be concluded that the integrity of relevant European Sites would not be affected. This impact prediction involved a consideration of the cumulative and in-combination effects.
- Examined, in relation to elements of the plan where it was not possible to conclude that the integrity of relevant sites would not be affected, whether appropriate mitigation measures could be designed which cancelled or minimised any potential adverse effects identified.
- Considered the comments received from statutory advisers and others on the draft AA
- Completed the AA, including DECC's conclusion on whether or not it is possible to go ahead with the plan.

In considering the above, DECC used the clarification of the tests set out in the Habitats Directive in line with the ruling of the ECJ in the Waddenzee case (Case C-127/02), namely that:

- Prior to the grant of any licence all activities which may be carried out following the grant of such a licence, and which by themselves or in combination with other activities can affect the site's conservation objectives, are identified in the light of the best scientific knowledge in the field.
- A licence can only be granted if DECC has made certain that the activities to be carried out under such a licence will not adversely affect the integrity of that site (i.e. cause deterioration to a qualifying habitat or habitat of qualifying species, and/or undermine the conservation objectives of any given site). That is the case where no reasonable scientific doubt remains as to the absence of such effects.

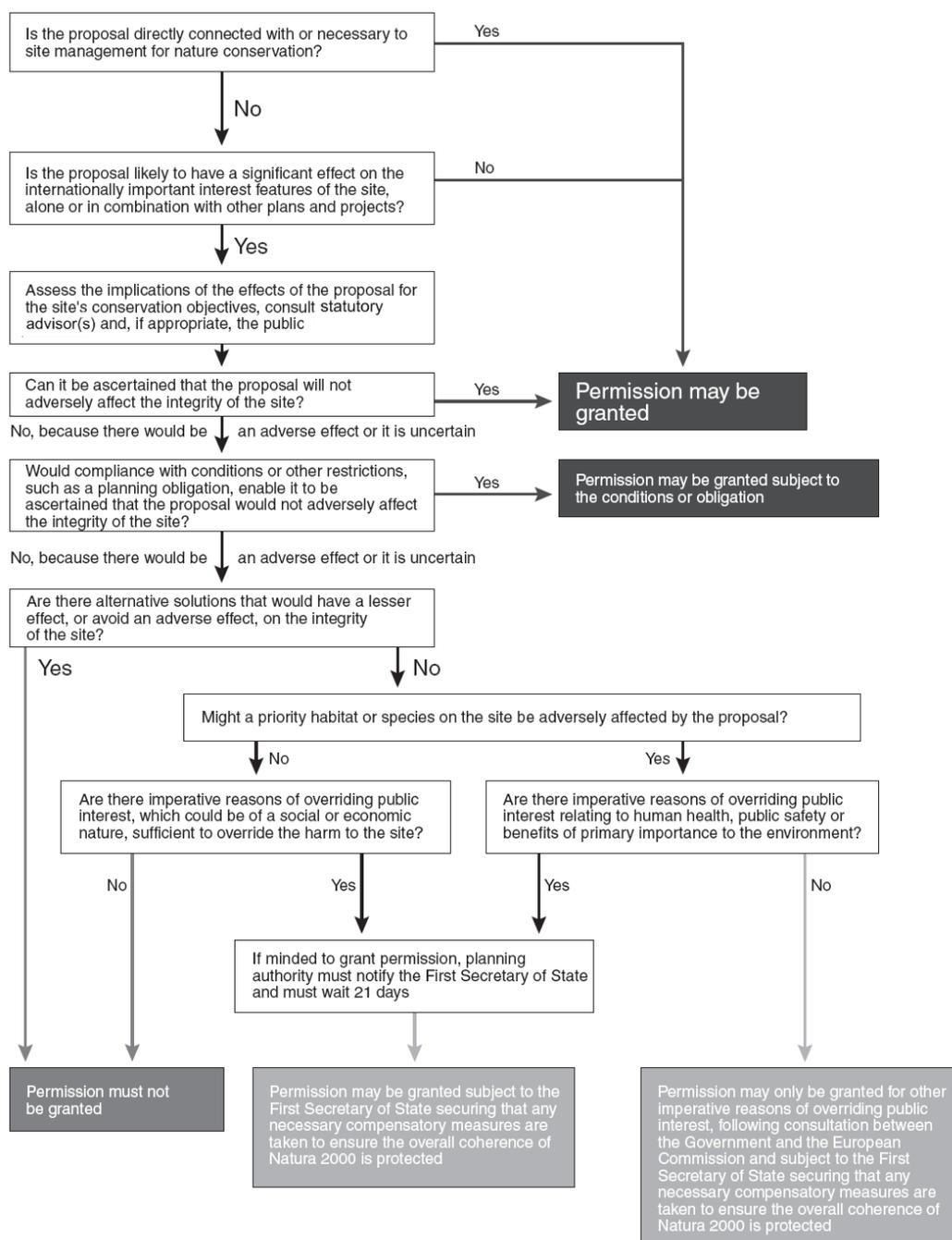
A flowchart summarising the process is shown in Figure 4.1.

4.2 Site integrity

Site integrity is defined by the ODPM Circular 06/2005 to accompany PPS9 (ODPM 2005b) as follows: "The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified." As clarified by Section 4.6.3 of the EC Guidance (2000), the integrity of a site relates to the site's conservation objectives. These objectives are assigned at the time of designation to ensure that the site continues, in the long-term, to make an appropriate contribution to achieving favourable conservation

status for the qualifying interest features. For example, it is possible that a plan or project will adversely affect the integrity of a site only in a visual sense or only habitat types or species other than those listed in Annex I or Annex II. In such cases, the effects do not amount to an adverse effect for purposes of Article 6(3), provided that the coherence of the network is not affected. The AA must therefore conclude whether the proposed activity adversely affects the integrity of the site, in the light of its conservation objectives. For sites where the potential for adverse affects has been identified, their conservation objectives are listed in a site-by-site consideration in Appendix C.

Figure 4.1: Summary of procedures under the Habitats Directive for consideration of plans or projects affecting Natura 2000 sites



Note: 'Statutory advisor(s)' refers to the relevant statutory Government advisor(s) on nature conservation issues. Source: After ODPM (2005b).

4.3 Assessment

The approach to ascertaining the absence or otherwise of adverse effects on the integrity of a European Site is set out in Section 4.1 above. This assessment has been undertaken in accordance with the European Commission Guidance (EC 2000), and with reference to various other guidance and reports including the Habitats Regulations guidance notes (e.g. SEERAD 2000), the Planning and Policy Statement note 9 (ODPM 2005a & b), the English Nature Research Reports, No 704 (Hoskin & Tyldesley 2006) and the Scottish Natural Heritage Habitats Regulations Appraisal of Plans, No 1739 (Tyldesley & Associates 2010).

Appendix A lists and summarises the relevant European Sites as defined in Section 3. Appendix B presents the results of a screening exercise of these sites to identify the potential for likely significant effects of activities that could follow the licensing of the 56 Blocks in question. Where potential effects are identified, more detailed information on the relevant sites is provided in Appendix C.

Detailed assessments are made in Sections 6-9 of the implications for the integrity of the relevant European Sites and their qualifying features and species, were a licence for any of the southern North Sea Blocks to be granted. The assessment is based on an indication of the potential work programme for the Block and likely hydrocarbon resources if present, along with the characteristics of the relevant sites as described in the Appendices. As noted in Section 2.2, the potential work programme is taken as the maximum of any application for that Block; however, on past experience, less activity actually takes place than is bid at the licence application stage. Activities which may be carried out following the grant of a licence, and which by themselves or in combination with other activities can affect the conservation objectives of relevant European Sites, are discussed under the following broad headings:

- Oil spills (including all liquid phase hydrocarbons)
- Physical disturbance and other effects (e.g. pipeline trenching, marine discharges)
- Underwater noise (in particular, seismic surveys)
- In-combination effects (e.g. cumulative and synergistic and secondary/indirect effects).

Use has been made of advice prepared by the conservation agencies under the various Habitats Regulations, since this typically includes advice on operations that may cause deterioration or disturbance to relevant features or species. Advice given under Regulation 33 (now Regulation 35 of the 2010 Regulations) includes an activities/factors matrix derived from MarLIN (www.marlin.ac.uk) where applicable. Several of the “probable” effects highlighted in the MarLIN matrices are not inevitable consequences of oil and gas exploration and production, since through the regulatory Environmental Impact Assessment (EIA) and permitting processes they are mitigated by timing, siting or technology requirements (or a combination of one or more of these). There is a requirement that these options would be evaluated in the environmental assessments required as part of activity consenting.

The conservation objectives identified for SAC and SPA features for sites where the potential for effects have been identified are listed in Appendix C and referred to where relevant throughout the document. These objectives, in relation to the specific qualifying features of each site, and the conservation status of these features, have been considered during this Appropriate Assessment. The basis and primary concern of the conservation objectives are to maintain or achieve favourable conservation status. Table 4.1 provides definition of conservation status based on Articles 1(e) and (i) of the Habitats Directive.

Table 4.1: Definition of favourable conservation status for sites defined in the Habitats Directive

For habitats	<p>Conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. The conservation status of a natural habitat will be taken as ‘favourable’ when:</p> <ul style="list-style-type: none"> • its natural range and areas it covers within that range are stable or increasing • the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future • the conservation status of its typical species is favourable (see below)
For species	<p>Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The <i>conservation status</i> will be taken as ‘favourable’ when:</p> <ul style="list-style-type: none"> • population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and • the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and • there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis

A set of high level mitigation measures have been identified with regards to each of the broad sources of effect listed above (see Table 4.2). These mitigation measures, which are discussed in more detail in sections 5-8, should *inter alia* help to avoid the deterioration of any qualifying habitats, and habitats supporting species, and seek to prevent undermining any of the conservation objectives for a given site in relation to the features for which it is designated. These high-level mitigation measures can be partly interpreted as “...conditions or other restrictions such as a planning obligation, [compliance with which would] enable it to be ascertained that the proposal would not adversely affect the integrity of the site” (see Figure 4.1, above), though also represent other non-statutory guidance etc. with regards to the avoidance of significant effects on sites. Where it is considered that no effect can arise from any of the given sources of effect for a particular species or habitat (e.g. due to animal behaviour and/or the location/characteristics of a particular habitat), certain sites may be screened out of the assessment, and these are listed in the relevant section (5-8) where this is the case (also see Appendix B).

Table 4.2: High level mitigation measures identified for potential sources of effect

High level Mitigation	
Physical disturbance	<p>All blocks under consideration are at least several kilometres offshore and remote from Natura 2000 sites. While new pipelines could conceivably come ashore at existing terminals, either through or near to coastal SACs and SPAs, there are well proven methods to prevent significant impacts – such mitigation would be defined at the project level, and be subject to project specific EIA and HRA.</p> <p>Potential disturbance of certain species/habitats (e.g. in relation to herring spawning) may be avoided by seabed survey prior to the commencement of drilling operations. Blocks for which herring spawning is a potential concern</p>

High level Mitigation	
	have been highlighted (See Section 2.2), and licensees should expect the occurrence of such a sensitivity to affect DECC's decision whether or not to approve particular activities.
Marine Discharges	Discharges from offshore oil and gas facilities have been subject to increasingly stringent regulatory controls over recent decades, and oil and other contaminant concentrations in the major streams (drilling wastes and produced water) have been substantially reduced or eliminated. Discharges would be considered in detail in project-specific Environmental Statements, AAs (where necessary) and chemical risk assessments under existing permitting procedures.
Other effects	<p>The IMO International Convention for the Control of Ballast Water and Sediment, serves to mitigate against the possible introduction of invasive alien species through shipping ballast, which may degrade sensitive local habitats and communities. Measures include the mid-ocean exchange of ballast water (with ultra-violet irradiation of ballast a proposed alternative).</p> <p>The potential for collision of birds with offshore infrastructure, increased by attraction of birds to lights, may be mitigated by controlling well test and routine flaring during production and by avoiding or limiting activities during months when large numbers of birds aggregate in the area.</p>
Underwater noise	<p>Application for consent to conduct seismic and other geophysical surveys – PON14</p> <p>Seismic operators are required, as part of the application process, to justify that their proposed activity is not likely to cause a disturbance etc. under the <i>Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001</i> (as amended) and <i>Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007</i> (as amended).</p> <p>It is a condition of consents issued under Regulation 4 of the <i>Petroleum Activities (Conservation of Habitats) Regulations 2001</i> (& 2007 Amendments) for oil and gas related seismic surveys that the JNCC, <i>Guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys</i>, are followed.</p> <p>European Protected Species (EPS) disturbance licences can also be issued under the <i>Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007</i>.</p> <p>DECC will expect that passive acoustic monitoring (PAM) will be routinely used as a mitigation tool.</p> <p>Potential disturbance of certain species may be avoided by the seasonal timing of noisy activities, and periods of seasonal concern for individual Blocks on offer have been highlighted (See Section 2.2) for which licensees should expect to affect DECC's decision whether or not to approve particular activities.</p>
Oil Spills	<p>Oil Pollution Emergency Plans (OPEPs): regulatory requirements on operators to prepare spill prevention and containment measures, risk assessment and contingency planning – these are reviewed by DECC, MCA, JNCC, MMO, and relevant SNCB.</p> <p>Additional conditions imposed by DECC, through block-specific licence conditions (i.e. "Essential Elements"), and seasonal periods of concern for drilling, within which there is a presumption for drilling activity to be refused unless appropriate mitigation measures can be agreed (defined at the project level).</p>

High level Mitigation	
	<p>Project level mitigation through permitting/HRA of specific activities (including conditions attached to consents/permits or potentially consent/permit refusal).</p> <p>MCA is responsible for a National Contingency Plan and maintains aerial spraying and surveillance aircraft based at Coventry and Inverness and counter-pollution equipment (booms, adsorbents etc.). The MCA presently has four Emergency Towing Vessels stationed around the UK which remain on standby at sea³.</p>
In-combination effects	<p>The competent authorities will assess the potential for in-combination effects during Habitats Regulations Assessments of project specific consent applications; this process will ensure that mitigation measures are put in place to ensure that subsequent to licensing, specific projects (if consented) will not result in adverse effects on integrity of European sites.</p>

³ The future of these vessels is presently subject to debate as a new funding stream is required for their maintenance, with the present contract terminated in 2011. The role of these vessels may be filled by a commercial alternative (see: <http://www.parliament.uk/business/committees/committees-a-z/commons-select/transport-committee/inquiries/coastguard/>).

5 Consideration of potential effects from oil spills on relevant sites

5.1 Overview of spill effects and context

Oil spills can have potentially adverse environmental effects, and are accordingly controlled by a legal framework aimed at minimising their occurrence, providing for contingency planning, response and clean up, and which enables prosecutions. It is however, not credible to conclude that in spite of the regulatory controls and other preventative measures, an oil spill will never occur as a result of 26th Round licensing.

In April 2010, a major incident occurred in the US Gulf of Mexico. During drilling of an exploratory well in deep water approximately 50 miles offshore Louisiana, there was an explosion and fire on the semi-submersible drilling rig Deepwater Horizon. The rig was drilling in a water depth of 5000ft with the oil reservoir at 18000ft. UK regulators have been in contact with their counterparts in the United States (the Bureau of Ocean Energy Management, Regulation, and Enforcement - BOEMRE) to understand the cause of the incident and whether there are implications for safety at offshore operations on the UK continental shelf.

The Health and Safety Executive (HSE) is responsible for regulating the risks to health and safety arising from work in the offshore industry on the UKCS. Inspectors from HSE's Offshore Division undertake offshore inspections of well control/integrity arrangements and related safety issues, and also review well designs and procedures. In the UK a safety case regime exists with specific safeguards including:

- The Offshore Installations (Safety Case) Regulations 2005 require written safety cases and risk assessments to be prepared by the operator, and then approved by HSE, for all mobile offshore drilling rigs operating in the UK.
- A system of well notification, where the HSE reviews well design and procedures.
- A requirement for the design and construction of a well to be examined by an independent and competent specialist.
- A scheme of independent verification of offshore safety critical equipment such as blowout preventers to ensure they are fit for purpose.
- Checks that workers involved in well operations have received suitable information, instruction, training and supervision.
- Offshore inspections of well control and integrity arrangements, and related safety issues, by specialist inspectors from HSE's Offshore Division.
- Weekly drilling reports submitted to HSE by operators.

A review has been carried out by DECC which has found that the existing system is fit for purpose, but in light of the Deepwater Horizon spill the regime is being strengthened further:

1. DECC has increased the oversight of drilling operations through the recruitment of additional inspectors in its Aberdeen office. This will allow the Department to carry out double inspections (i.e. inspections carried out by 2 inspectors) for more complex

drilling operations and it will also allow annual inspections of all mobile and fixed oil and gas installations, once all of the new inspectors are recruited and have completed relevant training.

2. In light of the Gulf of Mexico incident, DECC has reviewed the indemnity and insurance requirements for operating in the UK Continental Shelf.
3. DECC has issued letters (dated: 23rd December 2010, 21st July 2011, 20th September 2011) to all UK operators specifying a number of requirements and expectations regarding oil pollution prevention, response, emergency plans and consenting.
4. Industry trade association Oil and Gas UK established a group comprised of regulators, industry and trade union representatives (the Oil Spill Prevention and Response Advisory Group - OSPRAG) to examine the UK's strengths and weaknesses in responding to a Gulf like incident. DECC participated in this group. OSPRAG's work is documented in their final report, *Strengthening UK Prevention and Response*, published September 2011 and the Secretary of State is examining its findings closely.

As a result of the Deepwater Horizon incident a UK Parliamentary Select Committee Inquiry into the safety and environmental regulations and spill prevention and response provisions of oil and gas operations on the UKCS was held which reported in January 2011 (Energy and Climate Change Committee 2011). The report includes a series of recommendations regarding regulatory oversight, spill prevention, response and understanding. However, the Committee report did not conclude that a moratorium on drilling, even in deep water, was justified in the UK.

In January 2011 the US Government National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling released an extensive report (National Commission 2011) into the disaster, citing systematic management failures by the main companies involved and shortcomings in the US government regulatory regime as the principal sources of blame. A series of general recommendations are included in the report regarding spill prevention, response and understanding.

DECC (along with other parts of government) have considered the implications of these various findings and implemented a series of actions in response.

The potential for oil spills associated with exploration and production, the consequences of accidental spillages, and the prevention, mitigation and response measures implemented have been assessed and reviewed in successive SEAs covering the UKCS area under consideration in the 26th Round, including the recent Offshore Energy SEA2. Previous SEAs have concluded that given the UK regulatory framework and available mitigation and response, in relation to objective risk criteria (such as existing exposure to risk as a result of shipping), the incremental risk associated with exploration and production (E&P) is moderate or low.

A large number of site- and activity-specific risk assessments have also been carried out as a component of Environmental Assessments and under the relevant legislation implementing the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) (see the *Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998*).

Direct mortality of seabirds in the event of oil spill is highly relevant in the context of coastal breeding site classified as SPAs (and possible SPA extensions). Waterbird vulnerability to surface pollution has been quantified for each month on a block-by-block basis by JNCC in terms of the Offshore Vulnerability Index (OVI) (see Table 5.1), and seasonal concerns in

relation to drilling have been identified for a number of Blocks considered in this AA (see Table 2.1) for which there would be a presumption against such activity taking place.

The following section provides a high-level overview of risks, regulation, contingency planning and response capabilities; followed by an assessment of risks presented to relevant European Sites (Section 5.3) by activities resulting from the proposed licensing of the 56 Blocks in the 26th Round. As risks tend to be generic between sites, these have been categorised based on ecological sensitivity and an evaluation of spill probability and severity.

5.2 Spill risk

Risk assessment, under the terms of OPRC, includes considerations of probability and consequence, generally comprising an evaluation of: historical spill scenarios and frequency, fate of spilled oil, trajectory of any surface slick, and potential ecological effects. These considerations are discussed below.

The southern part of the North Sea is a gas province and so, although blowout risk cannot be excluded, it would not result in significant oil spillage. The only significant blowouts on the UKCS to date have been from West Vanguard (1985) and Ocean Odyssey (1988), both involving gas and not resulting in significant pollution.

Potential risks of oil spills are mitigated in the southern North Sea by the nature of the hydrocarbons present in those areas (natural gas). Spill risk is therefore associated mainly with transfer and storage of fuel and lubricating oils. Modelling, and field experiments and experience indicates that even very large diesel spills (> 1000 tonnes) in the UK disperse naturally within 8 to 9 hours, travelling some 24km under worst case conditions (constant 30 knot onshore wind). This allows a distinction in terms of relative risk, to be made between Blocks in the southern North Sea gas province and those in other areas.

5.2.1 Historical spill scenarios and frequency

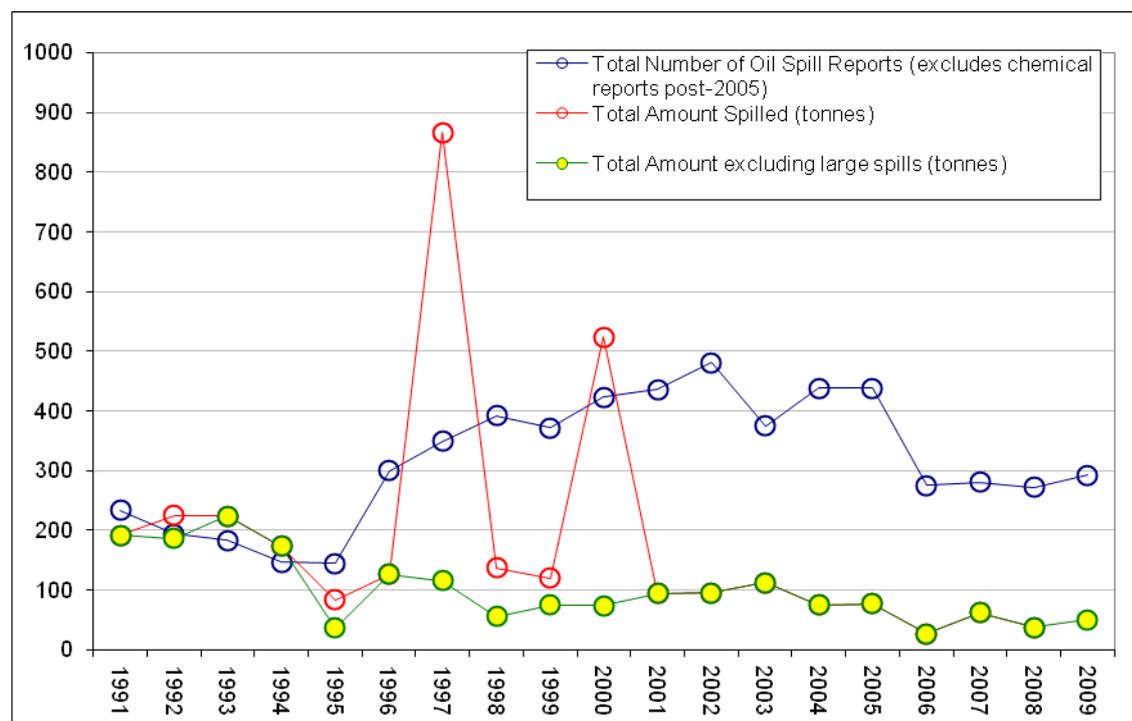
Oil spills on the UKCS have been subject to statutory reporting since 1974 under PON1 (formerly under CSON7); annual summaries of which were initially published in the “Brown Book” series, now superseded by on-line data available from the DECC website⁴ (Figure 5.1). Discharges, spills and emissions data from offshore installations are also reported by OSPAR (e.g. OSPAR 2009).

DECC data indicate that the most frequent types of spill from mobile drilling rigs have been organic phase drilling fluids (and base oil), diesel and crude oil. Topsides couplings, valves and tank overflows; and infield flowlines and risers are the most frequent sources of spills from production operations, with most spills being <1 tonne. A large proportion of reported oil spills in recent years (since about 1990) have resulted from process upsets (leading to excess oil in produced water). Estimated spill risk from UKCS subsea facilities was equivalent to a risk of 0.003 spills/year for an individual facility, with almost all reported spills less than a tonne (<5bbl) in size.

Well control incidents (i.e. “blowouts” involving uncontrolled flow of fluids from a wellbore or wellhead) have been too infrequent on the UKCS for a meaningful analysis of frequency based on historic UKCS data. A review of blowout frequencies cited in UKCS Environmental Statements as part of the OESEA2 gives occurrence values in the range 1/1,000-10,000 well-years.

⁴ Oil and chemical discharge notifications (accessed October 2010)
https://www.og.decc.gov.uk/information/bb_updates/chapters/Table_chart3_1.htm

Figure 5.1: Number and volume of reported oil spills from UKCS oil and gas installations over the period 1991-2009



Source: DECC website

An annual review of reported oil and chemical spills in the UKCS – covering both vessels and offshore installations – is made on behalf of the Maritime and Coastguard Agency (MCA) by the Advisory Committee on Protection of the Sea (e.g. ACOPS 2008 as reported in Dixon 2009). This includes all spills reported by POLREP reports by the MCA and PON1 reports to DECC. The number of accidental discharges attributed to oil and gas installations during 2008 showed a reduction of 6.5% over the previous year's total. Of these discharges, 65% were fuel, lubrication or hydraulic oils, with 29% of crude oil; additionally, of the discharges with volume information, 95% were less than 455 litres.

Since the mid-1990s, the reported number of spills has increased, consistent with more rigorous reporting of very minor incidents (e.g. the smallest reported spill in 2003 was 0.0001 litres). However, the underlying trend in spill quantity (excluding specifically-identified large spills) suggests a consistent annual average of around 100 tonnes. In comparison, oil discharged with produced water from the UKCS in 2009 totalled 2,900 tonnes (DECC website⁵).

Historic major spill events from UKCS production facilities include the 1986 Claymore pipeline leak (estimated 3,000 tonnes), 1988 Piper Alpha explosion (1,000 tonnes), 1996 Captain spill (685 tonnes) and 2000 Hutton TLP spill (450 tonnes). Although potentially significant at a local scale, these volumes are minor when compared to other inputs of oil to the marine environment, such as riverine inputs (OSPAR 2000, 2010).

⁵ Oil discharged with produced water 2005 – 2009

https://www.og.decc.gov.uk/information/bb_updates/chapters/Table3_2.htm

5.2.2 Trajectory and fate of spilled oil

The main oil weathering processes following a surface oil spill are spreading, evaporation, dispersion, emulsification, dissolution, oxidation, sedimentation and biodegradation. The anticipated reservoir hydrocarbon type in the southern North Sea Blocks is gas, therefore spills of crude oil are not considered a risk. Diesel spills generally evaporate and disperse without the need for intervention. A major diesel spill of ca. 1000 tonnes would disperse naturally in about 8 hours and travel some 24km in conditions of a constant unidirectional 30 knot wind.

Coincident with these weathering processes, surface and dispersed oil will be transported as a result of tidal (and other) currents, wind and wave action. Although strong winds can come from any direction and in any season, the predominant winds in the UK are from the southwest which for the southern North Sea Blocks would push spilled oil away from the coast. To support environmental assessments of individual drilling or development of gas projects, modelling is carried out for diesel oil releases. Representative modelling cases from various parts of the UKCS have been reviewed by successive SEAs.

5.2.3 Potential ecological effects

The most vulnerable components of the ecosystem to oil spills in offshore and coastal environments are seabirds and marine mammals, due to their close association with the sea surface. Seabirds are affected by oil pollution in several ways, including oiling of plumage resulting in the loss of insulating properties and the ingestion of oil during preening. Pollution of the sea by oil, predominantly from merchant shipping, can be a major cause of seabird mortality. Although locally important numbers of birds have been killed on the UKCS directly by oil spills from tankers, for example common scoter off Milford Haven following the Sea Empress spill in 1996, population recovery has generally been rapid. Chronic pollution resulting from illegal dumping or tank washing probably has a greater chronic impact on seabirds than accidental spills from shipping casualties.

The Offshore Vulnerability Index (OVI) developed by JNCC (Williams *et al.* 1994) is used to assess the vulnerability of bird species to surface pollution; it considers four factors:

- the amount of time spent on the water
- total biogeographical population
- reliance on the marine environment
- potential rate of population recovery

Vulnerability scores for offshore areas (see Table 5.1, below) are determined by combining the density of each species of bird present with its vulnerability index score. Of the species commonly present offshore in UK offshore waters, gannet, skuas and auk species (e.g. sites include Flamborough Head and Bempton Cliffs SPA) may be considered to be most vulnerable to oil pollution due to a combination of heavy reliance on the marine environment, low breeding output with a long period of immaturity before breeding, and the regional presence of a large percentage of the biogeographic population. In contrast, the aerial habits of the fulmar and gulls, together with large populations and widespread distribution, reduce vulnerability of these species.

Table 5.1: Monthly seabird vulnerability to surface pollution in relevant 26th Round Blocks

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
41/18	2	1	3	3	2	1	1	1	1	1	1	1	1
41/19	3	1	3	3	2	1	1	1	1	1	1	1	1
41/20	1	1	2	3	2	1	1	1	1	1	1	1	1
41/24	3	1	3	3	2	1	1	1	1	1	1	1	1
41/25	2	1	2	3	2	1	1	1	1	1	1	1	1
42/27	2	1	3	3	2	1	1	1	1	1	1	1	1
43/15	1	1	1	1	2	4	3	3	1	1	2	3	1
43/20	1	1	1	1	2	4	2	2	1	1	2	1	1
44/01	4	3	-	2	1	4	2	3	3	1	1	2	2
44/02	4	3	-	2	1	4	2	3	3	1	1	2	2
44/03	4	3	4	2	1	4	2	3	3	1	1	2	2
44/04	4	3	4	3	2	4	3	4	4	1	1	3	3
44/05	4	2	4	3	2	4	3	3	4	1	1	3	3
44/14	4	3	4	3	3	4	3	4	4	2	2	3	4
44/15	4	2	4	3	3	4	3	3	4	2	2	3	4
44/16	2	3	1	2	2	4	2	3	2	1	2	1	2
44/17	2	3	1	2	2	4	2	3	2	1	2	1	2
44/18	2	3	1	2	2	3	2	3	2	1	1	1	2
44/23	2	2	1	2	1	3	2	2	2	1	1	1	1
44/24	2	2	3	2	2	3	2	3	3	1	1	1	2
44/30	2	2	3	2	2	3	2	3	3	2	1	1	3
45/01	4	2	4	4	3	4	4	3	4	2	2	-	4
47/02	2	1	3	3	2	1	1	1	1	1	1	1	1
47/03	1	1	2	3	2	1	1	1	1	1	1	1	1
47/06	4	1	3	4	2	2	1	1	1	2	1	1	1
47/07	4	1	3	4	2	2	1	1	1	2	1	1	1
47/13	4	2	4	4	4	4	3	1	2	3	1	1	2
47/18	4	2	4	4	4	4	3	1	2	3	1	1	2
47/19	4	2	4	4	4	4	3	1	2	3	1	1	2
48/08	1	1	1	2	1	4	2	1	2	1	1	2	1
48/09	1	1	1	2	1	-	2	1	2	1	1	2	1
48/14	3	2	1	3	3	-	-	2	3	2	1	3	3
48/18	3	2	1	2	3	4	4	1	2	2	1	2	2
48/19	3	2	1	3	3	-	-	2	3	2	1	3	3
48/20	3	2	1	2	3	4	-	2	3	2	1	3	3
48/25	4	2	2	4	3	4	4	3	4	2	2	2	4
48/30	4	3	3	4	3	4	4	3	4	2	2	2	4
49/14	2	3	2	3	3	4	4	4	4	3	2	4	4
49/17	3	2	1	2	3	4	-	3	3	2	2	3	3
49/18	2	2	1	2	3	4	4	3	3	2	2	3	3

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
49/19	2	3	2	3	3	4	4	4	4	3	2	4	4
49/21	4	2	2	4	3	4	4	3	4	3	4	2	4
49/22	4	2	2	4	3	4	4	3	4	3	4	2	4
49/23	3	2	2	4	3	4	4	3	4	3	4	2	4
49/24	3	3	2	4	3	4	4	3	4	4	4	2	4
49/26	4	3	3	4	3	4	4	3	4	3	4	2	4
49/27	4	3	3	4	3	4	4	3	4	3	4	2	4
49/28	4	3	2	4	3	4	4	3	4	3	4	2	4
52/05	4	3	3	4	3	4	4	2	3	2	2	2	4
53/01	4	3	3	4	3	4	4	3	4	3	4	2	4
53/02	4	3	3	4	3	4	4	3	4	3	4	2	4

Note: 1 = very high, 2 = high, 3 = moderate, 4 = low.

Source: JNCC (1999).

As the major breeding areas for most wildfowl and wader species are outside the UK (in the high Arctic for many species), population dynamics are largely controlled by factors including breeding success (largely related to short-term climate fluctuations, but also habitat loss and degradation) and migration losses. Other significant factors include lemming abundance on Arctic breeding grounds (e.g. white-fronted goose). Variability in movements of wintering birds, associated with winter weather conditions in continental Europe, can also have a major influence on annual trends in UK numbers, as can variability in the staging stops of passage migrants.

Oil spill risks to marine mammals have been reviewed by successive SEAs and their supporting technical reports (e.g. Hammond *et al.* 2008, Murphy *et al.* 2008).

Generally, marine mammals are considered to be less vulnerable than seabirds to fouling by oil, but they are at risk from hydrocarbons and other chemicals that may evaporate from the surface of an oil slick at sea within the first few days. Symptoms from acute exposure to volatile hydrocarbons include irritation to the eyes and lungs, lethargy, poor coordination and difficulty with breathing. Individuals may then drown as a result of these symptoms.

Grey and harbour seals come ashore regularly throughout the year between foraging trips and additionally spend significantly more time ashore during the moulting period (February-April in grey seals and August-September in harbour seals) and particularly the pupping season (October-December in grey seals and June-July in harbour seals). Animals most at risk from oil coming ashore on seal haulout sites and breeding colonies are neonatal pups, which rely on their prenatal fur and metabolic activity to achieve thermal balance during their first few weeks of life, and are therefore more susceptible than adults to external oil contamination.

Coastal otter populations are also vulnerable to fouling by oil, should it reach nearshore habitats. They are closely associated with the sea surface and reliant upon fur, rather than blubber, for insulation.

Benthic habitats and species may be sensitive to deposition of oil associated with sedimentation, although based on hydrocarbon types present or used in operations, together with the distance offshore, this is unlikely to be significant in the southern North Sea. However, evidence from the Florida barge spill (Buzzards Bay, Massachusetts, September 1969, in which 700m³ of diesel fuel were released) suggests that in certain circumstances,

contamination from oil spills could be long-term. Monitoring immediately following the spill suggested rapid recovery (reviewed by Teal & Howarth 1984), while subsequent studies (sampling in 1989) indicated that substantial biodegradation of aromatic hydrocarbons in saltmarsh sediments had occurred (Teal *et al.* 1992). However, thirty years after the spill, significant oil residues remain in deep anoxic and sulphate-depleted layers of local salt marsh sediments (Reddy *et al.* 2002, Peacock *et al.* 2005). The ecological consequences of this residual contamination are unclear, although there is potential for remobilisation of sediment-bound contaminants through bioturbation or storm events (in which case, aerobic biodegradation would be expected to be rapid).

Those coastal and marine Annex I habitats which are most sensitive to oil spills are identified in Table 5.2, below. Generally, sheltered habitats of lower exposure to wave energy are considered most vulnerable; oil may persist for long periods in such environments.

5.3 Implications for relevant European Sites

Relevant sites have been screened in Appendix B and all sites where the potential for effects were identified are listed in detail in Appendix C. The identification of potential effects from oil spills on specific European Sites considers the following factors:

- Oil spill probability and severity (taking into account distance from blocks under offer, and probable hydrocarbon type)
- The ecological sensitivity of the qualifying feature(s) to oil spills
- Connected with the above, in what way an oil spill would have an immediate effect on the conservation objectives of SACs and SPAs as listed in Appendix C, and any long-term implications of a spill on these objectives

It should be noted that at a project level, DECC requirements for the preparation of OPEPs and ES submissions include, amongst other mitigation and response criteria, the modelling of a worst case blowout scenario considering a specific release location, crude oil type and historic metocean conditions as well as an unlikely 30 knot onshore wind, over a release time of 10 days. As any hydrocarbons to be recovered from licensing Blocks in the southern North Sea are likely to be gas, no significant hydrocarbon release is likely, and such a release would be restricted to diesel or lube oil.

5.3.1 Special Areas of Conservation

The ecological sensitivity of the qualifying features of relevant sites to oil spills varies. For several Annex I habitats and Annex II species, it is considered that any potential source of effect is unlikely to degrade the qualifying habitat or habitat of species, or undermine the conservation objectives of related sites (see Appendix C). These include:

- **Submerged reefs and sandbanks** – not generally vulnerable to surface oil pollution, except possibly following application of chemical dispersants (generally not permitted in waters shallower than 20m) – it is not expected that the extent, distribution or functioning of these habitats would be significantly affected, and therefore similarly, those of any species associated with, or relying on the functioning of these habitats, such that conservation objectives would be undermined.
- **Lagoons, dunes** – sites above Mean High Water Springs not generally vulnerable to surface oil pollution, except possibly to wind-blown oil or evaporated hydrocarbons. Lagoons typically have periodic connections to the sea; such connections can be protected from the ingress of surface pollutants.

- **Sea cliffs, sea caves** – generally not considered sensitive due to wave reflection and rapid recovery (e.g. Gundlach & Hayes 1978) – it is not expected that the extent, distribution or functioning of these habitats would be significantly affected by any possible spill, and therefore similarly, those of any species associated with, or relying on the functioning of these habitats such that conservation status would be detrimentally affected.
- **Terrestrial and freshwater aquatic species** – the potential for significant effects on the conservation objectives of these species and their supporting habitats is essentially negated by their distribution, as these features do not utilise marine or estuarine environments. For sites considered in this assessment, these include: non-coastal otter populations (*Lutra lutra*).

Table 5.2 provides information on those categories of Annex I habitats and Annex II species which may have their conservation objectives undermined in the event of being impacted by an oil spill – those sites for which such potential effects from oil spills has been identified (see Appendix B) are listed. Due to the limited distance spilled diesel oil travels before dispersion (up to ca. 24km), oil spill effects potential relates to a limited number of sites. Note: several sites are represented in more than one risk category.

Table 5.2: Annex I habitats and Annex II species potentially vulnerable to oil spills

Mudflats and sandflats
Particularly vulnerable in sheltered areas where wave energy is low. The biological communities associated with these sites are related to the degree of sheltering and subsequent sediment type; sheltered sites with fine, muddy sediments may support a high diversity and abundance of invertebrates and waterfowl.
Sites potentially at risk: Humber Estuary SAC, The Wash and North Norfolk Coast SAC
Estuaries
Complexes of several subtidal and intertidal habitats with varying freshwater influence. The sediments of estuaries support various biological communities, while the water column provides an important habitat for free-living species, such as fish, and juvenile stages of benthic plants and animals. Estuaries often contain several different Annex I habitats.
Sites potentially at risk: Humber Estuary SAC
Saltmarshes
Comprise intertidal mud and sandflats colonised by vegetation due to protection from strong wave action. Pioneering saltmarsh vegetation exists where tidal flooding is frequent, with progression to more diverse, stable communities in upper reaches where tidal flooding is less frequent. Upper reaches can be valuable for plants, invertebrates and wintering or breeding waterfowl.
Sites potentially at risk: Humber Estuary SAC, The Wash and North Norfolk Coast SAC
Inlets and Bays
Large indentations of the coast, and generally more sheltered from wave action than the open coast. They are relatively shallow, with water depth rarely exceeding 30m, and support a variety of subtidal and intertidal habitats and associated biological communities.
Sites potentially at risk: The Wash and North Norfolk Coast SAC
Harbour porpoise
Sites comprise a variety of marine habitats utilised by harbour porpoise (<i>Phocena phocena</i>) for foraging and other activities, with extensive areas beyond the site boundary also utilised. Vulnerable to oil spills due to their dependence on the sea surface for breathing.
Sites potentially at risk: Doggersbank cSAC

Seals

Designated sites comprise coastal habitats (beaches, estuaries, sandflats and rocky shores) supporting important breeding colonies of harbour seals (*Phoca vitulina*) and/or grey seals (*Halichoerus grypus*). Seals spend considerable periods of time at these sites during the breeding season and during the moult. Seals forage for prey in surrounding waters and also travel considerable distances beyond the boundaries of sites (particularly grey seals).

Sites potentially at risk: Humber Estuary SAC, The Wash and North Norfolk Coast SAC, Doggersbank cSAC

Coastal otters

Sites contain shallow, inshore coastal areas utilised by important populations of otter (*Lutra lutra*) for feeding.

Sites potentially at risk: The Wash and North Norfolk Coast SAC

5.3.1.1 The Wash and North Norfolk Coast SAC

(Annex I qualifying habitats: sandbanks which are slightly covered by sea water all the time, mudflats and sandflats not covered by seawater at low tide, large shallow inlets and bays, reefs, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*), coastal lagoons

Annex II qualifying species: Harbour seal *Phoca vitulina*, otter *Lutra lutra*)

Large numbers of harbour seal occur on the English east coast at The Wash and along the adjacent coastline, and utilise coastal waters surrounding these colonies. Current estimates of harbour seal population in The Wash is in the region of 2,829 for 2007-2009 (SCOS 2010). Harbour seals haul out on tidally exposed areas of rock, sandbanks or mud. Pupping occurs on land from June to July, while the moult is centred around August and extends into September. Therefore, from June to September, harbour seals are ashore more often than at other times of the year.

Regulation 33 advice available for the Wash and North Norfolk Coast SAC (English Nature 2000 – though at the time not recognising the qualifying Annex II otter), indicates that subtidal sandbanks are generally less vulnerable to the risk of oil spills than intertidal sediment environments (which are noted to be sensitive to smothering by substances such as oil), unless the oil is dispersed during clean-up operations, or if wave action allows sediment mobility and the incorporation of oil into the sediments. In addition, the advice notes Atlantic salt meadows are sensitive to spills reaching the coast due to their ability to trap sediments, and that all *Salicornia* species are highly susceptible to inundation by spills. No specific advice is made in relation to oil spills with regards to the harbour seal.

Consideration

The potential hydrocarbon resource in the Blocks is gas. Therefore the potential for the conservation objectives for the qualifying habitats and species of the Wash and North Norfolk Coast SAC to be undermined by a large oil spill is extremely remote. However, the possibility of spills of diesel fuel or lubricants cannot be discounted and is addressed through existing regulatory mechanisms. Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and

other mitigation measures are required of operators, and monitored by the regulator for offshore exploration and production.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not have the potential to undermine the conservation objectives of the Wash and North Norfolk Coast SAC (see Appendix C2).

5.3.1.2 Humber Estuary SAC

(Annex I qualifying habitats: Estuaries, mudflats and sandflats not covered by seawater at low tide Secondary features: Sandbanks which are slightly covered by seawater all the time, coastal lagoons, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritima*), embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes'), fixed dunes with herbaceous vegetation ('grey dunes'), dunes with *Hippophae rhamnoides*

Annex II qualifying species: Sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, grey seal *Halichoerus grypus*)

Interim Regulation 33 advice for the Humber (English Nature 2003) recognises that oil spills of crude oil may cause deterioration or disturbance to a number of qualifying habitats for which the site is designated (e.g. estuaries, coastal lagoons, Atlantic salt meadows, *Salicornia* and other annuals, intertidal mudflats and sandflats and subtidal sandbanks). The advice notes that smothering effects and toxicity of oil can affect lagoon and saltmarsh features, with saltmarsh plants being affected due to their ability to trap sediments. It is recommended that dispersants are not used to clean up oil spills on or close to saltmarshes due to their effects on saltmarsh plants. Eelgrasses of intertidal flats and their associated communities are also susceptible to oil spills, both from toxic effects and from smothering.

Donna Nook at the mouth of the Humber Estuary represents one of the larger English colonies of grey seal, with pup-production estimates for the site being 2,244 (Including Blakeney Point and Horsey) for 2009 (SCOS 2010). Most of the grey seal population will be on land for several weeks from October to December during the pupping and breeding season, and again in February and March during the annual moult. Densities at sea are likely to be lower during this period than at other times of the year. Animals most at risk from oil coming ashore on seal haul out sites and breeding colonies are neonatal grey seal pups, as these rely on their thicker fur for insulation during the first few weeks of their life before developing blubber and moulting into a sea-going coat. They are also restricted to their breeding colony until they are weaned, and are therefore more susceptible than adults to external oil contamination.

Consideration

The potential hydrocarbon resource in the Blocks is gas. Therefore the potential for the conservation objectives for the qualifying habitats and species of the Humber Estuary SAC to be undermined by a large oil spill is extremely remote. However, the possibility of spills of diesel fuel or lubricants cannot be discounted and is addressed through existing regulatory mechanisms. Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are required of operators, and monitored by the regulator for offshore exploration and production.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not have the potential to undermine the conservation objectives of the Humber Estuary SAC (see Appendix C2).

5.3.2 Riverine SACs

(Annex II qualifying species: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*)

The Humber Estuary maintains populations of sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis* (both favourable maintained). Both the river lamprey and sea lamprey migrate up rivers to spawn and spend the larval stage buried in muddy substrates in freshwater. Once metamorphosis takes place, the adults migrate to the sea where they live as a parasite on various species of fish. Sea lampreys are thought to inhabit both shallow coastal and deep offshore waters, venturing further than river lampreys.

Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites and species would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal), in addition to those mitigation measures which are mandatory – in all cases, rigorous spill prevention, response and other mitigation measures are required of operators and monitored by the regulator for offshore exploration and production.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not have an adverse affect which could undermine the conservation objectives of the qualifying features of the River Derwent. As stated previously, as the recoverable resources are gas, no significant oil spill can be expected in the case of a blowout.

5.3.3 Special Protection Areas

Table 5.3 provides information on those SPA types which are potentially vulnerable to oil spills. Those sites where the potential for effects from diesel oil spills has been identified (see Appendix B) are listed. Due to the limited distance which may be travelled by spilled diesel oil (up to ca. 24km), the potential for oil spill effects relate to a limited number of Blocks near the coast; these are listed alongside the relevant site. Note: several sites are represented in more than one risk category.

Table 5.3: SPA types potentially vulnerable to oil spills

Cliff-breeding seabird colonies
Designated for colonial breeding seabirds (including auks, fulmar, kittiwake, cormorant, and gannet) which nest either on, or generally associated with sea cliffs. Birds extensively utilise adjacent coastal waters for a variety of activities, and also forage beyond site boundaries.
Sites potentially at risk (relevant Block): Flamborough Head and Bempton Cliffs SPA (41/18, 19, 20, 24, 25)
Petrel, tern, skua or gull breeding populations
Designated for breeding seabirds, which generally forage over sea areas adjacent to (or in some cases at considerable distance from) breeding sites.
Sites potentially at risk (relevant Block): Humber Estuary SPA (47/2, 6, 7, 13, 18), The Wash SPA (47/18)

Red-throated diver breeding populations utilising coastal waters
Inland sites designated for breeding red-throated diver (<i>Gavia stellata</i>) which forage in neighbouring coastal waters.
Sites potentially at risk (relevant Block): None
Open coastline supporting wintering waders and seaduck
Contain coastal and intertidal habitats which support a variety of wintering waders and seaduck, often in large aggregations. The birds feed on wetlands and the surrounding shallow waters.
Sites potentially at risk (relevant Block): The Wash SPA (47/18)
Firths, lochs and estuaries supporting wintering waterfowl
Contain enclosed and semi-enclosed coastal and intertidal habitats (particularly wetlands) supporting a variety of wintering waterfowl and waders, often in large aggregations. Some species (e.g. seaducks) feed beyond the boundaries of sites.
Sites potentially at risk (relevant Block): Humber Estuary SPA (47/2, 6, 7, 13, 18), The Wash SPA(47/18)

5.3.3.1 Consideration

The conservation features of the sites listed in Table 5.3 are potentially vulnerable to a large oil spill due to both coastal and wider foraging, and for some species, time spent at the sea surface (see Section 5.2), which could result in significant disturbance to species. Additionally, such a large spill could result in damage to supporting habitats including intertidal areas utilised by a variety of wintering waterfowl and waders (e.g. Humber Estuary, the Wash). Blowout occurrence frequency is in the range of 1/1000-10,000 well years (see Section 5.2) and the southern North Sea basin is a gas province, which negates the possibility of a significant crude oil spill. Spill scenarios are restricted to accidental spills of diesel fuel or lubricants. The majority of the proposed work programmes indicate a drill or drop well. Therefore, following examination of existing seismic information a decision will be made by the prospective licensee to drill a well or relinquish the block. As the location and design of proposed drill or drop wells is not known, a detailed assessment of the potential for effects cannot be made at this time.

Following licensing, specific activities require permitting (see Section 5.4) and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Habitats Regulations Assessment procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are required of operators and monitored by the regulator for offshore exploration and production.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities, which may include the drilling of wells, will not have an adverse affect which could undermine the conservation objectives of the qualifying features of the SPAs within the Southern North Sea. Moreover, JNCC and Defra have highlighted periods of seasonal concern for drilling for a number of the Blocks under consideration in this AA (see Table 2.1), and DECC will apply a presumption that no drilling activity takes place during these periods unless agreement is reached with the body that requested the restriction, or appropriate mitigation measures can be agreed (defined at the project level).

5.4 Regulation and mitigation

Spill prevention and mitigation measures are implemented for offshore exploration and production inter alia through the *Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation) Regulations 1998* and the *Offshore Installations (Emergency Pollution Control) Regulations 2002*. The required measures include spill prevention and containment measures, risk assessment and contingency planning. Under the Regulations, all operators of an offshore installation or oil handling facility must have an Oil Pollution Emergency Plan, OPEP) in place. The plans are reviewed by DECC, MCA and relevant environmental consultees, such as the Marine Management Organisation or relevant Devolved Authority, the Joint Nature Conservation Committee and the relevant inshore statutory nature conservation body, e.g. Scottish Natural Heritage, before approval by DECC. OPEPs set out the arrangements for responding to incidents with the potential to cause marine pollution by oil, with a view to preventing such pollution or reducing or minimising its effect. Additional conditions can be imposed by DECC through block-specific licence conditions (i.e. “Essential Elements”).

Offshore, primary responsibility for oil spill response lies with the relevant Operator, although the Secretary of State’s Representative may intervene if necessary. The Maritime and Coastguard Agency is responsible for a National Contingency Plan and currently maintains four Emergency Towing Vessels stationed around the UK, which remain on standby at sea (see footnote 4 on page 23). The MCA maintains a contractual arrangement for provision of aerial spraying and surveillance, with aircraft based at Coventry and Inverness. Within two days, aircraft can deliver sufficient dispersant to treat a 16,000 tonne spill within 50 miles of the coast anywhere around the UK. MCA holds 1,400 tonnes of dispersant stockpiled in 14 locations around the UK, in addition to counter-pollution equipment (booms, adsorbents etc.) which can be mobilised within 2-12 hours depending on incident location. DECC is a partner in undertaking regular aerial surveillance operations of offshore installations, as a deterrent measure.

For activities in proximity to sensitive shorelines, the Department’s guidance (DECC 2009a) requires that the risk of shoreline contamination be determined through an appropriate risk assessment, and operators with oil spill scenarios that could impact the shoreline must have access to appropriate oil spill response resources suitable for shoreline clean-up operations. Additional resources are required for installations operating in any Block wholly or partly within 25 miles of the coastline dependent on the hydrocarbon inventory and the oil pollution incident scenarios identified, including:

- The presence near the facility at all times of a vessel:
 - with the capability of spraying dispersant within 30 minutes of an oil pollution incident notification
 - has a stock of dispersant sufficient to deal with an oil pollution incident of 25 tonnes, and if required, have the capability (equipment and capacity) of recovering any oil likely to be lost from the installation under a Tier 1⁶ scenario

⁶ Oil pollution incidents are classified according to the response levels they are most likely to require and not the volume of oil pollution, unless this is supported by a location specific risk assessment. For example, if a pollution incident requires the use of resources from a regional centre, this would be used to classify the necessary response level, irrespective of its size.

For consistency with the National Contingency Plan, the following Tier definitions apply:

- Tier 1 Local (within the capability of the operator on site);
- Tier 2 Regional (beyond the in-house capability of the operator);
- Tier 3 National (requiring national resources).

- In the event of a Tier 2 incident, Tier 2 resources must be available on scene within half the time taken for the oil to reach shore in 30 knot wind conditions
- Details of resources to deal with a Tier 3 incident (i.e. an oil pollution incident that cannot be controlled by Tier 1 or 2 resources), including sources transport and delivery system
- A Shoreline Protection Strategy Plan

UK oil spill contingency planning and response capabilities have been reviewed and revised following the Deepwater Horizon spill (see Section 5.1). Oil & Gas UK established the Oil Spill Prevention and Response Advisory Group (OSPRAG) to provide a focal point for the sector's review of the industry's practices in the UK, in advance of the conclusion of investigations into the Gulf of Mexico incident. The Group had four specialist review groups whose remit was to focus on:

- technical issues including first response for protection of personnel;
- oil spill response capability and remediation including national emergency response measures;
- indemnity and insurance requirements;
- pan-North Sea regulations and response mechanisms.

The Oil Spill Response Group (OSRG) of OSPRAG was established to review the UK's oil spill response capability and industry co-ordination with the national response mechanism. Its areas of focus were spill scenarios and modelling, review of physical response capability, sensitivity and protection mapping in relation to clean up and restoration, Oil Pollution Emergency Plans (OPEPs) and exercising OPEPs. An early action of the OSRG was to facilitate planning for an early exercise of the NCP (see above).

OSPRAG's technical review group has completed its review of the UK offshore oil and gas industry's practices in the following areas: well examination verification and primary well control, blow-out preventers (BOPs) and competency, behaviours and human factors. This work concluded that there is a high degree of confidence in the UK regulatory regime and that it drives the right safety and environmental behaviours. The Well Life Cycle Practices Forum (WLCPPF) will advance recommendations made by OSPRAG and facilitate the dissemination of lessons from Macondo and other similar events, with a specific focus (among others) on BOP issues, including liaison with the HSE on the recommendation made by the House of Commons Select Committee that it examines the case for prescribing the equipment of BOPs on the UKCS with two blind shear rams.

5.5 Conclusions

Individual European Sites have been categorised in terms of potential vulnerability, based on location in relation to known hydrocarbon prospectivity (gas) of proposed licence blocks and therefore the nature and magnitude of credible risks. Two categories of vulnerability were identified:

- Those sites considered to be at potential risk, with the possibility of impacts in the event of a significant spill of diesel or lube oil (i.e. where site conservation objectives are at risk of being undermined/where present conservation status may be negatively affected).
- Many sites are considered not to be at risk from oil spills associated with activities in the Blocks, due to their distance from the Blocks and relative sensitivity of the features.

The incremental risk associated with activities resulting from the proposed licensing (i.e. additional to existing risk; primarily associated with shipping and other maritime activities) is very low. This results from the combination of low probability and low severity (since most spills would be relatively small and of diesel oil). The activities which could reasonably be expected to follow from the proposed licensing would not have a significant effect on the existing risks associated with other activities.

Following licensing, specific activities considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and Appropriate Assessment procedures. In all cases, rigorous spill prevention, response and other mitigation measures are implemented for offshore exploration and production.

Oil spills can have potentially adverse effects, and are controlled in direct proportion to this by a legal framework that minimises their occurrence, provides for contingency planning, response and clean up, and which enables prosecutions. It is not possible to say that in spite of the regulatory controls and other preventative measures, an oil spill will never occur as a result of 26th Round licensing in the southern North Sea; however, as oil spills are not intended activities, a risk-based assessment is appropriate.

Following licensing, specific activities require permitting and those considered to present a risk to European Sites would be evaluated by DECC under mandatory contingency planning and HRA procedures which will allow mitigation measures to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). In all cases, rigorous spill prevention, response and other mitigation measures are required of operators and monitored by the regulator for offshore exploration and production.

Given the availability of mitigation measures, DECC considers that exploration and production activities that could follow the licensing of Blocks 41/18, 41/19, 41/2041/24, 41/25, 42/27, 43/15a, 43/20a, 43/20c, 44/01, 44/02, 44/03, 44/04, 44/05, 44/14, 44/15, 44/16a, 44/17d, 44/17e, 44/17f, 44/18c, 44/23c, 44/23d, 44/24c, 44/30, 45/01, 47/02b, 47/03g, 47/06, 47/07, 47/13b, 47/18, 47/19b, 48/08d, 48/09b, 48/14c, 48/18e, 48/19d, 48/20b, 48/25a, 48/30c, 49/14a, 49/17d, 49/18b, 49/19b, 49/21c, 49/22b, 49/23b, 49/23c, 49/24d, 49/26b, 49/27c, 49/28c, 52/05c, 53/01b and 53/02c, in so far as they may cause oil spills, will not adversely affect the integrity of European Sites.

Consent for activities will not be granted unless the operator can demonstrate that the proposed activities will not have an adverse affect on the site integrity of Natura 2000 sites.

6 Consideration of sites and potential physical and other effects

6.1 Introduction

Several activities associated with oil and gas exploration and production can lead to physical disturbance, damage, alteration or contamination of seabed habitats and geomorphological features, with consequent effects on benthic communities. The prime potential sources of effect are summarised below, followed by a consideration of the foreseeable effects on European Sites assessed to be at potential risk.

6.2 Physical damage at the seabed

The main sources of physical disturbance of the seabed from oil and gas activities are:

- **Anchoring of semi-submersible rigs.** Semi-submersible rigs use anchors to hold position, typically between 8 and 12 in number at a radius depending on the water depth, and cause seabed disturbance from the anchors and chain or cables, and in cohesive sediments, leave 'anchor mounds' after their retrieval. NB: such rigs are typically not used in the shallow water depths of the southern North Sea.
- **Placement of jack-up rigs.** Jack-up rigs, normally used in shallower water, leave three or four depressions from the feet of the rig (the spud cans) around 15-20m in diameter. In locations with an uneven seabed, material such as grout bags may be placed on the seabed to stabilise the rig feet.
- **Drilling of wells and wellhead removal.** The surface hole sections of exploration wells are typically drilled riserless, producing a localised (and transient) pile of surface-hole cuttings around the surface conductor. After installation of the surface casing (which will result in a small quantity of excess cement returns being deposited on the seabed), the blowout preventer (BOP) is positioned on the wellhead housing. These operations (and associated activities such as ROV operations) may result in physical disturbance of the immediate vicinity (a few metres) of the wellhead. When an exploration well is abandoned, the conductor and casing are plugged with cement and cut below the mudline (sediment surface) using a mechanical cutting tool deployed from the rig and the wellhead assembly is removed. The seabed "footprint" of the well is therefore removed.
- **Production platform jacket installation.** Limited physical footprint similar to a drilling rig, but present on site for longer period. Physical disturbance associated with platform removal during decommissioning is comparable to that of installation.
- **Subsea template and manifold installation.** Limited physical footprint at seabed, smaller than a drilling rig, but present on site for longer period. Physical disturbance associated with subsea template and manifold removal during decommissioning is comparable to that of installation.

- **Pipeline, flowline and umbilical installation, trenching and potentially, placement of rock armour.** Anticipated hydrocarbons are gas and given the location of the Blocks applied for, it is anticipated that new field developments will be 'tied back' to existing infrastructure. Large pipes (greater than 16" diameter) do not have to be trenched according to a general industry agreement as they will not be moved by fishing gear, but they may still need to be trenched for reasons of temperature loss or upheaval buckling (due to buoyancy). Trenches may require several passes before they are of the required depth, or it may be impossible to achieve the required depth due to obstructions, in which case rock is usually placed on the pipeline (rock dump) to protect and stabilise it.

DECC Oil and gas SEAs have compared the physical disturbance effects of oilfield activities to those of fishing and natural events in shallow water (e.g. storm wave action), and concluded that oilfield effects are typically minor on a regional scale. It is generally accepted that the principal source of human physical disturbance of the seabed and seabed features is bottom trawl fishing. Trawl scarring is a major cause of concern with regard to conservation of shelf and slope habitats and species (e.g. Witbaard & Klein 1993, de Groot and Lindeboom 1994, Kaiser *et al.* 2002a, Kaiser *et al.* 2002b, Gage *et al.* 2005). On the basis that seabed disturbance is qualitatively similar to the effects of severe storms in the southern North Sea, sand and gravel habitat recovery from the processes of anchor scarring, anchor mounds and cable scrape is likely to be relatively rapid (1-5 years) in most shallower and exposed (as opposed to sheltered) areas. Consequently, the effects of drill rig positioning and the installation of seabed infrastructure (including pipelines, umbilical and other cables) are considered minor and transient and such that they would not compromise the conservation objectives of relevant sites; this assumes that standard industry information gathering and regulatory controls are in place (see below).

Rock armouring of pipelines and cables is undertaken in some areas to protect against physical damage or scour in areas of strong tidal currents. The introduction of rock (as well as steel or concrete structures) into an area with a seabed of sand and/or gravel can provide "stepping stones" which might facilitate biological colonisation including by non-indigenous species by allowing species with short lived larvae to spread to areas where previously they were effectively excluded. However, on the UK continental shelf such "stepping stones" are already widespread and numerous, the result of for example of rock outcrops, glacial dropstones and moraines, relicts of periglacial water flows, accumulations of large mollusc shells, carbonate cemented rock etc. Rig site and pipeline route surveys in the southern North Sea typically reveal the presence of such natural "stepping stones" and therefore it is considered that facility installation and rock placement would not compromise the conservation objectives for the offshore SACs in the area.

The broad distribution of large scale biotopes of conservation importance is relatively well understood in the southern North Sea (e.g. see McBreen *et al.* 2011). Within the boundaries of designated and potential SACs the occurrence of habitats of interest is usually known with greater precision. The routine sources of potential physical damage are controlled by a range of statutory measures including Consent to Locate, PON15B, Environmental Statement, Pipeline Works Authorisation and, where relevant, AA. Provisions under the Marine and Coastal Access Act (2009) include certain activities previously covered by the Food and Environment Protection Act; guidance on these is pending. Based on the results of the assessments including AA, DECC may require additional mitigation measures to avoid or minimise any adverse effects, or where this is not possible, refuse consent.

6.3 Marine discharges

As described in previous DECC oil and gas SEAs, marine discharges from exploration and production activities include produced water, sewage, cooling water, drainage, drilling wastes and surplus water based mud (WBM), which in turn may contain a range of hydrocarbons in dissolved and suspended droplet form, various production and utility chemicals, metal ions or salts (including Low Specific Activity radionuclides).

Most studies of produced water toxicity and dispersion, in the UK and elsewhere (see E&P Forum 1994, OLF 1998, Riddle *et al.* 2001, Berry & Wells 2004) have concluded that the necessary dilution to achieve a No Effect Concentration (NEC) would be reached at <10 to 100m and usually less than 500m from the discharge point. However, under some circumstances (e.g. strong stratification: Washburn *et al.* 1999), a plume concentration sufficient to result in sub-lethal effects may persist for >1,000m (Burns *et al.* 1999).

Monitoring with caged mussels in the Netherlands and Norwegian sectors of the North Sea has shown that mussels exposed to produced water discharges may accumulate PAH and show biological responses up to 1,000m from the discharge. Concentrations of PAHs and alkyl phenols and measured biological responses in wild fish such as cod and haddock caught in the vicinity of offshore installations from Norwegian waters in 2002 and 2005 showed a mixed pattern mostly with no increased concentrations, but some elevated biological responses suggesting past exposure. Exposure of cod sperm cells to environmentally relevant concentrations (100, 200, 500 ppm) of produced water from the Hibernia platform, Newfoundland, did not result in a strong toxicity to the cells (only subtle changes were observed) or a significant change in fertilisation rate (Hamoutene *et al.* 2010).

The OSPAR QSR (2010) noted that results from water column monitoring are complex to interpret, particularly for wild fish for which it is not possible to link observed biological responses to a specific exposure source. Monitoring data are limited and do not yet allow conclusions to be drawn on the significance of observed responses for marine life and ecosystems. However, OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations includes a presumption against the discharge to sea of produced water from new developments. Only under certain circumstances (e.g. injection pump maintenance) may the effluent be routed to sea. Any produced water discharged will be treated since it is still required to meet legal quality standards in terms of oil in water concentration (DECC 2011).

Drilling wastes are a major component of the total waste streams from offshore exploration and production, with typically around 1,000 tonnes of cuttings resulting from an exploration or development well. Water-based mud cuttings are discharged at, or relatively close to sea surface during “closed drilling” (i.e. when steel casing and a riser is in place), whereas surface hole cuttings will be discharged at seabed during “open-hole” drilling. Use of oil based mud systems, for example in highly deviated sections or in water reactive shale sections, would require the onshore disposal or reinjection of a proportion of waste material (DECC 2011).

In contrast to historic oil based mud discharges, effects on seabed fauna of the discharge of cuttings drilled with WBM and of the excess and spent mud itself are usually subtle or undetectable, although the presence of drilling material at the seabed close to the drilling location (<500m) is often detectable chemically (e.g. Cranmer 1988, Neff *et al.* 1989, Hyland *et al.* 1994, Daan & Mulder 1996). Considerable data has been gathered from the North Sea and other production areas, indicating that localised physical effects are the dominant mechanism of ecological disturbance where water-based mud and cuttings are discharged (DECC 2011).

Currie & Isaacs (2005) reported that water based drilling muds and associated cuttings modified population densities of benthic infaunal species at sampling sites up to 200m from an exploration well in the Minerva field, Australia. The most pronounced effects were evident within 100m of the well-head, where declines in density of most abundant species exceeded 70% immediately following drilling. However, effects on the community structure at sites 100 and 200m from the wellhead did not persist beyond four months as natural species recruitment swamped residual effects over the same period. In contrast, benthic communities at the well-head site remained modified 11 months after drilling, in spite of recoveries in species diversity and abundance. This persistent community difference was likely due to the physical modification of the sediment at this site by drill cuttings discharge.

OSPAR (2009) concluded that the discharge of drill cuttings and water-based fluids may cause some smothering in the near vicinity of the well location. The impacts from such discharges are localised and transient, but may be of concern in areas with sensitive benthic fauna, for example corals and sponges.

In addition to these mainly platform-derived discharges, a range of discharges is associated with operation of subsea infrastructure (hydraulic fluids), pipeline testing and commissioning (treated seawater), and support vessels (sewage, cooling and drainage waters). Discharges from offshore oil and gas facilities have been subject to increasingly stringent regulatory controls over recent decades, and oil concentrations in the major streams (drilling wastes and produced water) have been substantially reduced or eliminated. Amendments to the Offshore Chemical Regulations (2002) in 2011 mean that additional activities are now captured within a permit. The effects of other marine discharges are judged to be negligible in the context of proposed licensing and the Natura 2000 sites in the area and are not considered further here. They would also be considered in detail in project-specific Environmental Statements, AAs (where necessary) and chemical risk assessments under existing permitting procedures.

6.4 Other effects

Through the transport and discharge of vessel ballast waters (and associated sediment), and to a lesser extent fouling organisms on vessel/rig hulls, non-native species may be introduced to the marine environment. Should these introduced species survive and form established breeding populations, they can exert a variety of negative effects on the environment. These include: displacing native species by preying on them or out-competing them for resources such as prey and habitat; irreversible genetic pollution through hybridisation with native species; increased occurrence of toxic algal blooms. The economic repercussions of these ecological effects can also be very significant. In response to these risks, a number of technical and procedural measures have been proposed (such as the use of ultraviolet radiation to treat ballast water) or introduced such as a mid-ocean exchange of ballast water (the most common mitigation against introductions of non-native species). International management of ballast waters is addressed by the International Maritime Organisation (IMO) through the International Convention for the Control and Management of Ships Ballast Water & Sediments, which was ratified in 30 States in 2005. The Convention includes Regulations with specified technical standards and requirements (IMO Globallast website). Further oil and gas activity is unlikely to change the risk of the introduction of non-native species as the vessels typically operate in a geographically localised area, de-ballasting is unlikely to take place in these areas and the risk from hull fouling is low, given the geographical working region and scraping of hulls for regular inspection.

The potential effects of light on birds have been raised in connection with offshore oil and gas over a number of years (e.g. Wiese *et al.* 2001). As part of navigation and worker safety, oilfield installations and associated vessels are lit at night and the lights will be visible at distance (some 10-12nm in good visibility). Furthermore, the flaring of hydrocarbons generates a bright light which may also be visible over a considerable distance. Platform illumination and flares have been shown to have an attractive effect on many species of seabird; this attraction is enhanced by conditions of poor visibility such as fog, haze and drizzle (Wiese *et al.* 2001 and references therein). Bird mortality resulting from collisions with the structure and flare (leading to incineration) is the primary concern, although any such mortality will be several orders of magnitude lower than that of natural or other anthropogenic mortality (e.g. predation by domestic cats) and is not considered to be significant at a population-level. The lights on installations and vessels are primarily non-flashing so the strong behavioural effects noted by Bruderer *et al.* (1999) in response to a strong searchlight being switched on and off are not anticipated. Potential effects can be mitigated through the control or avoidance of well test and routine flaring during production, and timing controls can be used since drilling and construction are temporary activities. It is therefore concluded that light effects will not affect site integrity, nor undermine the conservation objectives of sites with qualifying mobile species which could potentially interact with illuminated platforms and vessels.

Physical disturbance of seaduck and other waterbird flocks by vessel and aircraft traffic associated with hydrocarbon exploration and production is possible, particularly in SPAs established for shy species. Such disturbance can result in repeated disruption of bird feeding, loafing and roosting. As with light, it is considered this source of potential effect will not result in significant disturbance to the species within Natura 2000 sites or threaten the viability of populations of qualifying features at the sites (e.g. The Wash SPA, Humber Flats, Marshes and Coast SPA) because of the location of the SPAs and pSPAs relative to the Blocks applied for and the main ports of supply for operations within them. Gas developments and infrastructure in the area tend to be primarily subsea tie-back based and therefore any disturbance at the sea surface is reduced to periods of construction and decommissioning only with the likelihood of significant disturbance to species further reduced.

6.5 Implications for relevant European Sites

The screening process (summarised in Appendix B) identified that there was the potential for the conservation objectives/status of certain sites to be undermined by potential physical disturbance and discharge effects in a number of relevant sites. These are the Dogger Bank cSAC, North Norfolk Sandbanks and Saturn Reef cSAC, Inner Dowsing, Race Bank and North Ridge cSAC, and Haisborough, Hammond and Winterton cSAC as each encompasses or is overlapped by a number of the Blocks applied for. With the exception of the Inner Dowsing, Race Bank and North Ridge cSAC, these sites all contain existing gas fields and several blocks have been applied for within the indicative boundaries of these sites. Consequently the sites may be affected by a variety of activities, including rig/installation placement and pipelaying, which can result in direct physical damage by abrasion, changes in suspended sediment disturbance and deposits of rock. While local effects on the physical extent or structure of the qualifying habitats are foreseeable, activities that might follow a 26th Licensing Round would modify an extremely small area of these European Sites and rapid recovery of such effects has been observed in many similar circumstances. Any activities that may cause such disturbance would be subject to assessment and potential mitigation. In the long-term, it is not expected that such effects would result in a reduction in the diversity, community structure and typical species of the supporting habitats and sites as a whole, resulting in deterioration in conservation status. While the Saturn Reef feature is more restricted in its spatial extent and more sensitive to

physical disturbance than sandbank features, none of the Blocks under consideration overlap the documented extent of the reef feature, and any proposed seabed development in this area would require extensive survey to characterise the seabed allowing potential interactions to be assessed. Risks to overall site integrity from gas exploration and production activities would be prevented (mitigated) by the existing legal framework for the respective activities, which includes AA where necessary.

Contamination by introduction of synthetic and/or non-synthetic compounds has been noted as a potential threat to the sites. However, current rules effectively mean that only water based drill muds (WBM) would be discharged either on rock cuttings or as excess mud. Around 95% of the constituents of a typical WBM are naturally-occurring (and defined by OSPAR as posing little or no risk to the environment) while remaining chemicals would have low toxicity and bioaccumulation potential. There are strict regulatory controls over the use and discharge of offshore chemicals and toxic or enrichment effects are not envisaged. Dispersion of mud and cuttings is influenced by various factors. The range of cuttings particle size results in a significant variation in settling velocity, and a consequent gradient in the size distribution of settled cuttings, with coarser material close to the discharge location and finer material very widely dispersed away from the location. Extensive monitoring of the ecological effects of discharged WBM cuttings has been carried out in the North and Irish Seas (and internationally) and the consensus view is that any effects are subtle, very localised and transient. In view of the shallow water depths and energetic hydrography of the area the sites are believed to be tolerant of sediment disturbance and discharges of drilling solids. Such materials are an insignificant contribution to the regional sediment budget and do not, in general, accumulate in particular areas.

The generic consideration (above) of physical disturbance and discharge effects of the activities that could follow licensing indicate that the likely scale and duration of effects is transient or if longer term not compromising the site conservation objectives. Activities within any of the Blocks applied for would be subject to statutory risk assessment, mitigation and permitting measures, which would include assessment of the potential effects on the integrity of Natura 2000 sites.

6.6 Conclusions

All blocks under consideration in the southern North Sea are within or immediately adjacent to Natura 2000 sites. Adverse effects identified with regards to physical effects on the seabed, marine discharges and other disturbance effects (e.g. lighting, vessel and aircraft traffic), when aligned with project level mitigation and relevant activity permitting, will not threaten the long-term viability of qualifying habitats and/or populations of species of the Natura 2000 sites considered in this assessment. It is unlikely that any new terminals would be built as a result of developments following 26th Round Licensing. While new pipelines could conceivably come ashore at existing terminals, either through or near to coastal SACs and SPAs, there are well proven methods to prevent significant impacts. However, any adverse effects of activities that could result from licensing are considered minor, and able to be mitigated to the point where they would not compromise site conservation objectives. There is a legal framework, via e.g. EIA regulations and those implementing the Habitats Directive, to ensure that there are no adverse effects on Natura 2000 sites.

Taking into account the information presented above and in the Appendices, it is concluded that activities arising from the licensing of the 56 Blocks included in this assessment will not cause an adverse effect on the integrity of the European Sites, though consent for activities will not be granted unless the operator can demonstrate that the proposed activities which may include the drilling of a well will not have an adverse affect on the integrity of European Sites.

7 Consideration of sites and potential acoustic effects

7.1 Overview of effects of acoustic disturbance

Of all marine organisms, marine mammals are regarded as the most sensitive to acoustic disturbance. This is due to their use of acoustics for echolocation and vocal communication and their possession of lungs which are sensitive to rapid pressure changes. Most concern in relation to seismic noise disturbance has been related to cetacean species. However, some pinnipeds are known to vocalise at low frequencies (100-300Hz) (Richardson *et al.* 1995), suggesting that they have good low frequency hearing and are therefore sensitive to acoustic disturbance. Otters in coastal habitats may also experience acoustic disturbance from seismic exploration or piling. However, they generally occupy shallow, inshore areas where the propagation of seismic noise is very limited.

Defra has identified periods of concern for seismic (see Table 2.1) for a number of Blocks considered in this assessment, and DECC takes these periods into consideration when considering applications for noisy activities (e.g. seismic survey). Many species of fish are highly sensitive to sound and vibration (review in MMS 2004). Exposure to high sound pressure levels has been shown to cause long-term (>2 months) damage to sensory cells in fish ears (Hastings *et al.* 1996, McCauley *et al.* 2003). Other reported effects include threshold shifts (hearing loss), stress responses and other behaviour alterations (review in Popper *et al.* 2003). A number of field studies have observed displacement of fish and reduced catch rates, suggested to be attributable to behavioural responses to seismic exploration (e.g. Skalski *et al.* 1992, Engås *et al.* 1996, Hassel *et al.* 2004, Slotte *et al.* 2004). While lamprey are the only qualifying fish species of relevant European Sites in the southern North Sea area (e.g. Humber Estuary SAC), numerous fish species present in the region provide important components of the diet of qualifying species of other relevant European Sites, such as harbour seal *Phoca vitulina*, grey seal *Halichoerus grypus* (e.g. Berwickshire and North Northumberland Coast SAC, Humber Estuary SAC) and several seabird species such as puffin, kittiwake and gull species (e.g. Coquet Island SPA, Flamborough Head and Bempton Cliffs SPA, North Norfolk Coast SPA). Impact on prey species could undermine conservation objectives for sites though a deterioration in conservation status, for instance this may represent an indirect disturbance to qualifying species, or a temporary deterioration of the functioning of the habitats which support qualifying species, though mitigation measures are available (see Section 7.5) the implementation of which will also be assessed in detail once project plans are available.

There are currently no UK Natura 2000 sites with mobile marine invertebrates as qualifying features. However, as with fish, invertebrates such as crabs and squid may form an important component of the diet of qualifying species of relevant European Sites, for example grey seal. The study of effects of seismic noise on invertebrates is limited, and it has been suggested that no reliable conclusions can be made that negative effects exist or not (Moriyasu *et al.* 2004). Recent studies into the effects of seismic exploration on crustaceans have shown no significant long term effects on physiology, behaviour or catch rates (Christian *et al.* 2003, DFO 2004, Parry & Gason 2006). Due to their well developed nervous system, cephalopods such as squid may be more sensitive to seismic noise than other invertebrates; however, evidence for effects of seismic noise on them is very limited (review in Moriyasu *et al.* 2004).

Direct effects on seabirds because of seismic exploration noise could occur through physical damage, or through disturbance of normal behaviour. Diving seabirds (e.g. auks) may be most at risk of acute trauma. The physical vulnerability of seabirds to sound pressure is unknown, although McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic in some species (penguins) would be high, hence only at short ranges would individuals be adversely affected. Mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere. A study has investigated seabird abundance in Hudson Strait (Atlantic seaboard of Canada) during seismic surveys over three years (Stemp 1985). Comparing periods of shooting and non-shooting, no significant difference was observed in abundance of fulmar, kittiwake and thick-billed murre (Brünnich's guillemot).

Airborne noise, for example from helicopter overflights, could potentially disturb birds in coastal SPAs, although in the context of other military and civilian aircraft activities the anticipated level of E&P related noise is insignificant. In specific cases of concern, including seasonal concerns (for instance, during moulting), mitigation through routeing restrictions could be implemented, and these will be considered at a project specific level.

7.2 Noise sources and propagation

Compared to the noise derived from seismic surveys and piling, noise from other oil and gas activities is relatively minor; previous DECC SEAs have assessed noise in some detail, and the following discussion is focussed on seismic noise as the primary concern. The potential for significant effect is therefore largely related to the anticipated type, extent and duration of seismic survey associated with proposed licensing. The range over which noise propagates (and effects may result) varies with water depth, density stratification, substrate and other factors, and is therefore area-specific.

7.2.1 Seismic survey

With the exception of explosives and modern military sonar (and possibly wind farm monopile piling), airgun arrays used for seismic surveys are the highest energy man made sound sources in the sea; broadband peak-to-peak (p-p) source levels of 248-259dB re 1 μ Pa are typical of large arrays (Richardson *et al.* 1995). Airgun noise is impulsive (i.e. non-continuous), with a typical duty cycle of 0.3% (i.e. one 25ms pulse every 10s) and slow rise time (in comparison to explosive noise). These characteristics complicate both the measurement of seismic noise "dose" and the assessment of biological effects (many of which have been studied in relation to continuous noise). Most of the energy produced by airguns is below 200Hz, although some high frequency noise may also be emitted (Goold 1996). Peak frequencies of seismic arrays are generally around 100Hz; source levels at higher frequencies are low relative to that at the peak frequency but are still loud in absolute terms and relative to background levels.

Current levels of seismic survey in the UKCS are around 20-30 surveys per year, which has been the case for the past few years. This has declined from 75 surveys in 1997 (DECC database of PON14 closeout submissions).

The offshore energy SEA process has reviewed general aspects of noise propagation. Most environmental assessments of noise disturbance in deeper water use simple spherical propagation models to predict sound pressure levels at varying distances from source. However, additional signal modification and attenuation may result from a combination of reflection from sub-surface geological boundaries, sub-surface transmission loss due to frictional dissipation and heat; and scattering within the water column and sub-surface due to

reflection, refraction and diffraction in the propagating medium. In shallow water, reflection of high frequency signals from the seabed results in approximately cylindrical propagation and therefore higher received spectrum levels than for spherically propagated low frequency signals (which penetrate the seabed).

In general, as distance from the array increases, higher frequencies are attenuated more rapidly and beyond a few kilometres, the main contribution is in the 2kHz region. Finally beyond around 12km it will be the main low-frequency pulse of around 250Hz that has the main contribution. However, local propagation effects may have significant influence: for example frequency dependence due to destructive interference also forms an important part of the weakening of a noise signal. Simple models of geometric transmission loss may therefore be unreliable in relatively shallow water; in areas of complex seabed topography and acoustic reflectivity; where vertical density stratification is present in deep water; and where the noise does not originate from a point source. In the St George's Channel, Goold and Fish (1998) recorded 8kHz sounds above background levels at a range of 8km from the source, even in a high noise environment.

7.2.2 Other activities

Pile-driving of foundations may generate high source levels and has been widely recognised as a potential concern, in particular for large offshore wind developments where many piles may be installed sequentially over long time scales (as reviewed in DECC 2011). Brandt *et al.* (2011) reporting on piling operations at the Horns Rev II site off the Danish west coast, indicated that during one pile driving event, the peak noise level reached 196 dB re 1 μ Pa, the sound exposure level (SEL) reached a maximum of 176 dB re 1 μ Pa² s and the M-weighted SEL (see below) reached 170 dB re 1 μ Pa² s at 720m distance. At a distance of 2,300m, peak levels reached 184 dB re 1 μ Pa, SEL 164 dB re 1 μ Pa² s and M-weighted SEL reached 157 dB re 1 μ Pa² s. Pile-driving also occurs in connection with oil and gas facilities, although the pile diameters are smaller than wind turbine monopiles and typically result in lower source levels and durations.

Available measurements indicate that drilling activities produce mainly low-frequency continuous noise from several separate sources on the drilling unit (Richardson *et al.* 1995, Lawson *et al.* 2001). The primary sources of noise are various types of rotating machinery, with noise transmitted from a semi-submersible rig to the water column through submerged parts of the drilling unit hull, risers and mooring cables, and (to a much smaller extent) across the air-water interface. Noise transmission from jack-up rigs used in shallower water is less because of limited coupling with the water column. Under some circumstances, cavitation of thruster propellers is a further appreciable noise source, as may be the use of explosive cutting methods (e.g. for conductor removal).

Measured farfield sound pressure of around 170dB re 1 μ Pa, in the frequency range 10-2000Hz (Davis *et al.* 1991) is probably typical of drilling from a semi-submersible rig and is of the same order and dominant frequency range as that from large merchant vessels (e.g. McCauley 1994). Drilling noise has also been monitored west of Shetland, in the vicinity of the Foinaven and Schiehallion developments (Swift & Thompson 2000). High and variable levels of noise were initially believed to result from drilling related activity on two semi-submersible rigs operating in the area. However, subsequent analysis found more direct correlation between the use of thrusters and anchor handlers, during rig moves, and high levels of noise (Swift & Thompson 2000). Further measurements of drilling and pipelay noise in the North Sea have been undertaken (Nedwell & Needham 2001, Nedwell *et al.* 2001, Nedwell *et al.* 2002). Drilling duration may range from a few weeks for an exploration well, to years in the case of a large development programme.

Pipelay operations will result mainly in continuous noise (associated with rotating machinery), with relatively little impulse or percussive noise in comparison to many other marine construction activities. The overall source levels resulting from pipelay operations on the UKCS have not been measured, however, near-field cumulative sound levels associated with pipelay for the Clair field development were predicted to be a maximum of 177dB (Lawson *et al.* 2001), with a duration of weeks or months.

Although there is little published data, noise emission from production platforms is thought to be qualitatively similar to that from ships, and is produced mainly by rotating machinery (turbines, generators, compressors) (Richardson *et al.* 1995).

A further source of noise associated with all stages of the offshore oil industry is helicopter overflights. There is relatively little quantitative information on the transmission of helicopter airborne noise to the marine environment (Richardson *et al.* 1995). Measurements of an airsea rescue helicopter over the Shannon estuary (Berrow *et al.* 2002) indicated that due to the large impedance mismatch when sound travels from air to water, the penetration of airborne sound energy from the rotor blades was largely reflected from the surface of the water with only a small fraction of the sound energy coupled into the water.

7.3 Effects thresholds

Richardson *et al.* (1995) defined a series of zones of noise influence on marine mammals, which have been generally adopted by SEAs and EAs undertaken in relation to previous Licensing Rounds. Similarly, data on marine mammal responses have been exhaustively reviewed (e.g. Richardson *et al.* 1995, Gordon *et al.* 1998, Lawson *et al.* 2001, Simmonds *et al.* 2003, Nowacek *et al.* 2007, Weilgart 2007, Southall *et al.* 2007). Four zones are recognised which will generally occur at increasing sound level: (1) the zone of audibility; (2) zone of responsiveness; (3) zone of masking; (4) zone of hearing loss, discomfort or injury. Potential acute effects include physical damage, noise-induced hearing loss (temporary and permanent threshold shifts, TTS and PTS respectively) and short-term behavioural responses. Postulated chronic effects (for which evidence is almost entirely absent) include long term behavioural responses, exclusion, and indirect effects. The most likely physical/physiological effects are generally considered to be shifts in hearing thresholds and auditory damage.

There is now a reasonable body of evidence to quantify noise levels associated with both seismic survey and pile-driving, and to understand the likely propagation of such noise within the marine environment. There is less clarity about the potential effects on marine mammals (and other receptors including fish), particularly in relation to distinguishing a significant behavioural response from an insignificant, momentary alteration in behaviour. Consequently, recent expert assessments have recommended that onset of significant behavioural disturbance resulting from a single pulse is taken to occur at the lowest level of noise exposure that has a measurable transient effect on hearing. A similar approach can be taken to multi-pulsed sounds although the evidence base is small and contradictory.

Behavioural responses to anthropogenic noise have generally been studied by visual or acoustic monitoring of abundance. Visual monitoring of cetaceans during seismic surveys has been carried out over many years throughout the UKCS. Statistical analysis of 1,652 sightings during 201 seismic surveys, representing 44,451 hours of observational effort, was reported by Stone (2003) and Stone & Tasker (2006). Sighting rates of white-sided dolphins, white-beaked dolphins, *Lagenorhynchus* spp., all small odontocetes combined and all cetaceans combined were found to be significantly lower during periods of shooting on surveys with large airgun arrays. In general, small odontocetes showed the strongest

avoidance response to seismic activity, with baleen whales and killer whales showing some localised avoidance, pilot whales showing few effects and sperm whales showing no observed effects.

Brandt *et al.* (2011) reported on the spatial and temporal scale of behavioural responses of harbour porpoises to construction noise at the Horns Rev II offshore wind farm site. Porpoise acoustic activity (measured by passive acoustic monitoring devices (T-PODs)) was reduced by 100% during 1h after pile driving and stayed below normal levels for 24 to 72 h at a distance of 2.6km from the construction site. This period gradually decreased with increasing distance. A negative effect was detectable out to a mean distance of 17.8km. At 22km it was no longer apparent, instead, porpoise activity temporarily increased. This might indicate that porpoises at this distance showed no behavioural reaction to pile driving. Animals moving away from the construction site might have caused porpoise abundance and thus porpoise acoustic activity to temporarily increase as animals aggregated there. Out to a distance of 4.7km, the recovery time was longer than most pauses between pile driving events. Consequently, porpoise activity and possibly abundance were reduced over the entire 5 month construction period.

Both harbour and grey seals have shown short-term avoidance behaviour during controlled exposure experiments with small airguns (Thompson *et al.* 1998). In both cases seals abandoned foraging sites and swam away from airguns but returned to forage in the same areas on subsequent days. By contrast, Harris *et al.* (2001) making observations from a seismic vessel operating in a shallow lagoon system in the Canadian Arctic, found no significant change in sightings rate between firing and non firing periods. Mean radial distance to sightings did increase, suggesting some local avoidance behaviour (Hammond *et al.* 2006).

7.3.1 Injury and behavioural criteria

The Offshore Energy SEAs (DECC 2009b, 2011) reviewed recent data and recommendations for injury and behavioural criteria for noise assessment in marine mammals, although with emphasis on pulse noise from high-energy deep seismic survey and pile-driving. The OESEA utilised injury criteria proposed by Southall *et al.* (2007) composed both of unweighted peak pressures and M-weighted sound exposure levels which are an expression for the total energy of a sound wave. The M-weighted function also takes the known or derived species-specific audiogram into account. For three functional hearing categories of cetaceans, proposed injury criteria are an unweighted 230dB re 1 μ Pa p-p for all types of sounds and an M-weighted sound exposure level of 198 or 215dB re 1 μ Pa²·s for pulsed and non-pulsed sounds respectively. For pinnipeds, the respective criteria are 218dB 1 μ Pa p-p for all types of sound and 186 (pulsed) or 203 (non-pulse) dB re 1 μ Pa²·s (M-weighted). These proposals are based on the level at which a single exposure is estimated to cause onset of permanent hearing loss (PTS), by extrapolating from available data for TTS.

Southall *et al.* (2007) concluded that developing behavioural criteria was challenging, in part due to the difficulty in distinguishing a significant behavioural response from an insignificant, momentary alteration in behaviour. Consequently, they recommended that onset of significant behavioural disturbance resulting from a single pulse is taken to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (i.e. TTS-onset). These criteria for single pulses are an unweighted 224dB re 1 μ Pa p-p and an M-weighted sound exposure level of 183dB re 1 μ Pa²·s for three functional hearing categories of cetaceans, and 212dB re 1 μ Pa (p-p) and 171dB re 1 μ Pa²·s (M-weighted) for pinnipeds.

For multiple pulse and non-pulse (i.e. continuous) sources, Southall *et al.* (2007) were unable to derive explicit and broadly applicable numerical threshold values for delineating behavioural disturbance, and suggested that a context-based approach to deriving noise exposure criteria for behavioural responses will be necessary.

Based on the criteria developed by Southall *et al.* (2007), and the data reported by Lucke *et al.* (2009), indicative spatial ranges of injury and disturbance for cetaceans and pinnipeds may be calculated as indicated in Table 7.1 below. Calculated ranges for the Southall *et al.* (2007) criteria suggest that there is negligible risk of auditory damage to cetaceans, and a low to moderate risk of seals being within the required range (63m assuming modified cylindrical spreading) of seismic operations. Modified cylindrical spreading is usually considered to occur in water depths $<1.5 \times$ range, i.e. spherical spreading ($20\log R$) will occur to a range of 60m in a water depth of 40m.

Table 7.1: Indicative spatial ranges of various injury and disturbance indicators for cetaceans and pinnipeds

	Cetaceans	Pinnipeds
	seismic	seismic
Nominal vertical source level (dB p-p)	260	260
Horizontal array correction	-15	-15
Effective horizontal source level	245	245
Injury sound pressure level (multiple pulses; dB p-p)	230	218
Required propagation loss	15	27
Deep water (20logR) distance (m)	5.6	22.4
Shallow water (15logR) distance (m)	10.0	63.1
Behavioural response sound pressure level (single pulse; dB p-p)	224	212
Required propagation loss	21	33
Deep water (20logR) distance (m)	11.2	44.7
Shallow water (15logR) distance (m)	25.1	158.5
MTTS (4kHz) response sound pressure level in porpoise (single pulse; dB p-p)	200	
Required propagation loss	45.3	
Deep water (20logR) distance (m)	184	
Shallow water (15logR) distance (km)	1.05	

Source: Southall *et al.* (2007), Lucke *et al.* (2009)

The ranges affected by potential auditory injury resulting from modelled seismic survey, which assume a much larger source level than will be used for proposed site survey in the Blocks, represent a small proportion of the marine areas used by seals (and cetaceans) associated with European Sites in the region. Larger proportions of the overall ranges may be affected by noise levels possibly associated with behavioural modification, although the ecological significance of such postulated effects have not been demonstrated. It is acknowledged here that injury and disturbance do not necessarily lead to an adverse impact on the integrity of a European site under the Habitats Directive, and indeed disturbance licences can be granted for certain levels of activity, without site integrity being compromised. Therefore, disturbance effects both within and beyond site boundaries are not expected to have consequent effects on site integrity.

Popper *et al.* (2006) suggested interim criteria for injury of fish exposed to pile driving operations, although note that the majority of the evidence base for such criteria is derived from studies of seismic and explosive noise sources. A peak sound pressure level of 208dB re 1µPa for single pulses is proposed. This is supported by the findings of Popper *et al.* (2005) who showed that TTS onset (physiological fatigue and not damage) in three species of fish exposed to seismic air-gun pulses occurred within the range of 205-210dB re 1 µPa (p-p). Popper *et al.* (2006) considered available data as too sparse to set clear-cut science-based criteria for behavioural disturbance of fish or auditory masking from pile driving.

Seismic exploration noise could potentially result in direct effects on seabirds through physical damage, or through disturbance of normal behaviour. Diving seabirds (e.g. auks) may be most at risk of physical damage. The physical vulnerability of seabirds to sound pressure is unknown, although McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic in little penguins would be high, hence only at short ranges would penguins be adversely affected. Mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere. A study of seabird abundance in Hudson Strait (Atlantic Canada) during seismic surveys over three years (Stemp 1985) compared periods of shooting and non-shooting, found no significant difference in the abundance of fulmar, kittiwake and thickbilled murre (Brünnich's guillemot). Lacroix *et al.* (2003) in a study of long tailed ducks in the Beaufort Sea, found no difference in indices of site fidelity or diving intensity between the seismic area and two control areas although they could not discount subtle effects. It is therefore considered that offshore seismic noise will not result in significant injury or behavioural disturbance to seabirds in the general area.

7.4 Implications for relevant European Sites

As discussed above, it is considered that marine mammals and migratory fish are the only qualifying species which may potentially be affected (in terms of conservation status) by acoustic disturbance. It is noted that effects on fish which are also prey species (e.g. for marine mammals and birds), and may therefore result in the undermining of conservation objectives of qualifying species, are unlikely from noise sources associated with oil and gas activities, with noise levels suggested to cause injury to fish not extending beyond a few tens of metres around the noise source. Mandatory Habitats Regulations Assessment procedures will allow further consideration of the nature, timing and location of any planned activities and mitigation measures (see Section 7.5) deemed necessary to be defined (including conditions attached to consents/permits or potentially consent/permit refusal). The screening process (Appendix B) identified the potential for acoustic disturbance in the following sites:

7.4.1 The Wash and North Norfolk Coast SAC

(Annex II species: harbour seal *Phoca vitulina*; non-primary Annex II species: otter *Lutra lutra*)

The Wash is the largest embayment in the UK. Its extensive intertidal flats combined with those of the adjacent North Norfolk coast provide ideal breeding and haul-out conditions for harbour seal. This site is the largest colony of harbour seals in the UK, with some 7% of the total UK population. Their overall condition has been assessed as unfavourable (declining) due to a decline in the moult population⁷.

⁷ The Wash and North Norfolk Coast European Marine Site Draft Condition Assessment, September 2008.

Derived from aerial surveys of breeding colonies, the minimum number⁸ of harbour seals in the Wash in 2009 was estimated at 2,829 (SCOS 2010); counts in previous recent years were 1,695 (2006), 2,124 (2005) and 2,167 (2004) (Lonergan *et al.* 2007). While a high degree of uncertainty surrounds any apparent population trends, SCOS (2008) describe the harbour seal population of the east coast of England as a whole over the period 2004-2007 as having undergone recent decline. Following the 1988 phocine distemper virus (PDV) epidemic, the population along the east coast of England (mainly in the Wash) was reduced by 52%. Numbers then slowly increased to approximately pre-1988 epidemic levels before a second PDV epidemic in 2002 resulted in a 22% decline in the Wash (Thomsen *et al.* 2005). Counts in the Wash failed to recover until observations from 2009 which represent a significant increase (SCOS 2010); however, adjacent European colonies which have experienced rapid growth since 2002. Major declines have also now been documented in most populations around Scotland, with declines of up to 50% in Orkney and Shetland since 2000. A targeted research programme has been established including increased monitoring to confirm the magnitude and geographical extent of the declines (SCOS 2008).

Recent studies of foraging at sea by harbour seals have been funded by SNH and the Department (Sharples *et al.* 2005, 2008). These indicate high site fidelity to haul-out sites, but ranging over substantial distances at sea. Harbour seals hauling out in the Wash forage widely throughout coastal and offshore waters of the English southern North Sea from the North Yorkshire to Sussex coasts. Animals tended to make repeated trips of relatively long distance and duration. With all but one of 24 tagged seals travelling repeatedly to between 75 and 120km offshore and as far as 220km to assumed foraging patches. Foraging trips averaged 8.3 days in duration, and animals were fairly site faithful to the areas in which they foraged (Sharples *et al.* 2008).

7.4.1.1 Consideration

Most environmental assessments of noise disturbance use simple spherical propagation models of the form $SPL = SL - 20\log(R)$, where SL = source level, R = source-receiver range, to predict sound pressure levels (SPL) at varying distances from source. Cylindrical spreading, $SPL = SL - 10\log(R)$, is usually assumed in shallow water, depth $< R$. However, several workers have measured or modelled additional signal modification and attenuation due to a combination of reflection from sub-surface geological boundaries, sub-surface transmission loss due to frictional dissipation and heat; and scattering within the water column and sub-surface due to reflection, refraction and diffraction in the propagating medium (see SEA 4 Environmental Report). In shallow water, reflection of high frequency signals from the seabed results in approximately cylindrical propagation and therefore higher received spectrum levels than for spherically propagated low frequency signals (which penetrate the seabed). Attenuation of signal with distance is frequency dependent, with stronger attenuation of higher frequencies with increasing distance from the source. Frequency dependence due to destructive interference also forms an important part of the weakening of a noise signal.

In the case of the Wash and North Norfolk Coast SAC, the minimum direct linear range from the SAC boundary to the nearest Block (47/18) is approximately 20km, giving a propagation loss (assuming $15\log R$) of around 64dB, or a received sound level of 166dB re $1\mu\text{Pa}$ p-p for a typical seismic survey. These levels are considerably lower than the injury criteria proposed by Southall *et al.* (2007) in pinnipeds for both pulsed and non-pulsed sounds, and

<http://www.esfjc.co.uk/ems/pages/EMS%20condition%20assessment%20summary.pdf>

⁸ Numbers are counts of hauled-out seals from aerial surveys and provide a minimum population estimate, likely to represent approximately 60-70% of the total population.

also below those proposed for the onset of TTS (postulated as significant behavioural disturbance) for pulsed sounds.

Seismic survey occurring in the proposed licence Blocks will be audible to seals over a large area of the southern North Sea off the east coast of England characterised by moderate marine usage by foraging harbour seals associated with the Wash and North Norfolk Coast SAC and smaller adjacent haul-out sites. Available evidence suggests that significant effects at a population or individual level are unlikely. This conclusion is based on population monitoring of the Wash population over 40 years, during which time seismic survey activity in the southern North Sea has been considerable (see e.g. SEA 3 Environmental Report Figure 10.2). As noted above, inter-annual and longer-term population trends have varied, with known factors including recovery from historic hunting (in the Wash until 1970) and persecution, and periodic mass mortalities associated with disease (recorded in Britain since at least 1813; Harwood & Hall 1990). No cause has yet been identified for the apparently widespread current decline in the moult population (SCOS 2008) although attention has been focused on general health/pollutant burdens, and on competition with other predators notably grey seals. The geographical distribution of this trend does not appear to be related to sources of significant anthropogenic noise.

Noise levels suggested to cause auditory damage in phocids are rapidly attenuated with distance from source, and would therefore not propagate into the SAC and have very limited potential for spatial overlap with seals foraging beyond the boundary of the SAC. Furthermore, distances over which hearing damage may occur are well within the effective range of the mitigation measures which would be employed to minimise disturbance to marine mammals (see Section 7.5). Additionally, any future seismic survey plans would be subject to an extensive source- and site-specific assessment of the potential for adverse effects, including AA.

If significant ecological effects on prey species were to occur, even at considerable distances from the Wash and North Norfolk Coast SAC, these may influence the breeding population of the site. However, noise levels suggested to cause injury to fish (the primary prey species of seals) would not extend beyond a few tens of metres around the noise source. The range over which non-injurious disturbance effects on fish might occur is not possible to define, although available evidence suggests that the extent of any such disturbance of prey species is highly unlikely to have significant effects on relevant qualifying species.

Otters in coastal habitats may also experience acoustic disturbance from seismic exploration or construction piling. However, as they generally occupy shallow, inshore areas where the propagation of seismic noise is very limited, and the Blocks in question are well offshore, effects are not predicted.

Noise levels associated with other activities potentially resulting from the 26th Licensing Round such as a drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from seismic survey, and are not expected to have significant effects on relevant qualifying species.

7.4.2 Humber Estuary SCI

(Annex II species: grey seal *Phoca vitulina*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*)

The intertidal flats at Donna Nook, at the mouth of the Humber Estuary on the north Lincolnshire coast, provide an important habitat for grey seals. During the autumn, the site

supports considerable numbers of breeding seals. Pup-production estimates for the site were 2,244 (Including Blakeney Point and Horsey) for 2009 (SCOS 2010). This represents a 14.9% increase on 2008; pup production at Donna Nook has increased at approximately 15.8% over the 5 year period of 2004-2009 (SCOS 2010). Throughout the rest of the year, the intertidal flats also provide an important habitat for grey seals to haul out or rest, particularly during the spring moult.

Extensive information on the distribution of British grey seals at sea is available from models of habitat preference derived from satellite telemetry data (McConnell *et al.* 1999, Matthiopoulos *et al.* 2004, Murphy *et al.* 2008). At sea, movements range from short-range return trips from haul-out sites to local foraging areas, to extended journeys between distant haul-out sites. Foraging trips from haul-out sites usually last between two and five days, with seals targeting localised areas generally within 50km of haul-out sites; these areas are typically characterized by a gravel/sand seabed sediment, the preferred burrowing habitat of sandeels, an important component of grey seal diet.

While of relatively low density at a national level, models show grey seal foraging to be widely distributed off the Lincolnshire, Yorkshire and north Norfolk coasts; marine usage appears greater to the north off the Northumberland coast and over the Dogger Bank. However, it is noted that models are based on counts of seals at haul-out sites from 1996-1997; populations of grey seals have increased considerably in the Donna Nook and north Norfolk area since that time, whereas numbers on the Farnes have remained more stable. Therefore, models may underestimate grey seal foraging activity from Donna Nook and north Norfolk relative to adjacent areas to the north.

7.4.2.1 Consideration

In the case of the Humber Estuary SCI, the minimum direct linear range from the SAC boundary to the nearest Block (47/18) is approximately 10km, giving a propagation loss (assuming 15logR) of around 63dB, or a received sound level of 167dB re 1 μ Pa p-p for a typical seismic survey. This level is considerably lower than the injury criteria proposed by Southall *et al.* (2007) in pinnipeds for both pulsed and non-pulsed sounds, and also below those proposed for the onset of TTS (postulated as significant behavioural disturbance) for pulsed sounds. With regard to fish, these levels are considerably lower than the levels found by Popper *et al.* (2005) to induce TTS in several fish species.

Seismic survey occurring in the proposed licence Blocks will be audible to seals over a large area of the southern North Sea off the east coast of England, characterised by low-moderate marine usage by foraging grey seals associated with the Humber Estuary SCI and smaller colonies on the Norfolk coast. Marine usage is greatest in the northern part of this region. Available evidence suggests that significant effects at a population or individual level are unlikely; grey seal populations at Donna Nook and elsewhere around the UK have shown a consistent increasing trend. It is unlikely that seismic survey would be audible to seals within the SCI itself.

Noise levels suggested to cause auditory damage in phocids are rapidly attenuated with distance from source. For example, based on Southall *et al.*'s (2007) proposed criteria relating to pinnipeds and single pulsed sounds from a typical seismic survey, the range exceeding the injury criteria (onset of PTS) would extend to approximately 10m (p-p) or 1.5km (M-weighted) from source, and for significant behavioural disturbance (onset of TTS) approximately 20m (p-p) or 9km (M-weighted) from source. These ranges do not overlap with the SAC and represent a tiny proportion of the marine areas used by seals associated with European Sites; therefore, disturbance effects beyond site boundaries are not expected to have consequent effects on site integrity. Furthermore, distances over which hearing

damage may occur are well within the effective range of the mitigation measures which would be employed to minimise disturbance to marine mammals (see Section 7.5). Additionally, any future seismic survey plans would be subject to an extensive source- and site-specific assessment of the potential for adverse effects, including AA.

Noise levels associated with other activities potentially resulting from the 26th Licensing Round such as a drilling, vessel movements, pipe-laying operations, are of a considerably lower magnitude than those resulting from seismic survey, and are not expected to have significant effects on relevant qualifying species at a population or individual level.

7.4.3 Migratory fish

The potential for acoustic disturbance effects was identified for the River Derwent SAC due to presence of migratory lamprey species as qualifying features, which utilise waters of the Humber Estuary as a nursery area (river lamprey) or occupy adjacent coastal and offshore marine areas for part of their life cycle (sea lamprey).

Sea lamprey inhabit both shallow coastal and deep offshore waters, but migrate into fresh water to spawn. Young river lamprey use the estuarine water of the Humber as a nursery before migrating upstream to freshwater to spawn in the River Derwent and Ouse. Significant propagation of underwater noise into shallow enclosed and semi-enclosed bays and estuaries is not expected, therefore the potential for effects is restricted to sea lamprey occupying marine areas. Considering the low densities of sea lamprey which can be expected in offshore areas, their lack of a swim bladder, and the aforementioned limited range of significant effects of seismic survey on fish, significant effects on qualifying fish species at a population or individual level are unlikely. Furthermore, the potential for impact can be mitigated through timing of seismic survey to avoid the period of lamprey entry into the rivers and consequently significant effects on this qualifying feature can be avoided.

7.4.4 Adjacent waters SACs

The potential for acoustic disturbance effects was identified for the Doggerbank SAC due to presence of harbour porpoise and harbour seal as qualifying Annex II species, and for the Doggersbank cSAC and the Klaverbank cSAC where harbour porpoise, grey seal and harbour seal are qualifying Annex II species (see Appendix A3). Blocks 44/05, 44/15 and 45/01 abut the UK median line and the Doggersbank cSAC and Block 44/30 abuts the Klaverbank cSAC.

Based on Southall *et al.*'s (2007) proposed criteria relating to pinnipeds and single pulsed sounds from a typical seismic survey, the range exceeding the injury criteria (onset of PTS) would extend to approximately 10m (p-p) or 1.5km (M-weighted) from source, and for significant behavioural disturbance (onset of TTS) approximately 20m (p-p) or 9km (M-weighted) from source. These ranges represent a tiny proportion of the marine areas used by seals associated with European Sites; therefore, disturbance effects beyond site boundaries are not expected to have consequent effects on site integrity either through direct effects or on prey.

Simple noise propagation calculations suggest maximum received sound levels at the site boundaries are considerably lower than the injury criteria proposed by Southall *et al.* (2007) in cetaceans and pinnipeds for both pulsed and non-pulsed sounds, and also below those proposed for the onset of TTS (postulated as significant behavioural disturbance) for pulsed sounds; therefore effects on the integrity of these sites is not predicted.

7.5 Regulation and mitigation

Both planning and operational controls cover acoustic disturbance resulting from activities on the UKCS, specifically including geophysical surveying and pile-driving. Application for consent to conduct seismic and other geophysical surveys is made using *Petroleum Operations Notice No 14 (PON14)* supported by an Environmental Narrative to enable an accurate assessment of the environmental effects of the survey. Consultations with Government Departments and other interested parties are conducted prior to issuing consent, and JNCC may request additional risk assessment, specify timing or other constraints, or advise against consent. Any proposed activity with a potentially significant acoustic impact on a designated SAC or SPA would also be subject to the requirement for Appropriate Assessment.

The major operational control and mitigation over seismic surveys in the UK are through JNCC's *Guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys* (August 2010 revision reflects the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (Offshore Marine Regulations, as amended in 2009 and 2010)). It is a condition of consents issued under Regulation 4 of the *Petroleum Activities (Conservation of Habitats) Regulations 2001* (& 2007 Amendments) for oil and gas related seismic surveys that the JNCC Seismic Guidelines are followed. European Protected Species (EPS) disturbance licences can also be issued under the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007*.

The guidelines require visual monitoring of the area by a dedicated Marine Mammal Observer (MMO) prior to seismic testing to determine if cetaceans are in the vicinity, and a slow and progressive build-up of sound to enable animals to move away from the source. Passive Acoustic Monitoring (PAM) may also be required. Seismic operators are required, as part of the application process, to justify that their proposed activity is not likely to cause a disturbance etc. under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) and *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended). This assessment should consider all operational activities including shooting during hours of darkness or in poor visibility.

In their latest guidelines, JNCC (2010) advise that operators adopt mitigation measures which are appropriate to minimise the risk of an injury or disturbance offence⁹ and stipulate, whenever possible, the implementation of several best practice measure, including:

- If marine mammals are likely to be in the area, only commence seismic activities during the hours of daylight when visual mitigation using Marine Mammal Observers (MMOs) is possible.
- Only commence seismic activities during the hours of darkness, or low visibility, or during periods when the sea state is not conducive to visual mitigation, if a Passive Acoustic Monitoring (PAM) system is in use to detect marine mammals likely to be in the area, noting the limitations of available PAM technology (seismic surveys that commence during periods of darkness, or low visibility, or during periods when the observation conditions are not conducive to visual mitigation, could pose a risk of committing an injury offence).
- Plan surveys so that the timing will reduce the likelihood of encounters with marine mammals. For example, this might be an important consideration in certain areas/times,

⁹ Defined under Regulation 39 1(a) and 1(b) (respectively) of the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended), or Regulation 40 of *The Conservation of Habitats and Species Regulations 2010* in territorial waters.

e.g. during seal pupping periods near Special Areas of Conservation for harbour seals or grey seals.

- Provide trained MMOs to implement the JNCC guidelines.
- Use the lowest practicable power levels to achieve the geophysical objectives of the survey.
- Seek methods to reduce and/or baffle unnecessary high frequency noise produced by the airguns (this would also be relevant for other acoustic energy sources).

DECC will expect that passive acoustic monitoring (PAM) will be routinely considered for use as a mitigation tool. Periods of seasonal concern for seismic survey are also identified for a number of Blocks considered in this AA (see Table 2.1), for which there would be a presumption against such activity taking place.

In addition to marine mammal sensitivities, disturbance to populations of qualifying anadromous species can be mitigated through timing of seismic survey to avoid migratory periods and consequently significant disturbance can be avoided.

7.6 Conclusions

Direct significant effects on SPAs were not considered possible. Indirect mechanisms of effect, for example through disturbance of prey species, were also considered with the conclusion that these will not have an adverse effect on integrity (i.e. on population viability of qualifying bird species).

Significant effects arising from acoustic disturbance were only considered possible for SACs with marine mammals and fish as a qualifying feature. Although seismic survey, drilling and other oil industry noise is detectable by marine mammals, waterbirds and their prey, there is no evidence that such noise presents a risk to the viability of populations in UK waters and specifically not within designated Natura 2000 sites (see Defra 2010). This would require direct mortality, behavioural response with implications for reproductive success (e.g. disturbance at fixed breeding locations) or reduced long-term ecological viability (e.g. sustained displacement from foraging grounds). In the localised areas of Natura 2000 sites designated for marine mammals, acoustic disturbance from seismic survey activity resulting from proposed licensing would be intermittent and there is no evidence that cumulative effects of previous survey effort have been adverse. Despite considerable scientific effort, no causal link, or reasonable concern in relation to population viability has been found.

Modelling of seismic noise propagation for licensed Blocks in the southern North Sea has generally concluded that effects on the Wash and North Norfolk Coast SAC and Humber Estuary SCI will not be significant; similar conclusions apply to SACs in adjacent waters. In the case of the Blocks under consideration here, calculations considering the direct linear range to the SAC boundaries and the source level of a typical seismic survey suggest that received noise levels within all SACs will fall below relevant effects criteria as defined by Southall *et al.* (2007).

Taking into account the information presented above and in the Appendices, it is concluded that activities which could arise from the proposed licensing of the 56 Blocks considered here will not cause an adverse effect on the integrity of the European Sites (see Section 4.2) by undermining the conservation objectives relating to any specific qualifying feature.

8 In-combination effects

8.1 Underwater Noise

Seismic survey and other noise producing activities that might follow the proposed licensing are anticipated to be widely separated in space and time. Therefore, any acoustic disturbance to marine mammals causing displacement from foraging areas will be short-term and infrequent. SMRU (2007) note that “The effects of repeated surveys are not known, but insignificant transient effects may become important if potentially disturbing activities are repeated and/or intensified”. As noted in Section 7.2, the number of seismic surveys is substantially less than historic peaks and as a result significant in-combination effects with gas activities in existing licensed blocks are not foreseen. There is the potential for cumulative noise impacts where concurrent and sequential activities result in long-term exposure to elevated noise levels within the wider area. However, the likelihood of this is low (because of technical interference) and subject to mitigation in the near future by measures introduced to achieve Good Environmental Status under the Marine Strategy Framework Directive.

Other noise producing activities which are likely to occur within the southern North Sea include those associated with the development of marine renewable energy. Offshore wind energy is expected to undergo large-scale development off the east coast of England and wider southern North Sea over the next decade. In addition to the constructed offshore wind farms in UK waters of the southern North Sea, applications have been made and consents granted for several substantial offshore wind energy developments in the region in the outer Thames area and Greater Wash region (off North Norfolk, Lincolnshire and east Yorkshire). A limited number of these are currently under construction, with works expected to begin at several more in the near future.

In addition to the wind farm developments noted above, following the Offshore Energy SEA, The Crown Estate have entered two Round 3 zonal development agreements for the generation of up to 9 and 4 GW of offshore wind energy respectively. One area lies on the Dogger Bank, approximately overlapping the northern half of the Dogger Bank cSAC; another extends east from approximately 36km east of Flamborough Head to the median line; while the third lies east of Norfolk and Suffolk immediately south of the North Norfolk Sandbanks cSAC. However, the consenting of developments in this area will be subject to detailed project-specific EIA and Habitats Regulations Assessments. The development of offshore wind energy is also taking place in other North Sea nations, with plans for several large developments close to the UK median line, although these will similarly subject to EIA and Habitats Regulations Assessments.

There is currently no infrastructure deployed in the region associated with the extraction of wave and tidal energy, and none is envisaged in the immediate future.

While the operation, maintenance and decommissioning of marine renewable energy developments will introduce noise into the marine environment, these are typically of low intensity. The greatest noise levels arise during the construction phase, and it is these which have the greatest potential for acoustic disturbance effects (see Faber Maunsell & Metoc 2007, DECC 2009b, 2011). Pile-driving of mono-pile foundations is the principal source of construction noise, which will be qualitatively similar to pile-driving noise resulting from harbour works, bridge construction and oil and gas platform installation. Mono-pile foundations are the most commonly used for offshore wind farm developments at present.

In relation to offshore pile-driving, standard conditions on consents for Round 2 (and anticipated for Round 3) offshore wind farms include various protocols to minimise the potential for acoustic disturbance of marine life, including the use of soft start, MMOs and PAM. For future developments, additional measures are likely to be required in areas where EIA suggests that high cetacean densities or site fidelity may occur; these may include technical measures such as pile sleeves (see Nehls *et al.* 2007). The “Statutory nature conservation agency protocol for minimising the risk of disturbance and injury to marine mammals from piling noise” (JNCC 2009) outlines a protocol for the mitigation of potential underwater noise impacts arising from pile driving during offshore wind farm construction.

In addition to those activities which may follow licensing of the southern North Sea Blocks under consideration and future marine renewable energy development, there are a variety of other existing (e.g. gas production, wind turbine deployments, fishing, shipping, military exercise areas, aggregate extraction) and planned (e.g. gas exploration and production) noise-producing activities in overlapping or adjacent areas. Despite this, DECC is not aware of any projects or activities which are likely to cause cumulative or synergistic effects that when taken in-combination with the activities discussed above would undermine the conservation objectives of the relevant European Sites. This is due to the presence of effective regulatory mechanisms in place to ensure that operators, DECC and other relevant consenting authorities take such considerations into account during activity permitting. In respect of oil and gas activities and other developments with the potential to affect Natura 2000 sites, these mechanisms also include project specific Habitats Regulations Assessments.

The Marine Strategy Framework Directive (2008/56/EC) (MSFD) requires that the European Commission (by 15 July 2010) should lay down criteria and methodological standards to allow consistency in approach in evaluating the extent to which Good Environmental Status (GES) is being achieved. ICES and JRC were contracted to provide scientific support for the Commission in meeting this obligation. A total of 10 reports have been prepared relating to the descriptors of GES listed in Annex I of the Directive.

Task Group 11 reported on underwater noise and other forms of energy (Tasker *et al.* 2010). The Task Group developed three possible indicators of underwater sound. In no case was the Task Group able to define precisely (or even loosely) when Good Environmental Status occurs on the axes of these indicators. This is partly to do with insufficient evidence and recognised scientific challenges but also to no fully accepted definition of when, for example, a behavioural change in an organism is not good.

DECC is cognisant of the ongoing MSFD Technical Sub-Group Noise work to determine criteria for an indicator relating to high amplitude, low and mid-frequency impulsive anthropogenic sounds including those from pile driving, seismic surveys and some sonar systems. DECC will review the findings of this Technical Sub-Group closely with respect to consenting of relevant activities which may result from the draft plan/programme, as well as other activities which generate noise in the marine environment. The establishment of noise criteria and the consenting of activities will require a coordinated approach across different industries and activities, possibly through the future marine planning system.

It is noted that the Offshore Energy SEA recommended that operational criteria should be established to limit the cumulative pulse noise “dose” (resulting from seismic survey and offshore pile-driving) within specified areas, which included: areas adjacent to the Farne Islands and Donna Nook (grey seal); the Wash, outer Wash and off the Humber (harbour seal); and, offshore areas of the southern North Sea (harbour porpoise) (DECC 2009b).

8.2 Other Potential in-combination Effects

Potential incremental, cumulative, synergistic and secondary effects from a range of operations, discharges, emissions (including noise), and accidents were considered in the Offshore Energy SEA (DECC 2009b, 2011; see also OSPAR 2000, 2010).

8.2.1 Physical damage/change to features and habitats

Potential sources of physical disturbance to the seabed, and damage to biotopes, associated with oil and gas activities were identified by the OESEA2 as anchoring/positioning of drilling rigs; wellhead placement and recovery; production platform jacket installation and piling; subsea template and manifold installation and piling; pipeline, flowline and umbilical installation and trenching and decommissioning of infrastructure (DECC 2011).

In general, cumulative effects are likely to be dominated by trawling, with potential scour and physical damage from cable laying and other activities associated with potential offshore wind developments (e.g. Round 3 wind farm zones), which are likely to be more important in the future. Given the forecast scale of activity within this oil and gas licensing Round, it is likely that there will be considerable spatial and temporal separation between disturbance “footprints” and a low probability of incremental overlap of affected areas. Recovery of affected seabed through sediment mobility, and faunal recovery and recolonisation is expected to be rapid (less than five years) where the source of effects is transient (e.g. anchoring).

8.2.2 Physical presence

Physical presence of offshore infrastructure and support activities may also potentially cause behavioural responses in fish, birds and marine mammals. Previous SEAs have considered the majority of such interactions resulting from interactions with offshore oil and gas infrastructure (whether positive or negative) to be insignificant; in part because the number of surface facilities is relatively small (of the order of a few hundred) and because the majority are at a substantial distance offshore.

The larger numbers of individual surface or submerged structures associated with offshore wind developments, the presence of rotating turbine blades and considerations of their location and spatial distribution (e.g. in relation to coastal breeding or wintering locations for waterbirds and important areas for marine mammals), indicate a higher potential for physical presence effects. Potential displacement and barrier effects will likely be an important consideration at the project level for the large offshore wind developments that are planned for the southern North Sea and will likely form an important part of associated Habitats Regulations Assessments.

8.2.3 Marine discharges

As described in Section 6.3, most studies of produced water toxicity and dispersion, in the UK and elsewhere have concluded that the necessary dilution to achieve a No Effect Concentration (NEC) would be reached at <10 to 100m and usually less than 500m from the discharge point. Given the general separation distances of existing oil and gas installations within southern North Sea, a presumption against the discharge to sea of produced water from new developments, and that production is largely isolated to gas hydrocarbons, there is unlikely to be a cumulative effect from multiple produced water discharges.

Previous discharges of WBM cuttings in the UKCS have been shown to disperse rapidly and to have minimal ecological effects (Section 6.3). Dispersion of further discharges of mud

and cuttings could lead to localised accumulation in areas where reduced current allows the particles to settle on the seabed. However, in view of the scale of the region, the water depths and currents, and probability of reinjection of drill cuttings from any major field development, this is considered unlikely to be detectable and to have negligible cumulative ecological effect (DECC 2011).

8.3 Conclusions

Available evidence (see e.g. UKBenthos database and OSPAR 2000) for the southern North Sea indicates that past oil and gas activity and discharges has not lead to adverse impacts on the integrity of European sites in the area. The current controls on terrestrial and marine industrial activities, including oil and gas operations that could follow licensing, can be expected to prevent significant in-combination effects affecting relevant European sites.

The competent authorities will assess the potential for in-combination effects during Habitats Regulations Assessments of project specific consent applications; this process will ensure that mitigation measures are put in place to ensure that subsequent to licensing, specific projects (if consented) will not result in adverse effects on integrity of European sites. Therefore, bearing this in mind, it is concluded that the in-combination of effects from activities arising from the licensing of the 56 Blocks considered in this assessment with those from existing and planned activities in the southern North Sea will not cause an adverse effect on the integrity of the relevant European Sites.

9 Overall conclusion

Taking account of all the matters discussed, the Secretary of State is able to grant consent to the plan/programme (as defined) under the Habitats Directive and award the licences covering Blocks 41/18, 41/19, 41/20, 41/24, 41/25, 42/27, 43/15a, 43/20a, 43/20c, 44/01, 44/02, 44/03, 44/04, 44/05, 44/14, 44/15, 44/16a, 44/17d, 44/17e, 44/17f, 44/18c, 44/23c, 44/23d, 44/24c, 44/30, 45/01, 47/02b, 47/03g, 47/06, 47/07, 47/13b, 47/18, 47/19b, 48/08d, 48/09b, 48/14c, 48/18e, 48/19d, 48/20b, 48/25a, 48/30c, 49/14a, 49/17d, 49/18b, 49/19b, 49/21c, 49/22b, 49/23b, 49/23c, 49/24d, 49/26b, 49/27c, 49/28c, 52/05c, 53/01b and 53/02c (considered further in Sections 6-9). This is because there is certainty, within the meaning of the ECJ Judgment in the *Waddenzee* case, that implementation of the plan will not adversely affect the integrity of relevant European Sites, taking account of the mitigation measures that can be imposed through existing permitting mechanisms on the planning and conduct of activities.

These mitigation measures are incorporated in respect of habitat, diadromous fish, bird and marine mammal interest features through the range of legislation and guidance (see https://www.og.decc.gov.uk/environment/envIRON_leg_index.htm and <https://www.og.decc.gov.uk/regulation/pons/index.htm>) which apply to developer activities which could follow plan adoption. These mitigation measures include, where necessary, project-specific Appropriate Assessments based on detailed project proposals which would be undertaken by the competent authority before the granting of a permit/consent. The competent authority needs to be satisfied that the proposed activity will not result in adverse effects on integrity of European sites.

Even where a site/interest feature has been screened out in the plan level assessment, or where a conclusion of no adverse effect on integrity has been reached at plan level, project level assessment will be necessary if, for example, new European sites have been designated after the plan level assessment; new information emerges about the nature and sensitivities of interest features within sites, new information emerges about effects including in-combination effects; or if plan level assumptions have not been met at the project level.

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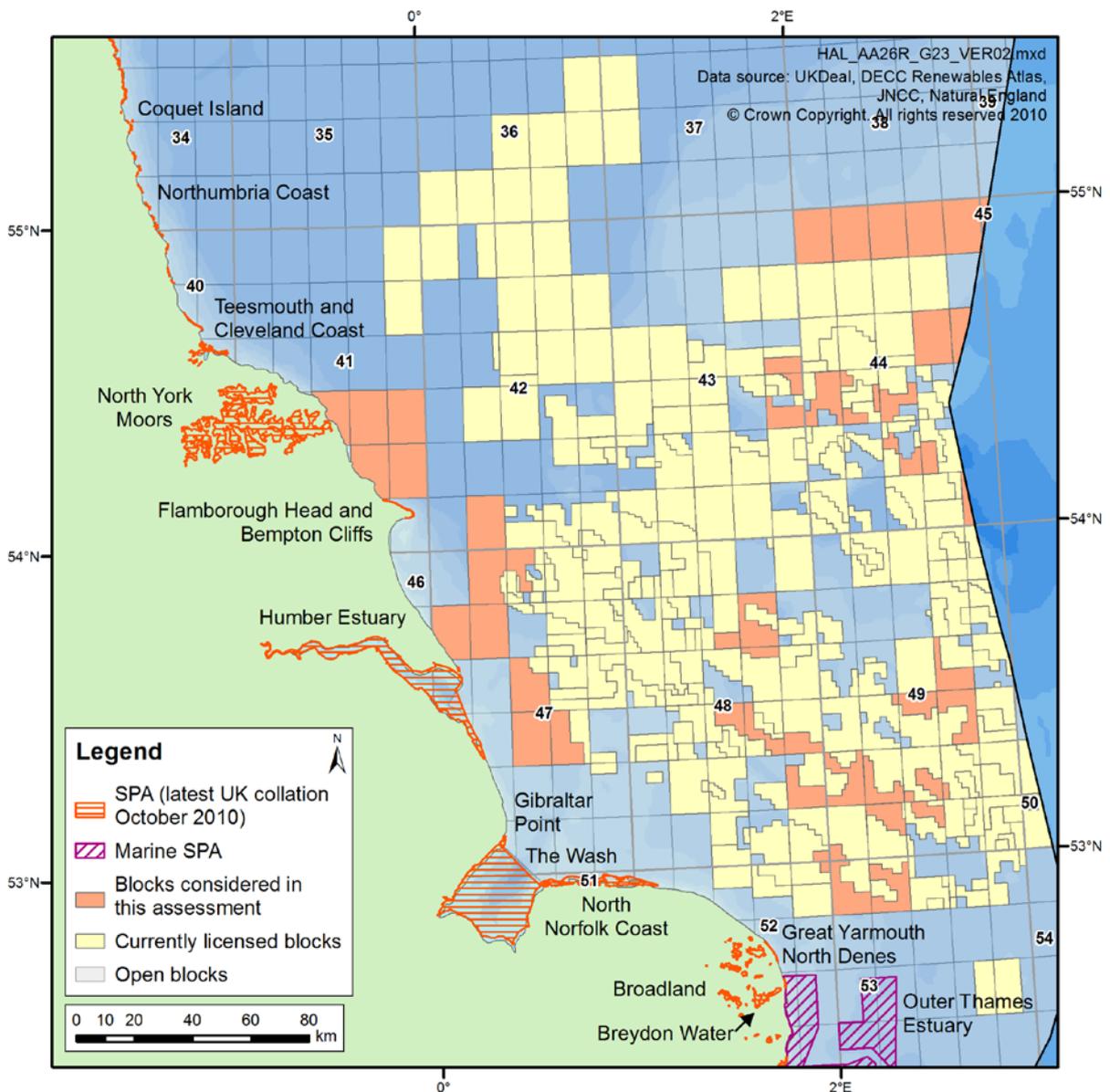
Appendix A - The sites

The migratory and/or Annex I bird species for which SPAs are selected in the UK are listed in Box A.1, and the SPAs from Northumbria to Suffolk and their qualifying features are given in Table A.1 and their locations shown in the Map A.1.

Abbreviations for the Annex 1 habitats used in SAC site summaries (Tables A.2, A.3 and A.4 and Map A.2) are listed in Box A.2.

A1 Coastal and Marine Special Protection Areas

Map A.1: Location of Special Protection Areas



Box A.1: Migratory and/or Annex I bird species for which SPAs are selected in the UK

Divers and grebes	Waders
Red-throated diver <i>Gavia stellata</i>	Oystercatcher <i>Haematopus ostralegus</i>
Black-throated diver <i>Gavia arctica</i>	Avocet <i>Recurvirostra avosetta</i>
Little grebe <i>Tachybaptus ruficollis</i>	Stone Curlew <i>Burhinus oedicnemus</i>
Great crested grebe <i>Podiceps cristatus</i>	Ringed Plover <i>Charadrius hiaticula</i>
Slavonian grebe <i>Podiceps auritus</i>	Dotterel <i>Charadrius morinellus</i>
Seabirds	Golden Plover <i>Pluvialis apricaria</i>
Fulmar <i>Fulmarus glacialis</i>	Grey Plover <i>Pluvialis squatarola</i>
Manx shearwater <i>Puffinus puffinus</i>	Lapwing <i>Vanellus vanellus</i>
Storm petrel <i>Hydrobates pelagicus</i>	Knot <i>Calidris canutus</i>
Leach's petrel <i>Oceanodroma leucorhoa</i>	Sanderling <i>Calidris alba</i>
Gannet <i>Morus bassanus</i>	Purple Sandpiper <i>Calidris maritima</i>
Cormorant <i>Phalacrocorax carbo carbo</i>	Dunlin <i>Calidris alpina alpina</i>
Shag <i>Phalacrocorax aristotelis</i>	Ruff <i>Philomachus pugnax</i>
Guillemot <i>Uria aalge</i>	Snipe <i>Gallinago gallinago</i>
Razorbill <i>Alca torda</i>	Black-tailed Godwit <i>Limosa limosa</i> (breeding)
Puffin <i>Fratercula arctica</i>	Black-tailed Godwit <i>Limosa limosa islandica</i> (non-breeding)
Gulls, terns and skuas	Bar-tailed Godwit <i>Limosa lapponica</i>
Arctic skua <i>Stercorarius parasiticus</i>	Whimbrel <i>Numenius phaeopus</i>
Great skua <i>Catharacta skua</i>	Curlew <i>Numenius arquata</i>
Mediterranean gull <i>Larus melanocephalus</i>	Redshank <i>Tringa totanus</i>
Black-headed gull <i>Larus ridibundus</i>	Greenshank <i>Tringa nebularia</i>
Common gull <i>Larus canus</i>	Wood Sandpiper <i>Tringa glareola</i>
Lesser black-backed gull <i>Larus fuscus</i>	Turnstone <i>Arenaria interpres</i>
Herring gull <i>Larus argentatus</i>	Red-necked Phalarope <i>Phalaropus lobatus</i>
Great black-backed gull <i>Larus marinus</i>	Waterfowl
Kittiwake <i>Rissa tridactyla</i>	Bewick's swan <i>Cygnus columbianus bewickii</i>
Sandwich tern <i>Sterna sandvicensis</i>	Whooper swan <i>Cygnus cygnus</i>
Roseate tern <i>Sterna dougallii</i>	Bean goose <i>Anser fabalis</i>
Common tern <i>Sterna hirundo</i>	Pink-footed goose <i>Anser brachyrhynchus</i>
Arctic tern <i>Sterna paradisaea</i>	Russian white-fronted goose <i>Anser albifrons albifrons</i>
Little tern <i>Sterna albifrons</i>	Greenland white-fronted goose <i>Anser albifrons flavirostris</i>
Crakes and rails	Icelandic greylag goose <i>Anser anser</i>
Spotted crane <i>Porzana porzana</i>	Greenland barnacle goose <i>Branta leucopsis</i>
Corncrake <i>Crex crex</i>	Svalbard barnacle goose <i>Branta leucopsis</i>
Coot <i>Fulica atra</i>	Dark-bellied brent goose <i>Branta bernicla bernicla</i>
Birds of prey and owls	Canadian light-bellied brent goose <i>Branta bernicla hrota</i>
Honey buzzard <i>Pernis apivorus</i>	Svalbard light-bellied brent goose <i>Branta bernicla hrota</i>
Red kite <i>Milvus milvus</i>	Shelduck <i>Tadorna tadorna</i>
Marsh harrier <i>Circus aeruginosus</i>	Wigeon <i>Anas penelope</i>
Hen harrier <i>Circus cyaneus</i>	Gadwall <i>Anas strepera</i>
Golden eagle <i>Aquila chrysaetos</i>	Teal <i>Anas crecca</i>
Osprey <i>Pandion haliaetus</i>	Mallard <i>Anas platyrhynchos</i>
Merlin <i>Falco columbarius</i>	Pintail <i>Anas acuta</i>
Peregrine <i>Falco peregrinus</i>	Shoveler <i>Anas clypeata</i>
Short-eared owl <i>Asio flammeus</i>	Pochard <i>Aythya ferina</i>
Other bird species	Tufted duck <i>Aythya fuligula</i>
Capercaillie <i>Tetrao urogallus</i>	Scaup <i>Aythya marila</i>
Nightjar <i>Caprimulgus europaeus</i>	Eider <i>Somateria mollissima</i>
Woodlark <i>Lullula arborea</i>	Long-tailed duck <i>Clangula hyemalis</i>
Fair Isle wren <i>Troglodytes troglodytes fridariensis</i>	Common scoter <i>Melanitta nigra</i>
Aquatic warbler <i>Acrocephalus paludicola</i>	Velvet scoter <i>Melanitta fusca</i>
Dartford warbler <i>Sylvia undata</i>	Goldeneye <i>Bucephala clangula</i>
Chough <i>Pyrhacorax pyrrhacorax</i>	Red-breasted merganser <i>Mergus serrator</i>
Scottish crossbill <i>Loxia scotica</i>	Goosander <i>Mergus merganser</i>

Table A.1: SPAs from Northumbria to Suffolk and their Qualifying Features

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages ¹⁰
NORTHEAST ENGLAND				
Lindisfarne	3679.22	Breeding: Little tern Over winter: Bar-tailed Godwit Golden Plover Whooper Swan	On passage: Ringed Plover Over winter: Grey Plover Greylag Goose Knot Light-bellied Brent Goose Wigeon	Over winter; Waterfowl
Farne Islands	101.86	Breeding: Arctic tern Common tern Roseate tern Sandwich tern	Breeding: Guillemot Puffin	Breeding: Seabirds
Northumbria Coast SPA	1,107.98	Breeding: Little tern	Over winter: Purple sandpiper Turnstone	N/A
Coquet Island SPA	22.28	Breeding: Arctic tern Common tern Roseate tern Sandwich tern	Breeding: Puffin	Breeding: Seabirds
Teesmouth and Cleveland Coast SPA	1,247.31	Breeding: Little tern On passage: Sandwich tern	On passage: Ringed plover Over winter: Knot Redshank	Over winter: Waterfowl
YORKSHIRE AND HUMBER				
North York Moors SPA	44087.68	Breeding: Merlin Golden Plover	N/A	N/A
Flamborough Head and Bempton Cliffs SPA	212.17	N/A	Breeding: Kittiwake	Breeding: Seabirds
Humber Flats, Marshes and Coast (Phases 1 and 2) SPA	15,202.53	Breeding: Little tern Marsh harrier Over winter: Bar-tailed godwit Bittern Golden plover Hen harrier	On passage: Redshank Sanderling Over winter: Dunlin Knot Redshank Shelduck	Over winter: Waterfowl

¹⁰ - A seabird assemblage of international importance. The area regularly supports at least 20,000 seabirds. Or

- A wetland of international importance. The area regularly supports at least 20,000 waterfowl.

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages ¹¹
LINCOLNSHIRE, NORFOLK and SUFFOLK				
Gibraltar Point SPA	414.09	Breeding: Little tern Over winter: Bar-tailed godwit	Over winter: Grey plover Knot	Over winter: Waterfowl
The Wash SPA	62,211.66	Breeding: Common tern Little tern Marsh harrier Over winter: Avocet Bar-tailed godwit Golden plover Whooper swan	On passage: Ringed plover Sanderling Over winter: Black-tailed godwit Curlew Dark-bellied brent goose Dunlin Grey plover Knot Oystercatcher Pink-footed goose Pintail Redshank Shelduck Turnstone	Over winter: Waterfowl
North Norfolk Coast SPA	7,886.79	Breeding: Avocet Bittern Common tern Little tern Marsh harrier Mediterranean gull Roseate tern Sandwich tern Over winter: Avocet Bar-tailed godwit Bittern Golden plover Hen harrier Ruff	Breeding: Redshank Ringed plover On passage: Ringed plover Over winter: Dark-bellied brent goose Knot Pink-footed goose Pintail Redshank Wigeon	Over winter: Waterfowl
Broadland SPA	5,462.4	Breeding: Bittern Marsh harrier Over winter: Bewick's swan Bittern Ruff Whooper swan	Over winter: Gadwall Pink-footed goose Shoveler	Over winter: Waterfowl

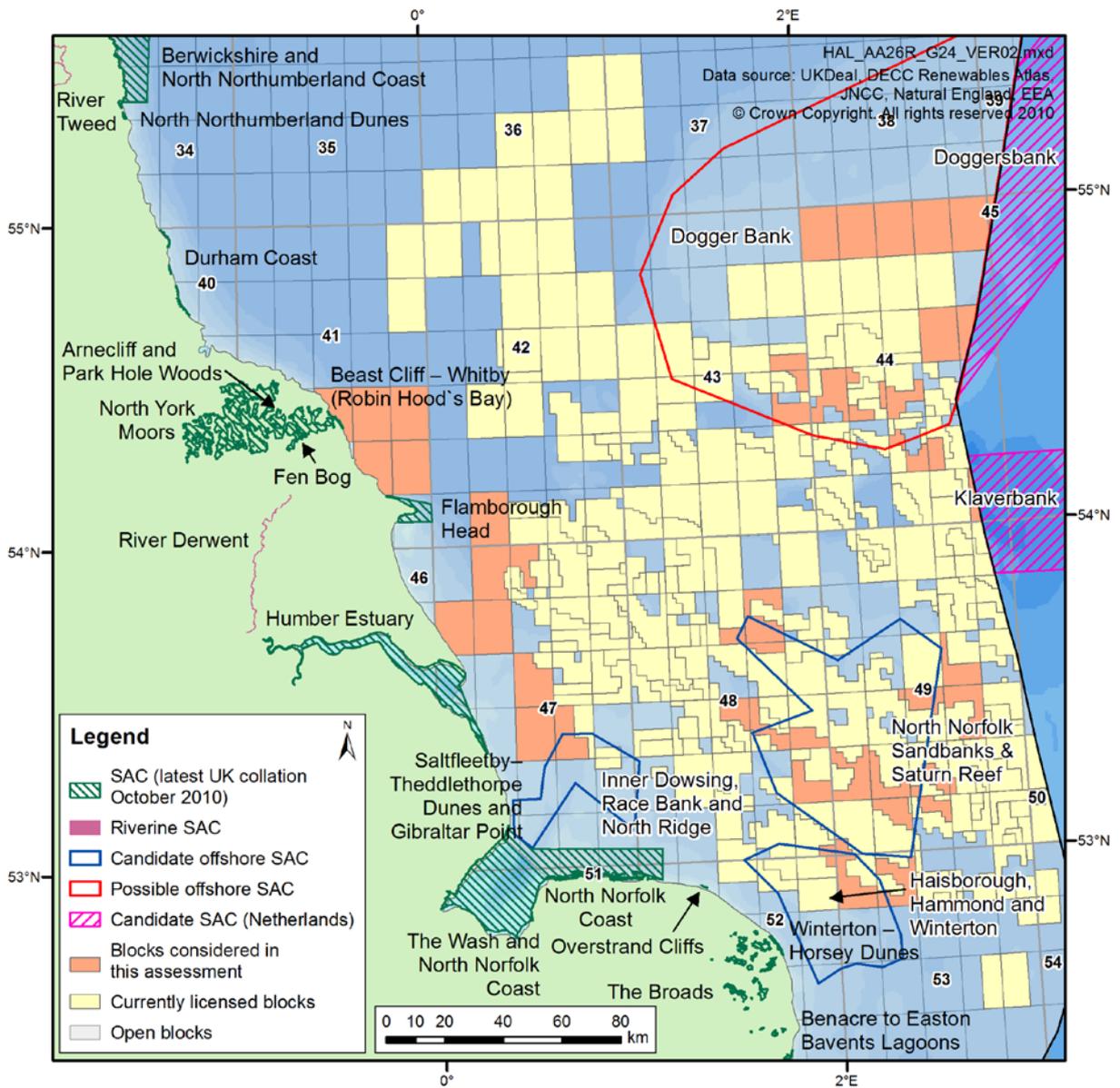
¹¹ - A seabird assemblage of international importance. The area regularly supports at least 20,000 seabirds. Or

- A wetland of international importance. The area regularly supports at least 20,000 waterfowl.

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages ¹¹
Great Yarmouth North Denes SPA	149.19	Breeding: Little tern	N/A	N/A
Breydon Water SPA	1,202.94	Breeding: Common tern Over winter: Avocet Bewick's swan Golden plover	N/A	Over winter: Waterfowl
Benacre to Easton Bavents SPA	516.83	Breeding: Bittern Little tern Marsh harrier Over winter: Bittern	N/A	N/A
Minsmere- Walberswick SPA	2,018.92	Breeding: Avocet Bittern Little tern Marsh harrier Nightjar Woodlark Over winter: Avocet Bittern Hen harrier	N/A	N/A
Alde-Ore Estuary SPA	2,416.87	Breeding: Avocet Little tern Marsh harrier Sandwich tern Over winter: Avocet	Breeding: Lesser black- backed gull Over winter: Redshank	Breeding: Seabirds Over winter: Waterfowl
Deben Estuary SPA	978.93	Over winter: Avocet	N/A	N/A
Outer Thames Estuary SPA	379,268.14	Over winter: Red-throated diver	N/A	N/A

A2 Coastal and Marine Special Areas of Conservation

Map A.2: Location of coastal, marine and offshore Special Areas of Conservation



Box A.2: Annex 1 Habitat Abbreviations Used in Site Summaries

Annex I Habitat (abbreviated)	Annex I Habitat(s) (full description)
Bogs	Active raised bogs * Priority feature Blanket bogs * Priority feature Degraded raised bogs still capable of natural regeneration Depressions on peat substrates of the <i>Rhynchosporion</i> Transition mires and quaking bogs
Coastal dunes	Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) Coastal dunes with <i>Juniperus</i> spp. Decalcified fixed dunes with <i>Empetrum nigrum</i> Dunes with <i>Hippophae rhamnoides</i> Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) Embryonic shifting dunes Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature Humid dune slacks Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (`white dunes`)
Coastal lagoons	Coastal lagoons * Priority feature
Estuaries	Estuaries
Fens	Alkaline fens Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> * Priority feature Petrifying springs with tufa formation (<i>Cratoneurion</i>) * Priority feature
Forest	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) * Priority feature Old sessile oak woods with <i>Quercus robur</i> on sandy plains
Grasslands	Alpine and subalpine calcareous grasslands Calaminarian grasslands of the <i>Violetalia calaminariae</i> Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>) (important orchid sites) * Priority feature Species-rich <i>Nardus</i> grassland, on siliceous substrates in mountain

Annex I Habitat (abbreviated)	Annex I Habitat(s) (full description)
	areas (and submountain areas in continental Europe) * Priority feature
Heaths	Alpine and Boreal heaths European dry heaths Northern Atlantic wet heaths with <i>Erica tetralix</i>
Inlets and bays	Large shallow inlets and bays
Limestone pavements	Limestone pavements * Priority feature
Machairs	Machairs
Mudflats and sandflats	Mudflats and sandflats not covered by seawater at low tide
Reefs	Reefs
Rocky slopes	Calcareous rocky slopes with chasmophytic vegetation
Running freshwater	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation
Salt marshes and salt meadows	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) <i>Salicornia</i> and other annuals colonising mud and sand <i>Spartina</i> swards (<i>Spartinion maritimae</i>)
Sandbanks	Sandbanks which are slightly covered by sea water all the time
Scree	Calcareous and calcshist screes of the montane to alpine levels (<i>Thlaspietea rotundifolii</i>) Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladanii</i>)
Scrub (mattoral)	<i>Juniperus communis</i> formations on heaths or calcareous grasslands
Sea caves	Submerged or partially submerged sea caves
Sea cliffs	Vegetated sea cliffs of the Atlantic and Baltic coasts
Standing freshwater	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp. Natural dystrophic lakes and ponds Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> -type vegetation Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>
Vegetation of drift lines	Annual vegetation of drift lines
Vegetation of stony banks	Perennial vegetation of stony banks

Table A.2: Coastal SACs from Northumbria to Suffolk and their Qualifying Features

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
NORTHEAST ENGLAND					
Berwickshire and North Northumberland Coast SAC	65045.5	Mudflats and sandflats Inlets and bays Reefs Sea caves	N/A	Grey seal <i>Halichoerus grypus</i>	N/A
North Northumberland Dunes SAC	1147.56	Coastal dunes	N/A	Petalwort <i>Petalophyllum ralfsii</i>	N/A
Durham Coast SAC	393.63	Sea cliffs	N/A	N/A	N/A
YORKSHIRE AND THE HUMBER					
North York Moors SAC	44082.25	Heaths	Bogs	N/A	N/A
Fen Bog SAC	27.49	Bogs	N/A	N/A	N/A
Beast Cliff-Whitby (Robin Hood's Bay) SAC	260.2	Sea cliffs	N/A	N/A	N/A
Flamborough Head SAC	6311.96	Reefs Sea cliffs Sea caves	N/A	N/A	N/A
Humber Estuary SAC	36657.15	Estuaries Mudflats and sandflats	Sandbanks Salt marshes and salt meadows Coastal lagoons Coastal dunes	N/A	River lamprey <i>Lampetra fluviatilis</i> Sea lamprey <i>Petromyzon marinus</i> Grey seal <i>Halichoerus grypus</i>
LINCOLNSHIRE, NORFOLK AND SUFFOLK					
Saltfleetby - Theddlethorpe Dunes and Gibraltar Point SAC	960.2	Coastal dunes	Coastal dunes	N/A	N/A

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
The Wash and North Norfolk Coast SAC	107761.28	Sandbanks Mudflats and sandflats Inlets and bays Reefs Salt marshes and salt meadows	Coastal lagoons	Harbour seal <i>Phoca vitulina</i>	Otter <i>Lutra lutra</i>
North Norfolk Coast SAC	3207.37	Coastal lagoons Vegetation of stony banks Salt marshes and salt meadows Coastal dunes			Otter <i>Lutra lutra</i> Petalwort <i>Petalophyllum ralfsii</i>
Overstrand Cliffs SAC	30.02	Sea cliffs	N/A	N/A	N/A
The Broads SAC	5865.6	Standing freshwater Bog Fens Forests	Grasslands	Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Fen orchid <i>Liparis loeselii</i>	Otter <i>Lutra lutra</i>
Winterton-Horsey Dunes SAC	425.94	Coastal dunes	Coastal dunes	N/A	N/A
Benacre to Easton Barents Lagoons SAC	366.93	Coastal lagoons	N/A	N/A	N/A
Minsmere to Walberswick Heaths and Marshes SAC	1265.52	Vegetation of drift lines Heath	Vegetation of stony banks	N/A	N/A
Alde, Ore and Butley Estuaries SAC	1561.53	Estuaries	Mudflats and sandflats Salt marshes and salt meadows	N/A	N/A

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Orfordness-Shingle Street SAC	901.19	Coastal lagoons Vegetation of drift lines Vegetation of stony banks	N/A	N/A	N/A

A3 Offshore Special Areas of Conservation

Table A.3: Offshore SACs in the Southern North Sea and their Qualifying Features

Site Name	Area (ha)	Annex I Habitat	Annex II Species
Doggerbank SAC (Germany)	169,895	Sandbanks	Harbour porpoise <i>Phocoena phocoena</i> Harbour seal <i>Phoca vitulina</i>
Doggersbank cSAC (Netherlands)	471,772	Sandbanks	Harbour porpoise <i>Phocoena phocoena</i> Harbour seal <i>Phoca vitulina</i> Grey seal <i>Halichoerus grypus</i>
Klaverbank cSAC (Netherlands)	123,764	Reefs	Harbour porpoise <i>Phocoena phocoena</i> Harbour seal <i>Phoca vitulina</i> Grey seal <i>Halichoerus grypus</i>
Dogger Bank cSAC	1,233,884	Sandbanks	N/A
North Norfolk Sandbanks and Saturn Reef cSAC	360,341	Sandbanks Reefs (biogenic <i>Sabellaria spinulosa</i>)	N/A
Inner Dowsing, Race Bank and North Ridge cSAC	84,514	Sandbanks Reefs	N/A
Haisborough, Hammond and Winterton cSAC	146,759	Sandbanks Reefs	N/A

A4 Riverine Special Areas of Conservation

In addition to the mapped SACs, the following riverine SACs designated for migratory fish and/or the freshwater pearl mussel are also considered.

Table A.4: Relevant riverine SACs designated for migratory fish and/or the freshwater pearl mussel

Site Name	Freshwater pearl mussel <i>Margaritifera margaritifera</i>	Migratory fish ¹
River Derwent	-	SL, RL

¹ SL - Sea lamprey *Petromyzon marinus*, RL - River lamprey *Lampetra fluviatilis*, AS - Atlantic salmon *Salmo salar*

Appendix B – Screening tables for the identification of likely significant effects on the sites

B1 Coastal and marine Special Protection Areas

Site name	Features present ¹			Vulnerability to effects ²				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
NORTHEAST ENGLAND								
Northumbria Coast	✓	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Coquet Island	✓	-	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Teesmouth and Cleveland Coast	✓	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
YORKSHIRE AND THE HUMBER								
North York Moors	✓	-	-	-	-	-	-	Site is terrestrial but a small part is adjacent to a block which could be drilled from land. Any onshore wellsite or development would require planning permission and associated Habitats Regulations Assessment. Conservation objectives would not be undermined by emissions or discharges from routine marine operations or accidental spills.

Site name	Features present ¹			Vulnerability to effects ²				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Flamborough Head and Bempton Cliffs	✓	-	-	✓	-	-	-	Site objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 41/24, 41/25 or 42/27, weathered spilled diesel oil could theoretically affect the qualifying features (breeding kittiwake) when foraging in adjacent areas beyond the site boundaries. However, mitigation would be possible. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Humber Flats, Marshes and Coast (Phases 1 and 2)	✓	✓	✓	✓	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 47/6, 47/7, 47/13, 47/18 or 47/19b, weathered spilled diesel oil could theoretically affect the features (over-wintering and breeding waterfowl and terns), although mitigation would be possible. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
LINCOLNSHIRE, NORFOLK AND SUFFOLK								
Gibraltar Point	✓	✓	-	-	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 47/18 or 47/19b, weathered spilled diesel oil could theoretically affect the features (breeding terns) when foraging in adjacent areas beyond the site boundaries. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project level mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
The Wash	✓	✓	✓	✓	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 47/18 or 47/19b, weathered spilled diesel oil could

Site name	Features present ¹			Vulnerability to effects ²				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
								theoretically affect the features (breeding terns) when foraging in adjacent areas beyond the site boundaries. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
North Norfolk Coast	✓	✓	✓	✓	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Broadland	✓	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Great Yarmouth and North Denes	✓	-	-	✓	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 53/1b or 53/2c, weathered spilled diesel oil could theoretically affect the features (breeding terns) when foraging in adjacent areas beyond the site boundaries. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project level mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Breydon Water	✓	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Benacre to Easton Bavents	✓	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

Site name	Features present ¹			Vulnerability to effects ²				Consideration
	Breeding	Wintering	Passage	Oil spills	Physical Disturbance	Acoustic Disturbance	In-combination	
Outer Thames	-	✓	-	-	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 53/1b or 53/2c, weathered spilled diesel oil could theoretically affect the features (over-wintering red throated divers). High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project level mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.

Notes: 1 ✓ denotes feature present; 2 ✓ denotes vulnerability to effect

B2 Coastal and marine Special Areas of Conservation

Site name	Features present ¹		Effects ²				Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
NORTHEAST ENGLAND							
Berwickshire and North Northumberland Coast	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
North Northumberland Dunes	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Durham Coast	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
YORKSHIRE AND THE HUMBER							
North York Moors	✓	-	-	-	-	-	Site is terrestrial but a small part is adjacent to a block which could be drilled from land. Any onshore wellsite or development would require planning permission and associated Habitats Regulations Assessment. Site conservation objectives would not be undermined by emissions or discharges from routine marine operations or accidental spills.
Fen Bog	✓	-	-	-	-	-	Site is terrestrial but near (though not immediately adjacent) to a block which could be drilled from land. Any onshore wellsite or development would require planning permission and associated Habitats Regulations Assessment. Site conservation objectives would not be undermined by emissions or discharges from routine marine operations or accidental spills.
Beast Cliff-Whitby (Robin Hood's Bay)	✓	-	-	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from adjacent Blocks (e.g. 41/18), weathered spilled diesel oil could theoretically affect the cliff habitat present. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further,

Site name	Features present ¹		Effects ²				Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
							project level mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Flamborough Head	✓	-	-	-	-	-	Site conservation objectives would not be undermined by emissions or discharges from routine operations. In the unlikely event of a major diesel oil spill from Blocks 41/24, 41/25 or 42/27, weathered spilled diesel oil could theoretically affect the features (reefs, vegetated sea cliffs and sea caves). High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project level mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Humber Estuary	✓	✓	-	-	✓	✓	In the unlikely event of a major diesel oil spill from Blocks 47/6, 47/7, 47/13, 47/18 or 47/19b, weathered spilled diesel oil could theoretically affect some qualifying habitats (e.g. estuaries, mudflats and sandflats), although mitigation would be possible. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species features (grey seal and migratory fish). High level mitigation measures have been identified in Section 7.5 and are summarised in Table 4.2. Further, project level mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. It is noted that this site could potentially be influenced by offshore wind energy developments off the east coast of England.
LINCOLNSHIRE, NORFOLK AND SUFFOLK							
Saltfleetby - Theddlethorpe Dunes and Gibraltar Point	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
The Wash and North Norfolk Coast	✓	✓	✓	-	✓	✓	Site conservation objectives would not be undermined by emissions or discharges from routine operations. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species features (harbour seal and otter) although the conservation status of these species are unlikely to be

Site name	Features present ¹		Effects ²				Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
							affected in the long-term (see Section 7.3 for more information). It is noted that this site could potentially be influenced by offshore wind energy developments off the east coast of England.
North Norfolk Coast	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Overstrand Cliffs	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
The Broads	✓	✓	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Winterton-Horsey Dunes	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.
Benacre to Easton Barents Lagoons	✓	-	-	-	-	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills.

Notes: ¹ ✓ denotes feature present; ² ✓ denotes vulnerability to effect; ³ including diesel and/or lube oil

B3 Offshore Special Areas of Conservation

Site name	Features present ¹			Effects ²			Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
Dogger Bank cSAC	✓	-	✓	✓	-	✓	Several blocks are within or adjacent to the cSAC. Certain activities in, or related to, these blocks could potentially undermine site conservation objectives through physical damage or loss from smothering by drilling discharges, the installation of gas (and renewable energy industry) infrastructure and cables. Oil spills within the site would be unlikely to undermine site conservation objectives/status as the features of interest are benthic (see Section 5.2), and the relatively small inventory of diesel, lube and similar oils involved. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
North Norfolk Sandbanks and Saturn Reef cSAC	✓	-	✓	✓	-	✓	Several blocks are within or adjacent to the cSAC. Certain activities in, or related to, these blocks could potentially undermine site conservation objectives through physical damage or loss from smothering by drilling discharges, the installation of gas (and renewable energy industry) infrastructure and cables. Oil spills within the site would be unlikely to undermine site conservation objectives as the features of interest are benthic (see Section 5.2), and the relatively small inventory of diesel, lube and similar oils involved. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.

Site name	Features present ¹		Effects ²				Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
Inner Dowsing, Race Bank and North Ridge cSAC	✓	-	-	✓	-	✓	Blocks 47/18 or 47/19b overlap with the cSAC. Certain activities in, or related to, these blocks could potentially undermine site conservation objectives through physical damage or loss from smothering by drilling discharges, the installation of gas (and renewable energy industry) infrastructure and cables. Oil spills within the site would be unlikely to undermine site conservation objectives/status as the features of interest are benthic (see Section 5.2), and the relatively small inventory of diesel, lube and similar oils involved. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Haisborough, Hammond and Winterton cSAC	✓	-	-	✓	-	✓	Several blocks are within or adjacent to the cSAC. Certain activities in, or related to, these blocks could potentially undermine site conservation objectives through physical damage or loss from smothering by drilling discharges, the installation of gas (and renewable energy industry) infrastructure and cables. Oil spills within the site would be unlikely to undermine site conservation objectives/status as the features of interest are benthic (see Section 5.2), and the relatively small inventory of diesel, lube and similar oils involved. High level mitigation measures have been identified in Section 5.4 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Doggerbank SAC	✓	✓	-	-	✓	✓	The German site is remote from blocks (and some 25km from UK median line) and its conservation objectives/conservation status would not be affected by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may be detectable within site boundaries.

Site name	Features present ¹			Effects ²			Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
Doggersbank cSAC	✓	✓	✓	-	✓	✓	The Dutch site abuts the UK median line and its conservation objectives may be undermined by emissions or discharges from routine operations or accidental spills from activities in adjacent blocks. Seismic survey noise would be detectable within site boundaries.
Klaverbank cSAC	✓	✓	✓	-	✓	✓	The Dutch site abuts the UK median line and its conservation objectives may be undermined by emissions or discharges from routine operations or accidental spills from activities in the adjacent Block 44/30 although mitigation of effects is possible – see Section 5.4 and summary of high level mitigation in Table 4.2. Seismic survey noise would be detectable within site boundaries (see Section 7.3).

Notes: ¹ ✓ denotes feature present; ² ✓ denotes vulnerability to effect; ³ including diesel and/or lube oil

B4 Riverine Special Areas of Conservation

Site name	Features present ¹		Effects ²				Consideration
	Habitats	Species	Oil spills ³	Physical Disturbance	Acoustic Disturbance	In-combination	
River Derwent	✓	✓	-	-	✓	-	Site is remote from blocks and its conservation objectives would not be undermined by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species features (river and sea lamprey) outside of the site boundaries, although mitigation would be possible. High level mitigation measures have been identified in Section 7.5 and are summarised in Table 4.2. Further, project specific mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.

Notes: ¹ ✓ denotes feature present; ² ✓ denotes vulnerability to effect; ³ including diesel and/or lube oil

Appendix C – Detailed information on Natura 2000 sites where the potential for effects have been identified

C1 Coastal and marine Special Protection Areas

Site Name: Flamborough Head and Bempton Cliffs SPA	
Location	Grid Ref: TA233723 (central point) Latitude 54° 07'55"N Longitude 00° 06'48"W
Area (ha)	212.17
Summary	Flamborough Head is located on the east coast of Yorkshire. The cliffs project into the North Sea, rising to 135 m at Bempton, exposing a wide section of chalk strata. The cliff-top vegetation comprises maritime grassland species alongside species more typical of chalk grassland. The site supports large numbers of breeding seabirds including kittiwake <i>Rissa tridactyla</i> and auks, as well as the only mainland-breeding colony of gannet <i>Morus bassanus</i> in the UK. The seabirds feed and raft in the waters around the cliffs, outside the SPA, as well as feeding more distantly in the North Sea. The intertidal chalk platforms are also used as roosting sites, particularly at low water and notably by juvenile kittiwakes.
Qualifying features for which the site is designated:	
<p>Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:</p> <p>During the breeding season: Kittiwake <i>Rissa tridactyla</i>, 83,370 pairs representing at least 2.6% of the Eastern Atlantic breeding population (as of 1987).</p>	
<p>Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds Assemblage qualification: A seabird assemblage of international importance.</p> <p>During the breeding season, the area regularly supports 305,784 individual seabirds including: Puffin <i>Fratercula arctica</i>, razorbill <i>Alca torda</i>, guillemot <i>Uria aalge</i>, herring gull <i>Larus argentatus</i>, gannet <i>Morus bassanus</i>, kittiwake <i>Rissa tridactyla</i>.</p>	
Conservation objectives:	
<p>Subject to natural change, maintain in favourable condition the habitats for the populations of migratory bird species (kittiwake), of European importance, with particular reference to:</p> <ul style="list-style-type: none"> • Coastal cliffs and caves 	
<p>Subject to natural change, maintain in favourable condition the habitats for the populations of seabirds that contribute to the breeding seabird assemblage of European importance, with particular reference to:</p> <ul style="list-style-type: none"> • Coastal cliffs and caves 	

Site Name: Humber Flats, Marshes and Coast SPA	
Location	Latitude 53° 37'58"N Longitude 00° 00'39"W
Area (ha)	15202.53
Summary	Humber Flats, Marshes and Coast SPA is located on the east coast of England, and comprises extensive wetland and coastal habitats within the Humber Estuary. The estuary drains a catchment of some 24,240 square kilometres and provides the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (7.2 m) and approximately one-third of the estuary is exposed as mud- or sand-flats at low tide. The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. It also supports important breeding populations of terns and raptors in summer.
Qualifying features for which the site is designated:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:	
<p>During the breeding season: <i>Little Tern Sterna albifrons</i>, 63 pairs representing at least 2.6% of the breeding population in Great Britain <i>Marsh Harrier Circus aeruginosus</i>, 11 pairs representing at least 6.9% of the breeding population in Great Britain (Count as at 1995)</p> <p>Over winter: <i>Bar-tailed Godwit Limosa lapponica</i>, 1,593 individuals representing at least 3.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)</p> <p><i>Bittern Botaurus stellaris</i>, 2 individuals representing at least 2.0% of the wintering population in Great Britain (5 year mean 91/2-95/6)</p> <p><i>Golden Plover Pluvialis apricaria</i>, 29,235 individuals representing at least 11.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)</p> <p><i>Hen Harrier Circus cyaneus</i>, 20 individuals representing at least 2.7% of the wintering population in Great Britain (5 year peak mean 1984/5-1988/9)</p>	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance.	
Over winter, the area regularly supports 187,617 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Mallard <i>Anas platyrhynchos</i> , Golden Plover <i>Pluvialis apricaria</i> , Bar-tailed Godwit <i>Limosa lapponica</i> , Shelduck <i>Tadorna tadorna</i> , Knot <i>Calidris canutus</i> , Dunlin <i>Calidris alpina alpina</i> , Redshank <i>Tringa totanus</i> , Cormorant <i>Phalacrocorax carbo</i> , Dark-bellied Brent Goose <i>Branta bernicla bernicla</i> , Bittern <i>Botaurus stellaris</i> , Teal <i>Anas crecca</i> , Curlew <i>Numenius arquata</i> , Pochard <i>Aythya ferina</i> , Goldeneye <i>Bucephala clangula</i> , Oystercatcher <i>Haematopus ostralegus</i> , Ringed Plover <i>Charadrius hiaticula</i> , Grey Plover <i>Pluvialis squatarola</i> , Lapwing <i>Vanellus vanellus</i> , Sanderling <i>Calidris alba</i> , Black-tailed Godwit <i>Limosa limosa islandica</i> , Wigeon <i>Anas penelope</i> , Whimbrel <i>Numenius phaeopus</i> .	
Conservation objectives:	
Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex I species, in particular: <ul style="list-style-type: none"> • Intertidal mudflats and sandflats • Saltmarsh communities • Tidal reedbeds • Coastal lagoons • Unvegetated sand and shingle 	
Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring migratory bird species, in particular: <ul style="list-style-type: none"> • Intertidal mudflats and sandflats • Saltmarsh communities 	

Site Name: Humber Flats, Marshes and Coast SPA

- Tidal reedbeds
- Coastal lagoons

Subject to natural change, maintain in favourable condition the habitats for the internationally important assemblage of waterfowl, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Subject to natural change, maintain the wetland regularly supporting 20,000 or more waterfowl in favourable condition, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Site Name: Great Yarmouth North Denes SPA

Location	Latitude 52° 44'02"N Longitude 01° 41'10"E
Area (ha)	149.19
Summary	Great Yarmouth North Denes is located on the North Sea coast of Norfolk in East Anglia about 30 km east of Norwich. Behind a wide shingle beach, the North Denes dune system is actively accreting. These low dunes are stabilised by Marram <i>Ammophila arenaria</i> and there are extensive areas of Grey Hair-grass <i>Corynephorus canescens</i> . The location supports important numbers of breeding Little Tern <i>Sterna albifrons</i> that feed outside the SPA in nearby waters.
Qualifying features for which the site is designated:	
<i>Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:</i>	
During the breeding season: Little Tern <i>Sterna albifrons</i>, 220 pairs representing at least 9.2% of the breeding population in Great Britain (5 year mean, 1992-1996)	
Conservation objectives:	
Subject to natural change, to maintain (or restore to favourable condition if features are judged to be unfavourable) the habitats in favourable condition, with particular reference to any dependent component special interest features for which the land is designated, as individually listed above.	

Site Name: Humber Estuary SPA	
Location	Latitude 53° 32'59"N Longitude 00° 03'25"E
Area (ha)	37630.24
Summary	The Humber Estuary is the largest coastal plain estuary on the east coast of Britain. The site supports internationally important populations of waterfowl species overwinter and provides a migratory feeding ground during spring and autumn migrations. In the summer the site supports several important breeding populations of declining species such as bittern, marsh harrier and avocet.
Qualifying features for which the site is designated:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:	
<p>During the breeding season:</p> <p>Bittern <i>Botaurus stellaris</i>, 10.5% of the breeding population in Great Britain (3 year mean 2000 – 2002) Marsh harrier <i>Circus aeruginosus</i>, 6.3% of the breeding population in Great Britain (3 year mean 2000 – 2002) Avocet <i>Recurvirostra avosetta</i>, 8.6% of the breeding population in Great Britain (3 year mean 2000 – 2002) Sandwich tern <i>Sterna sandvicensis</i>, 2.1% of the breeding population in Great Britain (3 year mean 2000 – 2002)</p> <p>Over winter:</p> <p>Bittern <i>Botaurus stellaris</i>, 4% of the wintering population in Great Britain (5 year peak mean 1998/9 - 2002/3) Hen harrier <i>Circus cyaneus</i>, 1.1% of the wintering population in Great Britain (5 year peak mean 1997/8 - 2001/2) Bar-tailed Godwit <i>Limosa lapponica</i>, 4.4% of the wintering population in Great Britain (5 year peak mean 1996/7 - 2000/1) Golden plover <i>Pluvialis apricaria</i>, 12.3% of the wintering population in Great Britain (5 year peak mean 1996/7 - 2000/1) Avocet <i>Recurvirostra avosetta</i>, 1.7% of the wintering population in Great Britain (5 year peak mean 1996/7 - 2000/1)</p> <p>On passage:</p> <p>Ruff <i>Philomachus pugnax</i>, 1.4% of the wintering population in Great Britain (5 year peak mean 1996 - 2000)</p>	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:	
<p>Over winter:</p> <p>Dunlin <i>Calidris alpina alpina</i>, 1.7% of the Northern Siberia/Europe/Western Africa population (5 year peak mean 1996/7 - 2000/1) Knot <i>Calidris canutus</i>, 6.3% of the breeding North-eastern Canada/Greenland/Iceland/North-western Europe population (5 year peak mean 1996/7 - 2000/1) Black-tailed Godwit <i>Limosa limosa islandica</i>, 3.2% of the breeding Iceland population (5 year peak mean 1996/7 - 2000/1) Shelduck <i>Tadorna tadorna</i>, 1.5% of the North-western Europe population (5 year peak mean 1996/7 - 2000/1) Redshank <i>Tringa totanus</i>, 3.6% of the wintering Eastern Atlantic population (5 year peak mean 1996/7 - 2000/1)</p> <p>On passage:</p> <p>Dunlin <i>Calidris alpina alpina</i>, 1.5% of the Northern Siberia/Europe/Western Africa population (5 year peak mean 1996 - 2000) Knot <i>Calidris canutus</i>, 4.1% of the breeding North-eastern Canada/Greenland/Iceland/North-western Europe population (5 year peak mean 1996 - 2000) Black-tailed Godwit <i>Limosa limosa islandica</i>, 2.6% of the breeding Iceland population (5 year peak mean 1996 - 2000) Redshank <i>Tringa totanus</i>, 5.7% of the wintering Eastern Atlantic population (5 year peak mean 1996 - 2000)</p>	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance.	
<p>In the non-breeding season, the area regularly supports 153934 individual waterfowl (5 year peak mean 1996/7 - 2000/1) including: Teal <i>Anas crecca</i>, Wigeon <i>Anas penelope</i>, Mallard <i>Anas platyrhynchos</i>, Ruddy turnstone <i>Arenaria interpres</i>, Pochard <i>Aythya farina</i>, Scaup <i>Aythya marila</i>, Bittern <i>Botaurus stellaris</i>, Dark-bellied brent goose <i>Branta bernicla bernicla</i>, Goldeneye <i>Bucephala clangula</i>, Sanderling <i>Calidris alba</i>, Dunlin <i>Calidris alpina alpina</i>, knot <i>Calidris canutus</i>, Ringed plover <i>Charadrius hiaticula</i>, Oyster catcher <i>Haematopus ostralegus</i>, Bar-tailed Godwit <i>Limosa lapponica</i>, Black-tailed Godwit <i>Limosa limosa islandica</i>, Curlew <i>Numenius arquata</i>,</p>	

Site Name: Humber Estuary SPA

Whimbrel *Numenius phaeopus*, Ruff *Philomachus pugnax*, Golden plover *Pluvialis apricaria*, Grey plover *Pluvialis squatarola*, Avocet *Recurvirostra avosetta*, Shelduck *Tadorna tadorna*, Greenshank *Tringa nebularia*, Redshank *Tringa totanus*, Lapwing *Vanellus vanellus*

Conservation objectives:

Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex I species, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons
- Unvegetated sand and shingle

Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring migratory bird species, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Subject to natural change, maintain in favourable condition the habitats for the internationally important assemblage of waterfowl, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Subject to natural change, maintain the wetland regularly supporting 20,000 or more waterfowl in favourable condition, in particular:

- Intertidal mudflats and sandflats
- Saltmarsh communities
- Tidal reedbeds
- Coastal lagoons

Site Name: North Norfolk Coast SPA	
Location	Grid Ref: TF745446 (central point) Latitude 52° 58'13"N Longitude 00° 35'55"E
Area (ha)	7886.79
Summary	The North Norfolk Coast SPA encompasses much of the northern coastline of Norfolk in eastern England. It is a low-lying barrier coast that includes a great variety of coastal habitats. The main habitats, found along the whole coastline, include extensive intertidal sand and mudflats, saltmarshes, shingle and sand dunes, together with areas of freshwater grazing marsh and reedbed, which has developed in front of rising land. The site contains some of the best examples of saltmarsh in Europe. The great diversity of high-quality freshwater, intertidal and marine habitats results in very large numbers of waterbirds occurring throughout the year. In summer, the site holds large breeding populations of waders, four species of terns, bittern and wetland raptors such as marsh harrier. In winter, the coast is used by very large numbers of geese, seaducks, other ducks and waders. The coast is also of major importance for staging waterbirds in the spring and autumn migration periods. Breeding terns, particularly sandwich tern, and wintering seaducks regularly feed outside the SPA in adjacent coastal waters. To the west, the coastal habitats of North Norfolk Coast SPA are continuous with the Wash SPA, with which area the ecology of this site is intimately linked.
Qualifying features for which the site is designated:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:	
During the breeding season:	
Avocet <i>Recurvirostra avosetta</i> , 177 pairs representing at least 30.0% of the breeding population in Great Britain (Count as at 1998)	
Bittern <i>Botaurus stellaris</i> , 3 individuals representing at least 15.0% of the breeding population in Great Britain (Count as at 1998)	
Common tern <i>Sterna hirundo</i> , 460 pairs representing at least 3.7% of the breeding population in Great Britain (Count as at 1996)	
Little tern <i>Sterna albifrons</i> , 377 pairs representing at least 15.7% of the breeding population in Great Britain (5 year mean 1994-1998)	
Marsh harrier <i>Circus aeruginosus</i> , 14 pairs representing at least 8.8% of the breeding population in Great Britain (Count as at 1995)	
Mediterranean gull <i>Larus melanocephalus</i> , 2 pairs representing at least 20.0% of the breeding population in Great Britain (Count as at 1996)	
Roseate tern <i>Sterna dougallii</i> , 2 pairs representing at least 3.3% of the breeding population in Great Britain (5 year mean 1994-1998)	
Sandwich tern <i>Sterna sandvicensis</i> , 3,457 pairs representing at least 24.7% of the breeding population in Great Britain (5 year mean 1994-1998)	
Over winter:	
Avocet <i>Recurvirostra avosetta</i> , 153 individuals representing at least 12.0% of the wintering population in Great Britain (Count as at 1997/8)	
Bar-tailed godwit <i>Limosa lapponica</i> , 1,236 individuals representing at least 2.3% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
Bittern <i>Botaurus stellaris</i> , 5 individuals representing at least 5.0% of the wintering population in Great Britain (5 year peak mean 1993/4 - 1998/9)	
Golden plover <i>Pluvialis apricaria</i> , 2,667 individuals representing at least 1.1% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
Hen harrier <i>Circus cyaneus</i> , 16 individuals representing at least 2.1% of the wintering population in Great Britain	

Site Name: North Norfolk Coast SPA

(5 year mean 1993/4-1997/8)

Ruff *Philomachus pugnax*, 54 individuals representing at least 7.7% of the wintering population in Great Britain (5 year peak mean 1993/4 - 1998/9)

This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

During the breeding season:

Redshank *Tringa totanus*, 700 pairs representing at least 1.2% of the breeding Eastern Atlantic - wintering population (Count as at 1998)

Ringed plover *Charadrius hiaticula*, 220 pairs representing at least 1.4% of the breeding Europe/Northern Africa - wintering population (Count as at 1998)

On passage:

Ringed plover *Charadrius hiaticula*, 1,256 individuals representing at least 2.5% of the Europe/Northern Africa - wintering population (5 year peak mean 1994/5 - 1998/9)

Over winter:

Dark-bellied brent goose *Branta bernicla bernicla*, 11,512 individuals representing at least 3.8% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6)

Knot *Calidris canutus*, 10,801 individuals representing at least 3.1% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Pink-footed goose *Anser brachyrhynchus*, 23,802 individuals representing at least 10.6% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean 1991/2 - 1995/6)

Pintail *Anas acuta*, 1,139 individuals representing at least 1.9% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Redshank *Tringa totanus*, 2,998 individuals representing at least 2.0% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1993/4 - 1997/8)

Wigeon *Anas penelope*, 14,039 individuals representing at least 1.1% of the wintering Western Siberia/Northwestern/Northeastern Europe population (5 year peak mean 1991/2 - 1995/6)

Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance.

Over winter, the area regularly supports 91,249 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: shelduck *Tadorna tadorna*, avocet *Recurvirostra avosetta*, golden plover *Pluvialis apricaria*, ruff *Philomachus pugnax*, bar-tailed godwit *Limosa lapponica*, pink-footed goose *Anser brachyrhynchus*, dark-bellied brent goose *Branta bernicla bernicla*, wigeon *Anas penelope*, pintail *Anas acuta*, knot *Calidris canutus*, redshank *Tringa totanus*, bittern *Botaurus stellaris*, white-fronted goose *Anser albifrons albifrons*, dunlin *Calidris alpina alpina*, gadwall *Anas strepera*, teal *Anas crecca*, shoveler *Anas clypeata*, common scoter *Melanitta nigra*, velvet scoter *Melanitta fusca*, oystercatcher *Haematopus ostralegus*, ringed plover *Charadrius hiaticula*, grey plover *Pluvialis squatarola*, lapwing *Vanellus vanellus*, sanderling *Calidris alba*, cormorant *Phalacrocorax carbo*.

Conservation objectives:

Subject to natural change, to maintain in favourable condition the habitats of the internationally important populations of regularly occurring Annex 1 bird species, under the EU Birds Directive, with particular reference to:

- coastal waters
- intertidal mud and sand
- saltmarsh
- sand and shingle
- tidal reedbed

Subject to natural change, to maintain in favourable condition the habitats of the internationally important assemblage of over 20,000 waterfowl including the internationally important populations of regularly occurring migratory bird species, under the EU Birds Directive, with particular reference to:

- intertidal mud and sand
- saltmarsh
- sand and shingle

Site Name: Gibraltar Point SPA	
Location	Latitude 53° 06'00"N Longitude 00° 20'16"E
Area (ha)	414.09
Summary	Gibraltar Point is located on the Lincolnshire coast in eastern England. It lies north of The Wash and consists of an actively accreting sand-dune system, saltmarsh and extensive intertidal flats. All stages of dune development are represented with the older dunes extensively colonised by scrub. There are also small areas of freshwater marsh and open water. The site accommodates large numbers of overwintering birds and significant colonies of breeding terns. The terns feed outside the SPA in nearby waters. The site is also important for waders during the spring and autumn passage period.
Qualifying features for which the site is designated:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:	
During the breeding season: Little Tern <i>Sterna albifrons</i> , 220 pairs representing at least 9.2% of the breeding population in Great Britain (5 year mean, 1992-1996)	
Over winter: Bar-tailed godwit <i>Limosa lapponica</i> , 719 individuals representing at least 1.4% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:	
Over winter: Grey plover <i>Pluvialis squatarola</i> , 2,017 individuals representing at least 1.3% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)	
Knot <i>Calidris canutus</i> , 10,155 individuals representing at least 2.9% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)	
Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance.	
Over winter, the area regularly supports 22,137 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: oystercatcher <i>Haematopus ostralegus</i> , knot <i>Calidris canutus</i> , grey plover <i>Pluvialis squatarola</i> , bar-tailed godwit <i>Limosa lapponica</i> .	
Conservation objectives:	
To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. On this site favourable condition requires the maintenance of the population of each designated species or assemblage.	
Little tern	
<ul style="list-style-type: none"> Maintain population within acceptable limits, subject to natural change: a minimum of 16 nesting pairs. Maintain effects of predators on nesting birds at an acceptable level. 	
Bar-tailed godwit	
Subject to natural change, maintain population within acceptable limits (in this context population is that of an individual species):	
<ul style="list-style-type: none"> <input type="checkbox"/> Baseline (winter): 2,580 Baseline (autumn passage): 7,400 	
Dark bellied brent goose	
Maintain population within acceptable limits (in this context population is that of an individual species):	
<ul style="list-style-type: none"> Baseline (winter period): 3,100 birds 	
Grey plover	
Subject to natural change, maintain population within acceptable limits (in this context population is that of an individual species):	
<ul style="list-style-type: none"> Baseline (winter): 3,300 birds Baseline (Aug-May): 4,180 	
Knot	

Site Name: Gibraltar Point SPA

Subject to natural change, maintain population within acceptable limits (in this context population is that of an individual species):

- Baseline (winter): 26,500
- Baseline (autumn passage): 32,600

Oystercatcher

Maintain population within acceptable limits, subject to natural change:

- Baseline 6,560 birds

Ringed plover

Maintain population within acceptable limits, subject to natural change:

- Baseline 26 birds

Sanderling

Subject to natural change, maintain population within acceptable limits (in this context population is that of an individual species):

- Baseline (winter): 382 birds
- Baseline (passage Aug-May): 750

Aggregations of non-breeding birds

Maintain population within acceptable limits (in this context population is that of the total population of an assemblage) subject to natural change:

- 20,974 wintering waterfowl

Site Name: The Wash SPA	
Location	Grid Ref: TF537403 (central point) Latitude 52° 56'16"N Longitude 00° 17'12"E
Area (ha)	62211.66
Summary	The Wash is the largest estuarine system in the UK. It is fed by the rivers Witham, Welland, Nene and Great Ouse that drain much of the east Midlands of England. The Wash comprises very extensive saltmarshes, major intertidal banks of sand and mud, shallow waters and deep channels. The eastern end of the site includes low chalk cliffs at Hunstanton. In addition, on the eastern side, the gravel pits at Snettisham are an important high-tide roost for waders. The intertidal flats have a rich invertebrate fauna and colonising beds of glasswort which are important food sources for the large numbers of waterbirds dependent on the site. The sheltered nature of the Wash creates suitable breeding conditions for shellfish, principally mussel, cockle and shrimps. These are important food sources for some waterbirds such as oystercatchers. The Wash is of outstanding importance for a large number of geese, ducks and waders, both in spring and autumn migration periods, as well as through the winter. The SPA is especially notable for supporting a very large proportion (over half) of the total population of Canada/Greenland breeding knot. In summer, the Wash is an important breeding area for terns and as a feeding area for marsh harrier that breed just outside the SPA. To the north, the coastal habitats of the Wash are continuous with Gibraltar Point SPA, whilst to the east the Wash adjoins the North Norfolk Coast SPA.
Qualifying features for which the site is designated:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:	
During the breeding season:	
Common tern <i>Sterna hirundo</i> , 152 pairs representing at least 1.2% of the breeding population in Great Britain (Count as at 1993)	
Little tern <i>Sterna albifrons</i> , 33 pairs representing at least 1.4% of the breeding population in Great Britain (5 year mean 1992-1996)	
Marsh harrier <i>Circus aeruginosus</i> , 15 pairs representing at least 9.4% of the breeding population in Great Britain (Count as at 1995)	
Over winter:	
Avocet <i>Recurvirostra avosetta</i> , 110 individuals representing at least 8.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
Bar-tailed godwit <i>Limosa lapponica</i> , 11,250 individuals representing at least 21.2% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
Golden plover <i>Pluvialis apricaria</i> , 11,037 individuals representing at least 4.4% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
Whooper swan <i>Cygnus cygnus</i> , 68 individuals representing at least 1.2% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)	
This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:	
On passage:	
Ringed plover <i>Charadrius hiaticula</i> , 1,185 individuals representing at least 2.4% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)	
Sanderling <i>Calidris alba</i> , 1,854 individuals representing at least 1.9% of the Eastern Atlantic/Western & Southern Africa - wintering population (2 year mean Aug 1994 - 1995)	
Over winter:	
Black-tailed godwit <i>Limosa limosa islandica</i> , 859 individuals representing at least 1.2% of the wintering Iceland - breeding population (5 year peak mean 1991/2 - 1995/6)	

Site Name: The Wash SPA

Curlew *Numenius arquata*, 3,835 individuals representing at least 1.1% of the wintering Europe - breeding population (5 year peak mean 1991/2 - 1995/6)

Dark-bellied brent goose *Branta bernicla bernicla*, 22,248 individuals representing at least 7.4% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6)

Dunlin *Calidris alpina alpina*, 35,620 individuals representing at least 2.5% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6)

Grey plover *Pluvialis squatarola*, 9,708 individuals representing at least 6.5% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)

Knot *Calidris canutus*, 186,892 individuals representing at least 53.4% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Oystercatcher *Haematopus ostralegus*, 25,651 individuals representing at least 2.9% of the wintering Europe & Northern/Western Africa population (5 year peak mean 1991/2 - 1995/6)

Pink-footed goose *Anser brachyrhynchus*, 33,265 individuals representing at least 14.8% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean 1991/2 - 1995/6)

Pintail *Anas acuta*, 923 individuals representing at least 1.5% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Redshank *Tringa totanus*, 2,953 individuals representing at least 2.0% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)

Shelduck *Tadorna tadorna*, 15,981 individuals representing at least 5.3% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Turnstone *Arenaria interpres*, 717 individuals representing at least 1.0% of the wintering Western Palearctic - wintering population (5 year peak mean 1991/2 - 1995/6)

Under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl Assemblage qualification: A wetland of international importance.

Over winter, the area regularly supports 400,273 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: black-tailed godwit *Limosa limosa islandica*, avocet *Recurvirostra avosetta*, golden plover *Pluvialis apricaria*, bar-tailed godwit *Limosa lapponica*, pink-footed goose *Anser brachyrhynchus*, dark-bellied brent goose *Branta bernicla bernicla*, shelduck *Tadorna tadorna*, pintail *Anas acuta*, oystercatcher *Haematopus ostralegus*, grey plover *Pluvialis squatarola*, whooper swan *Cygnus cygnus*, dunlin *Calidris alpina alpina*, sanderling *Calidris alba*, curlew *Numenius arquata*, redshank *Tringa totanus*, turnstone *Arenaria interpres*, little grebe *Tachybaptus ruficollis*, cormorant *Phalacrocorax carbo*, white-fronted goose *Anser albifrons albifrons*, wigeon *Anas penelope*, mallard *Anas platyrhynchos*, ringed plover *Charadrius hiaticula*, lapwing *Vanellus vanellus*, knot *Calidris canutus*, whimbrel *Numenius phaeopus*.

Conservation objectives:

Common tern

- Based on the known natural fluctuations of the Snettisham population within the site, maintain the population above 59 pairs i.e. the minimum recorded at this site.
- Maintain extent (up to 0.25ha) & location of existing shingle islands within the saline lagoons in the Snettisham Nature Reserve (subject to natural change). Losses >5% of the shingle island habitat that are not caused by natural change are not acceptable

Little tern

- There is no site specific target for Little Tern for The Wash SPA as species does not regularly breed within the site and was erroneously included in The Wash SPA citation.

Mediterranean Gull

- Discretionary interest feature because species was not recorded in the SPA when designated or when the JNCC SPA review was undertaken. However, the current breeding population of this Annex 1 species in The Wash is of national importance and should be maintained.
- Maintain extent (up to 0.25ha) & location of existing shingle islands within the saline lagoons in the Snettisham Nature Reserve (subject to natural change). Losses >5% of the shingle island habitat that

Site Name: The Wash SPA

are not caused by natural change are not acceptable

Aggregations of non-breeding birds. Individual species exceeding internationally important population thresholds

- Site unfavourable if population declines of 50% or more from the baseline level are recorded. Baseline is usually 5 year mean of peak winter counts, Nov-Mar. For some species (indicated in Conservation Objective) passage counts used, July-Oct & Apr-June.
- No decrease in extent of habitats from established baselines as defined in the conservation objectives for these habitats, subject to natural change

Aggregations of non-breeding Annex 1 birds. Individual species exceeding nationally important thresholds

- Site unfavourable if population declines of 50% or more from the baseline level are recorded for non-breeding Annex 1 Species, cited in the SPA citation. Baseline is 5 year mean of peak winter counts, Nov-Mar
- No decrease in extent of habitats from established baselines as defined in the conservation objectives for these habitats, subject to natural change

Aggregations of non-breeding birds >20,000 waterfowl

- The site should be judged unfavourable if the baseline population of 203,829 waterfowl declines by 50% or more. Baseline is based upon five-year mean counts of the total number of waterfowl.
- No decrease in extent of habitats from established baselines as defined in the conservation objectives for these habitats, subject to natural change

Site Name: Outer Thames Estuary SPA	
Location	Latitude 51° 54'58"N Longitude 01° 32'04"E
Area (ha)	379,268.14
Summary	<p>The Thames Estuary is located in the southern part of the North Sea on the east coast of England. The SPA boundary is divided into three areas: the main part of the site is the outer part of the estuary; a separate area extending south along the coast of E Norfolk to Woodbridge (Suffolk) and lying mainly within the 12nm zone; and a third area lying slightly further north and partly within 12nm, but also with a larger area extending well beyond the 12 nm zone. The seaward boundary of the SPA lies partly within the 20m depth contour and marginally into the 20-50m depth contour.</p> <p>The Outer Thames Estuary SPA consists of areas of shallow and deeper water, high tidal current streams and a range of mobile sediments. Large areas of mud, silt and gravelly sediments form the deeper water channels, the main ones of which form the approach route to the ports of London and as such are continually disturbed by shipping and maintenance dredging. Sand in the form of sandbanks separated by troughs predominates in the remaining areas and the crests of some of the banks are exposed at mean low water. The seabed in along the coast of Norfolk and Suffolk coast is of a similar composition to that in the main estuary with large shallow areas of mud, sand, silt and gravelly sediments but, in the absence of main port areas within this area, there is consequently less disturbance through shipping or dredging.</p> <p>The seabed and waters of the site provide an important habitat over winter for red-throated divers, which visit the area to feed on fish.</p>
Qualifying features for which the site is designated:	
Under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:	
Over winter: Red-throated diver <i>Gavia stellata</i> , 6,486 individuals representing 38% of the wintering population in Great Britain (annual mean peak count 1989-2006/07)	
Draft conservation objectives:	
For the Annex I species: 'Red-throated diver (<i>Gavia stellata</i>):' subject to natural change, maintain in favourable condition* the internationally important populations of:	
<ul style="list-style-type: none"> red-throated diver (<i>Gavia stellata</i>) and its supporting habitats and prey species (relevant habitats include shallow coastal waters and areas in the vicinity of sub-tidal sandbanks) 	
* For definitions of these terms, see the material presented in support of site selection by Natural England/JNCC: http://www.naturalengland.org.uk/Images/Thames-consobj_tcm6-21678.pdf	
Note: These are high-level draft conservation objectives, which may be refined by Natural England/JNCC in light of increased understanding of the features. The draft objectives must be viewed in light of the material presented in support of site selection and relevant definitions of favourable conservation status (see link above).	

C2 Coastal and marine Special Areas of Conservation

Site Name: Humber Estuary SAC	
Location	Latitude 53° 35'21"N Longitude 00° 44'05"W
Area (ha)	36657.15
Summary	The Humber is the second-largest coastal plain estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. It is a muddy, macro-tidal estuary, fed by the Rivers Ouse, Trent and Hull, Ancholme and Graveney. Suspended sediment concentrations are high, and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast. This is the northernmost of the English east coast estuaries whose structure and function is intimately linked with soft eroding shorelines. As salinity declines upstream, reedbeds and brackish saltmarsh communities fringe the estuary. This section of the estuary is also noteworthy for extensive mud and sand bars, which in places form semi-permanent islands. Significant fish species present include the migratory river lamprey and sea lamprey, which breed in the River Derwent, a tributary of the River Ouse. Donna Nook, on the south shore at the mouth of the estuary, is used by grey seals as a breeding colony and haul-out site.
Qualifying features for which the site is designated:	
<p>Annex I Habitat Primary features: Estuaries, mudflats and sandflats not covered by seawater at low tide Secondary features: Sandbanks which are slightly covered by seawater all the time, coastal lagoons, <i>Salicornia</i> and other annuals colonising mud and sand, Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>), embryonic shifting dunes, shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes'), fixed dunes with herbaceous vegetation ('grey dunes'), dunes with <i>Hippophae rhamnoides</i></p>	
<p>Annex II Species Primary features: None Secondary features: Sea lamprey <i>Petromyzon marinus</i>, river lamprey <i>Lampetra fluviatilis</i>, grey seal <i>Halichoerus grypus</i></p>	
Conservation objectives:	
<p>For Annex I Habitats</p> <p>Generally, to avoid deterioration of the qualifying habitats (listed above), thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying habitats that the following are maintained in the long term:</p> <ul style="list-style-type: none"> • Extent of the habitats on site • Distribution of the habitats within site • Structure and function of the habitats • Processes supporting the habitats • Distribution of typical species of the habitats • Viability of typical species as components of the habitats • No significant disturbance of typical species of the habitats <p>Specific objectives defined in Regulation 33 advice include:</p>	
<p>Estuaries Subject to natural change, maintain the estuary in favourable condition⁸, in particular the:</p> <ul style="list-style-type: none"> • Saltmarsh communities • Intertidal mudflat & sandflat communities • Subtidal sediment communities 	
<p>Coastal lagoons Subject to natural change, maintain the coastal lagoons in favourable condition.</p>	
<p>Atlantic salt meadows Subject to natural change, maintain the Atlantic salt meadows in favourable condition, in particular the:</p> <ul style="list-style-type: none"> • Low to mid marsh communities • Mid to upper marsh communities • Transitional communities 	

Site Name: Humber Estuary SAC***Salicornia* and other annuals colonising mud and sand**

Subject to natural change, maintain* ***Salicornia* and other annuals colonising mud and sand** in favourable condition, in particular the:

- Annual *Salicornia* (samphire) saltmarsh community
- *Suaeda maritima* (sea-blite) saltmarsh community

Mudflats and sandflats not covered by seawater at low tide

Subject to natural change, maintain* the **mudflats and sandflats not covered by seawater at low tide** in favourable condition, in particular the:

- Intertidal gravel and sand communities
- Intertidal muddy sand communities
- Intertidal mud communities
- Eelgrass bed communities

Sandbanks which are slightly covered by water all the time

Subject to natural change, maintain* the **sandbanks which are slightly covered by seawater all of the time** in favourable condition, in particular the:

- Subtidal gravel and sands
- Subtidal muddy sands

For Annex II Species

Generally, to avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest. To ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within the site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Specific objectives defined in Regulation 33 advice include:

***Lampetra fluviatilis* (river lamprey)**

Subject to natural change, maintain the habitats of ***Lampetra fluviatilis* (river lamprey)** in favourable condition.

***Petromyzon marinus* (sea lamprey)**

Subject to natural change, maintain the habitats of ***Petromyzon marinus* (sea lamprey)** in favourable condition.

Site Name: River Derwent SAC	
Location	Grid Ref: SE704474 (central point) Latitude 53° 55'03"N Longitude 00° 55'40"W
Area (ha)	411.23
Summary	The Derwent is one example of river lamprey populations which inhabit the many rivers flowing into the Humber estuary in eastern England. Only the lower reaches of the Derwent are designated, reflecting the spawning distribution of the species in the Derwent system. Larvae spend several years in silt beds before metamorphosing and migrating downstream into estuaries to feed on fish for 1-2 years before returning to freshwater to spawn.
Qualifying features for which the site is designated:	
Annex 1 Habitat Primary features: None Secondary features: Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	
Annex 2 Species Primary features: River lamprey <i>Lampetra fluviatilis</i> Secondary features: Sea lamprey <i>Petromyzon marinus</i> , bullhead <i>Cottus gobio</i> , otter <i>Lutra lutra</i>	
Conservation objectives:	
To maintain, in favourable condition, the: <ul style="list-style-type: none"> water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation to maintain, in favourable condition, the habitats for the population of: <ul style="list-style-type: none"> river lamprey (<i>Lampetra fluviatilis</i>) sea lamprey (<i>Petromyzon marinus</i>) bullhead (<i>Cottus gobio</i>) otter (<i>Lutra lutra</i>) 	
Site Name: The Wash and North Norfolk Coast SAC	
Location	Grid Ref: TF558403 (central point) Latitude 52° 56'13"N Longitude 00° 19'05"E
Area (ha)	107761.28
Summary	The Wash is the largest embayment in the UK with extensive areas of subtidal mixed sediment. In the tide-swept approaches to the Wash, the relatively common tube-dwelling polychaete worm <i>Sabellaria spinulosa</i> forms areas of biogenic reef. The site includes one of the largest expanses of sublittoral sandbanks and the second-largest area of intertidal flats in the UK. These habitats support important invertebrate communities; benthic communities on sandflats in the deeper, central part of the Wash are particularly diverse. The embayment supports a variety of mobile species, including a range of fish and harbour seal, with the subtidal sandbanks also providing important nursery grounds for young commercial fish species. Extensive saltmarsh habitats are also present, fringed by important areas of Mediterranean and thermo-Atlantic vegetation.
Qualifying features for which the site is designated:	
Annex 1 Habitat Primary features: Sandbanks which are slightly covered by sea water all the time, mudflats and sandflats not covered by seawater at low tide, large shallow inlets and bays, reefs, <i>Salicornia</i> and other annuals colonising mud and sand, Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>), Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) Secondary features: Coastal lagoons	
Annex 2 Species Primary features: Harbour seal <i>Phoca vitulina</i> Secondary features: Otter <i>Lutra lutra</i>	
Conservation objectives:	
For Annex I Habitats Sandbanks which are slightly covered by sea water all the time	

Site Name: River Derwent SAC

- No change in extent of inshore subtidal sediment, subject to natural change. No alteration in topography of inshore subtidal sediment, subject to natural change. Topography as shown on admiralty charts and Foster-Smith & Sotheran (1999).
- Maintain distribution of biotopes, subject to natural change (as identified in Foster-Smith & Sotheran, 1999; Bailey, Coad & Bamber, 2005)
- No change in extent of inshore subtidal sediment biotopes or sub-feature, subject to natural change
- No increase in abundance of negative indicator species: American jack-knife clam *Ensis directus*, Pacific oyster *Crassostrea gigas* and slipper limpet *Crepidula fornicata*

Mudflats and sandflats not covered by seawater at low tide

- No decrease in extent of intertidal sediment, subject to natural change.
- Maintain the variety of biotopes identified for The Wash in Yates et al (2002) and North Norfolk in Perrins & Bunker 1998) and West (2002), allowing for natural successional change.
- Maintain distribution of mud, muddy sand, and sand across the feature, subject to natural change. For The Wash identified in Yates et al, 2002; ESFJC qualitative assessments, Yates et al 1993. For North Norfolk identified in Perrins & Bunker 1998.
- Maintain distribution of biotopes, subject to natural change. Identified for The Wash in Yates et al, 2002, and North Norfolk in Perrins & Bunker, 1998 and West, 2002.
- No change in extent of *Zostera* biotope as shown in West 2002, subject to natural change: East Hills / Lodge Marsh, 25ha; Scolthead, 0.03ha, 0.75ha, 0.05ha; Stiffkey, 0.48ha.
- No decline in biotope quality due to change in species composition or loss of notable species, subject to natural change
- Maintain age/size class distribution of mussel and cockle. Maintain abundance of positive indicator species. No increase in presence or abundance of negative indicator species: invasive non-natives Pacific oyster, American slipper limpet, American jack-knife clam
- No change in topography of intertidal flats, subject to natural change. Topography as shown in EA beach profiles 1992-2006

Large shallow inlets and bays

- No change in extent of whole feature: 63,135ha (Wash SSSI citation)
- Maintain variety of habitats identified for the site, subject to natural change
- Maintain the pattern of distribution of predominant habitats throughout the feature (as identified in Foster-Smith & Sotheran, 1999; Bailey, Coad & Bamber, 2005)
- Target based on appropriate national or international standards (i.e. Water framework Directive, Urban Waste Water Treatment Directive, OSPAR convention)

Reefs

- No change in extent of *Sabellaria spinulosa* reef, subject to natural change. 1846.5ha (Jessop & Stoutt, 2006). Note this comprises several discrete areas of reef, not one continuous feature.
- Maintain the distribution of reef (as identified in Jessop & Stoutt, 2006), subject to natural change.
- Maintain the variety of reef biotopes identified for the site, subject to natural change
- No alteration in topography of inshore subtidal sediment, subject to natural change. Topography as shown on admiralty charts and Foster-Smith & Sotheran (1999).
- No change in composition of sediment types across feature, subject to natural change (as identified in Foster-Smith & Sotheran, 1999; Bailey et al, 2005)

***Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritima*), Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)**

- No decrease in extent of saltmarsh, subject to natural change. The Wash: 1982-85: 4,158ha (Hill, 1988) and 2001-2002: 4,886ha (Hemphill et al 2003). North Norfolk: 2127ha (Burd, 1989) and 2157.41ha (Stark et al, 2003).
- No alteration of natural creek patterns or loss of pans (as determined at the time of notification) as a result of anthropogenic factors
- Maintain the baseline range of saltmarsh zonation, NVC communities and Annex 1 habitats within the levels recorded in the 1982- 85 and 2001-2002 surveys in The Wash, and the 2001-2002 surveys of North Norfolk.
- Maintain the saltmarsh area as a mosaic of short turf swards (5 – 15 cm) interspersed with areas of tussocks (>15cm).
- Maintain frequency of characteristic species of saltmarsh zones
- Existing cordgrass (*Spartina anglica*) stands to show no evidence of expansion into pioneer saltmarsh zone.
- Other negative indicators include: artificial drainage channels limited to those established by IDBs at

Site Name: River Derwent SAC

their drainage outfalls prior to notification of SSSI. No unauthorised loss saltmarsh through erection of artificial structures.

- Maintain Annex 1 habitats (Pioneer saltmarsh, Atlantic saltmeadows, mediteranean saltmarsh scub at levels recorded in 2001-2002 for The Wash, North Norfolk). Maintain populations of nationally scarce plants. Maintain populations of nationally scarce invertebrates

Lagoons

- No reduction in saline lagoon extent: 17.38ha
- No change in structure of shingle bank
- Maintain salinity within 10-50ppt range
- Maintain variety of biotopes identified for the site, subject to natural change
- Lagoonal specialists are sublittoral specialists. At least 60% of the water of the lagoon persisting at all times
- Maintain distribution of EN.Lag.IMS.Ann biotope, subject to natural change
- Maintain presence or abundance of specified species including worms such as *Polydora cornuta* , lagoon snails: *Ventrosa ventrosa* , *Hydrobia neglecta* , *Littorina saxatilis lagunae* , crustaceans: such as lagoon sand shrimp *Gammarus insensibilis*

For Annex II Species**Harbour seal *Phoca vitulina***

- A stable or increasing area of usage (moult distribution as identified in Thompson, 2005; breeding distribution in Thompson, 2007).
- A stable or increasing number of harbour seals present throughout the site (SMRU annual moult and breeding surveys, Thompson 2005, 2007). Peak of 3,000 seals in Wash in 1988 prior to distemper virus outbreak, and in 2000 prior to 2002 outbreak. Pup production increased from 550 seals in 2001 to 1013 in 2006. Significant population at Blakeney. Peak count of 700 seals in 1988 and 2000 and since 2004.

Otter *Lutra lutra*

- Fish biomass stays within expected natural fluctuations.
- No reduction in overall availability of freshwater: number of streams or small pools on or near the site
- No increase in pollutants potentially toxic to otters.
- No decline in otter distribution or abundance.
- Otter populations not significantly impacted by human induced kills.

Site Name: Dogger Bank cSAC	
Location	Latitude 54° 51'27"N Longitude 02° 13'08"E
Area (ha)	1,233,884
Summary	The Dogger Bank in the Southern North Sea is the largest sandbank in UK waters and the possible SAC adjoins Dutch and German Dogger Bank sites. The bank supports communities typical of sandy sediments, characterised by polychaete worms, amphipods and small clams within the sediments and hermit crabs, flatfish and starfish on the seabed. Sandeels are abundant on the flanks of the bank and provide a food resource for seabirds, cetaceans and other commercial fish species, such as cod. Harbour porpoise, harbour seals and grey seals are also present at the site and have been included as non-qualifying features.
Qualifying features for which the site is designated:	
<p>Annex 1 Habitat Primary features: Sandbanks which are slightly covered by sea water all the time</p> <p>Annex II Species None</p>	
Draft conservation objectives:	
<p>For the Annex I Habitat: 'Sandbanks which are slightly covered by sea water all the time': subject to natural change, restore* the feature to favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is maintained • The natural environmental processes* are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of sandbanks which are slightly covered by sea water all the time in the southern North Sea are restored <p>* For definitions of these terms, see the material presented in support of site selection by Natural England/JNCC: http://www.jncc.gov.uk/pdf/DoggerBank_DraftCOsAndAdviceOnOperations_5.0.pdf</p> <p>Notes:</p> <ul style="list-style-type: none"> • In the case of the Dogger Bank site, there is some evidence to date that, due to damage caused by bottom trawling and possibly infrastructure development, the Annex I feature may not be in favourable condition and might require restoration where possible. As outlined, further information will be required to assess and monitor favourable condition of the interest feature at this offshore SAC. • These are high-level draft conservation objectives, which may be refined by Natural England/JNCC in light of increased understanding of the features. The draft objectives must be viewed in light of the material presented in support of site selection and relevant definitions of favourable conservation status (see link above). 	

Site Name: Haisborough, Hammond and Winterton cSAC	
Location	Latitude 52° 50'27"N Longitude 01° 57'58"E
Area (ha)	146,749
Summary	The Haisborough, Hammond and Winterton site contains a collection of sandbanks off the north-east coast of Norfolk. On the tops of the banks polychaete worms and amphipods are present in small numbers due to the high level of sediment movement. In the troughs between the banks where the sediments are more stable, bryozoans, hydroids and sea anemones have settled. Bivalves and crustaceans are found throughout the site. The site has also been recommended for the presence of biogenic <i>Sabellaria spinulosa</i> reef. The tiny sand-tubes that make up the reef support a diverse array of hydroids, sponges and tunicates. Harbour porpoise and grey seals are also present at the site and have been included as non-qualifying features
Qualifying features for which the site is designated:	
Annex I Habitat Sandbanks which are slightly covered by sea water all the time; reefs (biogenic <i>Sabellaria spinulosa</i>)	
Annex II Species None	
Draft conservation objectives:	
<p>For the Annex I Habitat: 'Sandbanks which are slightly covered by seawater all the time': subject to natural change, maintain* the feature in favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is maintained • The natural environmental processes* are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of low diversity dynamic sand communities are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of moderate diversity stable sand communities are maintained. <p>For the Annex I Habitat: 'Sabellaria spinulosa reefs': subject to natural change, maintain* or restore* <i>Sabellaria spinulosa</i> reefs in/to favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is maintained • The natural environmental processes* are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of <i>Sabellaria spinulosa</i> biogenic reef in the southern North Sea are maintained, or restored where deterioration has occurred. <p>(Note: the reef feature is dependent on the maintenance of the same underpinning environmental quality and environmental processes that will enable the sandbank feature to be in favourable condition.)</p> <p>* For definitions of these terms, see the material presented in support of site selection by Natural England/JNCC: http://www.jncc.gov.uk/pdf/HHW_DraftCOsandAdviceOnOperations_4_0.pdf</p> <p>Note: These are high-level draft conservation objectives, which may be refined by Natural England/JNCC in light of increased understanding of the features. The draft objectives must be viewed in light of the material presented in support of site selection and relevant definitions of favourable conservation status (see link above).</p>	

Site Name: Inner Dowsing, Race Bank and North Ridge cSAC	
Location	Latitude 53° 15'26"N Longitude 00° 43'14"E
Area (ha)	84,514
Summary	The site is located off the south Lincolnshire coast and has been recommended for the sandbank habitat and <i>Sabellaria spinulosa</i> reef communities present. A wide range of sandbank types are enclosed by the boundary including banks bordering channels, relict linear banks and sinusoidal banks. The area contains species such as polychaete and nemertean worms and the ascidian <i>Molgula</i> sp. The main areas of <i>S. spinulosa</i> reef are found in the southwest of the site, particularly at Lynn Knock and in the Docking Shoal area. These areas support a diverse community of bryozoans, hydroids, sponges and tunicates. Harbour porpoise and grey seal are also present at the site and have been included as non-qualifying features.
Qualifying features for which the site is designated:	
Annex I Habitat Sandbanks which are slightly covered by sea water all the time; reefs (biogenic <i>Sabellaria spinulosa</i>)	
Annex II Species None	
Draft conservation objectives:	
<p>For the Annex I Habitat: 'Sandbanks which are slightly covered by seawater all the time': subject to natural change, maintain* or restore* the feature in favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is maintained • The natural environmental processes* are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of low diversity dynamic sand communities are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of moderate diversity stable sand communities are maintained, or restored where deterioration has occurred. <p>For the Annex I Habitat: 'Sabellaria spinulosa reefs': subject to natural change, maintain* or restore* <i>Sabellaria spinulosa</i> reefs in/to favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is maintained • The natural environmental processes* are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of <i>Sabellaria spinulosa</i> biogenic reef in the southern North Sea are maintained, or restored where deterioration has occurred. <p>(Note: the reef feature is dependent on the maintenance of the same underpinning environmental quality and environmental processes that will enable the sandbank feature to be in favourable condition.)</p> <p>* For definitions of these terms, see the material presented in support of site selection by Natural England/JNCC: http://www.jncc.gov.uk/pdf/InnerDowsingandRaceBank_ConsObsAooFinal_2_0_030909.pdf Note: These are high-level draft conservation objectives, which may be refined by Natural England/JNCC in light of increased understanding of the features. The draft objectives must be viewed in light of the material presented in support of site selection and relevant definitions of favourable conservation status (see link above).</p>	

Site Name: North Norfolk Sandbanks and Saturn Reef cSAC	
Location	Latitude 53° 22'29"N Longitude 02° 07'15"E
Area (ha)	360,341
Summary	The North Norfolk Sandbanks consist of 10 main sandbanks and a number of smaller banks, which collectively form the most extensive example of offshore linear ridge sandbanks in UK waters. The banks are home to invertebrate communities typical of sandy sediments, such as polychaete worms, crabs and brittlestars. The Saturn reef is a <i>Sabellaria spinulosa</i> biogenic reef structure located within the area occupied by the sandbank site.
Qualifying features for which the site is designated:	
Annex I Habitat Sandbanks which are slightly covered by sea water all the time; reefs (biogenic <i>Sabellaria spinulosa</i>)	
Annex II Species None	
Draft conservation objectives:	
<p>For the Annex I Habitat: 'Sandbanks which are slightly covered by seawater all the time': subject to natural change, restore* the feature in favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is restored • The natural environmental processes* are restored • The extent*, physical structure*, diversity*, community structure* and typical species* representative of infralittoral mobile clean sands on tidal ridge sandbanks in the southern North Sea are restored where deterioration has occurred. <p>For the Annex I Habitat: 'Sabellaria spinulosa reefs': subject to natural change, restore* <i>Sabellaria spinulosa</i> reefs to favourable condition, such that:</p> <ul style="list-style-type: none"> • The natural environmental quality* is maintained • The natural environmental processes* are maintained • The extent*, physical structure*, diversity*, community structure* and typical species* representative of <i>Sabellaria spinulosa</i> biogenic reef in the southern North Sea are restored where deterioration has occurred. <p>(Note: the reef feature is dependent on the maintenance of the same underpinning environmental quality and environmental processes that will enable the sandbank feature to be in favourable condition.)</p> <p>* For definitions of these terms, see the material presented in support of site selection by Natural England/JNCC: http://www.jncc.gov.uk/pdf/NNSandbanksandSaturnReef_ConservationObjectives_AdviceonOperations_4.0.pdf Note: These are high-level draft conservation objectives, which may be refined by Natural England/JNCC in light of increased understanding of the features. The draft objectives must be viewed in light of the material presented in support of site selection and relevant definitions of favourable conservation status (see link above).</p>	

Site Name: Beast Cliff to Whitby (Robin Hood's Bay) SAC	
Location	Latitude 54° 24'50"N Longitude 00° 31'02"W
Area (ha)	260.2
Summary	Beast Cliff on the east coast consists of a complex of hard and soft cliffs. The combination of geology, topography and plant communities found at this site are unique and it is one of the best examples of vegetated sea cliffs on the north-east coast of England. The underlying geology varies from base-rich to base-poor, and this variation is reflected in a characteristic and diverse flora across the site. Vertical hard cliffs support maritime crevice and ledge vegetation, and the more gently sloping parts of Beast Cliff are covered by scrub and woodland.
Qualifying features for which the site is designated:	
Annex I Habitat Vegetated sea cliffs of the Atlantic and Baltic coasts	
Annex II Species None	
Conservation objectives:	
For Annex I Habitats Subject to natural change, to maintain the habitats and geological features in favourable condition, with particular reference to any dependent component special interest features (habitats, vegetation types, species, species assemblages etc.) for which the land is designated (SSSI, SAC, SPA, Ramsar), i.e. vegetated sea cliffs of the Atlantic and Baltic coasts.	

Site Name: Flamborough Head SAC	
Location	Latitude 54° 06'41"N Longitude 00° 04'37"W
Area (ha)	6311.96
Summary	Flamborough Head represents the most northerly outcrop of coastal chalk in the UK and the most southerly area of bedrock on the North Sea. The site is characterised by high chalk cliffs (up to 135m high and covering a distance of about 16km) which are partly vegetated, over 200 caves and a chalk reef which extends up to 6km offshore.
Qualifying features for which the site is designated:	
Annex I Habitat Reefs; vegetated sea cliffs of the Atlantic and Baltic coasts; submerged or partially submerged sea caves	
Annex II Species None	
Conservation objectives:	
For Annex I Habitats Subject to natural change, maintain the reefs in favourable condition, in particular: <ul style="list-style-type: none"> • Rocky shore communities • Kelp forest communities • Subtidal faunal turf communities Subject to natural change, maintain the submerged or partially submerged sea caves in favourable condition, in particular: <ul style="list-style-type: none"> • Microalgal and lichen communities • Faunal cushion and crust communities Note that presently available Regulation 33 advice does not list objectives for the feature, <i>vegetated sea cliffs of the Atlantic and Baltic coasts</i> , for the Flamborough Head SAC. For the purposes of assessment, it has been assumed that the overarching objective is to maintain favourable conservation status (see Table 4.1) through; the maintenance of the extent, distribution, structure and functioning of the habitat, the viability of associated species and their distribution, and that no significant disturbance of these species should take place.	

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