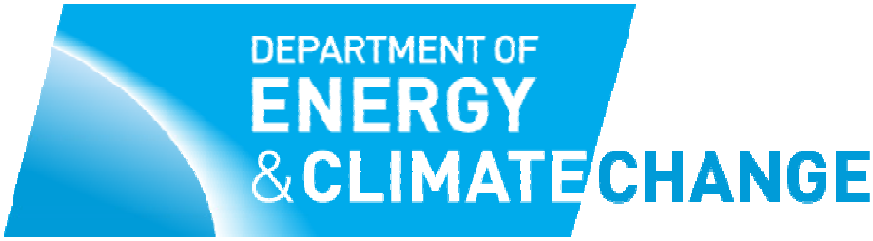


Offshore Oil & Gas Licensing

25th Seaward Round

Eastern Irish Sea
Blocks 112/13, 112/14 and 113/28b

Phase 2 Screening/
Appropriate Assessment

February 2010

CONTENTS

1 INTRODUCTION

1.1 Background and purpose

On 20th February 2008, the Secretary of State for Energy and Climate Change (through the Department of Energy and Climate Change, DECC) (then as the Secretary of State for Enterprise and Regulatory Reform, BERR) invited applications for licences in the 25th Seaward Licensing Round.

To comply with obligations under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) (OPAR, 2001), in summer 2008, 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 2008).

In so doing, the test set out by the European Court of Justice in the ***Waddenzee*** case (Case C-127/02) was applied, 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 46 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 second phase of screening and, where necessary, the Appropriate Assessments (AA) in respect of each potential licence award, are documented in four regional reports as follows:

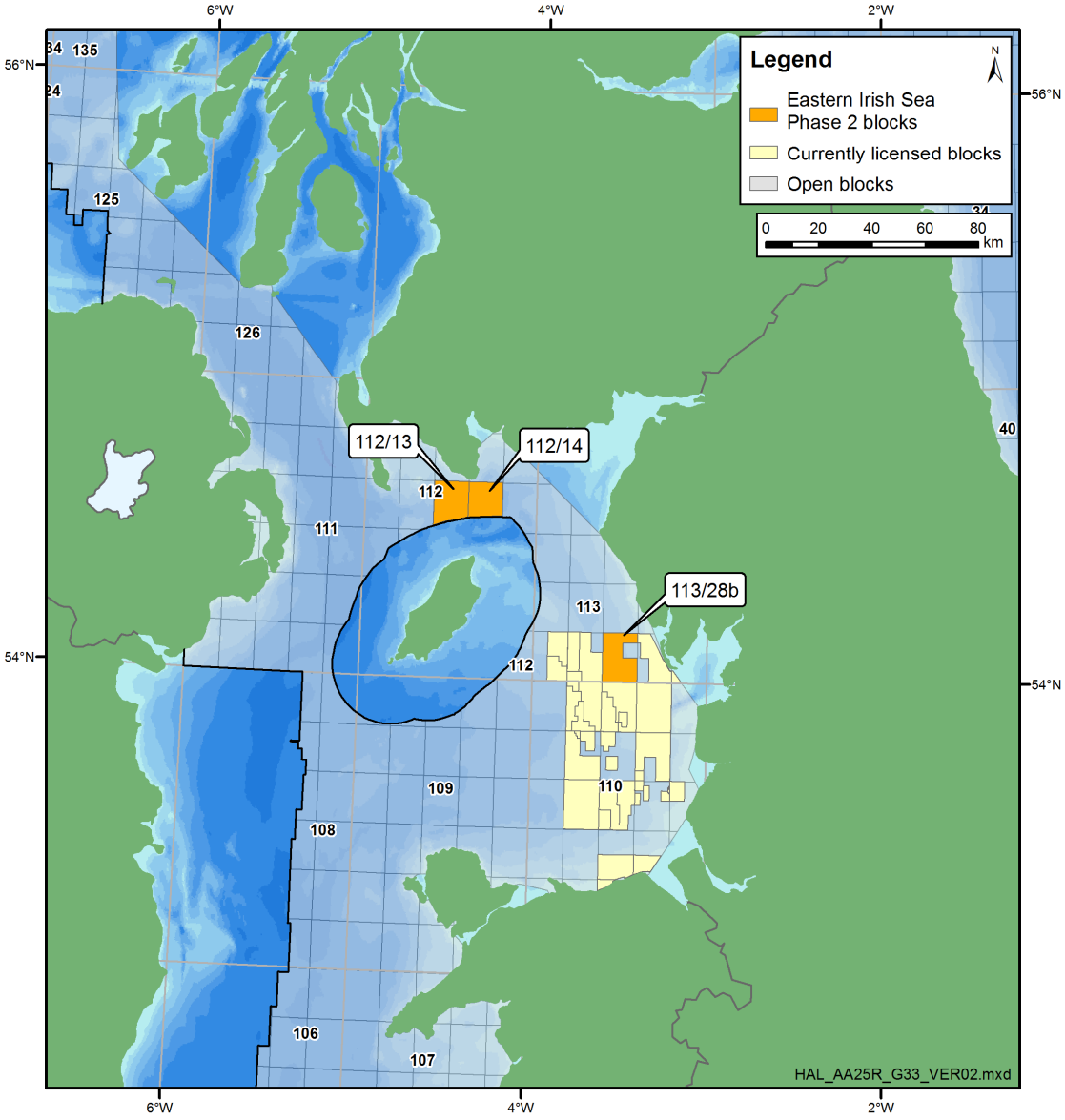
- Southern North Sea
- Eastern Irish Sea
- Outer Moray Firth
- West of Orkney and the Wyville Thomson Ridge/Darwin Mounds area.

This report documents the further assessment in relation to three Blocks in the eastern Irish Sea (see Section 1.2).

1.2 Eastern Irish Sea Blocks

The eastern Irish Sea Blocks applied for in the 25th Round and considered in this document are 112/13, 112/14 and 113/28b which are shown in dark orange in Figure 1.1 overleaf.

Figure 1.1 – Location of eastern Irish Sea Blocks



2 LICENSING AND ACTIVITY

2.1 Licensing

The exclusive rights to search for, 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* gives the Secretary of State the power to grant licences to explore for and exploit such petroleum. A Seaward Production Licence grants exclusive rights to the holders "to search and bore for, and get, petroleum" in the area covered by the licence, which may be the whole or part of a specified Block or a group of Blocks.

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 four Terms rather than three. A Frontier Production Licence has a longer exploration phase (six years as opposed to four) with the objective of allowing companies to screen larger areas, during a three year Initial Term so they can look for a wider range of prospects. At the end of the Initial Term, the Licensee must relinquish 75% of the licensed acreage. The Second Term lasts three years at the end of which (i.e. when the licence is six years old), 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 this sense, the end of a Frontier Licence's Second Term corresponds to the end of a Traditional Licence's Initial Term.

- In the 21st Offshore Oil and Gas Licensing Round (2002) the then Department of Trade and Industry 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 terms and conditions of the licences to be granted in this Licensing Round are contained in the *Petroleum Licensing (Production) (Seaward Areas) Regulations 2008* (SI 2008/225).

It is noted that the environmental management capacity and track record of applicants is explicitly examined by DECC, by way of 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 Blocks(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 conditional 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 only result in an actual 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 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 licence types and estimates of work commitments for the Blocks derived by DECC from the range of applications received are as follows:

- 112/13 & 112/14 - obtain 2D & 3D seismic, D/D well (Promote)
- 113/28b (part) - D/D well (Traditional)

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.

3 RELEVANT NATURA 2000 SITES

Relevant Natura 2000 sites (also referred to as 'European Sites') considered in this screening/assessment include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), whose location in relation to the three Blocks (see Section 1.2 above) which have been applied for, indicate the possibility of interactions.

Guidance on selection of the relevant Natura 2000 sites is given by Planning Policy Statement 9 (ODPM 2005a) which states that: "*The Habitats Regulations do not provide statutory protection for potential Special Protection Areas (pSPAs) or to candidate Special Areas of Conservation (cSACs) before they have been agreed with the European Commission. For the purposes of considering development proposals affecting them, as a matter of policy, the Government wishes pSPAs and cSACs included in a list sent to the European Commission, to be considered in the same way as if they had already been classified or designated*."

In accordance with Government policy (as set out in PPS9 and above), the relevant sites considered in this screening/assessment include classified and potential SPAs, designated and candidate SACs and Sites of Community Importance[1] (SCIs). The relevant sites are detailed in Appendix A and include:

- Coastal and marine Natura 2000 sites along the west coast of the UK from the Firth of Lorn, southwest Scotland, to Bardsey Island, west Wales[2]
- Riverine SACs within the area for migratory fish and/or the freshwater pearl mussel.

No SACs have been identified in offshore waters of the Irish Sea to date.

Guidance in relation to sites which have not yet been submitted to the European Commission is given by Circular 06/2005 (ODPM 2005b) 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.*" See Sections 4 and 10 for such sites.

Summaries of the sites, together with their features of interest, are given in Appendix A (Tables A.1 to A.3) together with location maps (Maps A.1 and A.2).

[1] 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.
[2] Also including Cardigan Bay SAC due to the wide range of the qualifying feature: bottlenose dolphin.

4 PHASE 2 SCREENING

The Phase 2 screening assessed the potential implications for Natura 2000 sites of the award of licences for the three UKCS Blocks listed in Section 1.2 in the 25th Licensing Round. The award of such licences may or may not give rise to subsequent development activity, the implications of which have been considered in this screening as far as possible. Where relevant, such future activities will themselves be subject to the screening procedure and tests under the Habitats Directive.

An initial screening assessment identified these Blocks as requiring further screening and potentially AA prior to licences being granted (DECC 2008). This is due to the potential for a significant effect on listed habitats or species from a consideration of the geographic location of the Blocks in relation to the sites, and the general characteristics of habitat and species present.

For all three eastern Irish Sea Phase 2 Blocks, no new information has become available which would alter the conclusions of the November 2008 screening. Therefore, it is considered that all three Blocks require AA.

The Liverpool Bay pSPA and Shell Flat and Lune Deep dSAC have yet undergo formal public consultation within the UK for possible classification/designation and so neither has been submitted to the European Commission. Although AA is therefore not required for these sites, Paragraph 6 of Circular 06/2005 states that planning authorities should take note of such potential designation in their consideration of any planning applications that may affect such sites. The Secretary of State has taken note of these sites in relation to the potential licensing of the Blocks above and a consideration of these is included.

5 ASSESSMENT OF THE EFFECTS OF THE PROJECT OR PLAN ON SITE INTEGRITY

5.1 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:

- 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.

- Produced a draft AA Report for consultation with its statutory advisors.

- Will consider whether, in the light of comments received, it is possible to go ahead with the plan.

In considering the above, DECC used the tests set out by the ECJ in the *Waddenzee* case, 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. That is the case where no reasonable scientific doubt remains as to the absence of such effects.

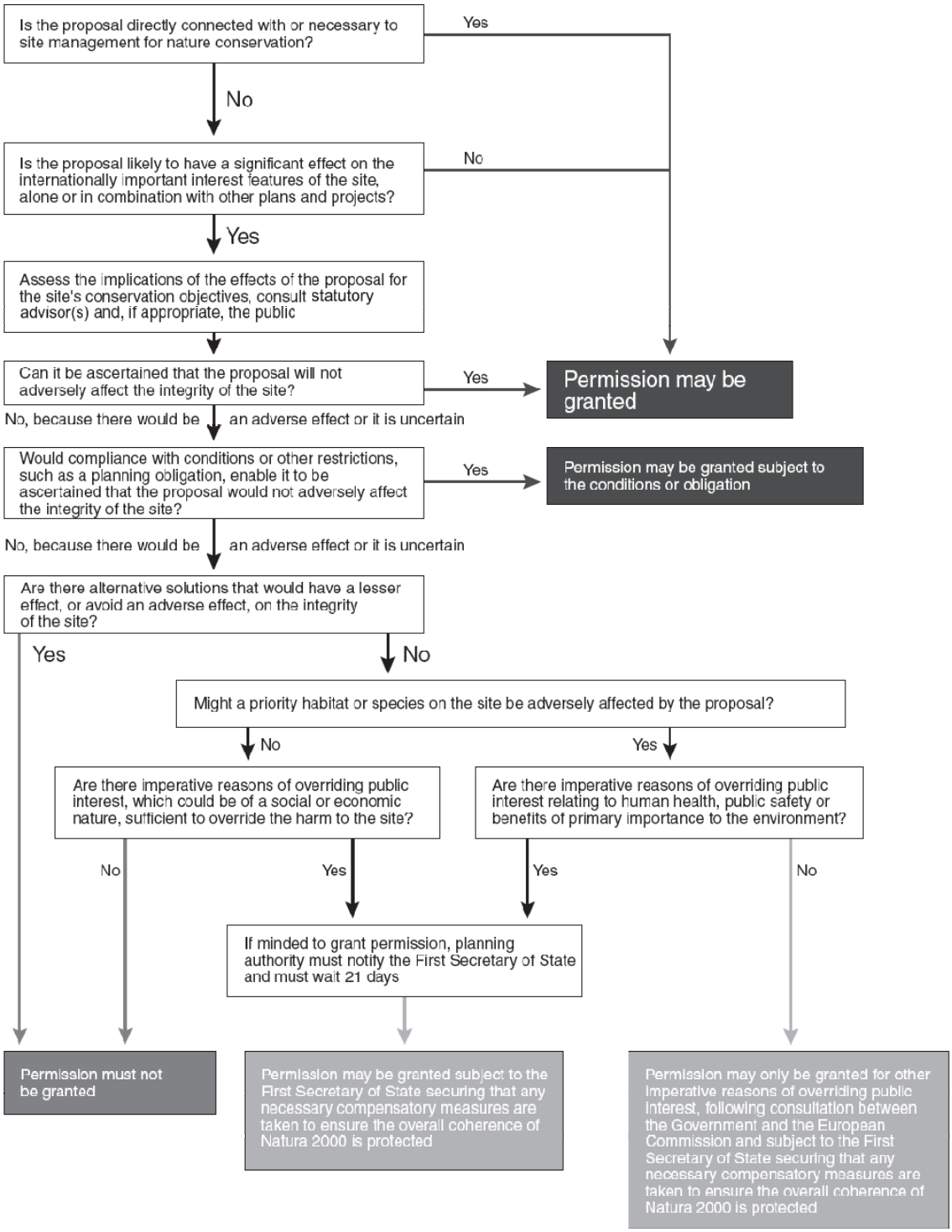
A flowchart summarising the process is shown in Figure 5.1.

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 full within Appendix C.

Figure 5.1 - 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).

5.2 Assessment

The approach to ascertaining the absence or otherwise of adverse effects on the integrity of a European Site is set out in Section 5.1 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) and English Nature Research Reports, No 704 (Hoskin & Tyldesley 2006).

Appendix A lists, maps and summarises the relevant European Sites as defined in Section 3. Appendix B then presents the results of a screening exercise of these sites to identify the potential effects of activities that could follow the licensing of Blocks 112/13, 112/14 and 113/28b during the 25th Round. 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 three eastern Irish 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. The Regulation 33 Advice 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 EIA and permitting processes they are mitigated by timing, siting or technology requirements (or a combination of one or more of these). There is an expectation that these options would be evaluated in the environmental assessments required as part of activity consenting.

6 CONSIDERATION OF POTENTIAL EFFECTS FROM OIL SPILLS ON RELEVANT SITES

6.1 Overview of spill effects and context

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 25th Round, including the recent Offshore Energy SEA. Previous SEAs have concluded that in relation to 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).

For activities in proximity to sensitive shorelines, the Department's guidance (DTI 2002) 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. These resources should be capable of mobilising to prioritised locations within the estimated beaching time established through oil spill modelling under worst case conditions (normally a 30 knot onshore wind).

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 by activities resulting from the proposed licensing of the Blocks 112/13, 112/14 and 113/28b in the 25th 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.

6.2 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.

Historical spill scenarios and frequency

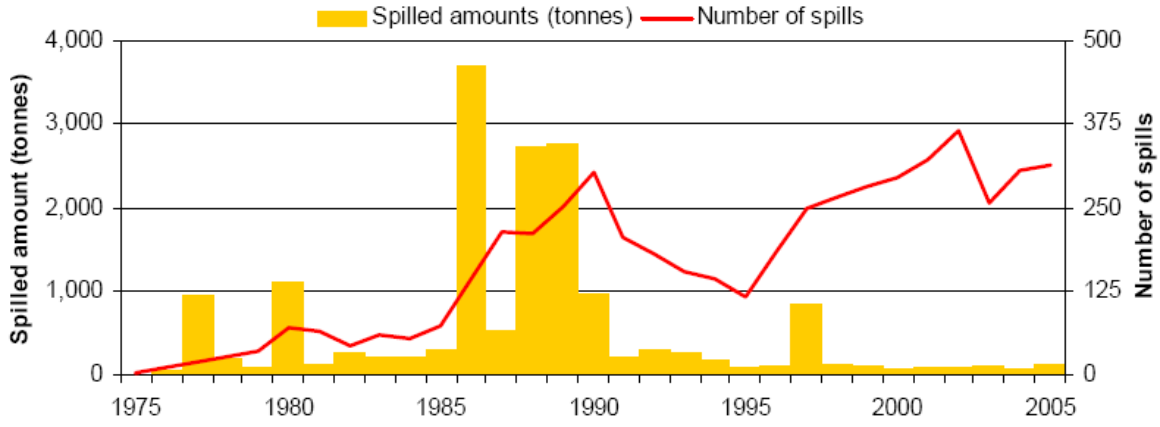
Hydrocarbon spills have been reported from exploration and production facilities on the UKCS since 1974 under PON1 (formerly under CSON7). Well control incidents (i.e. "blowouts" involving uncontrolled flow of fluids from a wellbore or wellhead) have been too infrequent on the UKCS for a meaningful analysis of frequency based on historic UKCS

data. The only significant blowouts on the UKCS to date have been from West Vanguard (1985) and Ocean Odyssey (1988), both involving gas.

The major 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).

Analysis of statistics of oil spills from the oil and gas industry (UKOOA 2006) showed that from 1975 to 2005, for every million tonnes of oil equivalents (TOE) produced on the UKCS, an average of 0.94 spills occurred, and with those the discharge of 3.06 tonnes of oil. An increasing trend in the number of reported spills occurred over the period 1975-1990 followed by a downward trend from 1991-1995 and an upward trend thereafter (see Figure 6.1). The latter trend reflects a lower level of overall production with an increasing number of smaller fields (UKOOA 2006).

Figure 6.1 - Number and volume of reported oil spills from UKCS oil and gas installations over the period 1975-2005



Source: UKOOA (2006)

Over the period 1975-2005, 46% of all oil spills were of crude oil, 18% diesel, 8% hydraulic oil, 4% oily water, 2% condensate and 8% of unknown type. The relative number of diesel, condensate and hydraulic oil spills has increased over the past 10 years. A shift can also be observed towards smaller oil spill volumes over the years. In the period 1975-1981, most spills were between 1 and 10 tonnes; between 2000 and 2005, most spills were between 1 and 100kg. This indicates that the oil spill risk (a function of likelihood and spill size) of the offshore oil and gas industry has reduced over the years. This trend is even clearer when the data are normalised against the number of fields in production (UKOOA 2006).

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). This includes all spills reported by POLREP reports by the MCA and PON1 reports to DECC. A total of 280 accidental discharges were attributed to oil and gas installations during 2007; this figure is the same as the mean annual total over the period 2000-2006. Of these 280 discharges, 65% were fuel, lubrication or hydraulic oils; additionally, of the 276 discharges with volume information, 95% were less than 455 litres. A total of 42 discharges of 2 tonnes or more originating from offshore oil and gas installations were reported during 2007; the

vast majority of these consisted of non-oil chemicals and hydraulic fluids, with only 6.62 tonnes of crude, 3.67 tonnes of diesel and 51.86 tonnes of OBM spilled (ACOPS 2008).

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 2006 totalled 4,356 tonnes.

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).

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 eastern Irish 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 under extreme 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 eastern Irish Sea Blocks would push spilled oil north and east towards the coast. To support environmental assessments of individual drilling or development of gas projects, modelling is usually carried out for diesel oil releases. Representative modelling cases from various parts of the UKCS have been reviewed by successive SEAs.

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 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 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.

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 common seals) and particularly the pupping season (October-December in grey seals and June-July in common 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, or following chemical dispersion. The proportion of a surface spill that is deposited to the seabed might be expected to increase as a result of high turbulence and suspended solids concentrations in the water column, both associated with storm conditions

in shallow water. Studies of macrobenthic infauna following the Braer spill (Kingston *et al*. 1995), which occurred under such conditions, found no significant changes in benthic community structure, as characterised by species richness, individual abundance and diversity, which could be related to the areas of seabed affected by the spill. This may have been because Braer oil was of low toxicity, or because the sampling programme was carried out too soon after the spill to enable the full effects of its impact to be detected. In recognition of this as part of the DECC SEA programme, further sampling of the study area has been conducted, ten years after the spill, results from which have indicated a substantial decline in sediment hydrocarbon concentrations.

In contrast, evidence from the Florida barge spill (Buzzards Bay, Massachusetts, September 1969, in which 700m^3 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 6.1, below. Generally, sheltered habitats of lower exposure to wave energy are considered most vulnerable; oil may persist for considerable periods of time in such environments.

6.3 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:

- The ecological sensitivity of the qualifying feature(s) to oil spills
- Oil spill probability and severity (taking into account distance from Blocks under offer, and probable hydrocarbon type)

Special Areas of Conservation

The ecological sensitivity of the qualifying features of relevant sites to oil spills varies. Several Annex I habitats and Annex II species are not considered to be particularly vulnerable and are not considered further in this assessment; 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).
- **Lagoons, dunes** – sites above Mean High Water Springs not generally vulnerable to surface oil pollution, except possibly to wind-blown oil or evaporated hydrocarbons.
- **Sea cliffs, sea caves** – generally not considered sensitive due to wave reflection and rapid recovery (e.g. Gundlach & Hayes 1978).
- **Migratory fish** – not generally vulnerable to surface oil pollution due to the absence or paucity of time spent at the water's surface.

- **Terrestrial and freshwater aquatic species** – generally not considered vulnerable to surface oil pollution as not utilising marine or estuarine environments. Includes: narrow-mouthed whorl snail (*Vertigo angustior*), freshwater pearl mussel (*Margaritifera margaritifera*), and non-coastal otter populations (*Lutra lutra*).

Table 6.1 provides information on those categories of Annex I habitats and Annex II species 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 fuel oil, the potential for oil spill effects relate to a limited number of Blocks only; these are listed alongside the relevant site. Note: several sites are represented in more than one risk category.

Table 6.1 - Annex I habitat types 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 (relevant Block):** Luce Bay and Sands SAC (112/13 & 112/14), Drigg Coast SAC (113/28b), Morecambe Bay SAC (113/28b)
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 (relevant Block):** Drigg Coast SAC (113/28b), Morecambe Bay SAC (113/28b)
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 (relevant Block):** Drigg Coast SAC (113/28b), Morecambe Bay SAC (113/28b)
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 (relevant Block):** Luce Bay and Sands SAC (112/13 & 112/14), Morecambe Bay SAC (113/28b)
Bottlenose dolphins
Sites comprise a variety of marine habitats utilised by bottlenose dolphins (*Tursiops truncatus*) 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 (relevant Block):** None
Seals
Designated sites comprise coastal habitats (beaches, estuaries, sandflats and rocky shores)

supporting important breeding colonies of common 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 (relevant Block):** None
Coastal otters
Sites contain shallow, inshore coastal areas utilised by important populations of otter (*Lutra lutra*) for feeding. **Sites potentially at risk (relevant Block):** None

Special Protection Areas

Table 6.2 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, the potential for oil spill effects relate to a limited number of Blocks only; these are listed alongside the relevant site. Note: several sites are represented in more than one risk category.

Table 6.2 - 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. In Scotland, these sites are typically subject to proposed seaward extensions of 1-2km. **Sites potentially at risk (relevant Block):** None
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. In Scotland, several of these sites are subject to proposed seaward extensions. **Sites potentially at risk (relevant Block):** Duddon Estuary SPA (113/28b), Morecambe Bay SPA (113/28b)
Red-throated diver breeding populations utilising coastal waters
Inland sites designated for breeding red-throated diver (*Gavia stellata*) 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):** Loch of Inch and Torrs Warren SPA (112/13), Duddon Estuary SPA (113/28b), Morecambe Bay SPA (113/28b)
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):** Duddon Estuary SPA (113/28b), Morecambe Bay SPA

(113/28b)
Marine areas supporting aggregations of non-breeding seabirds
Shallow (typically <20m) marine areas supporting large numbers of seabirds such as divers and seaduck outside of the breeding season. **Sites potentially at risk (relevant Block):** Liverpool Bay pSPA (113/28b)

6.4 Regulation, contingency planning and response capabilities

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.

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 maintains four Emergency Towing Vessels stationed around the UK, which remain on standby at sea. In addition, 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. DECC is a partner in this arrangement and undertakes regular aerial surveillance of offshore installations. 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.

Similar response capabilities, providing a tiered response capability, must be available to Operators prior to commencing drilling or production activities. These provisions are made under various long-term commercial contracts with specialist contractors, supplemented where necessary (e.g. for remote locations) with additional stockpiles. Site-specific Oil Spill Contingency Plans must also be submitted to DECC for approval prior to operations. Additional conditions can be imposed by DECC, through block-specific licence conditions (i.e. "Essential Elements").

6.5 Implications for European Sites

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

- Some sites are considered to be at low risk with the potential for impacts from significant spills of diesel or lube oil.
- Many sites are considered not to be at risk of oil spills associated with activities in proposed blocks, due to location and sensitivity of 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.

6.6 Conclusions

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 25th Round licensing in the eastern Irish Sea; however, as oil spills are not intended activities, a risk-based assessment is appropriate.

Given the availability of mitigation measures, DECC considers that exploration and production activities that could follow the licensing of Blocks 112/13, 112/14 and 113/28b, in so far as they may cause oil spills, will not adversely affect the integrity of European Sites.

7 CONSIDERATION OF SITES AND POTENTIAL PHYSICAL AND OTHER EFFECTS

7.1 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.

7.2 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 eastern Irish Sea water depths.

- **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. 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.

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, 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.

The broad-scale distribution of biotopes of conservation importance is relatively well understood in the eastern Irish Sea, and none are currently known in the Blocks applied for. An area of reef (bedrock and stony), often referred to as the Irish Sea Mounds, has been identified in the northwest Irish Sea. The potential conservation value of this site has been acknowledged by the JNCC (Johnston *et al*. 2004); however, a proposed area for SAC designation has not yet been submitted. 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. 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.

7.3 Marine discharges

As described in previous 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). 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. The effects of 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.

7.4 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).

The potential effects of light on birds have been raised in connection with offshore oil and gas activities over a number of years (e.g. Weise et al. 2001). As part of navigation and worker safety, oilfield installations and associated vessels are lit at night and the lights, together with any flared gas, will be visible at distance (some 10-12nm in good visibility). However, in view of the distance of the Blocks from coastal SPAs it is concluded that light effects will not affect site integrity.

Physical disturbance of seaduck and other waterbird flocks by vessel and aircraft traffic associated with oil and gas exploration and production is possible, particularly in SPAs established for shy species such as common scoter. 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 effects at Natura 2000 sites because of the location of the SPAs and pSPAs relative to the Blocks applied for, the projected limited scale and nature of developments and because mitigation, which would be identified during activity specific assessment and permitting processes, is possible. Available mitigation measures include strict use of existing shipping and aircraft routes, and timing controls on temporary activities to avoid sensitive periods. It is therefore concluded that adverse effects from physical disturbance are not expected.

7.5 Implications for relevant European Sites

Physical disturbance e.g. from pipeline trenching, and placing facilities or deposits on the seabed were considered to have the potential to result in significant effects on SACs only if the Block was within or impinged on the site boundary. Therefore, as identified by the screening process (Appendix B), the potential for such effects only exists with respect to Luce Bay and Sands SAC and Block 112/13. Potential effects are assessed below.

Additionally, physical disturbance e.g. from the physical presence of infrastructure and survey or maintenance vessels was considered to have the potential to result in significant effects on SPAs if the Blocks were within or immediately adjacent to sites designated for birds potentially vulnerable to physical disturbance, including common scoter and red-throated diver. The screening process did not identify the potential for any such effects; Liverpool Bay pSPA is the only site designated for such species in the region and its current draft boundary is at least 7km distant from the nearest Block, 113/28b. This is considered sufficient spatial separation to eliminate the potential for adverse effects on site integrity resulting from physical disturbance.

It is unlikely that any new terminals would be built as a result of developments following the licensing of these Blocks in the 25th Round. 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. There is a legal framework, via e.g. EIA and regulations implementing the Habitats Directive, to ensure that correct project design and mitigation is employed so that significant effects on Natura 2000 sites are avoided. Consequently, the potential for such effects were not identified by the screening process.

Luce Bay and Sands SAC

The northwest corner of Block 112/13 impinges on the boundary of Luce Bay and Sands SAC (see Figure A2). The area of overlap between the two is small, approximately 2.3km^2, representing approximately 0.5% of the total SAC area.

The site may be affected by a variety of activities occurring in the overlapping Block, including drilling, pipelaying via direct physical disturbance and deposits of rock and other particulates. While local effects are foreseeable, activities that might follow award of licences in the 25th Licensing Round would be subject to AA and consent may not be granted. If permitted, mitigation would be expected so that activities would not result in adverse effects on the integrity of the site. Mitigation could include the use of, for example, deviated drilling so that physical effects were avoided within the site boundaries.

Duddon Estuary SPA and Morecambe Bay SPA

The potential for physical disturbance to foraging terns from activities in Block 113/28 were considered. However, in view of the distance of the Block from the SPAs and likely tern feeding grounds (nearshore), and the potential for mitigation through timing of operations, significant effects on site integrity were discounted.

7.6 Conclusions

Any potentially damaging activities that could occur following licensing of Blocks 112/13, 112/14 and 113/28b 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. It is unlikely that any new terminals would be built as a result of developments following 25th 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. 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 the integrity of Natura 2000 sites.

Taking into account the information presented above and in the Appendices, it is concluded that activities arising from the licensing of Blocks 112/13, 112/14 and 113/28b will not cause an adverse effect on the integrity of the European Sites.

8 CONSIDERATION OF SITES AND POTENTIAL ACOUSTIC EFFECTS

8.1 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 large, gas filled organs 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.

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 and Atlantic salmon are the only qualifying fish species of relevant European Sites in the eastern Irish Sea area, numerous fish species present in the region provide important components of the diet of qualifying species of other relevant European Sites, such as bottlenose dolphin *Tursiops truncatus*, common seal *Phoca vitulina* and several seabird species.

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, mitigation through routeing restrictions would be implemented.

8.2 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.

Seismic survey

With the exception of explosives and modern military sonar (and possibly windfarm 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 1µPa 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.

Other activities

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 1µPa, 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 sponsored by the industry (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, although 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.

8.2.1 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.

Injury and behavioural criteria

The Offshore Energy SEA (DECC 2009) reviewed recent data and recommendations for injury and behavioural criteria for noise assessment in marine mammals. The difficult issue of determining when noise causes biologically significant effects in marine mammals has been addressed by NRC (2005). This clarifies the term biologically significant in the context of the US Marine Mammal Protection Act (MMPA), which considers two levels of harassment – level A and level B harassment; in turn specified by National Marine Fisheries Service (NMFS) criteria as noise pressure thresholds of 180 and 160 dB re 1 µPa rms respectively. These values were derived by the High Energy Seismic Survey (HESS) team panel of experts convened in 1999 to assess noise exposure criteria for marine mammals exposed to seismic pulses. The consensus was that, given the best available data at that time, exposure to airgun pulses with received levels above 180dB re 1 µPa (averaged over the pulse duration) was "likely to have the potential to cause serious behavioural, physiological, and hearing effects." The panel noted the potential for ± 10dB variability around the 180dB re 1 µPa level, depending on species, and that more information was needed.

The NMFS has continued to use a "do not exceed" exposure criterion of 180dB re 1 µPa for mysticetes and (recently) all odontocetes exposed to sequences of pulsed sounds, and a 190dB re 1 µPa criterion for pinnipeds exposed to such sounds. Behavioural disturbance criteria for pulsed sounds have typically been set at an SPL value of 160dB re 1 µPa, based mainly on the earlier observations of mysticetes reacting to airgun pulses. However, the relevance of the 160dB re 1 µPa disturbance criterion for odontocetes and pinnipeds exposed to pulsed sounds is not at all well-established. Although these criteria have been applied in various regulatory actions (principally in the U.S.) for more than a decade, they remain controversial, have not been applied consistently in the U.S., and have not been widely accepted elsewhere (Southall *et al*. 2007). Southall *et al*. (2007) have recently proposed injury criteria 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 1µPa p-p for all types of sounds and an M-weighted sound exposure level of 198 or 215dB re 1 $\mu Pa^2 \cdot s$ for pulsed and non-pulsed sounds respectively. For pinnipeds, the respective criteria are 218dB 1µPa p-p for all types of sound and 186 (pulsed) or 203 (non-pulse) dB re 1 $\mu Pa^2 \cdot s$ (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) have recently proposed injury criteria 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 1µPa p-p for all types of sounds and an M-weighted sound exposure level of 198 or 215dB re 1 $\mu Pa^2 \cdot s$ for pulsed and non-pulsed sounds respectively. For pinnipeds, the respective criteria are 218dB 1µPa p-p for all types of sound and 186

(pulsed) or 203 (non-pulse) dB re 1 $\mu Pa^2 \cdot s$ (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 1µPa p-p and an M-weighted sound exposure level of 183dB re 1 $\mu Pa^2 \cdot s$ for three functional hearing categories of cetaceans, and 212dB re 1µPa (p-p) and 171dB re 1 $\mu Pa^2 \cdot s$ (M-weighted) for pinnipeds.

For multiple pulse and non-pulse (i.e. continuous) sources, they were unable to derive explicit and broadly applicable numerical threshold values for delineating behavioural disturbance. A scoring paradigm was used to numerically rank, in terms of severity, behavioural responses observed in either field or laboratory conditions. However, due to various statistical and methodological problems, much of this data was not considered to provide sufficient scientific credence for establishment of exposure criteria. Southall *et al*. (2007) noted the importance of contextual variables in determining behavioural response; together with the presence or absence of acoustic similarities between the anthropogenic sound and biologically relevant natural signals (e.g. calls of conspecifics, predators, prey). They suggest that the concept of a context-based approach to deriving noise exposure criteria for behavioural responses will be necessary.

Based on NMFS and 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 9m (p-p) from source, and for significant behavioural disturbance (onset of TTS) approximately 22m (p-p) from source.

Seismic array / propagation characteristics	
Source Level	250 dB
array loss (horizontal directivity)	18 dB
propagation loss factor (logarithmic)	15 dB
Effect threshold	
Southall criteria	
single pulse PTS onset, pinnipeds	218 dB
single pulse TTS onset, pinnipeds	212 dB
NMFS A (18dB corr to p-p)	198 dB
NMFS B (18dB corr to p-p)	178 dB
Lucke (porpoise TTS)	184 dB
Required transmission loss (TL)[1]	
PTS single pulse range TL	14 dB
TTS single pulse range TL	20 dB
NMFS A (18dB corr to p-p)	34 dB
NMFS B (18dB corr to p-p)	54 dB
Lucke (porpoise TTS)	48 dB
Required range[2]	

PTS single pulse range	9 m
TTS single pulse range	22 m
NMFS A (18dB corr to p-p)	185 m
NMFS B (18dB corr to p-p)	4.0 km
Lucke (porpoise TTS)	1.6 km

1 TL = SL-array loss-effect threshold
2 Range = 10^(TL/propagation loss factor)

These ranges represent a tiny proportion of the marine areas used by seals associated with European Sites in the Irish Sea and adjacent areas; therefore, disturbance effects beyond site boundaries are not expected to have consequent effects on site integrity.

Popper *et a*l. (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.

8.3 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. The screening process (Appendix B) identified the potential for acoustic disturbance in the following sites:

Strangford Lough SAC and Murlough SAC

Common seal *Phoca vitulina* are a non-primary feature of both sites.

Strangford Lough supports one of the most important breeding populations of common seal in Ireland. North Boretree Rock, at the north of the Lough, supports one of the largest colonies while many of the low-lying rocky islands and reefs are regularly used as hauling sites. Large numbers have also been recorded on the north shore at the entrance to the lough. Peak annual counts of common seals in Strangford Lough were approximately 270 over the period 1999-2003, with a decline observed in pup production (SLMC 2005). This is the largest breeding colony in Northern Ireland, with the population estimated at 210 seals at the time of SAC designation (JNCC website). Aerial survey of the entire Northern Ireland coastline in August 2002 yielded a count of 1248 seals, including 180 in Strangford Lough (Duck 2006).

Environmental monitoring for the SeaGen tidal turbine in Strangford Narrows[3] included the tagging of common seals hauled-out within Strangford Lough SAC. Results indicated that seal distribution at sea is focussed within the Lough, the Narrows and adjacent coastal waters. Several seals were also recorded making long trips further offshore in the Irish Sea between the coast of Northern Ireland and the Isle of Man, and also south along the coast of County Down.

[3] See http://www.royalsoced.org.uk/international/RSE-Taiwan%20tidal%20energy%20slides/RSE-Taiwan/ROYSOCEDINPRES240209.ppt

Common seals are considered as commonly present within Murlough SAC, using the area for hauling-out to rest and moult. Seals forage within the marine areas of the SAC and beyond. The main haul-out sites within Murlough SAC are at Ballykinler and Minerstown in Dundrum Bay (Wilson *et al*. 2002); aerial survey in 2002 recorded 301 common seals within this area (Duck 2006).

Simple calculations of sound propagation can be made to estimate the likely maximum received sound levels at the boundaries of relevant European Sites should a typical seismic survey occur in any one of the Blocks applied for; the results of these are presented in Table 8.1. Most environmental assessments of noise disturbance use simple spherical propagation models of the form SPL = SL – 20log(R), where SL = source level, R = source-receiver range, to predict sound pressure levels (SPL) at varying distances from source. Cylindrical spreading, SPL = SL – 10log(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.

Propagation has been measured for sounds from pile-driving as well as sounds from operating wind turbines (Madsen *et al*. 2006. For the transient impact sounds from pile-driving, the available data suggest that transmission losses are close to spherical spreading (in the range 11log(R) to 35log(R) up to ranges of more than 1km. Similarly, quantitative modelling of seismic noise propagation in Queen Charlotte Basin, Canada (MacGillivray & Chapman 2005) predicted that received noise levels would be lowest in those areas of the basin with shallow bathymetry due to scattering and absorption of sound at the seabed.

In the case of the nearest site, Strangford Lough SAC, the minimum direct linear range from the SAC boundary to the nearest Block (112/13) is approximately 61km, giving a propagation loss (assuming 15logR) of around 72dB, or a received sound level of 158dB re 1μPa 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.

Table 8.1 - Estimated received sound levels in relevant European Sites associated with a typical seismic survey

Block	Strangford Lough SAC		Murlough SAC	
	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)	Minimum distance (km)	Received sound level (dB re 1μPa peak-to-peak)
112/13	61	158	76	157
112/14	74	157	89	156

Notes: Assumes a source level of 250dB re 1μPa peak-to-peak, a correction factor of -20dB to compensate for horizontal array effects, and a propagation loss of 15log(R). Figures are rounded to the nearest whole number. Block 113/28b is not considered relevant here as it is distant from the two sites and separated by the Isle of Man.

Seismic survey occurring in licence Blocks 112/13 and 112/14 will be audible to seals over a large area of the northern Irish Sea, characterised by moderate-low marine usage by foraging common seals associated with Strangford Lough and likely Murlough SACs. Audibility within the SAC itself is considered unlikely. The exact effects which this may have are unknown, although available evidence suggests that significant effects at a population level are unlikely.

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 damage to marine mammals. 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 Strangford Lough and Murlough SACs, these may influence the breeding populations of the sites. 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 at a population level.

Noise levels associated with other activities potentially resulting from the 25th 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 level.

Lleyn Peninsula and the Sarnau/Pen Llyn a'r Sarnau SAC and Cardigan Bay/Bae Ceredigion SAC

Bottlenose dolphin *Tursiops truncatus* are a primary qualifying feature of the Cardigan Bay SAC and a non-primary feature of the Lleyn Peninsula and the Sarnau SAC. Grey seals *Halichoerus grypus* are a non-primary feature of both sites. Both these sites are located a considerable distance to the south of the Blocks applied for, and separated by the land mass of northwest Wales. However, the distribution of bottlenose dolphins ranges beyond the boundaries of these sites into waters where the potential for acoustic effects has been identified (Appendix B). While grey seals are also known to range extensively beyond site boundaries, studies have shown the greatest areas of marine usage by these animals to occur in southern Cardigan Bay and between the Lleyn Peninsula and east coast of Ireland; marine usage by animals associated with these sites was very limited north of Anglesey (Hammond *et al*. 2005). Consequently, adverse effects on the grey seals associated with these sites are not considered likely. Grey seal occurrence in the eastern Irish Sea is dominated by animals associated with haul-out sites on the coasts of north Wales and southwest Scotland, which are not designated as SACs.

In recent years, sightings of bottlenose dolphins have been more frequently recorded off the north Wales coast - primarily around Anglesey but also closer to Liverpool Bay (Pesante *et al*. 2008). Sightings are most frequent from November to January. Recent photo-identification studies have shown that the majority of these individuals have previously been observed in the Cardigan Bay area during summer months. Their occurrence off the North

Wales coast is, therefore, linked to their status as features of the Lleyn Peninsula and the Sarnau SAC and the Cardigan Bay SAC.

Results of photo-ID surveys across a wide area of Cardigan Bay (beyond the SAC boundaries) from 2001-2007, when combined with an open population model, provide population estimates ranging between 154 (95% CI = 138-209) in 2002 and 248 (95% CI = 231-277) in 2007; estimates for the SAC alone range from 79 in 2002 to 150 in 2007. The population appears to be stable or increasing over this period (Pesante *et al*. 2008). The condition of bottlenose dolphins is currently classified as 'favourable maintained' in both sites. Bottlenose dolphin abundance across the wider Irish Sea was estimated by the SCANS-II survey in summer 2005 at 235 animals (95% CI = 63-870) (SCANS-II 2008). Winter abundance of bottlenose dolphins off the north Wales coast is currently unknown; observations from land over the period 2001-2007 have recorded a mean group size of 23 individuals over the period November-January, with several observations of larger groups of up to 86 individuals (Pesante *et al*. 2008).

Simple calculations of sound propagation can be made to estimate the likely maximum received sound levels at given distances from the Blocks applied for, should a typical seismic survey occur. In the case of the north Wales coast, the minimum distance to the nearest Block (113/28b) ranges from is approximately 75km, giving a propagation loss (assuming 15logR) of around 73dB, or a received sound level of 157dB re 1μPa p-p for a typical seismic survey. This level is 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.

Seismic survey occurring in Block 113/28b will be audible to bottlenose dolphins occurring in the eastern Irish Sea off the north Wales coast. The exact effects which this may have are unknown, although available evidence suggests that significant effects at a population level are unlikely. Weather conditions typically restrict seismic survey activity to summer months. Sightings data indicate that bottlenose dolphin occurrence in this area is limited during summer months, supported by increased sightings further south off the coast of west Wales.

If significant ecological effects on bottlenose dolphin prey species were to occur, these may influence the population of the designated sites. However, noise levels suggested to cause injury to fish 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 at a population level.

Noise levels associated with other activities potentially resulting from the 25th 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 level.

Solway Firth SAC, Dee Estuary SCI and River Dee and Bala Lake SAC

The migratory river lamprey *Petromyzon marinus* and sea lamprey *Lampetra fluviatilis* are present as a primary feature of the Solway Firth SAC, and non-primary features of both the Dee Estuary SCI and River Dee and Bala Lake SAC.

Sea lamprey migrate into fresh water to spawn in April and May. Larvae metamorphose in rivers from July-September before migrating to sea; the timing of migration varies from river to river. Relatively little is known about their marine distribution, where they have been recorded in both shallow coastal and deep offshore waters and attached to a variety of host species (Maitland 2003). Young river lamprey use the estuarine water of the Solway Firth and Dee Estuary as a nursery before migrating upstream to freshwater to spawn in several rivers upstream. 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.

Noise levels suggested to cause injury to fish 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 it is unlikely to affect site integrity. Furthermore, the potential for impact can be mitigated through timing of seismic survey to avoid the period of lamprey entry into the rivers; consequently, significant effects on this qualifying feature can be avoided.

Riverine SACs

The potential for acoustic disturbance effects was identified for the River Bladnoch SAC, River Ehen SAC, River Derwent and Bassenthwaite Lake SAC and River Eden SAC due to presence of migratory fish species as qualifying features, including Atlantic salmon *Salmo salar* in all sites and also sea and river lamprey in the latter two sites. Potential acoustic disturbance effects on these species relates only to their distribution beyond the boundaries of the sites.

Atlantic salmon leave rivers to enter the marine environment during spring-summer as smolts, before migrating to feeding areas in Nordic Seas and West Greenland. Following 1-3 years at sea, adult salmon return to their home rivers primarily during summer months. Due to their low densities in the eastern Irish Sea and the highly localized range of noise levels likely to cause injury to fish, the potential for acoustic disturbance effects is restricted to disruption to their migration from, and principally to, the designated rivers. The potential for impact can be mitigated through timing of seismic survey to avoid the period of peak salmon entry into the rivers and consequently significant effects on this qualifying feature can be avoided.

As described above, the potential for effects on lamprey is restricted to sea lamprey occupying marine areas, and significant effects on these qualifying features can be avoided.

8.4 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 within 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* (June 2009 revision to reflect the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* as amended). 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.

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 (2009) advise that operators adopt mitigation measures which are appropriate to minimise the risk of an injury or disturbance offence[4] and stipulate, whenever possible, the implementation of several best practice measure, including:

- only commence seismic activities during the hours of daylight when visual mitigation by MMOs is possible.
- only commence seismic activities during the hours of darkness, or low visibility (including unsuitable sea state for visual mitigation), if an effective PAM system is used. In areas of particular importance for marine mammals, a PAM system should be used during day, night and other poor visibility seismic shooting.
- plan surveys so that the timing will reduce the likelihood of encounters with marine mammals.
- 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 airguns (along with other acoustic energy sources).

8.5 Conclusions

As all blocks under consideration are at least several kilometres from the boundaries of SPAs, 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 primary or secondary 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. 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

[4] Defined under Regulation 39 1(a) and 1(b) (respectively) of the *Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007* (as amended)

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 eastern Irish Sea has generally concluded that effects on the relevant SACs will not be significant. In the case of the Blocks under consideration here, calculations considering the direct linear range to the SAC boundaries, and important areas beyond SAC boundaries used by qualifying features, and the source level of a typical seismic survey suggest that received noise levels within all these areas 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 Blocks 112/13, 112/14 and 113/28b will not cause an adverse effect on the integrity of the European Sites.

9 IN-COMBINATION EFFECTS

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 8, the number of seismic surveys is substantially less than historic peaks and as a result significant in-combination effects with oil and gas activities in existing licensed blocks are not foreseen.

Other noise producing activities which are likely to occur within the eastern Irish Sea include those associated with the development of marine renewable energy. Offshore wind energy is expected to undergo large-scale development in the region over the next decade. In addition to the 3 constructed offshore wind farms and 2 under construction in the eastern Irish Sea Sea (approx 510MW combined capacity), consent has been granted to a further 2.0GW of offshore wind energy in the region to be distributed off the north Wales coast and at various sites off the Cumbrian coast.

Following on from the aforementioned developments, The Crown Estate has identified a large area in the Irish Sea as a potential area for offshore wind energy development during the third Round of UK offshore wind leasing. This zone extends north from 15km north of Anglesey to border the southeastern limit of Isle of Man waters; its width is approximately defined by the 4°W and 5°W lines of longitude. However, the consenting of any such developments in this area will be subject to the conclusions of the Offshore Energy SEA, detailed project-specific EIA and Habitats Regulations Assessment. The Crown Estate have also recently awarded exclusivity agreements to various consortia of wind energy developers for several areas within Scottish territorial waters, including two areas off the Solway Firth and Wigtown Bay of 61km^2 and 51km^2 respectively. Consenting of any development within this area will also be subject to the conclusions of an SEA, project-specific EIA and Habitats Regulations Assessment.

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 are have the greatest potential for acoustic disturbance effects (see Faber Maunsell & Metoc 2007, DECC 2009a). 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. While considerable uncertainty exists over the likely nature and installation method of foundations for future wave and tidal devices, a precautionary approach to assessment dictates the assumption that some level of pile-driving will occur, at least for tidal energy developments. Mono-pile foundations are the most commonly used for offshore windfarm developments at present; these are the primary foundation type anticipated for Round 2 developments. In relation to offshore pile-driving, standard conditions on consents for Round 2 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.

Uncertainty exists over the types of foundations which will be utilised by Round 3 developments; a precautionary approach assumes significant use of mono-piles (as assumed in the Offshore Energy SEA), although further development of noise-reduction measures and alternative foundation types such as jacket, tripod, or gravity bases is

anticipated. 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. SNH may in the future produce similar guidance in respect of Scottish territorial waters.

In addition to those activities which may follow licensing of the eastern Irish Sea Blocks under consideration and future marine renewable energy development, there are a variety of other existing (e.g. oil and gas production, wind turbine deployments, fishing, shipping, military exercise areas, aggregate extraction) and planned (e.g. oil and 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 adversely affect the integrity 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. These mechanisms generally allow for public participation in the process, and this will be strengthened by regulations amending the offshore EIA regime which are due to come into force later this year. 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 Assessment.

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 (for certain species), which included: coastal areas form Cardigan Bay to Liverpool Bay, including the Lleyn Peninsula (bottlenose dolphin, harbour porpoise, Risso's dolphin, grey seal) (DECC 2009b).

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 2009a; see also OSPAR 2000). Available evidence for the Irish 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.

It is concluded that the in-combination of effects from activities arising from the licensing of Blocks 112/13, 112/14 and 113/28b with those from existing and planned activities in the eastern Irish Sea will not cause an adverse effect on the integrity of the relevant European Sites.

10 CONSIDERATION OF SITES NOT YET SUBMITTED TO THE EC

The Liverpool Bay pSPA is proposed for the Article 4.1 species, red-throated diver over winter and the Article 4.2 migratory species, common scoter also over winter. Consideration of vulnerability of these features to activities that could follow licensing is given below.

Prospectivity in the Blocks applied for is for gas, and all Blocks are relatively remote from the sites in question.

The Liverpool Bay pSPA site integrity would not be affected by emissions or discharges from routine operations in any of the Blocks applied for. Disturbance of red-throated diver and common scoter by supply and other vessels supporting operations in the Blocks applied for is possible; however, given the location of the Blocks and the existing supply bases onshore such disturbance would be negligible. The legal framework in respect of oil spills aims to minimise their occurrence, provide for contingency planning, response and clean up, and enables prosecutions. It is not credible to conclude that in spite of the regulatory controls, an oil spill will never occur as a result of 25th Round licensing and in the unlikely event of a major diesel oil spill from Block 113/28b, weathered spilled diesel oil could theoretically affect the features present, although mitigation would be possible, for example through deflection or collection booming.

The Shell Flat and Lune Deep dSAC is being considered for Annex 1 habitats specifically reefs (bedrock and stony) and sandbanks which are slightly covered by sea water all the time. The Shell Flat and Lune Deep dSAC is not adjacent to the blocks applied for (15km is the closest point of Block 113/28b) and its integrity would not be affected by emissions or discharges from routine operations or accidental spills. Licensing of the blocks would not result in any activities that would hinder efforts to maintain the qualifying Annex I habitat features in favourable condition.

In conclusion, planning and environmental permitting arrangements covering drilling, pipeline route and development provide effective mechanisms to ensure that these activities do not adversely affect the integrity of the Shell Flat and Lune Deep dSAC or the Liverpool Bay pSPA.

11 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 112/13, 112/14 and 113/28b. This is because there is certainty, within the meaning of the ECJ Judgment in the ***Waddenzee*** case, that 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/Ramsar 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/Ramsar 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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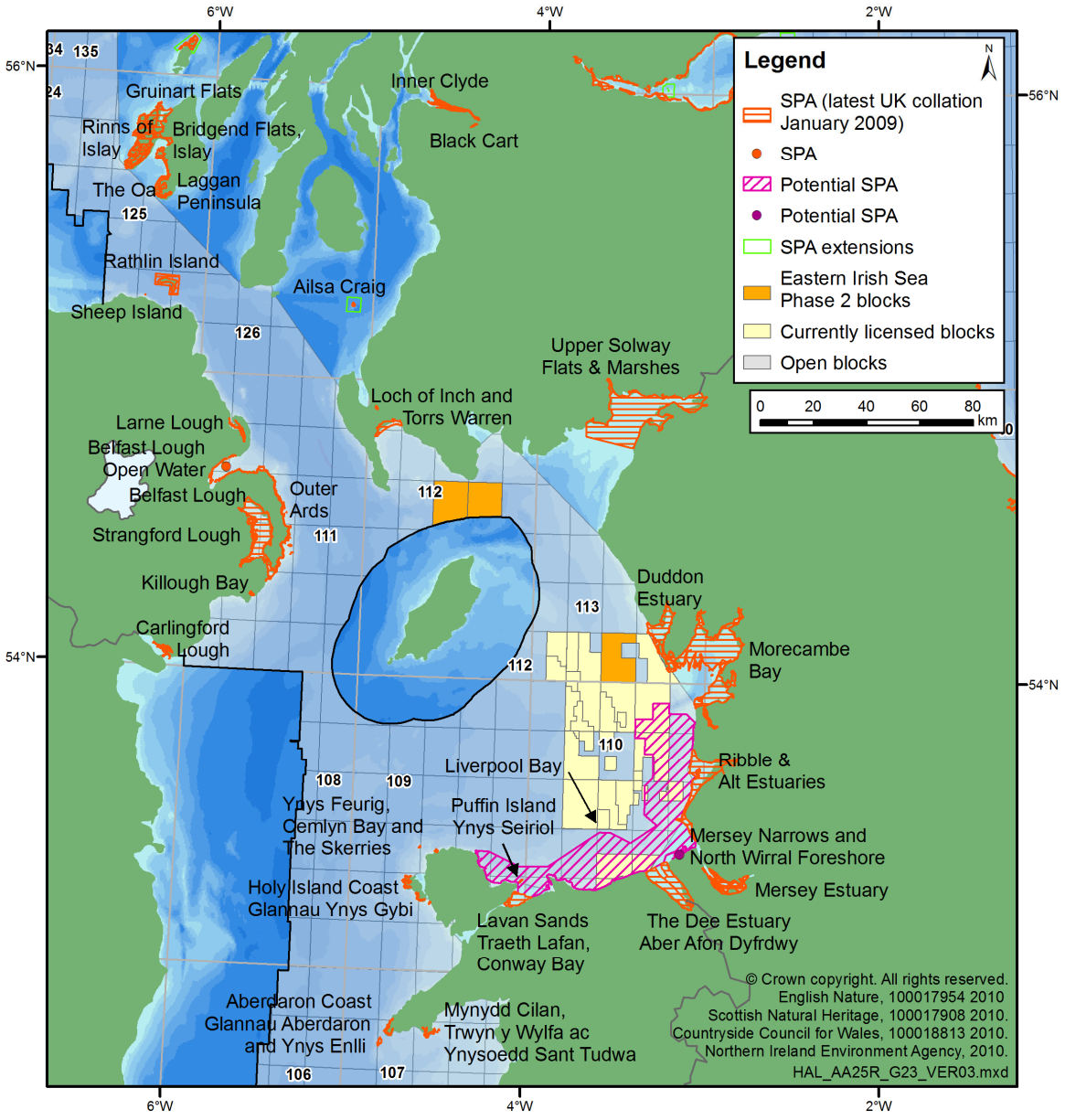
APPENDIX A - THE SITES

The migratory and/or Annex I bird species for which SPAs are selected in the UK are listed in Box A.1, and the relevant SPAs their qualifying features are given in Table A.1.

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

A1 Coastal and Marine Special Protection Areas

Figure A.1 - Location of coastal and marine SPAs



Note: Proposed SPA marine extensions (Scotland) are also indicated

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

Divers and grebes
Red-throated diver *Gavia stellata*
Black-throated diver *Gavia arctica*
Little grebe *Tachybaptus ruficollis*
Great crested grebe *Podiceps cristatus*
Slavonian grebe *Podiceps auritus*

Seabirds
Fulmar *Fulmarus glacialis*
Manx shearwater *Puffinus puffinus*
Storm petrel *Hydrobates pelagicus*
Leach's petrel *Oceanodroma leucorhoa*
Gannet *Morus bassanus*
Cormorant *Phalacrocorax carbo carbo*
Shag *Phalacrocorax aristotelis*
Guillemot *Uria aalge*
Razorbill *Alca torda*
Puffin *Fratercula arctica*

Gulls, terns and skuas
Arctic skua *Stercorarius parasiticus*
Great skua *Catharacta skua*
Mediterranean gull *Larus melanocephalus*
Black-headed gull *Larus ridibundus*
Common gull *Larus canus*
Lesser black-backed gull *Larus fuscus*
Herring gull *Larus argentatus*
Great black-backed gull *Larus marinus*
Kittiwake *Rissa tridactyla*
Sandwich tern *Sterna sandvicensis*
Roseate tern *Sterna dougallii*
Common tern *Sterna hirundo*
Arctic tern *Sterna paradisaea*
Little tern *Sterna albifrons*

Crakes and rails
Spotted crake *Porzana porzana*
Corncrake *Crex crex*
Coot *Fulica atra*

Birds of prey and owls
Honey buzzard *Pernis apivorus*
Red kite *Milvus milvus*
Marsh harrier *Circus aeruginosus*
Hen harrier *Circus cyaneus*
Golden eagle *Aquila chrysaetos*
Osprey *Pandion haliaetus*
Merlin *Falco columbarius*
Peregrine *Falco peregrinus*
Short-eared owl *Asio flammeus*

Other bird species
Capercaillie *Tetrao urogallus*
Nightjar *Caprimulgus europaeus*
Woodlark *Lullula arborea*
Fair Isle wren *Troglodytes troglodytes fridariensis*
Aquatic warbler *Acrocephalus paludicola*
Dartford warbler *Sylvia undata*
Chough *Pyrrhocorax pyrrhocorax*
Scottish crossbill *Loxia scotica*

Waders
Oystercatcher *Haematopus ostralegus*
Avocet *Recurvirostra avosetta*
Stone Curlew *Burhinus oedicnemus*
Ringed Plover *Charadrius hiaticula*
Dotterel *Charadrius morinellus*
Golden plover *Pluvialis apricaria*
Grey plover *Pluvialis squatarola*
Lapwing *Vanellus vanellus*
Knot *Calidris canutus*
Sanderling *Calidris alba*
Purple sandpiper *Calidris maritima*
Dunlin *Calidris alpina alpina*
Ruff *Philomachus pugnax*
Snipe *Gallinago gallinago*
Black-tailed godwit *Limosa limosa* (breeding)
Black-tailed godwit *Limosa limosa islandica* (non-breeding)
Bar-tailed Godwit *Limosa lapponica*
Whimbrel *Numenius phaeopus*
Curlew *Numenius arquata*
Redshank *Tringa totanus*
Greenshank *Tringa nebularia*
Wood Sandpiper *Tringa glareola*
Turnstone *Arenaria interpres*
Red-necked phalarope *Phalaropus lobatus*

Waterfowl
Bewick's swan *Cygnus columbianus bewickii*
Whooper swan *Cygnus cygnus*
Bean goose *Anser fabalis*
Pink-footed goose *Anser brachyrhynchus*
Russian white-fronted goose *Anser albifrons albifrons*
Greenland white-fronted goose *Anser albifrons flavirostris*
Icelandic greylag goose *Anser anser*
Greenland barnacle goose *Branta leucopsis*
Svalbard barnacle goose *Branta leucopsis*
Dark-bellied brent goose *Branta bernicla bernicla*
Canadian light-bellied brent goose *Branta bernicla hrota*
Svalbard light-bellied brent goose *Branta bernicla hrota*
Shelduck *Tadorna tadorna*
Wigeon *Anas penelope*
Gadwall *Anas strepera*
Teal *Anas crecca*
Mallard *Anas platyrhynchos*
Pintail *Anas acuta*
Shoveler *Anas clypeata*
Pochard *Aythya ferina*
Tufted duck *Aythya fuligula*
Scaup *Aythya marila*
Eider *Somateria mollissima*
Long-tailed duck *Clangula hyemalis*
Common scoter *Melanitta nigra*
Velvet scoter *Melanitta fusca*
Goldeneye *Bucephala clangula*
Red-breasted merganser *Mergus serrator*
Goosander *Mergus merganser*

Table A.1 - Relevant coastal and marine SPAs and their Qualifying Features

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages
ISLAY TO KINTYRE				
Gruinart Flats, Islay SPA	3261.32	Over winter: Barnacle goose Greenland white-fronted goose	N/A	N/A
Rinns of Islay SPA	9407.46	Breeding: Chough Corncrake Hen harrier On passage: Whooper swan Over winter: Chough Greenland white-fronted goose	Breeding: Common scoter	N/A
Bridgend Flats, Islay SPA	331.16	Over winter: Barnacle goose	N/A	N/A
Laggan, Islay SPA	1230.02	Over winter: Barnacle goose Greenland white-fronted goose	N/A	N/A
The Oa SPA	1943	Breeding: Chough	N/A	N/A
NORTH NORTHERN IRELAND				
Rathlin Island SPA	3344.62	Breeding: Peregrine	Breeding: Guillemot Razorbill	Breeding: Seabird
Sheep Island SPA	3.5	Breeding: Cormorant	N/A	N/A
EAST NORTHERN IRELAND				
Larne Lough SPA	395.94	Breeding: Common tern Roseate tern Sandwich tern|	Over winter: Light-bellied brent goose	N/A
Belfast Lough SPA	432.14	Over winter: Bar-tailed godwit	Over winter: Redshank Turnstone	Over winter: Waterfowl
Belfast Lough Open Water potential SPA	5592.99	TBC	TBC	TBC
Outer Ards SPA	1410.41	Breeding: Arctic tern Over winter: Golden plover	Over winter: Light-bellied brent goose Ringed plover Turnstone	N/A
Strangford Lough SPA	15580.79	Breeding: Arctic tern Common tern Sandwich tern Over winter: Bar-tailed godwit Golden plover	Over winter: Knot Light-bellied brent goose Redshank Shelduck	Over winter: Waterfowl
Killough Bay SPA	104.23	N/A	Over winter: Light-bellied brent goose	N/A

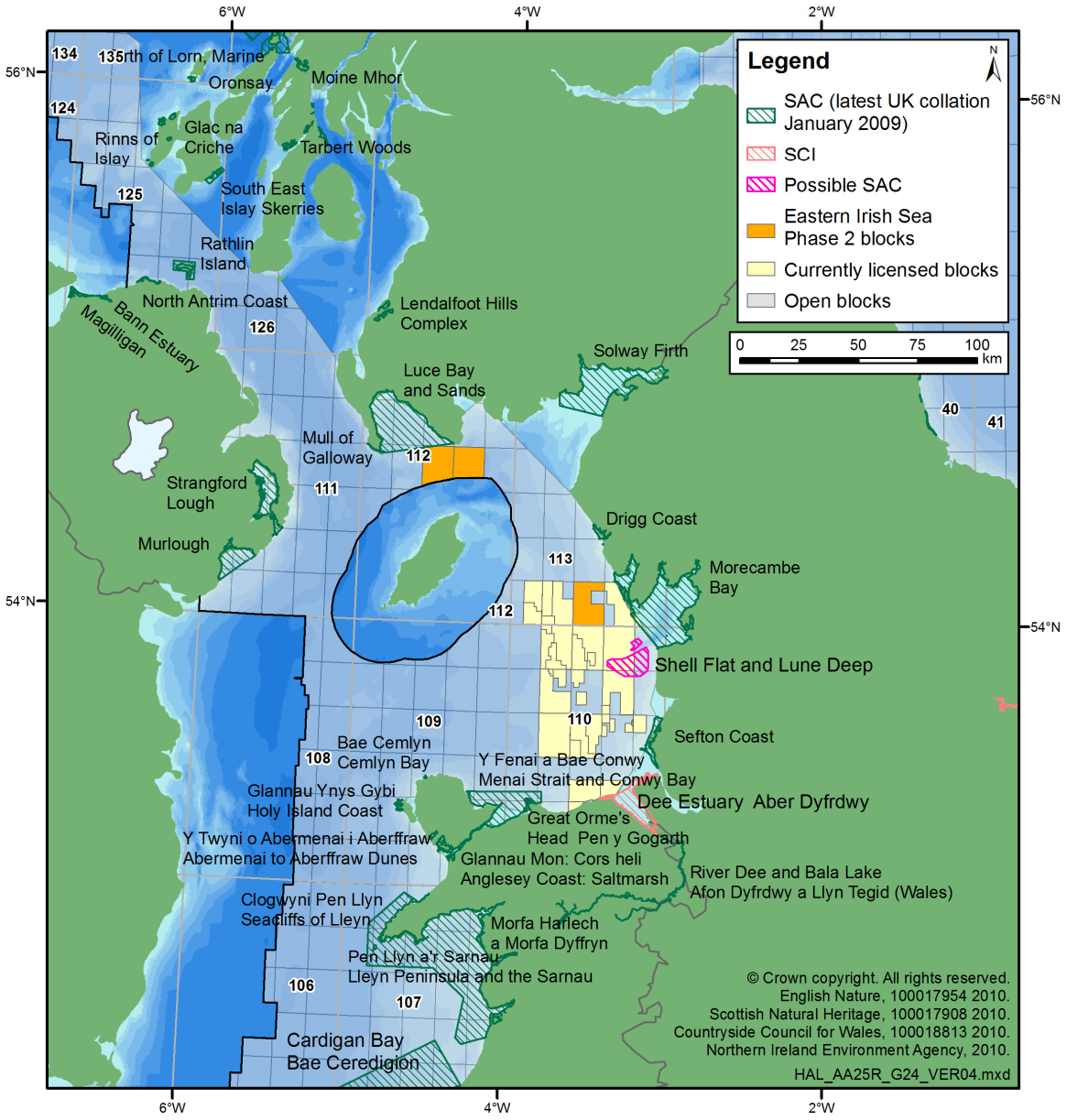
Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages
Carlingford Lough SPA	827.12	Breeding: Common tern Sandwich tern	Over winter: Light-bellied brent goose	N/A
SOUTHWEST SCOTLAND				
Black Cart SPA	56.3	Over winter: Whooper swan	N/A	N/A
Inner Clyde Estuary SPA	1826.02	N/A	Over winter: Redshank	N/A
Ailsa Craig SPA	99.94 + 2km extension	N/A	Breeding: Gannet Lesser black-backed gull	Breeding: Seabird
Loch of Inch & Torrs Warren SPA	2111.04	Over winter: Greenland white-fronted goose Hen harrier	N/A	N/A
Upper Solway Flats and Marshes SPA	30706.26	Over winter: Bar-tailed godwit Barnacle goose Golden plover Whooper swan	On passage: Ringed plover Over winter: Curlew Dunlin Knot Oystercatcher Pink-footed goose Pintail Redshank	Over winter: Waterfowl
NORTHWEST ENGLAND				
Duddon Estuary SPA	6806.3	Breeding: Sandwich tern	On passage: Ringed plover Sanderling Over winter: Knot Pintail Redshank	Over winter: Waterfowl
Morecambe Bay SPA	37404.6	Breeding: Little tern Sandwich tern Over winter: Bar-tailed godwit Golden plover	Breeding season: Lesser black-backed gull Herring gull On passage: Ringed plover Sanderling Over winter: Curlew Dunlin Grey plover Knot Oystercatcher Pink-footed goose Pintail Redshank Shelduck Turnstone	Breeding: Seabird Over winter: Waterfowl

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages
Ribble and Alt Estuaries SPA	12361.13	Breeding: Common tern Ruff Over winter: Bar-tailed godwit Bewick's swan Golden plover Whooper swan	Breeding: Lesser black-backed gull On passage: Ringed plover Sanderling Over winter: Black-tailed godwit Dunlin Grey plover Knot Oystercatcher Pink-footed goose Pintail Redshank Sanderling Shelduck Teal Widgeon	Breeding: Seabird Over winter: Waterfowl
Mersey Narrows and North Wirral Foreshore pSPA	2089.41	N/A	Over winter: Redshank Turnstone	Over winter: Waterfowl
Mersey Estuary SPA	5033.14	Over winter: Golden plover	On passage: Redshank Ringed plover Over winter: Dunlin Pintail Redshank Shelduck Teal	Over winter: Waterfowl
Liverpool Bay pSPA	197,504	Over winter: Red-throated diver	Over winter: Common scoter	N/A
Dee Estuary SPA	13076.29	Breeding: Common tern Little tern On passage: Sandwich tern Over winter: Bar-tailed godwit	On passage: Redshank Over winter: Black-tailed godwit Curlew Dunlin Grey plover Knot Oystercatcher Pintail Redshank Shelduck Teal	Over winter: Waterfowl
Liverpool Bay pSPA	170,225	Over winter: Red-throated diver	Over winter: Common scoter	N/A
NORTH AND WEST WALES				
Liverpool Bay pSPA	170,225	Over winter: Red-throated diver	Over winter: Common scoter	N/A
Traeth Lafan / Lavan Sands, Conway Bay SPA	2642.98	N/A	Over winter: Oystercatcher	N/A
Ynys Seiriol / Puffin Island SPA	31.21	N/A	Breeding: Cormorant	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory species	Article 4.2 Assemblages
Ynys Feurig, Cemlyn Bay and The Skerries SPA	85.66	Breeding: Arctic tern Common tern Roseate tern Sandwich tern	N/A	N/A
Glannau Ynys Gybi/Holy Island Coast SPA	352.59	Breeding: Chough Over winter: Chough	N/A	N/A
Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island SPA	505.03	Breeding: Chough Over winter: Chough	Breeding: Manx shearwater	N/A
Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal SPA	373.55	Breeding: Chough Over winter: Chough	N/A	N/A

A2 Coastal and Marine Special Areas of Conservation

Figure A.2 - Location of coastal and marine SACs



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 *Rhynchosporion*
	Transition mires and quaking bogs
Coastal dunes	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
	Coastal dunes with *Juniperus* spp.
	Decalcified fixed dunes with *Empetrum nigrum*
	Dunes with Hippophae rhamnoides
	Dunes with Salix repens ssp. argentea (Salicion arenariae)
	Embryonic shifting dunes
	Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature
	Humid dune slacks
	Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`)
Coastal lagoons	Coastal lagoons *Priority feature
Estuaries	Estuaries
Fens	Alkaline fens
	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* * Priority feature
	Petrifying springs with tufa formation (*Cratoneurion*) * Priority feature
Forest	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) * Priority feature
	Old sessile oak woods with *Quercus robur* on sandy plains
Grasslands	Alpine and subalpine calcareous grasslands
	Calaminarian grasslands of the *Violetalia calaminariae*
	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
	Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) (important orchid sites) * Priority feature
	Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe) * Priority feature
Heaths	Alpine and Boreal heaths
	European dry heaths
	Northern Atlantic wet heaths with *Erica tetralix*
Inlets and bays	Large shallow inlets and bays

Annex I Habitat (abbreviated)	Annex I Habitat(s) (full description)
Limestone pavements	Limestone pavements * Priority feature
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 *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
Salt marshes and salt meadows	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) *Salicornia* and other annuals colonising mud and sand Spartina swards (Spartinion maritimae)
Sandbanks	Sandbanks which are slightly covered by sea water all the time
Scree	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)
Scrub (mattoral)	*Juniperus communis* 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 *Chara* spp. Natural dystrophic lakes and ponds Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
Vegetation of drift lines	Annual vegetation of drift lines
Vegetation of stony banks	Perennial vegetation of stony banks

Table A.2 - Coastal and marine SACs and their Qualifying Features

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
FIRTH OF LORN TO ORONSAY					
Firth of Lorn, Marine SAC	20975.01	Reefs	N/A	N/A	N/A
Oronsay SAC	340.07	Machairs	N/A	N/A	N/A
ISLAY TO KINTYRE					
Moine Mhor SAC	1150.41	Bogs	Mudflats and sandflats Salt marshes and salt meadows Forests	N/A	Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* Otter *Lutra lutra*
Glac na Criche SAC	265.33	Bogs	Sea cliffs Heaths	N/A	Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*
Rinns of Islay SAC	1149.7	N/A	N/A	Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*	N/A
South-East Islay Skerries SAC	1498.3	N/A	N/A	Common seal *Phoca vitulina*	N/A
Tayvallich Juniper and Coast SAC	1213.47	Scrub (matorral)	N/A	Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*	Otter *Lutra lutra*
Tarbert Woods SAC	1595.97	Forests	N/A	N/A	N/A
NORTH NORTHERN IRELAND					
Magilligan SAC	1058.22	Coastal dunes	Coastal dunes	N/A	Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* Petalwort *Petalophyllum ralfsii*
Bann Estuary SAC	347.94	Coastal dunes	Salt marshes and salt meadows Coastal dunes	N/A	N/A
Rathlin Island SAC	3344.62	Reefs Sea cliffs Sea caves	Sandbanks Vegetation of drift lines	N/A	N/A
North Antrim Coast SAC	314.59	Sea cliffs	Vegetation of drift lines Salt marshes and salt meadows Coastal dunes Grasslands	Narrow-mouthed whorl snail *Vertigo angustior*	N/A

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
EAST NORTHERN IRELAND					
Strangford Lough SAC	15398.54	Mudflats and sandflats Coastal lagoons Inlets and bays Reefs	Vegetation of drift lines Vegetation of stony banks Salt marshes and salt meadows	N/A	Common seal *Phoca vitulina*
Murlough SAC	11902.03	Coastal dunes	Sandbanks Mudflats and sandflats Salt marshes and salt meadows Coastal dunes	Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia*	Common seal *Phoca vitulina*
SOUTHWEST SCOTLAND					
Lendalfoot Hills Complex SAC	1309.71	Grassland Fens	Heaths Grasslands Bogs	N/A	N/A
Mull of Galloway SAC	136.39	Sea cliffs	N/A	N/A	N/A
Luce Bay and Sands SAC	48759.28	Inlets and bays Coastal dunes	Sandbanks Mudflats and sandflats Reefs	N/A	Great crested newt *Triturus cristatus*
Solway Firth SAC	43636.72	Sandbanks Estuaries Mudflats and sandflats Salt marshes and salt meadows	Reefs Vegetation of stony banks Coastal dunes	Sea lamprey *Petromyzon marinus* River lamprey *Lampetra fluviatilis*	N/A
NORTHWEST ENGLAND					
Drigg Coast SAC	1397.44	Estuaries Coastal dunes	Mudflats and sandflats Salt marshes and salt meadows Coastal dunes	N/A	N/A
Morecambe Bay SAC	61506.22	Estuaries Mudflats and sandflats Inlets and bays Vegetation of stony banks Salt marshes and salt meadows Coastal dunes	Sandbanks Coastal lagoons Reefs Coastal dunes	Great crested newt *Triturus cristatus*	N/A

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Shell Flat and Lune Deep dSAC	14,014	Reefs Sandbanks	N/A	N/A	N/A
Sefton Coast SAC	4563.97	Coastal dunes	Coastal dunes	Petalwort *Petalophyllum ralfsii*	Great crested newt *Triturus cristatus*
Dee Estuary cSAC	15805.07	Mudflats and sandflats Salt marshes and salt meadows	Estuaries Sea cliffs Vegetation of drift lines Coastal dunes	N/A	River lamprey *Lampetra fluviatilis* Sea lamprey *Petromyzon marinus* Petalwort *Petalophyllum ralfsii*
River Dee and Bala Lake SAC	1308.93	Running freshwater	N/A	Atlantic salmon *Salmo salar* Floating water-plantain *Luronium natans*	Sea lamprey *Petromyzon marinus* Brook lamprey *Lampetra planeri* River lamprey *Lampetra fluviatilis* Bullhead *Cottus gobio* Otter *Lutra lutra*
NORTH AND WEST WALES					
Great Orme's Head / Pen y Gogarth SAC	302.63	Heaths Grasslands	Sea cliffs	N/A	N/A
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	26482.67	Sandbanks Mudflats and sandflats Reefs	Inlets and bays Sea caves	N/A	N/A
Bae Cemlyn/Cemlyn Bay SAC	43.43	Coastal lagoons	Vegetation of stony banks	N/A	N/A
Glannau Ynys Gybi/Holy Island Coast SAC	464.27	Sea cliffs Heaths	Heaths	N/A	N/A
Glannau Môn: Cors heli/Anglesey Coast: Saltmarsh SAC	1058	Salt marshes and salt meadows	Estuaries Mudflats and sandflats	N/A	N/A
Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC	1871.03	Coastal dunes	Standing freshwater	Petalwort *Petalophyllum ralfsii* Shore dock *Rumex rupestris*	N/A
Clogwyni Pen Llyn/Seacliffs of Lleyn SAC	1048.4	Sea cliffs	N/A	N/A	N/A

Site Name	Area (ha)	Annex 1 Habitat Primary	Annex 1 Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Pen Llyn a`r Sarnau/Lleyn Peninsula and the Sarnau SAC	146023.48	Sandbanks Estuaries Coastal lagoons Inlets and bays Reefs	Mudflats and sandflats Salt marshes and salt meadows Sea caves	N/A	Bottlenose dolphin *Tursiops truncatus* Otter *Lutra lutra* Grey Seal *Halichoerus grypus*
Morfa Harlech a Morfa Dyffryn SAC	1062.57	Coastal dunes	N/A	Petalwort *Petalphyllum ralfsii*	N/A
Cardigan Bae/Bae Ceredigion SAC	95860.36	Sandbanks Reefs Sea caves	N/A	Bottlenose dolphin *Tursiops truncatus*	Sea lamprey *Petromyson marinus* River lamprey *Lampetra fluviatilis* Grey seal *Halichoerus grypus*

A3 Riverine Special Areas of Conservation

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

Table A.3 – Relevant riverine SACs designated for migratory fish and/or the freshwater pearl mussel

Site Name	Freshwater pearl mussel *Margaritifera margaritifera*	Migratory fish[1]
Endrick Water		RL, AS
River Bladnoch		AS
River Eden		SL, RL, AS
River Derwent & Bassenthwaite Lake		SL, RL, AS
River Ehen	✓	AS
Afon Gwyrfai a Llyn Cwellyn		AS
Afon Eden - Cors Goch Trawsfynydd	✓	AS

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

APPENDIX B – SCREENING TABLES FOR IDENTIFICATION OF POTENTIAL EFFECTS ON THE SITES

B1 Special Protection Areas

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
ISLAY TO KINTYRE								
Gruinart Flats, Islay	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Rinns of Islay	✓	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Bridgend Flats, Islay	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Laggan, Islay	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
The Oa	✓	-	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
NORTH NORTHERN IRELAND								
Rathlin Island	✓	-	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Sheep Island	✓	-	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected 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[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
EAST NORTHERN IRELAND								
Larne Lough	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Belfast Lough	✓	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Belfast Lough Open Water	TBC	TBC	TBC	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Outer Ards	✓	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Strangford Lough	✓	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Killough Bay	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Carlingford Lough	✓	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
SOUTHWEST SCOTLAND								
Black Cart	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected 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[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Inner Clyde Estuary	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Ailsa Craig	✓	-	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Loch of Inch and Torrs Warren	-	✓	-	✓	-	-	-	Site integrity would not be affected by emissions or discharges from routine operations. In the unlikely event of a major fuel oil spill from Block 112/13, weathered spilled fuel oil could theoretically affect the feature present (wintering geese), although mitigation would be possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Upper Solway Flats and Marshes	-	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
NORTHWEST ENGLAND								
Duddon Estuary	✓	✓	✓	✓	✓	-	-	Site integrity would not be affected by emissions or discharges from routine operations. In the unlikely event of a major fuel oil spill from Block 113/28b, weathered spilled fuel oil could theoretically affect the features present (breeding terns, wintering and passage waterbirds), although mitigation would be possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. Physical disturbance to terns is a possible issue as a block is within an area of search for tern marine SPAs.

Site name	Features present[1]			Vulnerability to effects[2]				Consideration
	Breeding	Wintering	Passage	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Morecambe Bay	✓	✓	✓	✓	✓	-	-	Site integrity would not be affected by emissions or discharges from routine operations. In the unlikely event of a major fuel oil spill from Block 113/28b, weathered spilled fuel oil could theoretically affect the features present (breeding seabirds, wintering and passage waterbirds), although mitigation would be possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known. Physical disturbance to terns is a possible issue as a block is within an area of search for tern marine SPAs.
Ribble and Alt Estuaries	✓	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Mersey Narrows and North Wirral Foreshore	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Mersey Estuary	-	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Liverpool Bay	-	✓	-	✓	-	-	-	Site integrity would not be affected by emissions or discharges from routine operations. In the unlikely event of a major fuel oil spill from Block 113/28b, weathered spilled fuel oil could theoretically affect the features present (wintering red-throated diver and scoter), although mitigation would be possible.
Dee Estuary	✓	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected 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[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
NORTH AND WEST WALES								
Traeth Lafan / Lavan Sands, Conway Bay	-	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Ynys Seiriol / Puffin Island	✓	-	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Ynys Feurig, Cemlyn Bay and The Skerries	✓	-	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Glannau Ynys Gybi / Holy Island Coast	✓	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Glannau Aberdaron and Ynys Enlli / Aberdaron Coast and Bardsey Island	✓	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal	✓	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.

Notes: 1 ✓ denotes feature present; 2 ✓ denotes vulnerability to effect, 3 including fuel (diesel) oil

B2 Special Areas of Conservation

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
FIRTH OF LORN TO ORONSAY							
Firth of Lorn, Marine	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Oronsay	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
ISLAY TO KINTYRE							
Moine Mhor	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Glac na Criche	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Rinns of Islay	-	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
South-East Islay Skerries	-	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills. While the species feature (common seal) may forage at considerable distances from the site boundaries, noise associated with seismic activities would not propagate into the primary areas of marine usage; effects on site integrity are highly unlikely.
Tayvallich Juniper and Coast	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Tarbert Woods	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
NORTH NORTHERN IRELAND							
Magilligan	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Bann Estuary	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Rathlin Island	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
North Antrim Coast	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
EAST NORTHERN IRELAND							
Strangford Lough	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (common seal) when beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the eastern and central Irish Sea (offshore wind) and Strangford Narrows (tidal) areas; however, mitigation is possible. Such 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	
Murlough	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (common seal) when beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
SOUTHWEST SCOTLAND							
Lendalfoot Hills Complex	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Mull of Galloway	✓	-	-	-	-	-	Due to nature of feature present (sea cliffs), site integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Luce Bay and Sands	✓	✓	✓	✓	-	-	Despite partial site-block overlap, site integrity would not be affected by physical disturbance due to mitigation. In the unlikely event of a major fuel oil spill from Block 112/13 or 112/14, weathered spilled oil could theoretically affect several habitat features, although mitigation would be possible. Such 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	
Solway Firth	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected 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 (migratory fish), although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the Solway Firth, Wigtown Bay and the wider eastern and central Irish Sea (offshore wind); however, mitigation is possible and would be defined by subsequent Habitats Regulations Assessment once project plans are known.
NORTHWEST ENGLAND							
Drigg Coast	✓	-	✓	-	-	-	Site integrity would not be affected by emissions or discharges from routine operations. In the unlikely event of a major fuel oil spill from Block 113/28b, weathered spilled fuel oil could theoretically affect several habitat features, although mitigation would be possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Morecambe Bay	✓	✓	✓	-	-	-	Site integrity would not be affected by emissions or discharges from routine operations. In the unlikely event of a major fuel oil spill from Block 113/28b, weathered spilled fuel oil could theoretically affect several habitat features, although mitigation would be possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Shell Flat and Lune Deep	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Sefton Coast	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Dee Estuary / Aber Dyfrdwy	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected 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 (migratory fish), although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
River Dee and Bala Lake	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to several species features (migratory fish) beyond the site boundary, although effects on site integrity are unlikely. It is noted that this site could potentially be influenced by renewable energy developments in the eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
NORTH AND WEST WALES							
Great Orme's Head / Pen y Gogarth	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Bae Cemlyn / Cemlyn Bay	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Glannau Ynys Gybi / Holy Island Coast	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Y Twyni o Abermenai i Aberffraw / Abermenai to Aberffraw Dunes	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Clogwyni Pen Llyn / Seacliffs of Lleyn	✓	-	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Pen Llyn a`r Sarnau / Lleyn Peninsula and the Sarnau	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected 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 (bottlenose dolphin, grey seal, otter) beyond the site boundary. It is noted that this site could potentially be influenced by renewable energy developments in the eastern and central Irish Sea (offshore wind).
Morfa Harlech a Morfa Dyffryn	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Cardigan Bay/Bae Ceredigion	✓	✓	-	-	✓	✓	Site is remote from blocks and its integrity would not be affected 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 (bottlenose dolphin, grey seal) beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such 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 fuel (diesel) oil

B3 Riverine Special Areas of Conservation

Site name	Features present[1]		Effects[2]				Consideration
	Habitats	Species	Oil spills[3]	Physical Disturbance	Acoustic Disturbance	In-combination	
Endrick Water	-	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
River Bladnoch	-	✓	-	-	✓	✓	Due to nature of feature present (Atlantic salmon), site integrity would not be affected by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (Atlantic salmon) beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the Solway Firth, Wigtown Bay and the wider eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
River Eden	✓	✓	-	-	✓	✓	Due to nature of features present (migratory fish), site integrity would not be affected 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 (migratory fish) beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the Solway Firth, Wigtown Bay and the wider eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such 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	
River Derwent & Bassenthwaite Lake	✓	✓	-	-	✓	✓	Due to nature of features present (migratory fish), site integrity would not be affected 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 (migratory fish) beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the Solway Firth, Wigtown Bay and the wider eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
River Ehen	-	✓	-	-	✓	✓	Due to nature of feature present (Atlantic salmon), site integrity would not be affected by emissions or discharges from routine operations or accidental spills. Certain activities (i.e. seismic survey) may cause temporary acoustic disturbance to the species feature (Atlantic salmon) beyond the site boundary, although mitigation is possible. It is noted that this site could potentially be influenced by renewable energy developments in the Solway Firth, Wigtown Bay and the wider eastern and central Irish Sea (offshore wind); however, mitigation is possible. Such mitigation measures would be defined by subsequent Habitats Regulations Assessment once project plans are known.
Afon Gwyrfai a Llyn Cwellyn	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.
Afon Eden - Cors Goch Trawsfynydd	✓	✓	-	-	-	-	Site is remote from blocks and its integrity would not be affected by emissions or discharges from routine operations or accidental spills.

Notes: 1 ✓ denotes feature present; [2] ✓ denotes vulnerability to effect; [3] including fuel (diesel) oil

APPENDIX C – DETAILED INFORMATION ON NATURA 2000 SITES WHERE THE POTENTIAL FOR EFFECTS HAVE BEEN IDENTIFIED

C1 Coastal and marine Special Protection Areas

The following tables provide detailed information of the relevant sites, including full listing of their qualifying features. For Scottish and Welsh sites where available, information is provided on the assessed condition of the qualifying features, as stated on the SNH sitelink website and provided by CCW.

Site Name: Loch of Inch and Torrs Warren SPA	
Location	Grid Ref: NX154534 (central point) Latitude 54°50'30"N Longitude 04°52'30"W
Area (ha)	2111.04
Summary	The site is located on the south coast of Galloway in southwest Scotland. It comprises two separate areas: a large eutrophic freshwater loch (Loch of Inch) and an area of foreshore and sand dunes (Torrs Warren). The latter system contains important examples of dune slacks. Both components of the site support, in winter, important numbers of Greenland white-fronted goose and wintering hen harrier.
Qualifying features for which the site is designated [condition]:	
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:** Greenland white-fronted goose *Anser albifrons flavirostris,* 534 individuals representing up to 3.8% of the wintering population in Great Britain (5 year peak mean, 1991/2-1995/6) [favourable: maintained] Hen harrier *Circus cyaneus*, 8 individuals representing up to 1.1% of the wintering population in Great Britain (5 year peak mean 1991/2-1995/6)	
Conservation objectives:	
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 to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within 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	

Site Name: Duddon Estuary SPA	
Location	Grid Ref: SD180765 (central point) Latitude 54º10'39"N Longitude 03º15'24"W
Area (ha)	6806.3
Summary	The Duddon Estuary is located northwest of Morecambe Bay on the coast of Cumbria. It is formed where the River Duddon and the smaller Kirkby Pool opens into the Irish Sea. It is a complex site, mostly consisting of intertidal sand and mud-flats (containing abundant invertebrates), important for large numbers of wintering and passage waterbirds. Several settlements and industrial areas exist on the periphery of the site. Artificial habitats include slag banks and a flooded iron-ore working (Hodbarrow Lagoon) forms the largest coastal lagoon in northwest England. Saltmarshes, sand dunes and Hodbarrow Lagoon act as important high-tide roosts for terns and wintering waders and wildfowl. High-tide roosts are also found outside the site boundary on the landward side. The site is also of importance for breeding terns which nest in dune areas and slag banks, and feed in the shallow waters of the estuary and surrounding waters.

Qualifying features for which the site is designated [condition]:

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:
Sandwich tern *Sterna sandvicensis*, 210 pairs representing at least 1.5% of the breeding population in Great Britain (5 year mean, 1988-1992)

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 *Charadrius hiaticula*, 628 individuals representing at least 1.3% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Sanderling *Calidris alba*, 1,055 individuals representing at least 1.1% of the Eastern Atlantic/Western & Southern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Over winter:
Knot *Calidris canutus*, 4,495 individuals representing at least 1.3% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Pintail *Anas acuta*, 1,636 individuals representing at least 2.7% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Redshank *Tringa totanus*, 2,289 individuals representing at least 1.5% of the wintering Eastern Atlantic - 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 78,415 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: curlew *Numenius arquata*, dunlin *Calidris alpina alpina*, sanderling *Calidris alba*, oystercatcher *Haematopus ostralegus*, red-breasted merganser *Mergus serrator*, shelduck *Tadorna tadorna*, redshank *Tringa totanus*, knot *Calidris canutus*, pintail *Anas acuta*.

Conservation objectives:

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 to ensure for the qualifying species that the following are maintained in the long term:

Site Name: Duddon Estuary SPA
• Population of the species as a viable component of the site • Distribution of the species within 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

Site Name: Morecambe Bay SPA	
Location	Grid Ref: SD375700 (central point) Latitude 54º07'19"N Longitude 02º57'21"W
Area (ha)	37404.6
Summary	Morecambe Bay is located on the Irish Sea coast of northwest England. It is one of the largest estuarine systems in the UK and is fed by five main river channels (the Leven, Kent, Keer, Lune and Wyre) which drain through the intertidal flats of sand and mud. Mussel beds and banks of shingle are present, and locally there are stony outcrops. The whole system is dynamic, with shifting channels and phases of erosion and accretion affecting the estuarine deposits and surrounding saltmarshes. The flats contain an abundant invertebrate fauna that supports many of the waterbirds using the bay. The capacity of the bay to support large numbers of birds derives from these rich intertidal food sources together with adjacent freshwater wetlands, fringing saltmarshes and saline lagoons, as well as dock structures and shingle banks that provide secure roosts at high tide. The site is of European importance throughout the year for a wide range of bird species. In summer, areas of shingle and sand hold breeding populations of terns, whilst very large numbers of geese, ducks and waders not only overwinter, but (especially for waders) also use the site in spring and autumn migration periods. The bay is of particular importance during migration periods for waders moving up the west coast of Britain.
Qualifying features for which the site is designated [condition]:	

Site Name: Morecambe Bay SPA

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 *Sterna albifrons*, 26 pairs representing at least 1.1% of the breeding population in Great Britain (Count, as at 1994)

Sandwich tern *Sterna sandvicensis*, 290 pairs representing at least 2.1% of the breeding population in Great Britain (5 year peak mean for 1992 to 1996)

Over winter:
Bar-tailed godwit *Limosa lapponica*, 2,611 individuals representing at least 4.9% of the wintering population in Great Britain (5 year peak mean for 1991/92 to 1995/96)

Golden plover *Pluvialis apricaria*, 4,097 individuals representing at least 1.6% of the wintering population in Great Britain (5 year mean for 1991/92 to 1995/96)

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:
Herring gull *Larus argentatus*, 11,000 pairs representing at least 1.2% of the breeding Northwestern Europe (breeding) and Iceland/Western Europe - breeding population (5 year mean 1992 to 1996)

Lesser black-backed gull *Larus fuscus*, 22,000 pairs representing at least 17.7% of the breeding Western Europe/Mediterranean/Western Africa population (5 year mean 1992 to 1996)

On passage:
Ringed plover *Charadrius hiaticula*, 693 individuals representing at least 1.4% of the Europe/Northern Africa - wintering population (5 year peak mean for 1991/92 to 1995/96)

Sanderling *Calidris alba*, 2,466 individuals representing at least 2.5% of the Eastern Atlantic/Western & Southern Africa - wintering population (Count as at May 1995)

Over winter:
Curlew *Numenius arquata*, 13,620 individuals representing at least 3.9% of the wintering Europe - breeding population (5 year peak mean for 1991/92 to 1995/96)

Dunlin *Calidris alpina alpina*, 52,671 individuals representing at least 3.8% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean for 1991/92 to 1995/96)

Grey plover *Pluvialis squatarola*, 1,813 individuals representing at least 1.2% of the wintering Eastern Atlantic - wintering population (5 year peak mean for 1991/92 to 1995/96)

Knot *Calidris canutus*, 29,426 individuals representing at least 8.4% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96)

Oystercatcher *Haematopus ostralegus*, 47,572 individuals representing at least 5.3% of the wintering Europe & Northern/Western Africa population (5 year peak mean for 1991/92 to 1995/96)

Pink-footed goose *Anser brachyrhynchus*, 2,475 individuals representing at least 1.1% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean for 1991/92 to 1995/96)

Pintail *Anas acuta*, 2,804 individuals representing at least 4.7% of the wintering Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96)

Redshank *Tringa totanus*, 6,336 individuals representing at least 4.2% of the wintering Eastern

Site Name: Morecambe Bay SPA
Atlantic - wintering population (5 year peak mean for 1989/90 to 1993/94) Shelduck *Tadorna tadorna*, 6,372 individuals representing at least 2.1% of the wintering Northwestern Europe population (5 year peak mean for 1991/92 to 1995/96) Turnstone *Arenaria interpres*, 1,583 individuals representing at least 2.3% of the wintering Western Palearctic - wintering population (5 year peak mean for 1991/92 to 1995/96) ***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.*** During the breeding season, the area regularly supports 61,858 individual seabirds (5 year peak mean for 1991/92 to 1995/96) including: herring gull *Larus argentatus*, lesser black-backed gull *Larus fuscus*, little tern *Sterna albifrons*, sandwich tern *Sterna sandvicensis*. ***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 210,668 individual waterfowl (5 year peak mean for 1991/92 to 1995/96) including: great crested grebe *Podiceps cristatus*, bar-tailed godwit *Limosa lapponica*, pink-footed goose *Anser brachyrhynchus*, shelduck *Tadorna tadorna*, pintail *Anas acuta*, oystercatcher *Haematopus ostralegus*, grey plover *Pluvialis squatarola*, knot *Calidris canutus*, dunlin *Calidris alpina alpina*, curlew *Numenius arquata*, golden plover *Pluvialis apricaria*, turnstone *Arenaria interpres*, black-tailed godwit *Limosa limosa islandica*, cormorant *Phalacrocorax carbo*, wigeon *Anas penelope*, teal *Anas crecca*, mallard *Anas platyrhynchos*, eider *Somateria mollissima*, goldeneye *Bucephala clangula*, red-breasted merganser *Mergus serrator*, ringed plover *Charadrius hiaticula*, lapwing *Vanellus vanellus*, sanderling *Calidris alba*, redshank *Tringa totanus*, whimbrel *Numenius phaeopus*.
Conservation objectives:
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 to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within 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

Site Name: Liverpool Bay pSPA	
Location	Grid Ref: TBC Latitude TBC Longitude TBC
Area (ha)	197504.24
Summary	While final site boundaries are still to be confirmed, the current extent of the Liverpool Bay pSPA extends from the coast to approximately 10-25km offshore from the southern end of Morecambe Bay to the east coast of Anglesey (see Figure A1). Analyses of aerial survey data by Webb *et al*. (2004) revealed Liverpool Bay to host populations of red-throated diver and common scoter in numbers exceeding thresholds to qualify for SPA status. The relatively shallow waters of this area provide important foraging grounds for these two species outside of the breeding season; the highest densities of birds have been recorded in water depths of 10m or less.
Qualifying features for which the site is designated [condition]:	
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 *Gavia stellata* ***Under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:*** ***Over winter:*** Common scoter *Melanitta nigra*	
Conservation objectives:	
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 to ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within 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	

C2 Coastal and marine Special Areas of Conservation

Site Name: Strangford Lough SAC	
Location	Grid Ref: J559577 (central point) Latitude 54º 26'40"N Longitude 05º 35'40"W
Area (ha)	15398.54
Summary	Strangford Lough, on the east coast of Northern Ireland, is an outstanding example of a large, enclosed fjardic sea lough. Sea water enters the Lough through a narrow entrance, expanding into a broad, mostly shallow basin that has a central deep channel (30-60m deep), which carries rapid currents and causes great turbulence in some parts, particularly the Narrows. With a wide range of tidal stream strengths and depths, there is a remarkable marine fauna within Strangford Lough and it is one of the most diverse sea loughs in the UK. The communities present range from the very rich high-energy communities near the mouth, which depend on rapid tidal streams, to communities in extreme shelter where fine muds support burrowing brittlestars, prawns *Nephrops norvegicus*, and a rich community associated with horse mussel reefs. Varied saltmarsh habitats fringe the intertidal areas. The Lough supports one of the most important breeding populations of common seal in Ireland; North Boretree Rock, at the north of the Lough, supports one of the largest colonies while many of the low-lying rocky islands and reefs are regularly used as hauling sites.
Qualifying features for which the site is designated [condition]:	

Site Name: Strangford Lough SAC
Annex 1 Habitat Primary feature: Mudflats and sandflats not covered by seawater at low tide, coastal lagoons, large shallow inlets and bays, reefs Secondary features: Annual vegetation of drift lines, perennial vegetation of stony banks, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) **Annex 2 Species** Primary features: None Secondary features: Common seal *Phoca vitulina*
Conservation objectives:
For Annex I Habitats 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: • 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
For Annex II Species 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

Site Name: Murlough SAC	
Location	Grid Ref: J445313 (central point) Latitude 54º 12'40"N Longitude 05º 47'00"W
Area (ha)	11902.03
Summary	One of the most diverse and natural dune systems in Northern Ireland. The site is an ancient system with acidic sands and a long history of traditional management. A complex mosaic of different communities, some of which are very species-rich, covers the 'grey dunes'. These 'grey dunes' form part of a well-developed natural succession from embryonic shifting dunes and shifting dunes along the shoreline on the seaward side, to areas of dune heath and gorse scrub on the landward side. A variety of important intertidal habitats are present, and also subtidal sanbanks within the marine area of the site. The site holds one of the largest populations of marsh fritillary in Northern Ireland, with a number of sub-populations present; this population is long-established and well-studied. Common seals are also regularly present; they haul-out at several sites within the bay to rest and moult, and forage in the marine areas of the SAC and beyond the site boundaries.

Qualifying features for which the site is designated [condition]:

Annex 1 Habitat
Primary features: Fixed dunes with herbaceous vegetation ('grey dunes'), Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
Secondary features: Sandbanks which are slightly covered by seawater all the time, mudflats and sandflats not covered by seawater at low tide, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), embryonic shifting dunes, shifting dunes along the shoreline with *Ammophilia arenaira* ('white dunes'), dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)

Annex 2 Species
Primary features: Marsh fritillary butterfly *Euphydryas* (*Eurodryas, Hypodryas*) *aurinia*
Secondary features: Common seal *Phoca vitulina*

Conservation objectives:

For Annex I Habitats
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:

- 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

For Annex II Species
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

Site Name: Luce Bay and Sands SAC	
Location	Grid Ref: NX223434 (central point) Latitude 54º 45'00"N Longitude 04º 45'00"W
Area (ha)	48759.28
Summary	Luce Bay and Sands represents a high-quality large shallow inlet and bay. The sediments within the bay range from mixed-sized boulders, deep sediments and highly mobile fringing sands, all of which support rich plant and animal communities typical of a large embayment in southwest Scotland. Water depths in Luce Bay are shallow, ranging from 0-10m fringing the coastline and at the head of the bay. Shallow depths extend further out into the bay where the major sandbanks are located along the western and northern shores. Most of the intertidal area of the bay comprises small boulders, often resting on sediment. Some larger boulders on the lower shores have spaces beneath and between them which provide shelter for false Irish moss and permit rich under-boulder communities to develop, including ascidians, sponges and crustose coralline algae. In the subtidal area mixed boulders and sediment harbour a shallow-water community of sparse kelp and sea-oak, red algae and the dahlia anemone, typical of sand-influenced hard substrata. Much of the central part of Luce Bay consists of slightly deeper-water sediments that support a rich community of invertebrates. At Mull of Galloway in the west and Scare Rocks near the seaward boundary of the bay, tide-swept rocky reefs support *L. hyperborea* on shallow sublittoral rocks and very rich sponge- and hydroid-dominated communities below 10m. There are a range of dune types present, including large areas of shifting and fixed dunes, which provide considerable diversity and complexity along with associated dune slack, fen and heath habitats.
Qualifying features for which the site is designated [condition]:	

Site Name: Luce Bay and Sands SAC

Annex 1 Habitat

Primary feature: Large shallow inlets and bays, embryonic shifting dunes [favourable: maintained], shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') [favourable: maintained], fixed dunes with herbaceous vegetation ('grey dunes') [unfavourable: declining], Atlantic decalcified dunes (*Calluno-Ulicetea*) [unfavourable: declining]

Secondary features: Sandbanks which are slightly covered by seawater all the time, mudflats and sandflats not covered by seawater at low tide, reefs

Annex 2 Species

Primary features: None

Secondary features: Great crested newt *Triturus cristatus* [favourable: maintained]

Conservation objectives:

For Annex I Habitats

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:

- 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

For Annex II Species

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

Site Name: Solway Firth SAC	
Location	Grid Ref: NY144648 (central point) Latitude 54º 58'15"N Longitude 03º 20'12"W
Area (ha)	43636.72
Summary	The Solway is a large, complex estuary on the west coast of Britain. It is one of the least-industrialised and most natural large estuaries in Europe. The sublittoral sandbanks present comprise mainly gravelly and clean sands, owing in part to the very dynamic nature of the estuary with mobile channels and banks. It contains the third-largest area of continuous littoral mudflats and sandflats in the UK. These occur within a natural estuary system substantially unaffected by activities such as industrial development and dredging. Benthic diversity is greatest in areas where less extreme conditions occur and substrates are more varied, typically within the outer estuary. Important pioneering saltmarsh habitats are present, as are large areas of upper marsh and transitions to freshwater grassland communities. The estuary acts as a migratory pathway for sea and river lamprey which spawn in a number of rivers upstream.

Qualifying features for which the site is designated [condition]:

Annex 1 Habitat
Primary features: Sandbanks which are slightly covered by seawater all the time [favourable: maintained], estuaries, mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand [favourable: maintained], Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [unfavourable: no change]
Secondary features: Reefs, perennial vegetation of stony banks [favourable: maintained], fixed dunes with herbaceous vegetation ('grey dunes') [unfavourable: declining]

Annex 2 Species
Primary features: Sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*
Secondary features: None

Conservation objectives:

For Annex I Habitats
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:

- 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

For Annex II Species
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

Site Name: Drigg Coast SAC	
Location	Grid Ref: SD071960 (central point) Latitude 54º 21'02"N Longitude 03º 25'47"W
Area (ha)	1397.44
Summary	Drigg is an example of a small, bar-built estuary on the northwest coast of England. It is fed by three rivers (the Irt, Mite and Esk) which discharge through a mouth that has been narrowed by large sand and shingle spits. Sediments within the estuary are largely muddy within the Rivers Irt and Mite, while those of the Esk are more sandy, particularly towards the mouth. There is a substantial freshwater influence in the upper reaches of all three rivers, with good development of associated animal communities. Within the site are some of the least-disturbed transitions to terrestrial habitats of any estuary found in the UK. There are substantial areas of Atlantic decalcified dunes, showing a wide range of ecological variation, along with several other dune types present.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary features: Estuaries, Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), dunes with *Salix repens* spp. *argentea* (*Salicion arenariae*) Secondary features: Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaira* ('white dunes'), fixed dunes with herbaceous vegetation ('grey dunes'), humid dune slacks **Annex 2 Species** Primary features: None Secondary features: None	
Conservation objectives:	
For Annex I Habitats 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: • 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	

Site Name: Morecambe Bay SAC	
Location	Grid Ref: SD371697 (central point) Latitude 54º 07'09"N Longitude 02º 57'42"W
Area (ha)	61506.22
Summary	Morecambe Bay, in northwest England, is the confluence of four principal estuaries, the Leven, Kent, Lune and Wyre (the latter lies just outside the site boundary), together with other smaller examples such as the Keer. Collectively, these form the largest single area of continuous intertidal mudflats and sandflats in the UK and the best example of muddy sandflats on the west coast. The estuaries are macro-tidal with a spring tidal range of 9m. The significant tidal prisms of the estuaries result in the Bay being riven by large low-water channel systems. The Kent, Leven and Lune estuaries have been modified variously by railway embankments, flood embankments and training walls but support extensive intertidal areas. Although coarser sediment accumulations occur at their mouths, the estuaries consist predominantly of fine sands and muddy sands. The estuaries support dense invertebrate communities, their composition reflecting the salinity and sediment regimes within each estuary. Extensive saltmarshes and glasswort beds are present in the Lune estuary, contrasting with the fringing saltmarshes and more open intertidal flats of the Leven and Kent estuaries. Most of the saltmarshes are grazed, a characteristic feature of northwest England. In the upper levels of the saltmarshes there are still important transitions from saltmarsh to freshwater and grassland vegetation. Water quality is generally good.
Qualifying features for which the site is designated [condition]:	

Site Name: Morecambe Bay SAC
Annex 1 Habitat Primary features: Estuaries, mudflats and sandflats not covered by seawater at low tide, large shallow inlets and bays, perennial vegetation of stony banks, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), shifting dunes along the shoreline with *Ammophila arenaira* ('white dunes'), fixed dunes with herbaceous vegetation ('grey dunes'), humid dune slacks Secondary features: Sandbanks which are slightly covered by sea water all the time, coastal lagoons, reefs, embryonic shifting dunes, Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), dunes with *Salix repens* spp. *argentea* (*Salicion arenariae*) **Annex 2 Species** Primary features: Great crested newt *Triturus cristatus* Secondary features: None
Conservation objectives:
For Annex I Habitats 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: • 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
For Annex II Species 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

Site Name: Dee Estuary/Aber Dyfrdwy SCI	
Location	Grid Ref: SJ191819 (central point) Latitude 53º19'39"N Longitude 03º12'53"W
Area (ha)	15805.07
Summary	Located in on the England/north Wales border, the Dee Estuary contains important pioneer glasswort saltmarsh habitat, along with extensive Atlantic salt meadows and intertidal mud and sand flats. A variety of dune habitats are also present, along with areas of sea cliffs. The estuary acts as a migratory pathway for sea and river lamprey which spawn in rivers upstream.

Qualifying features for which the site is designated [condition]:

Annex 1 Habitat
Primary features: Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
Secondary features: Estuaries, annual vegetation of drift lines, vegetated sea cliffs of the Atlantic and Baltic coasts, embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaira* ('white dunes'), fixed dunes with herbaceous vegetation ('grey dunes'), humid dune slacks

Annex 2 Species
Primary features: None
Secondary features: Sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, petalwort *Petalophyllum ralfsii*

Conservation objectives:

For Annex I Habitats
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:

- 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

For Annex II Species
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

Site Name: River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC	
Location	Grid Ref: SJ423503 (central point) Latitude 53º02'50"N Longitude 02º51'40"W
Area (ha)	1308.93
Summary	This watercourse lies along the England/Wales border, extending inland from its tidal reaches abutting the Dee Estuary SAC. It contains important populations of a number of migratory fish species.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary features: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [unfavourable: unclassified] Secondary features: None **Annex 2 Species** Primary features: Atlantic salmon *Salmo salar* [unfavourable: unclassified], floating water-plantain *Luronium natans* Secondary features: Sea lamprey *Petromyzon marinus* [unfavourable: unclassified], brook lamprey *Lampetra planeri* [unfavourable: unclassified], river lamprey *Lampetra fluviatilis* [unfavourable: unclassified], bullhead *Cottus gobio* [unfavourable: unclassified], otter *Lutra lutra* [favourable: unclassified]	
Conservation objectives:	
For Annex I Habitats 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: • 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	
For Annex II Species 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	

Site Name: Lleyn Peninsula and the Sarnau/Pen Llyn a'r Sarnau SAC	
Location	Grid Ref: SH401130 (central point) Latitude 52º41'39"N Longitude 04º21'59"W
Area (ha)	146023.48
Summary	Lleyn Peninsula SAC lies in the north of Cardigan Bay, and incorporates a large area of coastal and marine environment. It is designated for a variety of coastal, intertidal and subtidal habitats, along with dolphins, seals and otters as secondary species features.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary feature: Sandbanks which are slightly covered by sea water all the time [favourable: maintained], estuaries [favourable: maintained], coastal lagoons [favourable: maintained], large shallow inlets and bays [favourable: maintained], reefs [unfavourable: no change] Secondary features: Mudflats and sandflats not covered by seawater at low tide [unfavourable:declining], *Salicornia* and other annuals colonising mud and sand [favourable: unclassified], Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [unfavourable unclassified], submerged or partially submerged sea caves [favourable: maintained] **Annex 2 Species** Primary features: None Secondary features: Bottlenose dolphin *Tursiops truncatus* [favourable: maintained], otter *Lutra lutra* [favourable: unclassified], grey seal *Halichoerus grypus* [favourable: maintained]	
Conservation objectives:	
For Annex I Habitats 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: • 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	
For Annex II Species 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	

Site Name: Cardigan Bay/Bae Ceredigion SAC	
Location	Grid Ref: SN214641 (central point) Latitude 52º14'47"N Longitude 04º37'02"W
Area (ha)	95860.36
Summary	Cardigan Bay SAC lies in the southern half of Cardigan Bay, and covers a coastal/marine area extending several kilometres offshore. These waters support important numbers of bottlenose dolphin, in addition to grey seals and lamprey. Several important subtidal habitats are present.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary feature: None Secondary features: Sandbanks which are slightly covered by sea water all the time, reefs, submerged or partially submerged sea caves [favourable: maintained] **Annex 2 Species** Primary features: Bottlenose dolphin *Tursiops truncatus* [favourable: maintained] Secondary features: Sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, grey seal *Halichoerus grypus* [favourable: maintained]	
Conservation objectives:	
For Annex I Habitats 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: • 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	
For Annex II Species 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	

C3 Riverine Special Areas of Conservation

Site Name: River Bladnoch SAC	
Location	Grid Ref: NX347604 (central point) Latitude 54º54'30"N Longitude 04º35'00"W
Area (ha)	300.02
Summary	The River Bladnoch supports a high quality salmon population in southwest Scotland which, unusually for rivers in this area, still supports a spring run of salmon. The river drains a moderate-sized catchment with both upland and lowland areas, and this variety is reflected in the river's ecological and water quality characteristics. Whilst there are problems in the river's headwaters arising from acidification, national and local initiatives are both reducing and ameliorating the worst effects of this pollution source.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary features: None Secondary features: None **Annex 2 Species** Primary features: Atlantic salmon *Salmo salar* [unfavourable: recovering] Secondary features: None	
Conservation objectives:	
For Annex II Species 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	

Site Name: River Eden SAC	
Location	Grid Ref: NY462237 (central point) Latitude 54º36'19"N Longitude 02º49'58"W
Area (ha)	2463.23
Summary	The River Eden, in northwest England, supports important population of migratory fish. Large and healthy populations of sea and river lamprey are supported in the middle to lower regions of the river and widely within the catchment respectively. The Eden also represents one of the largest populations of Atlantic salmon in northern England; influenced by both the high ecological value of the river system and the fact that the salmon are able to use most of the catchment (even above Ullswater, a large natural lake on the main river).

Qualifying features for which the site is designated [condition]:

Annex 1 Habitat
Primary features: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*, water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, alluvial forests with *ALnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
Secondary features: None

Annex 2 Species
Primary features: White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*, sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, Atlantic salmon *Salmo salar*, bullhead *Cottus gobio*, otter *Lutra lutra*
Secondary features: None

Conservation objectives:

For Annex I Habitats
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:

- 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

For Annex II Species
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

Site Name: River Derwent and Bassenthwaite Lake SAC	
Location	Grid Ref: NY262207 (central point) Latitude 54º34'35"N Longitude 03º08'32"W
Area (ha)	1832.96
Summary	The River Derwent, in northwest England, supports important population of migratory fish. A large population of sea lamprey is supported in the middle to lower regions, while an important population of river lamprey is supported by a good presence of both spawning and nursery habitats. With good water quality and extensive gravel shoals, the Derwent also supports a large population of Atlantic salmon.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary features: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* Secondary features: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation **Annex 2 Species** Primary features: Marsh fritillary butterfly *Euphydryas* (*Eurodryas, Hypodryas*) *aurinia*, sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, Atlantic salmon *Salmo salar*, otter *Lutra lutra,* floating water-plantain *Luronium natans* Secondary features: None	
Conservation objectives:	
For Annex I Habitats 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: • 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	
For Annex II Species 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	

Site Name: River Ehen SAC	
Location	Grid Ref: NY031144 (central point) Latitude 54º30'55"N Longitude 03º29'51"W
Area (ha)	24.39
Summary	The River Ehen supports the largest freshwater pearl mussel population in England. Exceptionally high densities (greater than 100 per m^2) are found at some locations, with population estimates for the entire river exceeding 100,000. The conservation importance of the site is further enhanced by the presence of juvenile pearl mussels, indicating recruitment since 1990. Atlantic salmon are also present.
Qualifying features for which the site is designated [condition]:	
Annex 1 Habitat Primary features: None Secondary features: None **Annex 2 Species** Primary features: Freshwater pearl mussel *Margaritifera margaritifera* Secondary features: Atlantic salmon *Salmo salar*	
Conservation objectives:	
For Annex II Species 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	