Department for Business, Energy & Industrial Strategy

OFFSHORE OIL & GAS LICENSING 30TH SEAWARD ROUND

Habitats Regulations Assessment

Stage 1 – Block and Site Screenings

February 2018

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Contents

1 Introduction

1.1 Background and overview of plan

The plan/programme covering this and future seaward licensing rounds has been subject to a Strategic Environmental Assessment (OESEA3), completed in July 2016. The SEA Environmental Report includes detailed consideration of the status of the natural environment and potential effects of the range of activities which could follow licensing, including potential effects on conservation sites. The SEA Environmental Report was subject to an 8 week public consultation period following which a post-consultation report was produced. The post-consultation report summarises the comments received and provides further clarifications which has enabled the decision to adopt the plan/programme. This decision has allowed the Oil & Gas Authority (OGA) to progress with further seaward oil and gas licensing rounds. The OGA is offering 821 Blocks for licensing as part of a 30th Seaward Licensing Round covering mature areas of the UK continental shelf (UKCS).

The exclusive rights to search and bore for petroleum in Great Britain, the territorial sea adjacent to the United Kingdom and on the UKCS are vested in the Crown and the *Petroleum Act 1998* (as amended) gives the OGA the power to grant licences to explore for and exploit these resources. Offshore licensing for oil and gas exploration and production commenced in 1964 and has progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence grants exclusive rights to the holders "to search and bore for, and get, petroleum" in the area covered by the Licence but does not constitute any form of approval for activities to take place in the Blocks, nor does it confer any exemption from other legal or regulatory requirements. Offshore activities are subject to a range of statutory permitting and consenting requirements, including, where relevant, activity specific Appropriate Assessment (AA) under Article 6(3) of the Habitats Directive (Directive 92/43/EC).

The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended) (OPAR 2001) implement the requirements of Articles 6(3) and 6(4) of the Habitats Directive with respect to oil and gas activities in UK territorial waters and on the UK Continental Shelf. The *Conservation of Offshore Marine Habitats and Species Regulations 2017* cover other relevant activities in offshore waters (i.e. excluding territorial waters). Within territorial waters, the Habitats Directive is transposed into UK law via the *Conservation of Habitats and Species Regulations 2017* in England and Wales, the *Conservation (Natural Habitats, &c.) Regulations 1994* in Scotland (for non-reserved matters), and the *Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995* (as amended) in Northern Ireland.

1.2 Purpose

As the petroleum licensing aspects of the plan/programme are not directly connected with or necessary for nature conservation management of European (Natura 2000) sites, to comply with its obligations under the relevant regulations, the Department for Business, Energy and Industrial Strategy (BEIS, formerly the Department of Energy and Climate Change) is undertaking a Habitats Regulations Assessment (HRA)[1].

In this HRA, the Department has applied the Habitats Directive test[2] (elucidated by the European Court of Justice in the case of Waddenzee (Case C-127/02)[3]) which is:

> *…any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives 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 a 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.*

1.3 Approach to screening

This screening assessment is the first stage of the HRA to determine whether licensing of any of the Blocks offered in the 30th Round may have a significant effect on a relevant site, either individually or in combination[4] with other plans or projects. The screening assessment has been undertaken in accordance with the European Commission Guidance (EC 2000) and with reference to other guidance and reports, including the Habitats Regulations Guidance Notes (English Nature 1997, Defra 2012, SEERAD 2000), SNH (2015), the National Planning Policy

[1] Note that while certain licensing and related regulatory functions were passed to the OGA (a government company wholly owned by the Secretary of State for BEIS) on 1 October 2016, environmental regulatory functions are retained by BEIS, and are administered by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).
[2] See Article 6(3) of the Habitats Directive.
[3] Also see the Advocate General's Opinion in the recent 'Sweetman' case (Case C-258/11), which confirms those principles set out in the Waddenzee judgement.
[4] Note that "in-combination" and "cumulative" effects have similar meanings, but for the purposes of HRA, and in keeping with the wording of Article 6(3) of the Habitats Directive, "in-combination" is used to describe the potential for such effects throughout. More information on the definitions of "cumulative" and "in-combination" effects are available in MMO (2014a) and Judd *et al.* (2015).

Framework (DCLG 2012[5]), English Nature report, No. 704 (Hoskin & Tyldesley 2006) and Natural England report NECR205 (Chapman & Tyldesley 2016).

The approach taken to screening has been to identify all relevant European sites with the potential to be affected by exploration/appraisal activities that could follow licensing (i.e. those sites with marine qualifying features or with a marine ecological linkage such as anadromous and catadromous fish) (see Section 3). These sites are screened for the likelihood of significant effects based on the nature and scale of potential activities (as outlined in Section 2). Consideration is also given as appropriate to the site specific advice on operations. Those Blocks which are screened in will be subject to a second stage of HRA, Appropriate Assessment if applied for and before licensing decisions are taken. It should be noted that even when a licensing decision has been taken, any activities that may follow licensing will be subject to activity specific assessment and where necessary, an HRA.

This screening assessment report is organised as follows:

- Overview of the plan, including a list and map of the Blocks offered, summary of the licensing process and nature of the activities that could follow (see Section 2)
- Identification of all European sites potentially affected, together with their various interest features (Section 3 and Appendix A)
- Description of the screening assessment process used to identify likely significant effects on relevant European sites (Section 4)
- The screening assessment including a consideration of in-combination effects (Section 5)
- Summary of conclusions including list of Blocks from which likely significant effects on relevant European sites could not be discounted at the screening stage and for which further assessment (Appropriate Assessment) is required before licensing decisions are made (Section 6 and Appendix B)

As part of this process, BEIS has consulted with the Joint Nature Conservation Committee (JNCC), Natural England, Scottish Natural Heritage (SNH), Natural Resources Wales (NRW) and the Department of Agriculture, Environment and Rural Affairs (DAERA) on a draft of this screening assessment.

[5] Which states that “listed or proposed Ramsar sites”, should receive the same protection as European sites

2 Blocks offered and potential activities

2.1 Blocks offered

Offshore Blocks on offer during the 30th Seaward Licensing Round which are considered in this screening assessment are listed in Table 2.1 and shown on Figure 2.1. The Blocks are located in mature areas to the west of Shetland, in the central and northern North Sea, southern North Sea and in the Irish Sea.

2.2 Licensing

The exclusive rights to search and bore for and get petroleum in the territorial sea adjacent to the United Kingdom and on the UK Continental Shelf (UKCS) are vested in the Crown and the *Petroleum Act 1998* (as amended) gives the OGA the power to grant licences to explore for and exploit these resources. The main type of offshore Licence is the Seaward Production Licence. Offshore licensing for oil and gas exploration and production commenced in 1964 and has progressed through a series of Seaward Licensing Rounds. A Seaward Production Licence may cover the whole or part of a specified Block or a group of Blocks. A Seaward Production Licence grants exclusive rights to the holders "to search and bore for, and get, petroleum" in the area covered by the Licence but does not constitute any form of approval for activities to take place in the Blocks, nor does it confer any exemption from other legal or regulatory requirements.

Several sub-types of Seaward Production Licence were available in previous rounds (Traditional, Frontier and Promote) which have been replaced by the single "Innovate" licence[6]. As per previous licensing structures, the Innovate licence is made up of three terms covering exploration (Initial Term), appraisal and field development planning (Second Term), and development and production (Third Term). The lengths of the first two terms are flexible, but have a maximum duration of 9 and 6 years respectively. The Third Term is granted for 18 years but may be extended if production continues beyond this period. The Innovate licence introduces three Phases to the Initial Term, covering:

- Phase A: geotechnical studies and geophysical data reprocessing (note that the acquisition of new seismic could take place in this phase for the purpose of defining a 3D survey as part of Phase B, but normally this phase will not involve activities in the field)

[6] *The Petroleum and Offshore Gas Storage and Unloading Licensing (Amendment) Regulations 2017* amend the Model Clauses to be incorporated in Seaward Production Licences so as to implement the Innovate licences to be issued in the 30th Round.

- Phase B: shooting of new seismic and other geophysical data
- Phase C: exploration and appraisal drilling

Applicants may propose the Phase combination in their submission to the OGA. Phase A and Phase B are optional and may not be appropriate in certain circumstances, but every application must propose a Phase C, except where the applicant does not think any exploration is needed (e.g. in the development of an existing discovery or field re-development) and proposes to go straight to development (i.e. 'straight to Second Term'). The duration of the Initial Term and the Phases within it are agreed between the OGA and the applicant. Applicants may choose to spend up to 4 years on a single Phase in the Initial Term, but cannot take more than 9 years to progress to the Second Term. Failure to complete the work agreed in a Phase, or to commit to the next Phase means the licence ceases, unless the term has been extended by the OGA.

Financial viability is considered prior to licence award for applicants proposing to start at Phase A or B, but further technical and financial capacity for Phase C activities would need to be demonstrated before the licence could enter Phase C and drilling could commence. If the applicant proposes to start the licence at Phase C or go straight to the Second Term, the applicant must demonstrate that it has the technical competence to carry out the activities that would be permitted under the licence during that term, and the financial capacity to complete the Work Programme, before the licence is granted. It is noted that the safety and environmental capability and track record of all applicants are considered by the OGA (in consultation with the Offshore Safety Directive Regulator)[7] through written submissions before licences are awarded[8]. Where full details cannot be provided via the written submissions at the application stage, licensees must provide supplementary submissions that address any outstanding environmental and safety requirements before approvals for specific offshore activities such as drilling can be issued.

2.3 Activity

As part of the licence application process, applicants provide the OGA with details of work programmes they propose in the Initial Term. These work programmes are considered along with a range of other factors by the OGA before arriving at a 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 OGA to drill a well. Firm drilling commitments are preferred on the basis that, if there were no such commitment, the OGA could not be certain that potential licensees would make full use of the exclusivity the

[7] The Offshore Safety Directive Regulator is the Competent Authority comprising of the Department for Business, Energy and Industrial Strategy (BEIS) Offshore Petroleum Regulator for Gas Environment and Decommissioning (OPRED) and the Health and Safety Executive (HSE) working in partnership.
[8] Refer to OGA technical guidance and safety and environmental guidance on applications for the 30th Round at: https://www.ogauthority.co.uk/licensing-consents/licensing-rounds/

licence offers. 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 activity specific environmental and other regulatory assessments.

- A Contingent Drilling Commitment is also a commitment to the OGA to drill a well, but it includes specific provision for the OGA to waive the commitment in light of further technical information.
- A Drill or Drop (D/D) Drilling Commitment is a conditional commitment with the proviso that the licence is relinquished if a well is not drilled.

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

The OGA general guidance[9] makes it clear that an award of a Production Licence does not automatically allow a licensee to carry out any offshore petroleum-related activities from then on (this includes those activities outlined in initial work programmes, particularly Phases B and C). Offshore activities (see Table 2.2) such as seismic survey or drilling are subject to relevant activity specific environmental assessments by BEIS, and there are other regulatory provisions exercised by the Offshore Safety Directive Regulator and bodies such as the Health and Safety Executive. It is the licensee's responsibility to be aware of, and comply with, all regulatory controls and legal requirements.

The proposed work programmes for the Initial Term are detailed in the licence applications. For some activities, such as seismic survey, the potential impacts associated with noise could occur some distance from the licensed Blocks and the degree of activity is not necessarily proportional to the size or number of Blocks in an area. In the case of direct physical disturbance, the licence Blocks being applied for are relevant.

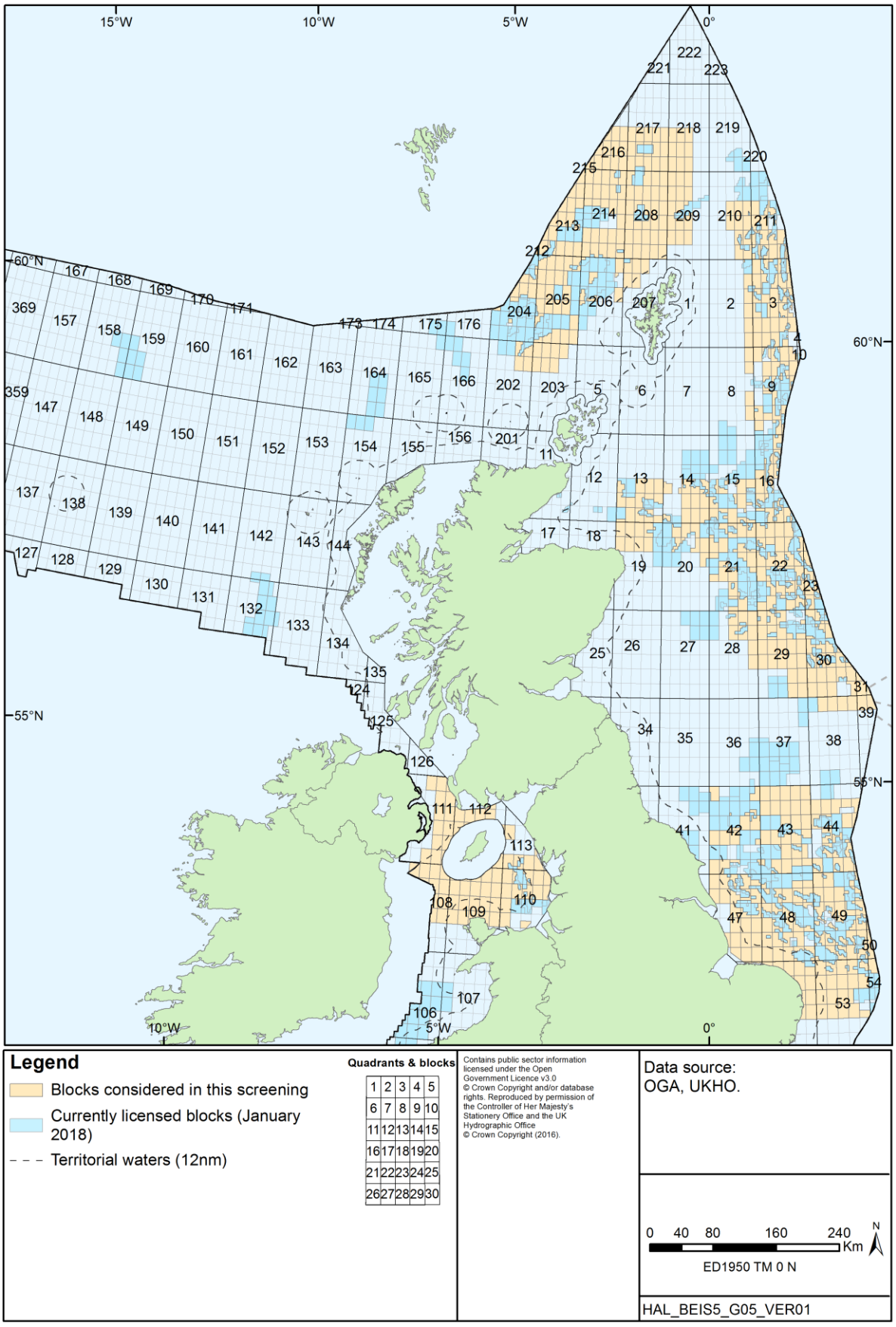
[9] https://www.ogauthority.co.uk/media/3951/general-guidance.pdf

Table 2.1: List of Blocks offered in the 30th Seaward Licensing Round

West of Shetland									
202/4b	202/4c	202/5b	202/9	202/10	203/1	203/2	203/3	203/4	203/6
203/7	203/8	204/5c	204/8	204/9c	204/10c	204/12	204/13	204/14d	204/15
204/16	204/18c	204/23d	205/1b	205/2b	205/3	205/4c	205/5c	205/6	205/7
205/8	205/9b	205/11	205/12	205/14	205/16b	205/17	205/18	205/19	205/21c
205/25	205/26e	205/27b	205/28	205/29	205/30	206/1c	206/5	206/7b	206/10a
206/11d	206/11e	206/12b	206/15	206/16a	207/1c	207/2	207/3	207/6	207/7
208/1a	208/3a	208/4	208/5	208/6	208/7	208/8	208/9	208/10	208/11
208/12b	208/13a	208/14	208/15	208/16	208/17b	208/18a	208/19	208/20	208/21
208/22	208/23	208/24	208/25	208/26	208/27	208/28	208/29	208/30	209/1
209/2	209/3	209/6	209/7	209/8	209/11b	209/12b	209/13b	209/13c	209/16b
209/17b	209/18	209/21	209/22	209/23	212/30	213/4	213/5	213/8	213/9
213/10	213/12	213/13	213/14	213/15a	213/16	213/17	213/18	213/19b	213/20d
213/21	213/22	213/25a	213/26a	213/27b	213/27c	213/28	213/29	213/30	214/1
214/2	214/3	214/4b	214/5b	214/6	214/7	214/8	214/9b	214/10b	214/11b
214/12b	214/13b	214/14	214/15	214/20	214/21	214/22	214/23	214/24	214/25
214/26	214/27b	214/28a	214/29	214/30c	215/30	216/17	216/18	216/19	216/20
216/21	216/22	216/23	216/24	216/25	216/26	216/27	216/28	216/29	216/30
217/16	217/17	217/18	217/19	217/20	217/21	217/22b	217/23b	217/23c	217/24b
217/25	217/26	217/27a	217/28a	217/29	217/30	218/16	218/17	218/18	218/21
218/22	218/23	218/26	218/27	218/28					
Central and Northern North Sea									
2/5c	2/10a	2/15b	2/20	2/25	2/30	3/1	3/2d	3/2e	3/3c
3/3d	3/4f	3/4g	3/4h	3/5	3/6b	3/7b	3/8g	3/9d	3/10a
3/11c	3/11d	3/12b	3/13c	3/14c	3/15d	3/16b	3/17b	3/18	3/19d
3/20d	3/20e	3/20g	3/21	3/22	3/23	3/24c	3/25b	3/26	3/27a
3/28c	3/29c	3/29e	4/21	8/10b	8/20	8/25	8/5	9/1	9/2d
9/2e	9/3c	9/3d	9/4	9/5c	9/7	9/8b	9/9e	9/9f	9/9g
9/10	9/12c	9/12d	9/13g	9/13h	9/14c	9/14d	9/15c	9/17c	9/18f
9/21b	9/22c	9/23a	9/24e	9/26b	9/28c	9/28d	9/29b	10/6	13/16c
13/18	13/19	13/20	13/21c	13/22b	13/23c	13/24d	13/25b	13/26b	13/27
13/28b	13/29c	13/29d	13/30c	14/16b	14/17b	14/18c	14/19b	14/19c	14/20a
14/20d	14/23	14/24	14/25b	14/26d	14/28	14/29	14/30d	15/16e	15/17b
15/17c	15/18c	15/18d	15/19	15/20d	15/21e	15/23c	15/24	15/25e	15/26a
15/27b	15/27c	15/28	15/29c	15/29d	15/30c	16/3e	16/4	16/7d	16/7f
16/8b	16/11b	16/12c	16/12d	16/13c	16/16	16/17b	16/17d	16/21e	16/22b
16/22d	16/23d	16/24d	16/24e	16/26b	16/27d	16/28c	16/28d	16/29e	16/30
19/1	19/2	19/3	19/4b	19/5c	19/6	19/7	19/8	19/9	20/2d
20/3b	20/4c	20/7d	20/8b	20/9b	20/10	20/15c	21/1b	21/2d	21/3c
21/3d	21/4b	21/5b	21/6a	21/7	21/8c	21/9c	21/10c	21/11b	21/12d
21/13c	21/14a	21/15	21/16b	21/17	21/18b	21/18c	21/20c	21/23c	21/24c
21/28b	21/28c	21/29c	22/1b	22/2b	22/3	22/4b	22/6b	22/6d	22/7b
22/8	22/9b	22/10b	22/11b	22/12d	22/12e	22/13d	22/14c	22/15c	22/15d
22/16	22/17a	22/17c	22/18d	22/19f	22/20e	22/22c	22/23c	22/24f	22/25c

22/26b	22/27b	22/28e	22/29d	22/30d	23/1	23/6	23/11b	23/16d	23/16e
23/17	23/21b	23/22b	23/26e	23/27c	28/5	28/8b	28/9c	28/9d	28/10
28/15	28/20	28/3a	28/4b	29/1e	29/2e	29/2f	29/3b	29/5e	29/6
29/7b	29/7d	29/8b	29/9a	29/10e	29/11	29/12	29/13	29/14	29/15
29/16	29/17	29/18	29/19	29/20	29/24	29/25	29/29	29/30	30/1a
30/2e	30/2f	30/3b	30/3d	30/6d	30/7d	30/7e	30/8	30/11d	30/12c
30/13c	30/14b	30/14c	30/16g	30/16h	30/17e	30/17f	30/17g	30/17h	30/18c
30/18d	30/19c	30/20b	30/21	30/22	30/23	30/24d	30/25a	30/26	30/27
30/28	30/30b	31/21	31/26	31/27	38/2	38/3	38/4	38/5	39/1
39/2	210/13	210/14	210/15b	210/18	210/19	210/20a	210/24d	210/25b	210/29b
210/30d	211/11	211/12b	211/13e	211/16d	211/17b	211/18f	211/21b	211/22d	211/23c
211/23e	211/24c	211/26a	211/26b	211/26c	211/27f	211/28	211/29f	211/29i	211/30
Southern North Sea									
42/1b	42/5b	42/8a	42/9a	42/10c	42/13b	42/14	42/15b	42/16	42/17
42/18	42/20a	42/26	42/27b	42/28f	42/30d	43/1	43/2	43/3	43/4
43/5	43/6	43/7	43/8	43/9	43/10	43/13a	43/14	43/15	43/16
43/17a	43/18a	43/19c	43/20a	43/22c	43/23	43/24b	43/24c	43/25a	43/26c
43/27b	43/27c	43/28	43/29b	43/30a	44/6	44/7	44/8b	44/9b	44/10b
44/11d	44/12d	44/12e	44/14	44/15	44/17d	44/18g	44/19c	44/22d	44/22e
44/23h	44/24d	44/25	44/26b	44/28c	44/29a	44/30b	47/1	47/2d	47/3f
47/3j	47/4e	47/5f	47/6	47/7	47/8f	47/9e	47/10d	47/13c	47/14c
47/15c	47/18	47/19	47/20	47/22	47/23	47/24	47/25	47/28	47/29
47/30	48/1e	48/4c	48/5b	48/6b	48/6d	48/7d	48/8b	48/9b	48/10c
48/10d	48/11c	48/11d	48/12b	48/12f	48/13c	48/14b	48/14c	48/15d	48/16
48/17d	48/18b	48/19b	48/20c	48/21b	48/22d	48/23d	48/24a	48/26	48/27
48/28b	48/29b	48/29c	48/30b	48/30c	49/1b	49/2b	49/4e	49/5d	49/6b
49/6c	49/7	49/8b	49/9e	49/9f	49/10e	49/11c	49/12c	49/13	49/14a
49/14c	49/15b	49/16b	49/16d	49/17c	49/17d	49/17e	49/18b	49/18c	49/19c
49/20c	49/20d	49/21e	49/21f	49/22b	49/23b	49/23c	49/24b	49/24c	49/25c
49/26b	49/27c	49/28c	49/28e	49/29b	49/30f	50/11	50/16	50/21	50/26b
51/4	51/5	52/1	52/2	52/3	52/4b	52/5b	52/5c	52/8	52/9
52/10	52/14	52/15	52/19	52/20	53/1b	53/2c	53/3a	53/4a	53/5d
53/6	53/7	53/8	53/9	53/10b	53/11	53/12	53/13	53/14b	53/16
53/17	53/18	53/19	53/20b	54/1a					
Irish Sea									
108/2	108/3	108/4	108/5	108/7	108/8	108/9	108/10	108/14	108/15
108/19	108/20	109/1	109/2	109/3	109/4	109/5	109/6	109/7	109/8
109/9	109/10	109/11	109/12	109/13	109/14	109/15	109/16	109/17	109/18
109/19	109/20	110/1	110/2d	110/3b	110/4	110/5	110/6	110/7b	110/8b
110/9c	110/10	110/11	110/12c	110/14e	110/16	110/18a	111/3	111/4	111/5
111/9	111/10	111/14	111/15	111/19	111/20	111/24	111/25	111/28	111/29
111/30	112/8	112/9	112/11	112/12	112/13	112/14	112/16	112/17	112/20
112/21	112/29	112/30	113/16	113/24	113/26c	113/27e	113/27f	113/28	113/29
113/30									

Figure 2.1: Location of Blocks offered in the context of existing licences



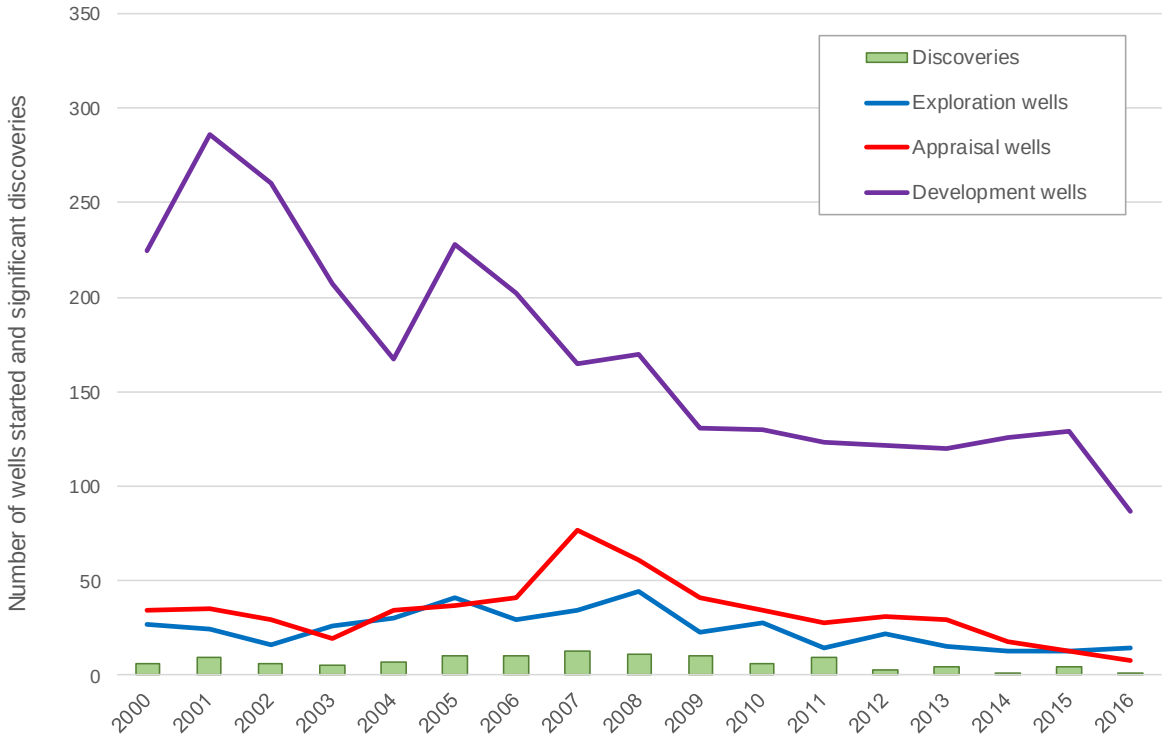
2.3.1 Likely scale of activity

This assessment has been undertaken at the stage at which Blocks are offered for licensing. To place the scale of the 30th Round in context, rounds of comparable size (i.e. in terms of number of Blocks offered, such as the 18th-22nd Rounds) have attracted applications for between 13% and 16% of the Blocks offered. On past experience the activity that actually takes place is less than what is included in the work programme at the licence application stage. A proportion of Blocks awarded may be relinquished without any offshore 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, less than half will have a potential to progress to development. For example, the OGA analysis of exploration well outcomes from the Moray Firth & Central North Sea between 2003 and 2013 indicated an overall technical success rate of 40% with respect to 150 exploration wells and side-tracks (Mathieu 2015). Depending on the expected size of finds, there may be further drilling to appraise the hydrocarbons (appraisal wells). For context, Figure 2.2 highlights the total number of exploration and appraisal wells started on the UKCS each year since 2000 as well as the number of significant discoveries made (associated with exploration activities).

Discoveries that progress to development may require further development drilling, installation of infrastructure such as wellheads, pipelines and possibly fixed platform production facilities, although recent developments are mostly tiebacks to existing production facilities rather than stand-alone developments. For example, of the 48 current projects identified by the OGA's Project Pathfinder (as of 4th August 2017)[10], 18 are planned as subsea tie-backs to existing infrastructure, 4 involve new stand-alone production platforms and 10 are likely to be developed via Floating Production, Storage and Offloading facilities (FPSO). The final form of development for many of the remaining projects is not decided, with some undergoing re-evaluation of development options but some are likely to be subsea tie-backs. Figure 2.2 indicates that the number of development wells has declined over time and this pattern is likely to continue. The nature and scale of potential environmental impacts from the drilling of development wells are similar to those of exploration and appraisal wells and thus the screening criteria described in Section 4 are applicable to the potential effects of development well drilling within any of the 30th Round Blocks.

[10] https://itportal.ogauthority.co.uk/eng/fox/path/PATH_REPORTS/pdf

Figure 2.2: UKCS Exploration, appraisal & development wells, and significant discoveries since 2000



Note: The description "significant" generally refers to the flow rates that were achieved (or would have been reached) in well tests (15 mmcfgd or 1000 BOPD). It does not indicate the commercial potential of the discovery. Source: OGA Drilling Activity (October 2017), Significant Offshore Discoveries (April 2017)

2.3.2 30th Round activities considered by the HRA

The nature, extent and timescale of development, if any, which may ultimately result from the licensing of 30th Round Blocks is uncertain, and therefore it is regarded that at this stage a meaningful assessment of development level activity (e.g. pipelay, placement of jackets, subsea templates or floating installations) cannot be made. Moreover, once project plans are in place, subsequent permitting processes relating to exploration, development and decommissioning, would require assessment including where appropriate an HRA, allowing the opportunity for further mitigation measures to be identified as necessary, and for permits to be refused if necessary. In this way the opinion of the Advocate General in ECJ (European Court of Justice) case C-6/04, on the effects on Natura sites, "*must be assessed at every relevant stage of the procedure to the extent possible on the basis of the precision of the plan. This assessment is to be updated with increasing specificity in subsequent stages of the procedure"* is addressed. Therefore only activities as part of the work programmes associated with the Initial Term and its associated Phases A-C will be considered in this HRA.

For the purposes of this screening assessment, the implications of geophysical survey and drilling are considered in a generic way for all the Blocks offered; a generic description of the nature and scale of these activities is given in Table 2.2 below. The screening assessment considers:

- The potential disturbance and drilling effects associated with the drilling of an exploration or appraisal well within each Block offered.
- The potential acoustic disturbance effects associated with undertaking a deep geological seismic survey within each Block offered (as well as undertaking site specific seismic operations including rig site survey and Vertical Seismic Profiling).
- The potential for in-combination effects.

Subsequent Appropriate Assessment (AA) of Blocks applied for, for which a likely significant effect cannot currently be excluded will consider an approach based on the maximum likely work programme associated with the Initial Term and its associated Phases A-C.

Table 2.2: Indicative overview of potential activities that could arise from Block licensing

Potential activity	Description
Initial Term Phase B: Geophysical survey	
Deep geological seismic (2D and 3D) survey	2D seismic involves a survey vessel with an airgun array and a towed hydrophone streamer (up to 12 km long), containing several hydrophones along its length. The reflections from the subsurface strata provide an image in two dimensions (horizontal and vertical). Repeated parallel lines are typically run at intervals of several kilometres (minimum *ca*. 0.5km) and a second set of lines at right angles to the first to form a grid pattern. This allows imaging and interpretation of geological structures and identification of potential hydrocarbon reservoirs. 3D seismic survey is similar but uses several hydrophone streamers towed by the survey vessel. Thus closely spaced 2D lines (typically between 25 and 75m apart) can be achieved by a single sail line. These deep-geological surveys tend to cover large areas (300-3,000km^2) and may take from several days up to several weeks to complete. Typically, large airgun arrays are employed with 12-48 airguns and a total array volume of 3,000-8,000 in^3. From available information across the UKCS, arrays used on 2D and 3D seismic surveys produce most energy at frequencies below 200Hz, typically peaking at 100Hz, and with a peak source level of around 256dB re 1µPa @ 1m (Stone 2015). While higher frequency noise will also be produced which is considerably higher than background levels, these elements will rapidly attenuate with distance from source; it is the components < 1,000Hz which propagate most widely.
Initial Term Phase C: Drilling and well evaluation	
Rig tow out & de-mobilisation	Mobile rigs are towed to and from the well site typically by 2-3 anchor handling vessels. The physical presence of a rig and related tugs during tow in/out is both short (a number of days depending on initial location of rig) and transient.
Rig placement/ anchoring	Semi-submersible rigs use either anchors (deployed and recovered by anchor handler vessels) or dynamic positioning (DP) to manoeuvre into and stay in position over the well location. Eight to 12 anchors attached to the rig by cable or chain are deployed radially from the rig (at up to 1.5km in the North Sea and 3km in deep waters such as to the west of Shetland); part of the anchoring hold is provided by a proportion of the cables or chains lying on the seabed (catenary). In the deepest waters to the west of the UK DP drill ships are typically used. Jack-up rigs are used in shallower waters (normally <120m, for example in the southern and central North Sea and Irish Sea) and jacking the rig legs to the seabed supports the drilling deck. It is assumed that jack-up rigs will be three or four-legged rigs with 20m diameter spudcans with an approximate seabed footprint of 0.001km^2 within a radius of *ca*. 50m of the rig centre. A short review of 18 Environmental Statements which included drilling operations in the southern North Sea since 2007 (specifically in quadrants 42, 43, 44, 47, 48, 49 and 53) indicated that rig stabilisation (e.g. using rock placement) was either not considered necessary and/or assessed as a worst case contingency option. Where figures were presented, the spatial scale of potential rock deposit operations was estimated at between 0.001-0.004km^2 per rig siting. A BEIS study due to report this year will compare the rock volumes estimated in operator applications (e.g. drilling application) with those actually used (from close-out returns).

Potential activity	Description
Marine discharges	Typically around 1,000 tonnes of cuttings (primarily rock chippings) result from drilling an exploration well. Water-based mud cuttings are typically discharged at, or relatively close to sea surface during "closed drilling" (i.e. when steel casing in the well bore and a riser to the rig are in place), whereas surface hole cuttings are normally discharged at seabed during "open-hole" drilling. Use of oil based mud systems, for example in highly deviated sections or in drilling water reactive shales, would require onshore disposal or treatment offshore to the required standards prior to discharge. The footprint of cuttings and other marine discharges, or the distance from source within which smothering or other effects may be considered is generally a few hundred metres. For the purposes of the screening assessment it is assumed that effects may occur within 500m of the well location covering an area in the order of 0.8km^2.
Conductor piling	Well surface holes are usually drilled "open-hole" with the conductor subsequently inserted and cemented in place to provide a stable hole through which the lower well sections are drilled. Where the nature of the seabed sediment and shallow geological formations are such that they would not be stable open-hole (i.e. risking collapse), the conductor may be driven into the sediments. In North Sea exploration wells, the diameter of the conductor pipe is usually 26" or 30" (<1m), which is considerably smaller than the monopiles used for offshore wind farm foundations (>3.5m diameter), and therefore require less hammer energy and generate noise of a considerably lower amplitude. For example, hammer energies to set conductor pipes are in the order of 90-270kJ (see: Matthews 2014, Intermoor website), compared to energies of up to 3,000kJ in the installation of piles at some southern North Sea offshore wind farm sites. Direct measurements of underwater sound generated during conductor piling are limited. Jiang *et al.* (2015) monitored conductor piling operations at a jack-up rig in the central North Sea in 48m water depth and found peak sound pressure levels (L_{pk}) not to exceed 156dB re 1 µPa at 750m (the closest measurement to source) and declining with distance. Peak frequency was around 200Hz, dropping off rapidly above 1kHz; hammering was undertaken at a stable power level of 85 ±5 kJ but the pile diameter was not specified (Jiang *et al.* 2015). The need to pile conductors is well-specific and is not routine. It is anticipated that a conductor piling event would last between 4-6 hours.
Rig/vessel presence and movement	On site, the rig is supported by supply and standby vessels. Supply vessels typically make 2-3 supply trips per week between rig and shore. Helicopter trips to transfer personnel to and from the rig are typically made several times a week. The 30th Round Blocks are in mature hydrocarbon areas, and helicopters are therefore likely to follow established routes. A review of Environmental Statements for exploratory drilling suggests that a rig could be on location for up to 10 weeks.
Rig site survey	Rig site surveys are undertaken to identify seabed and subsurface hazards to drilling, such as wrecks and the presence of shallow gas. The surveys use a range of techniques, including multibeam and side scan sonar, sub-bottom profiler, magnetometer and high-resolution seismic involving a much smaller source (mini-gun or four airgun cluster of 160in^3) and a much shorter hydrophone streamer. Arrays used on site surveys and some VSP operations (see below) typically produce frequencies predominantly up to around 250Hz, with a peak source level of around 235dB re 1µPa @ 1m (Stone 2015). The survey typically covers 2-3km^2. The rig site survey vessel may also be used to characterise seabed habitats, biota and background contamination. Survey durations are usually of the order of four or five days.
Well evaluation (e.g. Vertical Seismic Profiling, VSP)	Sometimes conducted to assist with well evaluation by linking rock strata encountered in drilling to seismic survey data. A seismic source (airgun array, typically with a source size around 500 in^3 and with a maximum of 1200 in^3) is deployed from the rig, and measurements are made using a series of geophones deployed inside the wellbore. VSP surveys are of short duration (one or two days at most).

3 Relevant Natura 2000 sites

Sites were considered for inclusion/exclusion in the screening process with respect to whether there was a pathway for interaction[11] between the marine features for which they are designated and potential exploration/appraisal activities which could arise following Block licensing (see Table 2.2). Sites considered include designated Natura 2000 sites and potential sites for which there is adequate information on which to base an assessment.

Guidance in relation to sites which have not yet been submitted to the European Commission is given by Circular 06/2005 (ODPM 2005) 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*." However, in accordance with the National Planning Policy Framework (DCLG 2012), devolved policy (e.g. Scottish Planning Policy) and Marine Policy Statement (HM Government 2011), the relevant sites considered here include classified and potential SPAs, designated and candidate SACs and Sites of Community Importance (SCIs). In addition to the above sites, the Scottish Government completed consultation on 14 proposed marine SPA sites between October 2016 and January 2017[12]. Natural England have also completed consultation on a number of proposed SPA sites[13] and with JNCC, consulted on the Greater Wash pSPA in October 2016[14]. Extensions to two SACs (the Braemar Pockmarks & Scanner Pockmark) have also been proposed, with consultation taking place between 25th August and 17th November 2017[15].

The full details of all sites including their type, status and qualifying features are provided in Appendix A.

If further Natura 2000 sites are established during this HRA process, they will be subject to screening and if necessary included in subsequent Appropriate Assessment stages. The primary sources of site data were the latest JNCC SAC[16] (version as of 30th January 2017) and

[11] Based on knowledge of potential sources of effect resulting from the activities (from previous BEIS AAs and SEAs), and pathways by which these effects may impact receptors present on the site (from previous BEIS AAs and SEAs, Statutory Nature Conservation Body advice on operations and literature sources etc). Also refer to Section 4.2.

[12] http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/proposed-marine-spas/

[13] https://www.gov.uk/government/collections/marine-special-protection-area-consultations

[14] https://consult.defra.gov.uk/natural-england-marine/greater-wash-potential-special-protection-area-com

[15] http://jncc.defra.gov.uk/page-3995

[16] http://jncc.defra.gov.uk/page-1461

SPA[17] (version as of 30th June 2017) summary data and interest features and site characteristics were filtered for their coastal and marine relevance (also noting the separate data on SACs and SPAs with marine components, versions as of 24th July 2017 and 20th July 2017 respectively[18]). The websites of the relevant Statutory Nature Conservation Bodies (SNCBs) were also reviewed to verify and augment site information including SNH[19], Natural England[20,21,] Natural Resources Wales (NRW)[22] and the Department of Agriculture, Environment and Rural Affairs (DAERA)[23]. Any sites designated in the future would also be considered as necessary in subsequent project specific assessments.

The sites included in the screening process include:

- Coastal and marine Natura 2000 sites along the coasts of the United Kingdom and in territorial waters
- Offshore Natura 2000 sites (i.e. those largely or entirely beyond 12nm from the coast)
- Riverine Natura 2000 sites designated for migratory fish and/or the freshwater pearl mussel
- Relevant sites in adjacent states
- Coastal Ramsar sites

A number of Natura 2000 sites are designated for mobile species (seabirds, marine mammals and fish) which may be present beyond site boundaries. These are considered in Section 4.6.

In addition, Natura 2000 sites in the waters of other member states at or adjacent to the UK median line have been considered. All relevant sites are shown in Figures 3.1 to 3.6 overleaf and further site details can be found in Appendix A.

[17] http://jncc.defra.gov.uk/page-1409

[18] http://jncc.defra.gov.uk/page-4661

[19] http://gateway.snh.gov.uk/sitelink/index.jsp

[20] http://publications.naturalengland.org.uk/category/6490068894089216

[21] https://www.gov.uk/government/collections/conservation-advice-packages-for-marine-protected-areas

[22] http://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/designated-sites/?lang=en

[23] https://www.daera-ni.gov.uk/topics/biodiversity-land-and-landscapes/protected-areas

Figure 3.1: SPAs included in the screening process: west of Shetland, and central and northern North Sea

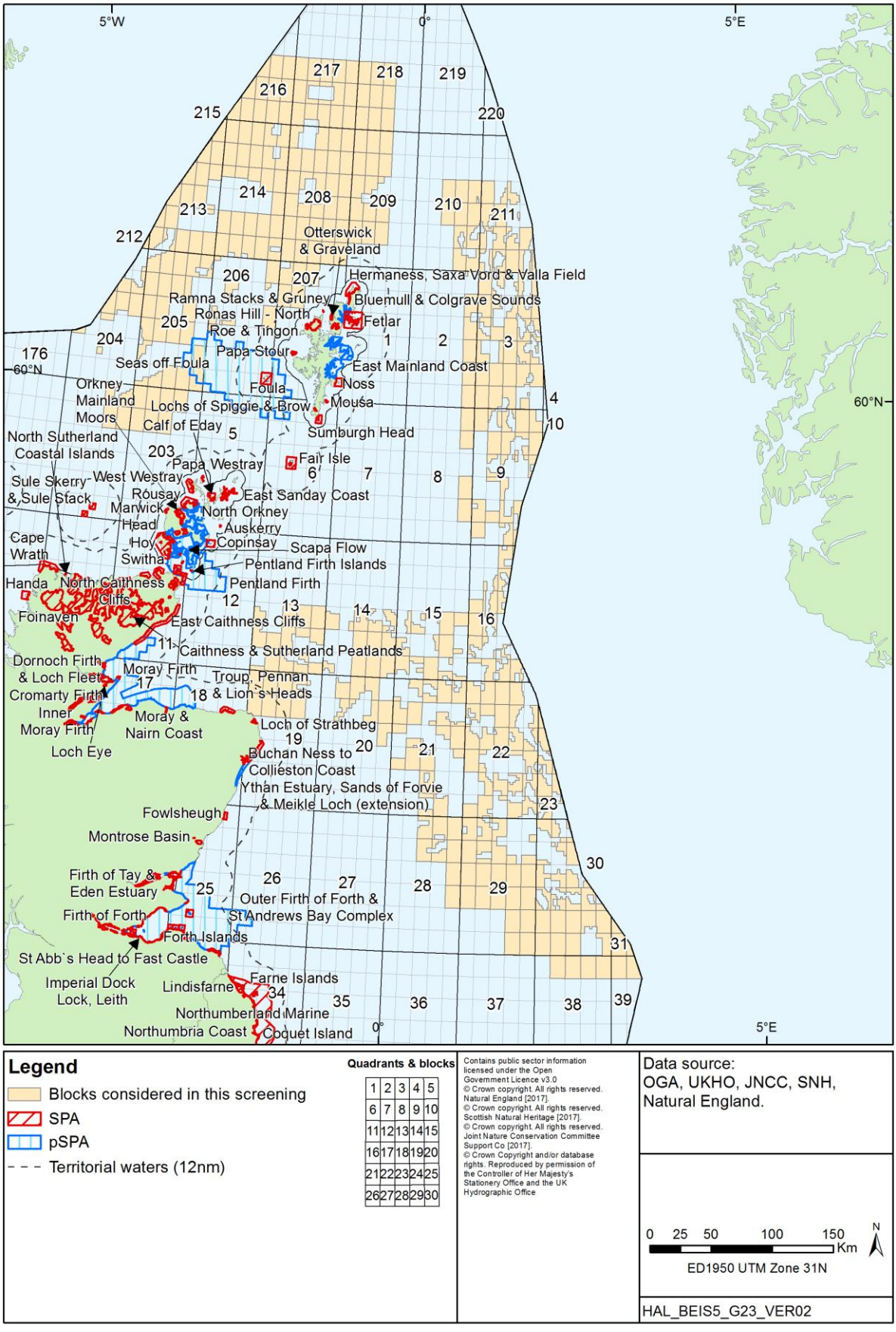


Figure 3.2: SPAs included in the screening process: southern North Sea

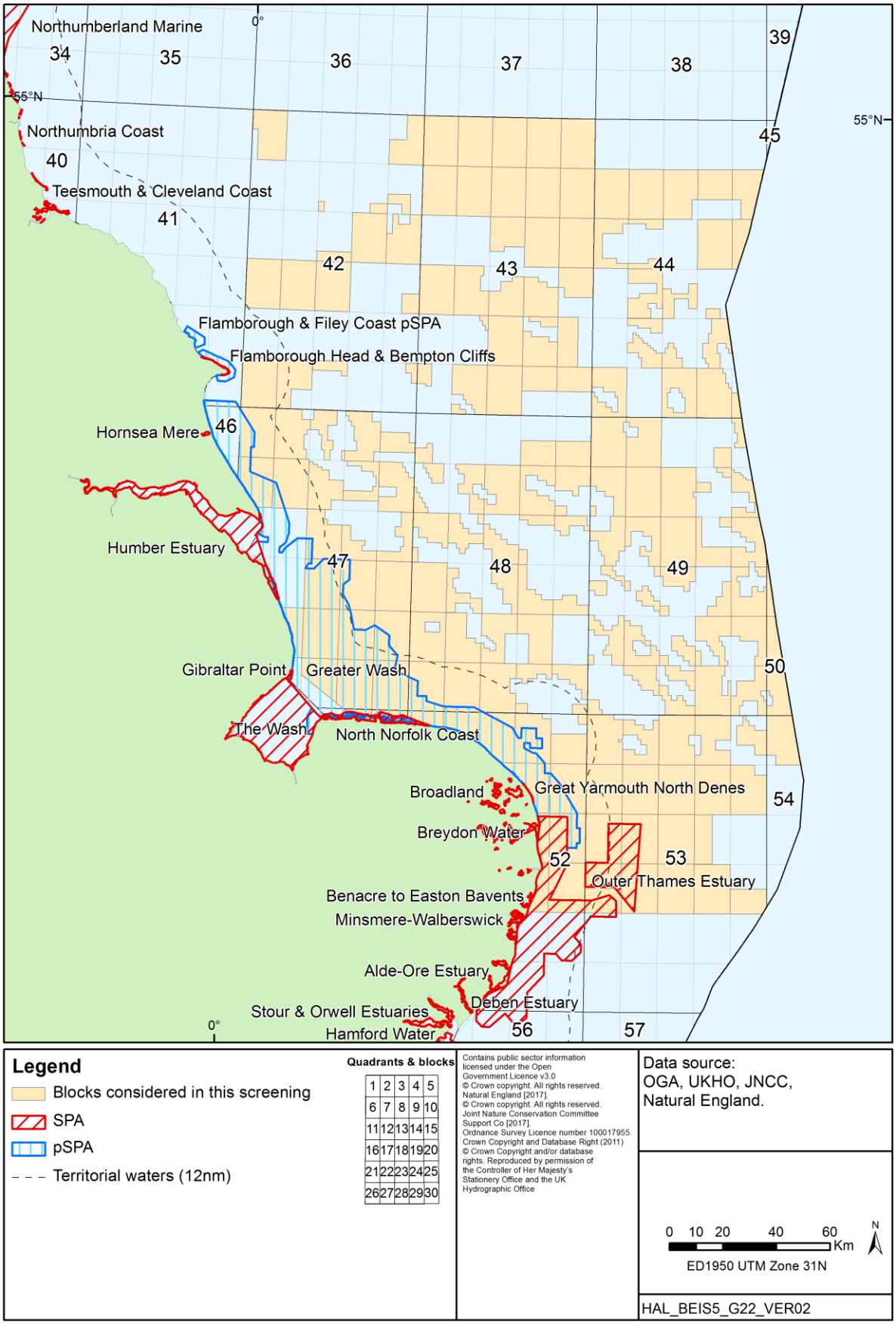


Figure 3.3: SPAs included in the screening process: Irish Sea

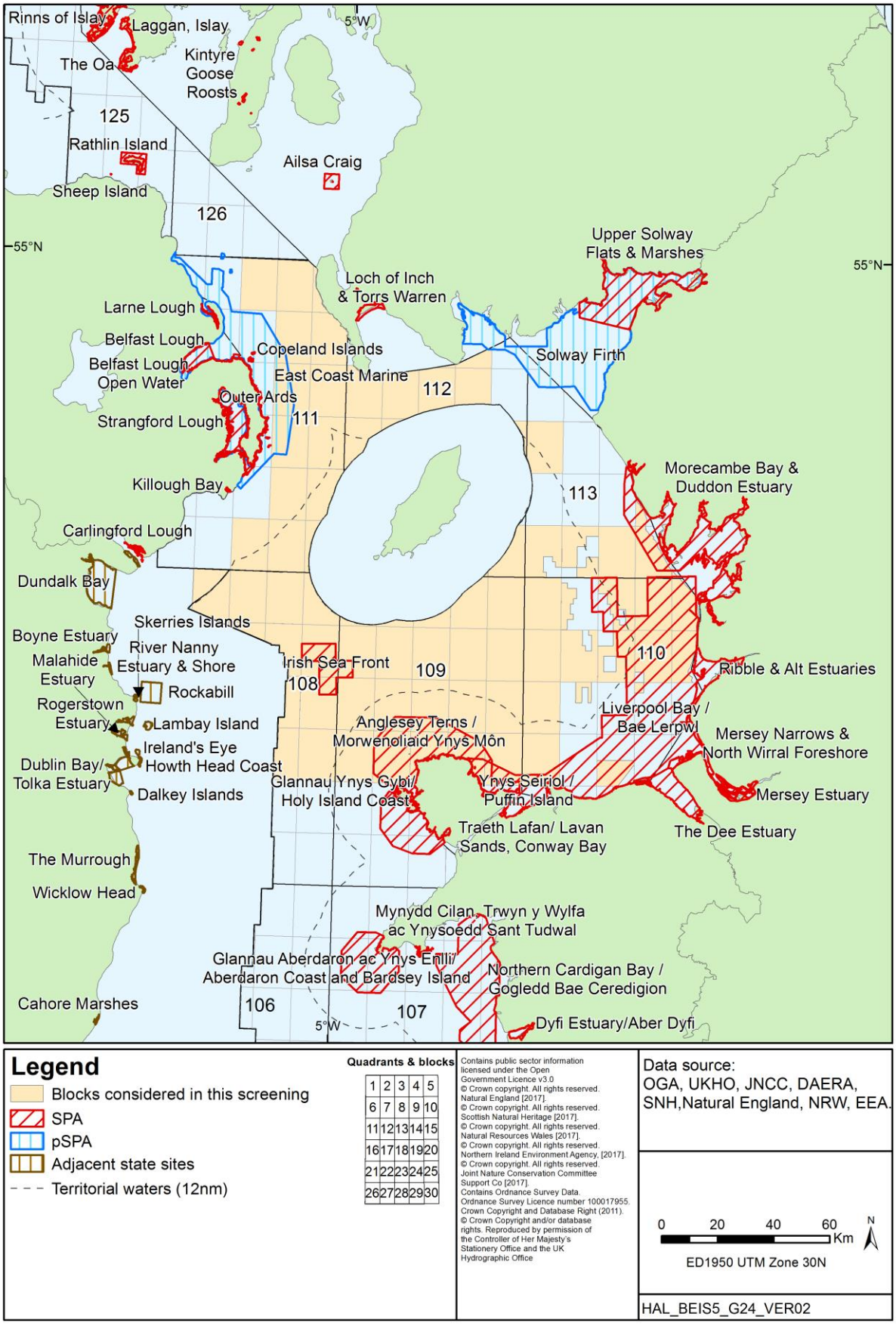


Figure 3.4: SACs included in the screening process: west of Shetland, and central and northern North Sea

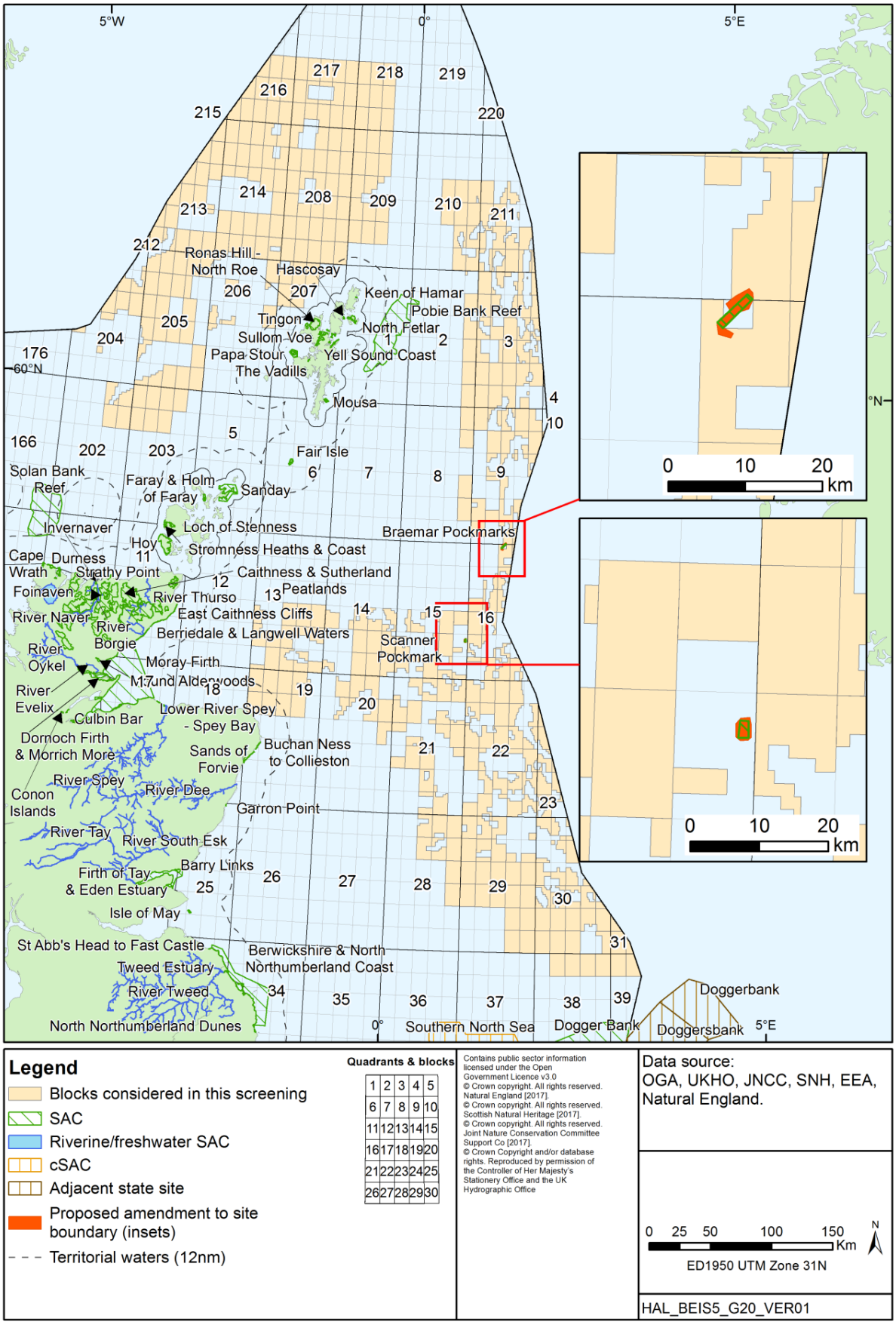


Figure 3.5: SACs included in the screening process: southern North Sea

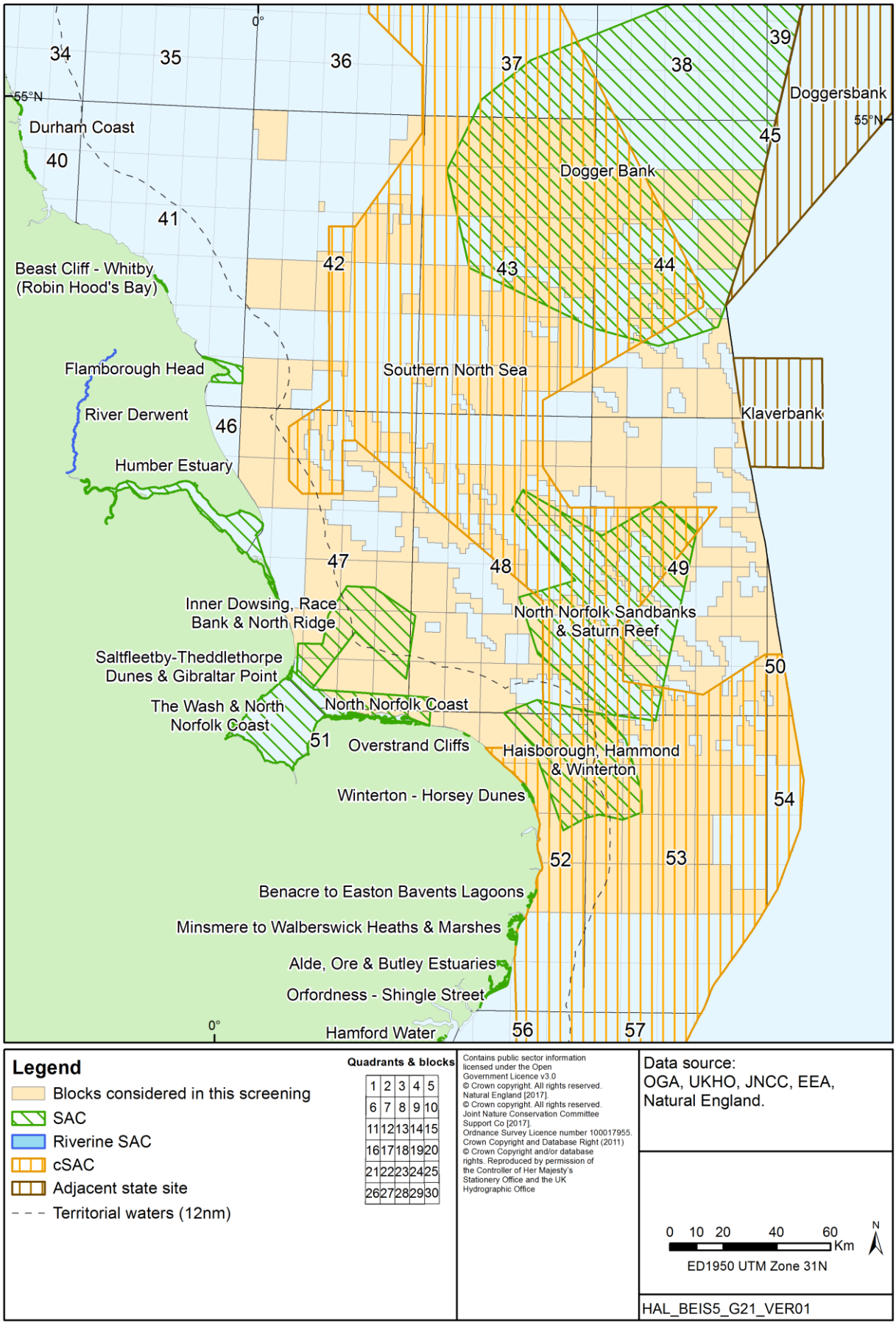
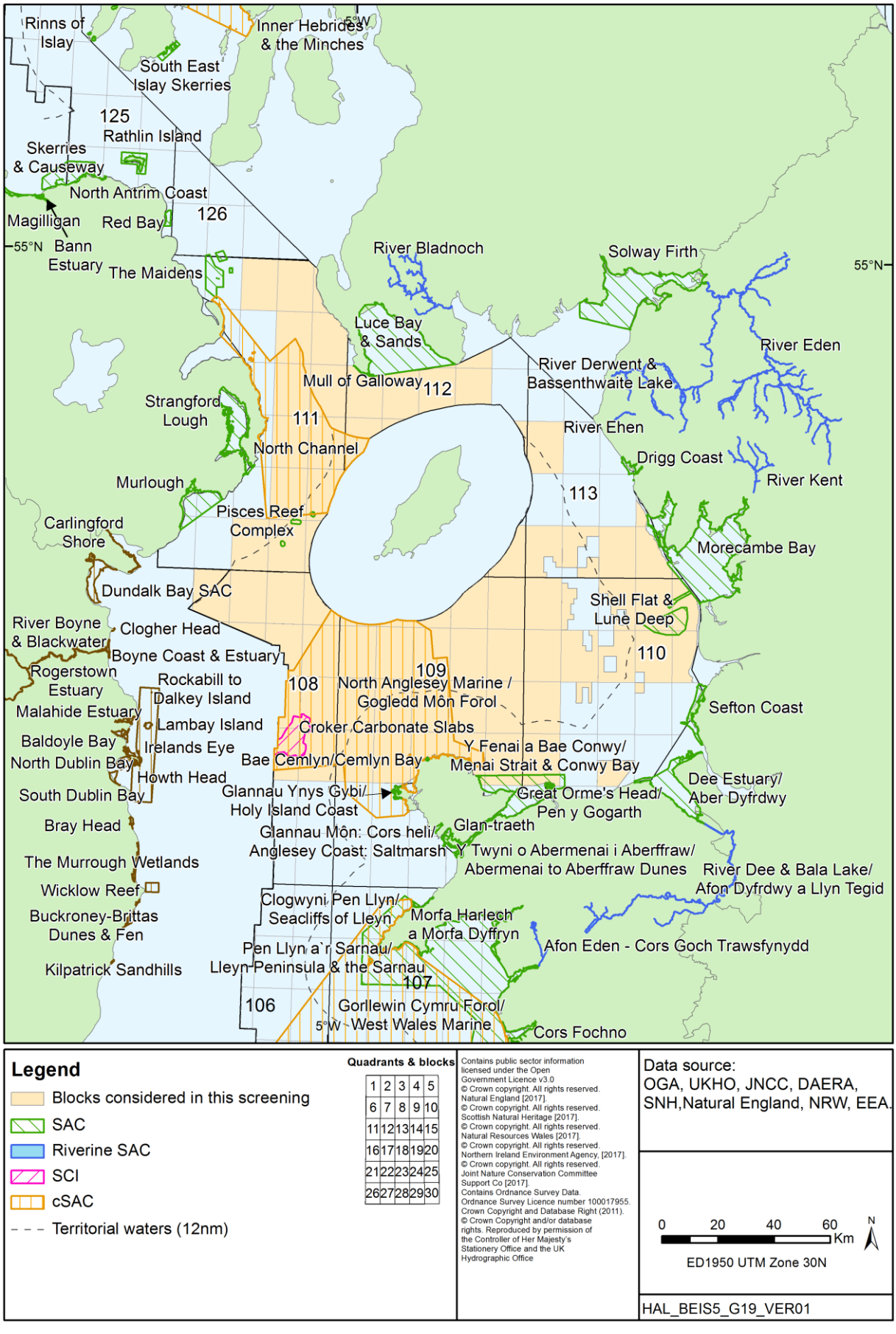


Figure 3.6: SACs included in the screening process: Irish Sea



4 Screening Assessment Process

4.1 Introduction

This screening assessment is the first stage of an HRA to determine whether licensing of any of the Blocks offered in the 30th Round is likely to have a significant effect on a relevant European site, either individually or in combination with other plans or projects. The approach to the screening assessment has been undertaken in accordance with the European Commission Guidance (EC 2000) augmented by reference to a range of other guidance and reports (see list in Section 1.3).

The approach taken to screening has been to:

- Define the likely location and nature of exploration/appraisal activities that could follow licensing, together with their potential to result in likely significant effects on European sites – see Section 2.
- Identify all relevant European sites and their qualifying primary and non-primary features with the potential to be affected by exploration/appraisal activities (i.e. those sites with marine features or with a marine ecological linkage) – see Section 3 and Appendix A.
- Screen the relevant sites for the likelihood of significant effects that could result from the licensing of individual Blocks offered, based on the nature and scale of potential effects from exploration and appraisal activities and mapping in a geographic information system (GIS) – see Section 5. Consideration is also given as appropriate to the potential for mobile qualifying species (e.g. seabirds, marine mammals and fish) to be present beyond relevant site boundaries – see Section 4.6.
- Screen the relevant sites for likely significant effects that could result from the licensing of individual Blocks offered, in combination with other marine activities and plans – see Sections 4.7 and 5.
- Those Blocks which are screened in (i.e. for which likely significant effects on relevant European sites could not be discounted at the screening stage) will be subject to a second stage of HRA, Appropriate Assessment, if applied for and before decisions on whether to grant licences are taken – see Section 6 and Appendix B.

4.2 Sources of effect considered in this screening

As outlined in Section 2.3, activities which may be undertaken during the initial term of a Seaward Production Licence will comprise exploration activities in the form of seismic survey and exploration or appraisal drilling. The foreseeable interactions from these activities with the potential to result in likely significant effects on relevant Natura 2000 sites are therefore

assessed in this report. These activities, their environmental effects, and relevant legal and other controls are extensively described in the previous SEA Environmental and Technical Reports[24] and are not duplicated in detail here.

Subsequent field development activity is contingent on successful exploration and appraisal and may or may not result in the eventual installation of infrastructure. Where relevant, such future activities will themselves be subject to a screening procedure and tests under the Habitats Directive.

Conservation Advice[25] (as referred to under Regulation 37 of the *Conservation of Habitats and Species Regulations 2017*) was taken into account since it includes advice on operations that may cause deterioration or disturbance to relevant features or species. In addition, significant work has been undertaken in the area of sensitivity assessments and activity/pressure matrices in recent years (e.g. Tillin *et al*. 2010) resulting in agreed lists of pressures at a UK and North East Atlantic level (the OSPAR Intersessional Correspondence Group on Cumulative Effects (ICG-C), see Tillin & Tyler-Walters 2014). Defra (2015) includes an evidence base for the latest pressures-activity matrix produced by JNCC (2013). These are intended to be representative of the types of pressures that act on marine species and habitats from a defined set of activities, based on benchmarks of these pressures where the magnitude, extent or duration is qualified or quantified in some way. SNCB advice on operations for many Natura 2000 sites is now based on sensitivity of site features to pressures which have been identified as relevant to other activities including oil and gas exploration. Whilst these matrices are informative and note many of the pressures associated with hydrocarbon exploration, resultant effects are not inevitable consequences of oil and gas activity since often they can be mitigated through timing, siting or technology (or a combination of these). The Department expects that these options would be evaluated by the licensees and documented in the environmental assessments required as part of the activity specific consenting regime.

A consideration of the potential for the above activities to result in likely significant effects was made, informed by the evidence base in the scientific literature, relevant BEIS Strategic Environmental Assessments, and recent Environmental Statements for the relevant activities. Based on this consideration, this screening assessment addresses those sources of impact generally considered to have the potential to affect relevant Natura 2000 sites, specifically:

- Physical disturbance and drilling effects (e.g. rig siting, marine discharges, rig/vessel presence and movement)
- Underwater noise

[24] https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process

[25] Under this Regulation, advice must be provided by the appropriate nature conservation body to other relevant authorities as to: a European site's conservation objectives and any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated.

- In-combination effects

Potential accidental events, including spills, are not considered in this HRA screening as they are not part of the work plan. Measures to prevent accidental events, response plans and potential impacts in the receiving environment would be considered as part of the environmental impact assessment process for specific projects that could potentially follow licensing when the location, nature and timing of the proposed activities are available to inform a meaningful assessment of such risks.

4.3 Existing regulatory requirements and controls

The HRA screening assumes that the high level controls described below are applied as standard to activities since they are legislative requirements which if not adhered to would constitute an offence. These are distinct from further mitigation measures which may be identified and employed to avoid likely significant effects on relevant sites.

4.3.1 Physical disturbance and drilling

There is a mandatory requirement to have sufficient recent and relevant data to characterise the seabed in areas where activities are due to take place (e.g. rig placement)[26]. If required, survey reports must be made available to the relevant statutory bodies on submission of a relevant permit application or Environmental Statement for the proposed activity, and the identification of any potential sensitive habitats by such survey (including those under Annex I of the Habitats Directive) may influence BEIS's decision on a project level consent.

Discharges from offshore oil and gas facilities have been subject to increasingly stringent regulatory controls over recent decades (see review in DECC 2016, and related Appendices 2 and 3). As a result, oil and other contaminant concentrations in the major streams (drilling wastes and produced water) have been substantially reduced or eliminated (e.g. the discharge of oil based muds and contaminated cuttings is effectively banned), with discharges of chemicals and oil exceeding permit conditions or any unplanned release, potentially constituting a breach of the permit conditions and an offence. Drilling chemical use and discharge is subject to strict regulatory control through permitting, monitoring and reporting (e.g. the mandatory Environmental Emissions Monitoring System (EEMS) and annual environmental performance reports). The use and discharge of chemicals must be risk assessed as part of the permitting process (e.g. Drilling Operations Application) under the *Offshore Chemicals Regulations 2002* (as amended), and the discharge of chemicals which would be expected to have a significant negative impact would not be permitted.

At the project level, discharges would be considered in detail in project-specific environmental impact assessments, (where necessary through HRAs) and chemical risk assessments under existing permitting procedures.

[26] See BEIS (2017). Guidance notes on the *Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999* (as amended).

4.3.2 Acoustic disturbance

Controls are in place to cover all significant noise generating activities on the UKCS, including geophysical surveying. Seismic surveys (including VSP and high-resolution site surveys), sub-bottom profile surveys and shallow drilling activities require an application for consent under the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) and cannot proceed without consent. These applications are supported by an EIA, which includes a noise assessment. Applications are made through BEIS's Portal Environmental Tracking System using a standalone Master Application Template (MAT) and Geological Survey Subsidiary Application Template (SAT). Regarding noise thresholds to be used as part of any assessment, applicants are encouraged to seek the advice of relevant SNCB(s) (JNCC 2017b) in addition to referring to European Protected Species (EPS) guidance (JNCC 2010). Applicants should be aware of recent research development in the field of marine mammal acoustics and the publication in the US of a new set of criteria for injury (NMFS 2016, referred to as NOAA thresholds).

BEIS consults the relevant statutory consultees on the application for advice and a decision on whether to grant consent is only made after careful consideration of their comments. Statutory consultees may request additional information or risk assessment, specific additional conditions to be attached to consent (such as specify timing or other specific mitigation measures), or advise against consent.

It is a condition of consents issued under Regulation 4 of the *Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001* (as amended) for oil and gas related seismic and sub-bottom profile surveys that the JNCC Seismic Guidelines are followed. Where appropriate, EPS disturbance licences may also be required under the *Conservation of Offshore Marine Habitats and Species Regulations 2017*[27]. JNCC have recently updated their guidelines (2017) and reaffirm that adherence to these guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Applicants are expected to make every effort to design a survey that minimises sound generated and consequent likely impacts, and to implement best practice measures described in the guidelines.

In addition, potential disturbance of certain qualifying species (or their prey) may be avoided by the seasonal timing of offshore activities. For example, periods of seasonal concern for individual Blocks on offer have been highlighted with respect to seismic survey and fish spawning (see Section 2 of OGA's Other Regulatory Issues[28] which accompanied the 30th Round offer) which licensees should take account of. Licensees should also be aware that it may influence BEIS's decision whether or not to approve particular activities.

[27] Disturbance of European Protected Species (EPS) (i.e. those listed in Annex IV) is a separate consideration under Article 12 of the Habitats Directive, and is not considered in this assessment.
[28] https://www.ogauthority.co.uk/media/4004/other_regulatory_issues.docx

4.4 Physical disturbance and drilling effects

The pathways by which exploration activities may have physical disturbance and drilling effects on Natura 2000 sites include:

- Physical damage to benthic habitats caused by semi-submersible drilling rig anchor placement, dragging and contact of anchor cables and chains with the seabed (see Section 4.4.1)
- Physical damage to benthic habitats caused by the placement of jack-up drilling rig spud cans (see Section 4.4.1)
- Physical loss and change of benthic habitats through rock placement around jack-up legs for rig stabilisation (see Section 4.4.2)
- Physical loss of benthic habitats through the discharge of surface hole cuttings around the well and placement of wellhead assembly (see Section 4.4.2)
- Smothering by settlement of drill cuttings on seabed following discharge near sea surface (see Section 4.4.2)
- Displacement of sensitive receptors by visual/acoustic disturbance from the presence and movement of vessels and aircraft (see Section 4.4.3)

These are described briefly below and have informed the setting of screening criteria for physical disturbance and drilling effects (Section 4.4.4).

4.4.1 Physical damage to benthic habitats

Semi-submersible rigs typically use anchors to hold position, typically between 8 and 12 in number at a radius related to water depth, seabed conditions and anticipated metocean conditions. The seabed footprint associated with semi-submersible rig anchoring results from a combination of anchor scars caused by anchors dragging before gaining a firm hold, and scraping by the cable and/or chain linking the anchor to the rig, where these touch the seabed (the catenary contact). In relatively shallow North Sea depths, rig anchors extend to a radius of up to *ca*. 1,500m (note that semi-submersible rigs are typically not used in water depths of less than 120m). In contrast, in the Faroe-Shetland Channel, a rig drilling in 1,200m water depth had anchors extending to a radius of some 2,750m (which accords with Gulf of Mexico experience, see Continental Shelf Associates 2006). In the deeper waters to the west of the UK, the use of anchors can be largely negated through the use of dynamically positioned (DP) drill ships or DP semi-submersible rigs. These use a number of thrusters and accurate positioning information to maintain their station. For the purposes of this screening assessment, physical disturbance of the seabed to a maximum distance of 3km from a semi-submersible rig has been assumed.

Jack-up rigs, normally used in shallower water (<120m), leave three or four seabed depressions from the feet of the rig (the spud cans) of approximately 15-20m in diameter. The form of the footprint depends on numerous factors such as the spudcan shape, the soil

conditions, the footing penetration and the subsequent method of extraction, with the local sedimentary and hydrography regime affecting the longevity of the footprint (HSE 2004). For example, swathe bathymetry data collected as part of FEPA monitoring of the Kentish Flats wind farm off the Kent coast indicated a set of six regular depressions in the seabed at each of the turbine locations resulting from jack-up operations. Immediately post-construction, a January 2005 survey recorded these depressions as having depths of between 0.5 and 2.0m. By November 2007, these depths had reduced by an average of 0.6m indicating that the depressions were naturally infilling as a result of the mobile sandy sediments present across the area (Vattenfall 2009). A four-legged rig with 20m diameter spudcans would have an approximate seabed footprint of 1,250m^2 within a radius of *ca*. 50m of the rig centre. In locations with an uneven or soft seabed, material such as grout bags or rocks may be placed on the seabed to stabilise the rig feet, and recoverable mud mats may be used in soft sediment (see below).

4.4.2 Physical loss of benthic habitats and smothering

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. These cuttings are derived from shallow geological formations and a proportion will therefore be similar to surficial sediments in composition and characteristics. The persistence of cuttings discharged at the seabed is largely determined by the potential for it to be redistributed by tidal and other currents. 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 (seabed 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 although post-well sediments may vary in the immediate vicinity of the well compared to the surrounding seabed (see for example, Jones *et al*. (2012)).

The extent and potential impact of drilling discharges have been reviewed in successive SEAs, OESEA, OESEA2 and OESEA3 (DECC 2009, 2011 and 2016, respectively).

The past discharge to sea of drill cuttings contaminated with oil based drill mud (OBM) resulted in well documented acute and chronic effects at the seabed (e.g. Davies *et al.* 1989, Olsgard & Gray 1995, Daan & Mulder 1996). These effects resulted from the interplay of a variety of factors of which direct toxicity (when diesel based muds were used) or secondary toxicity as a consequence of organic enrichment (from hydrogen sulphide produced by bacteria under anaerobic conditions) were probably the most important. Through OSPAR and other actions, the discharge of oil based and other organic phase fluid contaminated material is now effectively banned. The "legacy" effects of contaminated sediments on the UKCS resulting from OBM discharges have been the subject of joint industry work (UKOOA 2002) and reporting to OSPAR.

In response to OSPAR measures and the progressive tightening of UK regulations relating to discharges of cuttings drilled with OBM and organic phase fluids, discharges of oil in produced

water; and discharges of production, drilling and cementing chemicals, the UK Government/Industry Environmental Monitoring Committee has reviewed UK offshore oil and gas monitoring requirements. The committee has developed a monitoring strategy which aims to ensure that adequate data is available on the environmental quality status in areas of operations for permitting assurance and to meet the UK's international commitments to report on UK oil industry effects. This strategy has been implemented since 2004 and has included regional studies in various parts of the North Sea, and surveys around specific single and multi-well sites. The most recent survey was undertaken as part of BEIS SEA monitoring with a survey in the Fladen Ground in late 2015 (see Appendix 1b of OESEA3).

Overall, there are positive indications of recovery of sediments and communities in both the Fladen Ground and East Shetland Basin from the historic effects of oil-based mud discharges. The total PAH and total n-alkane concentrations in Fladen Ground sediments were all lower in 2001 than in 1989 and are now at levels which are considered below 'background'. The results of the most recent Fladen Ground survey confirm this general pattern of recovery.

In contrast to historic oil based mud discharges[29], effects on seabed fauna resulting from the discharge of cuttings drilled with water based muds (WBM) and of the excess and spent mud itself are usually subtle or undetectable (e.g. Cranmer 1988, Neff *et al*. 1989, Hyland *et al*. 1994, Daan & Mulder 1996, Currie & Isaacs 2005, OSPAR 2009, Bakke *et al.* 2013, DeBlois *et al.* 2014). Considerable data has been gathered from the North Sea and other production areas, indicating that localised physical effects are the dominant mechanism of ecological disturbance where water-based mud and cuttings are discharged. Modelling of WBM cutting discharges has indicated that deposition of material is generally thin and quickly reduces away from the well. Jones *et al.* (2006, 2012) compared pre- and post-drilling ROV surveys of a West of Shetland exploration well in Block 206/1a in *ca*. 600m water depth and documented physical smothering effects within 100m of the well. Outside the area of smothering, fine sediment was visible on the seafloor up to at least 250m from the well. After 3 years, there was significant reduction of cuttings material visible particularly in the areas with relatively low initial deposition (Jones *et al*. 2012). The area with complete cuttings cover had reduced from 90m to 40m from the drilling location, and faunal density within 100m of the well had increased considerably and was no longer significantly different from conditions further away.

OSPAR (2009) concluded that the discharge of water-based muds and drill cuttings may cause some smothering in the near vicinity of the well location. The impacts from such discharges are localised and transient, but may be of concern in areas with sensitive benthic fauna, for example corals and sponges. Field experiments on the effects of water-based drill cuttings on benthos by Trannum *et al*. (2011) found after 6 months only minor differences in faunal composition between the controls and those treated with drill cuttings. This corresponds with the results of field studies where complete recovery was recorded within 1-2 years after deposition of water-based drill cuttings (Daan & Mulder 1996, Currie & Isaacs 2005).

[29] OSPAR Decision 2000/3 on the Use of Organic-Phase Drilling Fluids (OPF) and the Discharge of OPF-Contaminated Cuttings came into effect in January 2001 and effectively eliminated the discharge of cuttings contaminated with oil based fluids (OBF) greater than 1% by weight on dry cuttings.

Finer particles may be dispersed over greater distances than coarser particles although exposure to WBM cuttings in suspension will in most cases be short-term (Bakke *et al.* 2013). Chemically inert, suspended barite has been shown under laboratory conditions to potentially have a detrimental effect on suspension feeding bivalves. Standard grade barite, the most commonly used weighting agent in WBMs, was found to alter the filtration rates of four bivalve species (*Modiolus modiolus, Dosinia exoleta, Venerupis senegalensis* and *Chlamys varia*) and to damage the gill structure when exposed to 0.5mm, 1.0mm and 2.0mm daily depth equivalent doses (Strachan 2010, Strachan & Kingston 2012). All three barite treatments altered the filtration rates leading to 100% mortality. The horse mussel (*M. modiolus*) was the most tolerant to standard barite with the scallop (*C. varia*) the least tolerant. Fine barite, at a 2mm daily depth equivalent, also altered the filtration rates of all species, but only affected the mortality of *V. senegalensis*, with 60% survival at 28 days. The bulk of WBM constituents (by weight and volume) are on the OSPAR list of substances used and discharged offshore which are considered to Pose Little or No Risk to the Environment (PLONOR). Barite and bentonite are the materials typically used in the greatest quantities in WBMs and are of negligible toxicity. Field studies undertaken by Strachan (2010) showed that the presence of standard grade barite was not acutely toxic to seabed fauna but did alter benthic community structure. When the suspended barite levels used in laboratory studies are translated to field conditions (i.e. distances from the point of discharge) it is clear that any effects will be very local to a particular installation (in the case of oil and gas facilities, well within 500m).

Relevant information on the recovery of benthic habitats to smothering mainly comes from studies of dredge disposal areas (see Newell *at al.* 1998). Recovery following disposal occurs through a mixture of vertical migration of buried fauna, together with sideways migration into the area from the edges, and settlement of new larvae from the plankton. The community recolonising a disturbed area is likely to differ from that which existed prior to construction. Opportunistic species will tend to dominate initially and on occasion, introduced and invasive species may then exploit the disturbed site (Bulleri & Chapman 2010). Harvey *et al.* (1998) suggest that it may take more than two years for a community to return to a closer resemblance of its original state (although if long lived species were present this could be much longer). Shallow water (<20m) habitats in wave or current exposed regimes, with unconsolidated fine grained sediments have a high rate of natural disturbance and the characteristic benthic species are adapted to this. Species tend to be short lived and rapid reproducers and it is generally accepted that they recover from disturbance within months. By contrast a stable sand and gravel habitat in deeper water is believed to take years to recover (see Newell *et al.* 1998, Foden *et al*. 2009).

As noted, there may be a requirement for jack-up rig stabilisation (e.g. rock placement or use of mud mats) depending on local seabed conditions. In soft sediments, rock deposits may cover existing sediments resulting in a physical change of seabed type. The introduction of rock into an area with a seabed of sand and/or gravel can hypothetically provide “stepping stones” which might facilitate biological colonisation including by non-indigenous species by allowing species with short lived larvae to spread to areas where previously they were effectively excluded. On the UK continental shelf such “stepping stones” are already widespread and numerous for example in the form of rock outcrops, glacial dropstones and

moraines, relicts of periglacial water flows, accumulations of large mollusc shells, carbonate cemented rock etc., and these are often revealed in rig site and other (e.g. pipeline route) surveys.

4.4.3 Presence and movement of vessels

Blocks may support important numbers of seabirds at certain times of the year including overwintering birds and those foraging from coastal SPAs. Therefore, the presence and/or movement of vessels and aircraft from and within Blocks during exploration and appraisal activities could temporarily disturb foraging seabirds from relevant SPA sites. The anticipated level of airborne noise from helicopter traffic associated with Block activity is likely to be insignificant in the context of existing helicopter, military and civilian aircraft activity levels. Given the mature nature of the regions within which 30th Round Blocks are being offered, helicopter traffic is also likely to use established routes. Given the seasonal nature of the sensitivity, where relevant it is more appropriate to consider this in project level assessment (e.g. EIA and HRA where necessary), when the location and timing of activities are known.

Physical disturbance of seaduck and other waterbird flocks by vessel and aircraft traffic associated with hydrocarbon exploration and appraisal is possible, particularly in SPAs established for shy species (e.g. common scoter). Such disturbance can result in repeated disruption of bird feeding, loafing and roosting. For example, large flocks of common scoter were observed being put to flight at a distance of 2km from a 35m vessel, though smaller flocks were less sensitive and put to flight at a distance of 1km (Kaiser 2002, also see Schwemmer *et al.* 2011). Larger vessels would be expected to have an even greater disturbance distance (Kaiser *et al.* 2006). With respect to the disturbance and subsequent displacement of seabirds in relation to offshore wind farm (OWF) developments, the Joint SNCB interim displacement advice[30] recommends for most species a standard displacement buffer of 2km with the exception of the species groups of divers and sea ducks. Divers and sea ducks have been assessed as being the most sensitive species groups to offshore development and associated boat and helicopter traffic. Therefore for divers and sea ducks a 4km displacement buffer is recommended. Whilst displacement effects for divers have been detected at greater distances (e.g. 5-7km, Webb 2016), this is with respect to the construction and operation of offshore wind farms rather than oil and gas exploration activities, which have a much smaller spatial and temporal footprint.

A significant number of various bird species migrate across the North Sea region twice a year or use the area as a feeding and resting area (OSPAR 2015). Some species crossing or using the area may become attracted to offshore light sources, especially in poor weather conditions with restricted visibility (e.g. low clouds, mist, drizzle, Wiese *et al*. 2001), and this attraction can potentially result in mortality through collision (OSPAR 2015). As part of navigation and worker safety, and in accordance with international requirements, drilling rigs and associated vessels are lit at night and the lights will be visible at distance (some 10-12nm in good visibility). Guidelines (applicable to both existing and new offshore installations) aimed at reducing the

[30] http://jncc.defra.gov.uk/pdf/Joint_SNCB_Interim_Displacement_AdviceNote_2017.pdf

impact of offshore installations lighting on birds in the OSPAR maritime area are available (OSPAR 2015). Exploration drilling activities are temporary so a drilling rig will be present at a location for a relatively short period (e.g. up to 10 weeks), limiting the potential for significant interaction with migratory bird populations. Given the seasonal nature of the sensitivity, where relevant it is more appropriate to consider this in project level assessment (e.g. EIA and HRA where necessary), when the location and timing of activities are known.

The presence and/or movement of vessels from and within Blocks during exploration and appraisal activities could also potentially disturb marine mammals foraging within or close to designated or potential SACs for which they are a qualifying feature. Reported responses include avoidance, changes in swimming speed, direction and surfacing patterns, alteration of the intensity and frequency of calls and increases in stress-related hormones (Veirs *et al.* 2016, Rolland *et al.* 2012, Dyndo *et al.* 2015). Harbour porpoises, white-sided dolphins and minke whales have been shown to respond to survey vessels by moving away from them, while white-beaked dolphins have shown attraction (Palka & Hammond 2001). A study on captive harbour porpoises in a semi-natural net-pen complex in a Danish canal, recorded their behaviour while simultaneously measuring underwater noise of vessels passing the enclosure; reaction to noise was defined to occur when a highly stereotyped 'porpoising' behaviour was observed. Porpoising occurred in response to almost 30% of vessel passages; the most likely behavioural trigger were medium- to high- frequency components (0.25–63 kHz octave bands) of vessel noise, while low- frequency components of vessel noise and additional pulses from echo-sounders could not explain the results (Dyndo *et al*. 2015).

More evidence is available on bottlenose dolphins, especially for coastal populations. Shore-based monitoring of the effects of boat activity on the behaviour of bottlenose dolphins off the US South Carolina coast, indicated that slow moving, large vessels, like ships or ferries, appeared to cause little to no obvious response in bottlenose dolphin groups (Mattson *et al*. 2005). Pirotta *et al*. (2015) used passive acoustic techniques to quantify how boat disturbance affected bottlenose dolphin foraging activity in the inner Moray Firth. The presence of moving motorised boats appeared to affect bottlenose dolphin buzzing activity (foraging vocalisations), with boat passages corresponding to a reduction by almost half in the probability of recording a buzz. The boat effect was limited to the time where a boat was physically present in the sampled area and visual observations indicated that the effect increased for increasing numbers of boats in the area (Pirotta *et al.* 2013). Dolphins appeared to temporarily interrupt their activity when disturbed, staying in the area and quickly resuming foraging as the boat moved away.

Of primary concern for this HRA, is whether vessels linked to potential operations result in a significant increase to overall local traffic. New *et al*. (2013) developed a mathematical model simulating the complex social, spatial, behavioural and motivational interactions of coastal bottlenose dolphins in the Moray Firth to assess the biological significance of increased rate of behavioural disruptions caused by vessel traffic. A scenario was explored in which vessel traffic increased from 70 to 470 vessels a year but despite the more than six fold increase traffic, the dolphins' behavioural time budget, spatial distribution, motivations and social structure remained unchanged. While harbour porpoises appear to be more sensitive to

potential disturbance than bottlenose dolphins, the increase in vessel traffic linked to the proposed plan is expected to be negligible (see Table 2.2). In UK waters, a modelling study indicated a negative relationship between the number of ships and the presence and abundance of harbour porpoises within relevant management units when shipping intensity exceeded a suggested threshold of approximately 50 ships per day (within any of the model's 5km grid cells) in the Celtic Sea/Irish Sea and 80 ships per day in the North Sea (Heinänen & Skov 2015). The Marine Management Organisation commissioned project "Mapping UK shipping density and routes from AIS" (MMO 2014b) and the 2015 national dataset of marine vessel traffic[31] provides relevant shipping density information[32]. From 2015 AIS-derived ship density data, the approaches to major ports such as in the Humber and Thames regions had estimated shipping densities of up to 500 vessels per week, with the majority of coastal waters (10-25 vessels per week) and offshore waters (<5 vessels per week) supporting much lower densities. Jones *et al.* (2017) used the MMO (2014) data to highlight areas where high rates of co-occurrence between seals at-sea and shipping coincided with SACs. They predicted exposure to shipping (and associated shipping noise) was likely to be high in areas where very high intensities of spatial overlap occurred for one or both species of seals such as Orkney (e.g. Faray and Holm of Faray SAC), Shetland (e.g. Yell Sound Coast SAC), east coast of Scotland and England (e.g. Berwickshire and North Northumberland Coast SAC, Humber Estuary SAC, the Wash and North Norfolk Coast SAC), west Scotland (South East Islay Skerries SAC) and north Wales (no adjacent SAC with seals as a feature).

Worldwide, collisions with vessels are a potential source of mortality to marine mammals, primarily cetaceans. Whales are occasionally reported to be struck and killed, especially by fast-moving ferries but smaller cetacean species and seals can also be impacted by propeller strikes from smaller vessels. In the UK certain areas experience very high densities of commercial and recreational shipping traffic, some of which may also be frequented by large numbers of marine mammals; despite this, relatively few deaths are recorded as results of collisions (Hammond *et al.* 2008). Between 2000 and 2009, only 11 out of 1,100 post-mortems on harbour porpoises and common dolphins identified collision as the cause of death (UKMMAS 2010). Draft advice on operations for the Southern North Sea cSAC[33] indicates that post mortem investigations of harbour porpoise deaths have revealed death caused by trauma (potentially linked with vessel strikes) is not currently considered a significant risk.

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 result in negative effects on the environment. These include: displacing native species by preying on them or out-competing them for resources; irreversible genetic pollution through hybridisation with native species, and increased occurrence of harmful algal blooms (as reviewed in Nentwig 2006). The economic repercussions of these

[31] https://data.gov.uk/dataset/vessel-density-grid-2015
[32] Note that shipping densities are low over the majority of Blocks with higher densities primarily in coastal waters close to major ports.

ecological effects can also be significant (see IPIECA & OGP 2010, Lush *et al*. 2015, Nentwig 2007). In response to these risks, a number of technical measures have been proposed such as the use of ultraviolet radiation to treat ballast water or procedural measures such as a mid-ocean exchange of ballast water (the most common mitigation against introductions of non-native species). 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 will enter into force in 2018 after being ratified by 30 States in September 2017[34]. The Convention includes Regulations with specified technical standards and requirements (IMO Globallast website[35]). Further oil and gas activity is unlikely to change the risk of the introduction of non-native species as the vessels typically operate in a geographically localised area (rigs currently move between the Irish Sea and North Sea), and the risk from hull fouling is low, given the geographical working region and scraping of hulls for regular inspection.

4.4.4 Screening criteria for physical and drilling effects

With respect to **physical and drilling effects**, any Block should be screened in that is within or impinges on a Natura 2000 site, together with any Block within a buffer of 10km from a Natura 2000 site where there is a potential interaction between site features and exploration/appraisal activities in the Block.

Blocks and relevant Natura 2000 sites screened in on the basis of physical and drilling effects are shown in Figures 5.1 (SPAs) and 5.2 (SACs), and listed in Appendix B2. The relevant pathways of effect to be considered at the AA stage will depend on the location of the Blocks applied for and the qualifying features of the relevant sites.

4.5 Underwater noise

4.5.1 Noise sources and propagation

The sources, measurement, propagation, ecological effects and potential mitigation of noise associated with hydrocarbon exploration and production have been extensively reviewed, assessed and updated in each of the successive offshore energy SEAs (see DECC 2009, 2011, 2016).

Of those activities which could follow licensing (Table 2.2), geological seismic survey is of primary concern for noise effects. Other noise levels associated with activities potentially resulting from licensing of Blocks such as rig site survey, Vertical Seismic Profiling (VSP), pile-

[34] http://www.imo.org/en/About/Conventions/StatusOfConventions/Documents/List%20of%20Conventions%20and%20their%20amndts.pdf

[35] http://archive.iwlearn.net/globallast.imo.org/the-bwmc-and-its-guidelines/index.html

driving of conductors, drilling and vessel movements, are of a considerably lower magnitude and duration than those resulting from a deep geological seismic survey (see Table 2.2). There is now a reasonable body of evidence to quantify noise levels associated with these activities and to understand the likely propagation of such noise within the marine environment, even in more complex coastal locations.

4.5.2 Effects thresholds

Potential effects of anthropogenic noise on receptor organisms range widely, from masking of biological communication and small behavioural reactions, to chronic disturbance, auditory injury and mortality. In addition to direct effects, indirect effects may also occur for example via effects on prey species, complicating the overall assessment of significant effects. Marine mammals, and in particular the harbour porpoise, are regarded as the most sensitive to acoustic disturbance therefore it is considered appropriate to focus on marine mammals when assessing risk from underwater noise. While generally the severity of effects tends to increase with increasing exposure to noise, it is important to draw a distinction between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance.

Marine mammals

With respect to injury, risk from an activity can be assessed using threshold criteria based on sound levels. The latest SEA (OESEA3) supports the application of injury thresholds criteria developed by Southall *et al.* (2007), including the subsequent update for harbour porpoises in Lepper *et al*. (2014), based on the work by Lucke *et al.* (2009). It is recognised that seismic surveys have the potential to generate sound that exceeds thresholds of injury, but only within a limited range from source (tens to hundreds of meters). Within this zone, current mitigation measures as described in JNCC guidelines are thought sufficient in minimising the risk of injury to negligible levels.

With respect to disturbance, however, it has proved much more difficult to establish broadly applicable threshold criteria based on exposure alone; this is largely due to the inherent complexity of animal behaviour where the same sound level is likely to elicit different responses depending on an individual's behavioural context and exposure history. Field observations during industrial activities are fundamental sources of information for assessment. There is evidence for several species of cetaceans (mainly baleen whales) to suggest avoidance over distances most commonly around 2-5km from the seismic source while changes in acoustic communication have been recorded at much greater distances (up to tens or hundreds of kilometres) but the biological significance of these observed changes is uncertain. Evidence of the effects of seismic surveys on odontocetes and pinnipeds is limited but of note are the recent studies carried out in the Moray Firth observing responses to a 10 day 2-D seismic survey (Thompson *et al.* 2013a). Thompson *et al*. (2013a) reported a relative decrease in the density of harbour porpoises within 10km of the survey vessel and a relative increase in numbers at distances greater than 10km. These effects were short-lived with porpoise returning to impacted areas within 19 hours after cessation of activities. Overall, it was concluded that while short-term disturbance was induced, the survey did not lead to long-term or broad-scale displacement (Thompson *et al*. 2013a). Further acoustic analyses

revealed that for those animals which stayed in proximity to the survey, there was a 15% reduction in buzzing activity associated with foraging or social activity; however, high levels of natural variability in the detection of buzzes was noted prior to survey (Pirotta *et al*. 2014). Passive acoustic monitoring provided evidence of short-term behavioural responses also for bottlenose dolphins but no measurable effect on the number of dolphins using the Moray Forth SAC could be revealed (Thompson *et al*. 2013b).

Fish

Many species of fish are highly sensitive to sound and vibration and broadly applicable sound exposure criteria have recently been published (Popper *et al.* 2014). In addition to consideration of Annex II fish species as qualifying features of European sites (e.g. Atlantic salmon, sea lamprey), fish more broadly are important prey items of marine mammal and seabird qualifying features; for the latter, sandeels, small pelagic species and young gadoids are particularly important. Studies investigating fish mortality and organ damage from noise generated during seismic surveys are very limited and results are highly variable, from no effect to long-term auditory damage (reviewed in Popper *et al.* 2014). On the other hand, behavioural responses and effects on fishing success ("catchability") have been reported following seismic surveys (Pearson *et al.* 1992, Skalski *et al.* 1992, Engås *et al.* 1996, Wardle *et al*. 2001). Potential effects on migratory diadromous fish is an area of significant interest for which empirical evidence is still limited, especially as salmonids and eels are sensitive to particle motion (not sound pressure) (Gill & Bartlett 2010). Atlantic salmon *Salmo salar* have been shown through physiological studies to respond to low frequency sounds (below 380Hz), with best hearing at 160Hz (threshold 95 dB re 1 µPa). Hence, their ability to respond to sound pressure is regarded as relatively poor with a narrow frequency span, a limited ability to discriminate between sounds, and a low overall sensitivity (Hawkins & Johnstone 1978, cited by Gill & Bartlett 2010).

Studies on the hearing abilities of sandeels and their responses to noise are very limited. Hassel *et al.* (2004) observed startle responses from caged sandeels in response to seismic survey noise in the North Sea; no sandeels took refuge in the sand during seismic shooting, and no increased mortality was observed in comparison with controls. A study of the auditory thresholds of the closely-related Japanese sandeel (*Ammodytes personatus)* reported an ability to detect low frequency tone bursts at ≤500Hz, although their sensitivity was less than that of other fish species (Suga *et al*. 2005). The lack of a swim bladder in sandeel is considered to be responsible for their observed low sensitivity to underwater noise.

Diving birds

Direct effects from seismic exploration noise on diving birds could occur through physical damage, or through disturbance of normal behaviour, although evidence for such effects is very limited. Deeper-diving species which spend longer periods of time underwater (e.g. auks) may be most at risk of exposure to high-intensity noise from seismic survey and consequent injury or disturbance, but all species which routinely submerge in pursuit of prey and benthic feeding opportunities (i.e. excluding shallow plunge feeders and dabblers) may be exposed to anthropogenic noise. Relevant species are listed in Box 4.1. Very high amplitude low frequency underwater noise may result in acute trauma to diving seabirds, with two studies

reporting mortality of diving birds in very close (i.e. tens of metres) proximity to underwater explosions (Stemp 1985, Danil & St Leger 2011). However, mortality of seabirds has not been observed during extensive seismic operations in the North Sea and elsewhere. While seabird responses to approaching vessels are highly variable, flushing disturbance would be expected to displace most diving seabirds from close proximity to seismic airgun arrays, particularly among more sensitive species such as scoter, divers and cormorant (Garthe & Hüppop 2004).

The reported in-air hearing sensitivity for a range of diving duck species, red-throated diver and gannet have been tested for tone bursts between frequencies of 0.5-5.7kHz; results revealed a common region of greatest sensitivity from 1-3kHz, with a sharp reduction in sensitivity >4kHz (Crowell e*t al.* 2015). Testing on one of these species underwater (the long-tailed duck), showed reliable responses to high intensity stimuli (> 117 dB re 1µPa) from 0.5-2.9kHz (Crowell 2014). One recent study of underwater hearing in the cormorant suggested a hearing threshold of 70-75 dB re 1µPa rms for tones at tested frequencies of 1-4kHz (Hansen *et al*. 2017). The authors argue that this underwater hearing sensitivity, which is broadly comparable to that of seals and small odontocetes at 1-4kHz, is suggestive of the use of auditory cues for foraging and/or orientation and that cormorant, and possibly other species which perform long dives, are sensitive to underwater sound. One study showed that the use of acoustic pingers mounted on the corkline of a gillnet in a salmon fishery, emitting regular impulses of sound at *ca*. 2kHz, was associated with a significant reduction in entanglements of guillemot, but not rhinoceros auklet (Melvin *et al*. 1999).

A study 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). McCauley (1994) inferred from vocalisation ranges that the threshold of perception for low frequency seismic in some species (e.g. penguins, considered as a possible proxy for auk species) would be high, hence only in close proximity to the source might individuals be adversely affected. More recently, Pichegru *et al*. (2017) used telemetry data from breeding African penguins to document a shift in foraging distribution concurrent with a 2D seismic survey off South Africa. Pre/post shooting, areas of highest use (indicated by the 50% kernel density distribution) bordered the closest boundary of the seismic survey; during shooting, their distribution shifted away from the survey area, with areas of higher use at least 15km distant to the closest survey line. However, insufficient information was provided on the spatio-temporal distribution of seismic shooting or penguin distribution to determine an accurate displacement distance. It was reported that penguins quickly reverted to normal foraging behaviour after cessation of seismic activities, suggesting a relatively short-term influence of seismic activity on these birds' behaviour and/or that of their prey (Pichegru *et al*. 2017).

These data are limited, and further studies across a variety of diving species are required. However, the observed regions of greatest hearing sensitivity for cormorants in water and other diving birds in air are above those low frequencies (i.e. <500Hz) which dominate and propagate most widely from geological survey. While there is some evidence of noise-induced changes in the distribution and behaviour of diving birds in response to impulsive underwater

noise, these have been temporary and may be a direct disturbance or reflect a change in fish distribution during that period (possibly as a result of seismic activities).

Box 4.1: Migratory and/or Annex I diving bird species considered in the screening for potential acoustic effects

Divers and grebes	**Diving ducks**
Great northern diver *Gavia immer*	Pochard *Aythya ferina*
Red-throated diver *Gavia stellata*	Tufted duck *Aythya fuligula*
Black-throated diver *Gavia arctica*	Scaup *Aythya marila*
Little grebe *Tachybaptus ruficollis*	Eider *Somateria mollissima*
Great crested grebe *Podiceps cristatus*	Long-tailed duck *Clangula hyemalis*
Slavonian grebe *Podiceps auritus*	Common scoter *Melanitta nigra*
Seabirds	Velvet scoter *Melanitta fusca*
Manx shearwater *Puffinus puffinus* [a]	Goldeneye *Bucephala clangula*
Gannet *Morus bassanus*	Red-breasted merganser *Mergus serrator*
Cormorant *Phalacrocorax carbo carbo*	Goosander *Mergus merganser*
Shag *Phalacrocorax aristotelis*	
Guillemot *Uria aalge*	
Razorbill *Alca torda*	
Puffin *Fratercula arctica*	

Note: Includes species which are known to engage in pursuit diving or benthic feeding in marine, coastal and estuarine waters at least during part of the year. [a] *Recent research suggests that Manx shearwater routinely dive deeper than previously assumed, with an average depth of 9.6m and maximum depth of 55m (n = 36 tagged individuals) (Shoji et al. 2016).*

4.5.3 Screening criteria for underwater noise effects

With respect to **acoustic disturbance**, any Block should be screened in that is within 15km of a SAC with qualifying features regarded as sensitive to underwater noise (e.g. marine mammals and migratory fish). In the context of established injury threshold criteria (e.g. Southall *et al.* 2007), and the outcome of studies on the effects of seismic activity on marine mammal species in the UKCS (e.g. Thompson *et al.* 2013a, Pirotta *et al.* 2013), this is considered to be a conservative estimate of a maximum distance within which likely significant effects could be expected from the loudest noise sources associated with geological seismic survey activities. Blocks within 15km of an SPA designated for diving birds (see Box 4.1) should also be screened in.

Blocks and relevant Natura 2000 sites screened in on the basis of acoustic disturbance effects are shown in Figures 5.3 (SPAs) and 5.4 (SACs) and listed in Appendix B3.

4.6 Consideration of mobile species

There is the potential for mobile qualifying species (primarily seabirds, marine mammals and fish) of relevant sites to interact with exploration and appraisal activities which could occur in 30th Round Blocks while those species are outside of Natura 2000 sites. An overview of the

current understanding of the foraging ranges of relevant species is given below, including a discussion of their potential interaction with work programme activities at distance from relevant sites.

4.6.1 Seabirds

Information on the foraging movements of a number of seabird species has increased in recent years, mainly due to advances in satellite and other tracking technologies (e.g. Langston *et al*. 2013, Wakefield *et al*. 2015, 2017, Thaxter *et al*. 2014, Cleasby *et al*. 2015, Bogdanova *et al*. 2017, Carter *et al*. 2016, Edwards *et al*. 2016). There is generally limited information on foraging areas used by species from particular colonies, and to help address this, Thaxter *et al*. (2012) reported on representative breeding season foraging ranges for a range of species.

Table 4.1 provides indicative foraging ranges (mean maximum and mean) travelled for a range of seabird species from a breeding colony to a foraging area. The mean maximum foraging range value has been used here to show possible connectivity to breeding colony SPAs, however bird density will not be continuous throughout this range. Other ways of representing foraging ranges (e.g. the mean, or percentage foraging area derived from kernel analyses) may therefore provide more useful information, where available. Whilst applying mean maximum foraging radius would encompass the majority of a population's home-range area, the overall size of the predicted foraging areas around the colony would potentially make it too large to be a useful management tool, without further refinement using habitat and bathymetric data (Soanes *et al.* 2016). Similarly, the assumption that seabirds are uniformly distributed out to some threshold distance from their colonies, such as their putative maximum foraging range, is unrealistic. Seabird density declines with distance from the colony with density-dependent competition, coastal morphology and habitat preference resulting in highly non-uniform distributions (Wakefield *et al*. 2017).

Table 4.1: Indicative breeding season foraging ranges

Species	Mean maximum[1] (km)	Mean[2] (km)	Confidence level[3]
Eider	80	2.4	Poor
Red-throated diver	9	4.5	Low
Fulmar	400 ± 245.8	47.5 ± 1	Moderate
Manx shearwater	18.3 ± 12.5 & >330	2.3 ±0.8	Moderate
Leach's storm petrel	91.7 ± 27.5	-	Poor
Gannet	229.4 ± 124.3	92.5 ± 59.9	Highest
Cormorant	25 ± 10	5.2 ± 1.5	Moderate
Shag	14.5 ± 3.5	5.9 ± 4.7	Moderate
Arctic skua	62.5 ± 17.2	6.4 ± 5.9	Uncertain
Great skua	10.9 ± 3.0 & 86.4	-	Moderate, Poor
Black-headed gull	25.5 ± 20.5	11.4 ± 6.7	Uncertain
Common gull	50	25	Poor
Mediterranean gull	20	11.5	Uncertain
Herring gull	61.1 ± 44	10.5	Moderate
Lesser black-backed gull	141.0 ± 50.8	71.9 ± 10.2	Moderate
Kittiwake	60.0 ± 23.3	24.8 ±12.1	Highest
Sandwich tern	49.0 ± 7.1	11.5 ± 4.7	Moderate

Species	Mean maximum[1] (km)	Mean[2] (km)	Confidence level[3]
Roseate tern	16.6 ± 11.6	12.2 ± 12.1	Low
Common tern	15.2 ± 11.2	4.5 ± 3.2	Moderate
Arctic tern	24.2 ± 6.3	7.1 ± 2.2	Moderate
Little tern	6.3 ± 2.4	2.1	Low
Guillemot	84.2 ± 50.1	37.8 ± 32.2	Highest
Razorbill	48.5 ± 35.0	23.7 ± 7.5	Moderate
Puffin	105.4 ± 46.0	4	Low

Notes:

1. The maximum range reported in each study averaged across studies.

2. The mean foraging range reported for each colony averaged across all colonies. For tracking studies, this was typically the mean foraging range from all central place foraging trips assessed at the colony.

3. Confidence levels were assigned as follows: highest (based on >5 direct studies); moderate (between 2-5 direct studies); low (indirect measures or only one direct tracking study); uncertain (survey-based estimates); poor (few survey estimates or speculative data available).

Source: Thaxter et al. (2012)

The distribution at sea throughout the year of many of the species in Table 4.1 is summarised in Appendix A1a.6 of the OESEA3 Environmental Report (DECC 2016); in general, they are widely distributed at low densities with areas of moderate or higher density. Within the North Sea, these areas include: the shelf edge for gannet and lesser black-backed gulls; the Dogger Bank for guillemot; the Dutch Bank for herring gull; Fladen Ground for kittiwake; and, the Moray Firth and Aberdeen bank for razorbill (Stone *et al*. 1995). To the north west of the UK, seabird distribution is closely correlated to water depth with more birds found over shallower continental shelves than the deeper oceanic waters. Birds present in the deeper slope and oceanic waters will comprise mainly pelagic species (e.g. fulmar, gannet and kittiwake). Some high density areas are also likely to be transitory, associated with short-lived natural feeding aggregations or attraction to fishing vessels. A BEIS-funded three-year telemetry study of gannets from Bempton Cliffs indicated a marked decline in the density of foraging locations with distance from colony, which was the over-riding influence on gannet distribution at-sea during the breeding season (Langston *et al*. 2013). Similarly, Votier *et al*. (2010, 2011) reported that breeding gannets, constrained by the need to regularly return to the nest, foraged less widely than immature birds. Other studies using GPS tracking of breeding gannets have indicated some consistency in the use of foraging areas by individual adults (e.g. Hamer *et al*. 2007, Patrick *et al*. 2015, Wakefield *et al*. 2015). Wakefield *et al.* (2017) used extensive tracking data and environmental covariates to model the predicted at-sea distribution of four seabird species during the breeding season (shag, guillemot, razorbill and kittiwake), including extrapolations for Seabird 2000 census counts at approximately 5,500 breeding sites in Britain and Ireland. Seabird density was shown to decline with distance from the colony, with kittiwake distribution being the most diffuse (albeit with discrete high-density areas) and shag the most confined to near-shore waters. While density-dependent competition, coastal morphology and habitat preferences resulted in highly non-uniform distributions, the core areas of use of all four study species overlapped within most of the coastal waters in Scotland, highlighting the importance of this area to these species (Wakefield *et al*. 2017).

As part of the process of identifying potential Marine Protected Areas, seabird aggregations have been delineated through analysis of the European Seabirds at Sea (ESAS) database (Kober *et al.* 2010, 2012). Forty-two areas were identified for eleven seabird species, covering many of the species highlighted in Table 4.2 (fulmar, Manx shearwater, gannet, shag, great skua, kittiwake, common gull, herring gull, Arctic tern, guillemot and puffin) in both the breeding and the non-breeding seasons. A review of 25 of these areas in light of other independent information was carried out to provide a more robust and complete evidence-base on which to base any future decisions about these areas (note that a number are currently proposed SPAs) (Cook *et al.* 2015). The review also considered whether there was a sound ecological rationale behind each aggregation such as the presence of suitable habitat, proximity to known breeding colonies, or high abundance of prey species in the area. Based on this process, a number of proposed marine SPAs have recently undergone consultation covering foraging areas during breeding periods as well as wintering areas for most of the species identified above. These proposed SPAs have been screened in where appropriate. BEIS will ensure that the HRA process considers the ongoing marine SPAs identification process.

Physical, visual or acoustic disturbance from exploration drilling and seismic survey is not regarded to result in significant effects for bird species in relation to Blocks beyond those already screened in, as outlined in Sections 4.4 and 4.5. This is due to: the relatively small seabed footprint and transitory nature of rig placement/installation and drilling discharges coupled with the relatively low densities of seabirds in offshore waters; that none of the species that are likely to be present offshore (outside Blocks screened in by the 10km physical disturbance criterion) are particularly vulnerable to disturbance by shipping (Garthe & Hüppop 2004) and are therefore unlikely to be significantly disturbed by the presence and movement of vessels associated with exploration activities. The likely low density of diving birds in offshore areas, and their limited exposure time and likely low sensitivity to underwater noise (see Section 4.5) would indicate that significant disturbance from seismic surveys in Blocks beyond those already screened in by the 15km noise criterion is unlikely.

4.6.2 Marine mammals

Applicable Annex II species include the two species of seal which breed in the UK and Republic of Ireland: the harbour (*Phoca vitulina*) and grey seal (*Halichoerus grypus*); and two cetaceans: the harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*).

Seals

The seal management units (MU) currently in use around the UK (indicated on Figures 5.5 and 5.6) were originally formulated in response to requirements of legislative drivers and do not define discrete populations. Given the movement of animals between MUs (Russell *et al*. 2013), especially in the case of grey seals, impacts on animals may have effects at the population level outside the particular MU with which the 'population' is associated (SCOS 2014). For harbour seals, these are broadly similar to OSPAR EcoQO units (OSPAR Ecological Quality Objectives) and supported by recent ICES advice on assessment units for the Marine Strategy Framework Directive (MSFD) (ICES 2014). For grey seals, ICES has advised for only two assessment units, one for the North Sea and one to combine western

Britain, Ireland and Western France. An Inter-Agency Marine Mammal Working Group (IAMMWG 2015) paper on management units for cetaceans in UK waters indicated that an as yet unpublished paper outlining seal MUs was in preparation. Genetic studies suggest differentiation of harbour seals into four main clusters of: southern UK-mainland Europe; northern Ireland-west coast Scotland; east Scotland, Orkney and Shetland; and, Norway (Olsen *et al*. 2017).

Major breeding colonies of grey and harbour seals are protected around the UK as a series of coastal SACs, several of which extend, to varying degrees, into adjacent waters. As central-place foragers, seal colonies and haul-out sites are important not only in the breeding season, but throughout the year through provision of habitat for resting and during moulting periods. Nonetheless, grey and harbour seals are highly mobile marine species which spend extensive periods of time foraging beyond the boundaries of colony SACs (Matthiopoulos *et al*. 2004, Sharples *et al*. 2012, Jones *et al*. 2015). One study estimated that between 21-58% of female grey seals predominately foraged in a different region[36] to that within which they bred (Russell *et al*. 2013), while telemetry and individual recognition (photo-identification) data have revealed the movement of seals, particularly grey seals, between the UK and the waters of adjacent Member States (Jones *et al*. 2015, Brasseur *et al*. 2015).

Models of the at-sea distribution of grey and harbour seals which breed and haul-out around the UK and Ireland have been developed from extensive tagging data combined with population estimates derived from aerial and land-based counts. These data include 259 grey seals tracked between 1991 and 2013 and 277 harbour seals tagged between 2003 and 2013 (Jones *et al*. 2015). An update for grey seals in the North Sea region was provided in 2016 to incorporate data from a further 21 tags deployed off south-east England in 2015 and four on the east coast of Scotland in 2013 (Jones & Russell 2016). Figures 5.5 and 5.6 show the UK-wide density of harbour and grey seals respectively in relation to the 30th Round Blocks offered, those Blocks screened in and relevant seal management units. The usage maps represent the estimated number of seals in each 5x5km grid square at any point in time (Jones *et al*. 2015).

Results show that grey seals use offshore areas (up to 100km from the coast) connected to their haul-out sites by prominent corridors, while harbour seals primarily stay within 50 km of the coastline (Jones *et al*. 2015). For both species, density is greatest in coastal waters adjacent to colonies. Very few Blocks offered in the 30th Seaward Licensing Round overlap territorial waters of Scotland, including Orkney and Shetland, or northeast England, which comprise some of the most important marine areas for grey and harbour seals in UK and Irish waters. Those Blocks offered which abut the coastline are largely restricted to the southern North Sea and Irish Sea areas, where the highest at-sea densities of grey and harbour seals are generally within 15km of SAC boundaries for which seals are a qualifying feature (e.g. Irish Sea - Strangford Lough SAC, Murlough SAC, the Maidens SCI; southern North Sea - Humber

[36] The regions investigated included: Hebrides; northern Scotland (*ca*. Cape Wrath to Rattray Head); east coast (*ca*. Rattray Head to R. Tees); and, south-east coast (*ca*. R. Tees to Deal) (Russell *et al*. 2013).

Estuary SAC, The Wash and North Norfolk Coast SAC) and are consequently already screened in.

There are several offshore areas in the southern North Sea with high modelled densities of grey seals (e.g. > 10 seals per 5x5km grid cell) which appear to support important foraging habitat for this species (Jones & Russell 2016; Figure 5.6). While a proportion of the seals using these areas will be associated with the Humber Estuary SAC, the offshore estimated densities are far lower than those close to the boundary of the SAC, which can exceed 200 seals per 5x5km grid cell (Jones & Russell 2016). Consequently, it is considered that the underwater noise criteria (15km; see Section 4.5) screens in all Blocks of relevance to the areas of highest seal density associated with the Humber Estuary SAC. Grey seals move widely throughout the wider North Sea, with individuals regularly travelling long distances between breeding colonies, haul-outs and foraging areas. For example, a disproportionately large foraging population (compared to the breeding population) in the UK southern North Sea suggests that some animals forage in this area but breed elsewhere, such as colonies further north (Russell 2016). Therefore, offshore areas of importance to this mobile species are likely to be used by animals associated with multiple breeding colonies over a wide area and it is not considered necessary to screen in additional offshore Blocks for likely significant effects on the integrity of a specific site(s).

At-sea usage modelling of grey seals suggests an area of high density (up to 127 seals per 5x5km grid cell) in Liverpool Bay in the Irish Sea, with the area used by foraging animals which haul-out on Hilbre Island and West Hoyle sandbank at the mouth of the Dee Estuary (maximum count of 518 seals reported in May 2002; Westcott & Stringell 2004). These animals do not breed in Liverpool Bay, and there are no colony SACs for which they are qualifying features within many tens of kilometres of this area of high use. Telemetry and photo-identification data indicate grey seals occurring in Liverpool Bay move widely throughout the Irish Sea (SCOS 2013, Stone *et al*. 2013, Hammond *et al*. 2005) and it is not possible to assign a majority of individuals to a particular colony SAC. Individuals of breeding age likely breed among various small colonies round the North Wales coast and Isle of Man, with others travelling further to breed at SACs where they are qualifying features on the Welsh coast[37], Irish east coast[38] and within the Hebrides[39], and it is likely that at least a proportion of animals breed at small colonies where they are not qualifying features of any SAC. In view of the available information, significant effects to specific SACs are not considered likely, and no further Blocks are screened in.

Cetaceans

Analyses of photo-identification data and some genetic studies have shown that within European waters there are coastal/inshore groups of bottlenose dolphins which are mobile and range over large areas but still show strong site fidelity along defined stretches of coast (see ICES 2013, Quick *et al*. 2014). Some dolphins appear to make long-distance movements from

[37] Lleyn Peninsula & the Sarnau SAC; Cardigan Bay SAC; Pembrokeshire Marine SAC
[38] Lambay Island SAC; The Maidens SCI
[39] Treshnish Isles SAC

the east coast of Scotland to the west coast of Scotland and to Irish waters, although the population identity of these apparently wide-ranging individuals is unknown (Robinson *et al*. 2012). Whilst ICES (2013) recognised that in some areas information is incomplete, that distribution may be ephemeral and the animals present likely comprise sympatric populations, they proposed a series of bottlenose dolphin MUs for UK waters; the boundaries of which were finalised by IAMMWG (2015) (Figure 5.7).

With regard to the MU for bottlenose dolphin in the coastal regions of east of Scotland (Figure 5.7), the closest Blocks offered in the 30th Round to the Moray Firth SAC - the only Natura 2000 site designated for this population - are 76km distant. However, the range of this population extends well beyond the boundaries of the Moray Firth SAC as animals utilise waters off the southern Moray Firth, Grampian and Fife coasts (Cheney *et al*. 2013). Quick *et al*. (2014) indicated that individual dolphins range up and down the coast, with much spatial and temporal variability in individual movements. Outside of the SAC, dolphins were most frequently encountered in waters less than 20m deep and within 2km of the coast in and around the Tay Estuary as well as along the coast between Montrose and Aberdeen. Dolphins present within those 30th Round Blocks which fall within the coast east Scotland MU are likely to be transiting between the SAC and these other areas on the east coast.

Similarly, relevant SACs for the Irish Sea MU for bottlenose dolphins include the Lleyn Peninsula and Sarnau SAC and Cardigan Bay SAC, which are located to the south of the 30th Round Blocks (Figure 5.7). The ranging patterns of dolphins associated with these two sites are not well known, and occasional sightings throughout much of the Irish Sea coast suggest that some animals may range widely throughout the region (Baines & Evans 2012). However, persistently high sighting rates and extensive matches of individuals with those observed in Cardigan Bay indicate that coastal waters around the north and east coast of Anglesey are important for animals associated with these two SACs (Pesante *et al*. 2008, Baines & Evans 2012, Evans *et al*. 2015). It is apparent that a large proportion of this population spend the winter in waters off north Wales, whilst smaller numbers can be seen in this area throughout the year (Pesante *et al*. 2008). Relevant 30th Round Blocks (109/16, 109/17, 109/18, 109/19, 109/20 and 110/16) have already been screened in through application of the physical disturbance and underwater noise criteria to the North Anglesey Marine cSAC designated for harbour porpoise.

The harbour porpoise is the most common cetacean in UK waters; it is wide-ranging and abundant throughout the UK shelf seas, both coastally and offshore (Reid *et al*. 2003). This species is sighted throughout the year, although peak numbers are generally recorded in summer months from June to October. Since the early 1990s it appears to have become much less common around the Northern Isles, while increasing in numbers in the English Channel, southern North Sea and in the Celtic Sea, where few individuals had been previously observed (i.e. SCANS-I 1994) (Hammond *et al*. 2013, 2017; also see Evans *et al.* 2015). In coastal waters they are often encountered close to islands and headlands with strong tidal currents (e.g. Pierpoint 2008); sightings becoming increasingly rare close to the continental shelf edge, with relatively few records in deeper waters beyond the shelf edge (Reid *et al*. 2003). Individuals across the UKCS are part of the north east Atlantic population which is

mainly considered to be a single 'continuous' population, even though some degree of genetic differentiation has been observed (Andersen *et al.* 1997, 2001, Tolley *et al.* 2001, Fontaine *et al.* 2007). However, for management and conservation purposes, three distinct UK Management Units have been proposed (IAMMWG 2015); the North Sea, West Scotland and the Celtic & Irish Seas.

Heinänen & Skov (2015) identified discrete and persistent areas of relatively high porpoise density, which were found to mainly lie within the Irish Sea and Welsh coastal waters, shelf waters of the North Sea and along the north-west Scottish coast. Following on from this work, six candidate Special Areas of Conservation (cSACs) (in both inshore and offshore waters) for harbour porpoise were identified, all of which were submitted to the European Commission in January 2017.

Three of these sites occur within the Irish Sea region: The North Channel cSAC, North Anglesey Marine cSAC and West Wales Marine cSAC (to the south of the Blocks). These sites have been selected as areas with predicted persistent high densities of harbour porpoise. Similarly, there is a considerable body of evidence supporting the importance of the southern North Sea to harbour porpoise (e.g. Hammond *et al*. 2013, 2017), with the Southern North Sea cSAC encompassing a large area of persistently high relative density which includes areas of importance during both summer (primarily the northern two thirds) and winter (primarily the southern third). Most of these sites, along with the Doggersbank SAC and Klaverbank SAC in neighbouring Dutch waters, have already been screened in along with relevant Blocks for likely physical disturbance and underwater noise effects. Given that these sites encompass the main environmental variables (e.g. habitats, depth, current strength) determining the distribution of harbour porpoise, it is not considered necessary to screen in any additional Blocks.

4.6.3 Fish

Of those fish listed under Annex II of the EC Habitats Directive, only Atlantic salmon, sea lamprey and river lamprey are qualifying species of sites relevant to the 30th Round Blocks.

Given their widespread and transient presence offshore, particularly in the majority of Blocks to the west of the UK in deeper waters, where diadromous species for example will only be present on migration and unlikely to be encountered, potential exploration activity in the 30th Round Blocks away from the coast is unlikely to have a significant effect on relevant sites. Consequently, no additional Blocks to those already screened in on the basis of physical disturbance or noise effects have been identified for further assessment.

4.6.4 Conclusion

Whilst individuals of the mobile species discussed above could potentially interact with work programme activities associated with the Initial Term (see Section 2.2) for Blocks other than those already screened in, significant effects on the populations of sites relating to such species, and therefore the conservation status of such sites, are not considered likely. This is due to the combination of:

- The small physical footprint of activities and their transitory nature.

- The likely scale of potential activity (i.e. number of licences applied for and awarded, and actual activity which follows, see Section 2.3.1), and the duration of the initial term (up to 9 years) within which activity could take place.
- The likely relative density of relevant features in relation to activities which could take place.

4.7 In-combination effects

This screening assessment includes the potential for in-combination effects resulting from the interaction of exploration/appraisal activities in 30th Round Blocks with activities resulting from other marine plans, programmes and activities to lead to likely significant effects on European sites.

Marine planning has a key role in informing strategic and project level spatial considerations, with the Marine Policy Statement indicating, *"Marine Plans should reflect and address, so far as possible, the range of activities occurring in, and placing demands on, the plan area. The Marine Plan should identify areas of constraint and locations where a range of activities may be accommodated. This will reduce real and potential conflict, maximise compatibility between marine activities and encourage co-existence of multiple uses."*

Currently, there are 11 marine plan areas within English inshore and offshore regions and marine plans have been adopted for two of these which are relevant to Blocks offered as part of the 30th Round, the East Inshore and Offshore plans. Marine plans are presently in development for the other 9 areas, with a draft of the South Marine Plan published for consultation in November 2016, and all are due to be complete by 2021. The Scottish National Marine Plan was adopted in March 2015 and subsequent regional planning has been proposed for a further 11 inshore areas. The Welsh Government launched the formal consultation on the draft Welsh National Marine Plan (WNMP)[40] in December 2017 and the marine plan for Northern Irish waters is still in development[41]. To date, whilst the marine plans acknowledge the potential interactions between activities and map these, indicate key resource areas and provide policy context in relation to potential activity interactions, they are not spatially prescriptive and therefore provide a limited indication of the location of possible future development.

The uncertainty over the scale and timing of activities which could follow licensing of 30th Round Blocks and the activities resulting from other plans and programmes is recognised. Using a GIS, the 30th Round Blocks (distinguishing those screened in and screened out following the application of the criteria given in Section 4.3-4.5) are considered in the context of areas of activity and proposals for a range of marine activities/potential activities including:

[40] https://consultations.gov.wales/consultations/draft-welsh-national-marine-plan
[41] See: https://www.daera-ni.gov.uk/articles/marine-plan-northern-ireland

- Existing oil and gas licences (Figures 5.8 and 5.9)
- Leases/licences or Agreement for Leases for Carbon Capture and Storage or hydrocarbon gas storage (Figures 5.8 and 5.9)
- Existing oil and gas infrastructure (Figures 5.8 and 5.9)
- Marine renewable energy developments, zones and related cables/cable agreement areas (Figures 5.10 and 5.11)
- Marine aggregate extraction (Figure 5.10 and 5.11)
- Shipping density (Figures 5.12 and 5.13)
- Fisheries

GIS outputs are included for each of the above showing the spatial relationship to SPAs and SACs and a text based consideration is made of the potential for in-combination effects leading to likely significant effects on European sites (see Section 5).

5 Screening

5.1 Screening of potential effects of 30th Round Block activities

The screening of the various sources of impact from exploration and appraisal activities which could follow licensing of the 30th Round Blocks (as described in Section 4) were applied to the relevant European sites and considered in the context of mobile species when not within site boundaries. This led to the identification of a number of Blocks for which likely significant effects on European sites could not be discounted at the screening stage. Figures 5.1-5.4 illustrate these initial screening results as paired maps showing the Blocks and sites which have been screened in.

The Blocks screened in at this stage are listed in Table 5.1.

Table 5.1: List of Blocks initially screened in

West of Shetland and Central and Northern North Sea									
9/28c	9/29b	15/19	15/24	15/25e	16/3e	16/4	16/16	16/21e	19/6
19/7	203/4	205/14	205/18	205/19	205/25	205/28	205/29	205/30	206/11d
206/11e	206/12b	206/16a	207/7	208/30					
Southern North Sea									
42/5b	42/8a	42/9a	42/10c	42/13b	42/14	42/15b	42/17	42/18	42/20a
42/26	42/27b	42/28f	42/30d	43/1	43/2	43/3	43/4	43/5	43/6
43/7	43/8	43/9	43/10	43/13a	43/14	43/15	43/16	43/17a	43/18a
43/19c	43/20a	43/22c	43/23	43/24b	43/24c	43/25a	43/26c	43/27c	43/27b
43/28	43/29b	43/30a	44/6	44/7	44/8b	44/9b	44/10b	44/11d	44/12d
44/12e	44/14	44/15	44/17d	44/18g	44/19c	44/22d	44/22e	44/23h	44/24d
44/25	44/26b	44/28c	44/29a	44/30b	47/1	47/2d	47/3j	47/3f	47/4e
47/5f	47/6	47/7	47/8f	47/9e	47/10d	47/13c	47/14c	47/15c	47/18
47/19	47/20	47/22	47/23	47/24	47/25	47/28	47/29	47/30	48/1e
48/4c	48/5b	48/6b	48/6d	48/7d	48/8b	48/9b	48/10c	48/10d	48/11c
48/11d	48/12b	48/12f	48/13c	48/14c	48/14b	48/15d	48/16	48/17d	48/18b
48/19b	48/20c	48/21b	48/22d	48/23d	48/24a	48/26	48/27	48/28b	48/29c
48/29b	48/30b	48/30c	49/1b	49/2b	49/4e	49/5d	49/6b	49/6c	49/7
49/8b	49/9e	49/9f	49/10e	49/11c	49/12c	49/13	49/14c	49/14a	49/15b
49/16d	49/16b	49/17d	49/17e	49/17c	49/18c	49/18b	49/20c	49/21e	49/21f
49/22b	49/23b	49/23c	49/24b	49/24c	49/25c	49/26b	49/27c	49/28c	49/28e
49/29b	49/30f	50/11	50/16	50/21	50/26b	51/4	51/5	52/1	52/2
52/3	52/4b	52/5b	52/5c	52/8	52/9	52/10	52/14	52/15	52/19
52/20	53/1b	53/2c	53/3a	53/4a	53/5d	53/6	53/7	53/8	53/9
53/10b	53/11	53/12	53/13	53/14b	53/16	53/17	53/18	53/19	53/20b
54/1a									

Table 5.1: List of Blocks initially screened in

Irish Sea									
108/2	108/3	108/4	108/5	108/7	108/8	108/9	108/10	108/14	108/15
108/19	108/20	109/1	109/2	109/3	109/4	109/6	109/7	109/8	109/9
109/10	109/11	109/12	109/13	109/14	109/15	109/16	109/17	109/18	109/19
109/20	110/1	110/2d	110/3b	110/4	110/5	110/6	110/7b	110/8b	110/9c
110/10	110/11	110/12c	110/14e	110/16	110/18a	111/3	111/4	111/5	111/9
111/10	111/14	111/15	111/19	111/20	111/24	111/25	111/28	111/29	111/30
112/8	112/9	112/11	112/12	112/13	112/14	112/16	112/17	112/20	112/21
113/16	113/24	113/26c	113/27e	113/27f	113/28	113/29	113/30		

5.2 Screening for potential in-combination effects

All blocks offered as part of the 30th Round, including those screened in (Table 5.1), were considered further in terms of the potential for likely significant effects to arise from activities following licensing, in-combination with those from other marine activities. Relevant marine activities were identified based on those referred to in Appendix 1h of OESEA3 (DECC 2016) and where it was considered that a relevant pathway of in-combination effect was present. The sources of in-combination effect are regarded to be largely related to physical disturbance and noise, and in the context of those areas being offered for licensing, any such effects are expected to be primarily from other offshore energy activity, specifically offshore wind in the southern North Sea and Irish Sea. The areas to the west of Shetland have a comparatively low density of activity.

Figures 5.8 and 5.9 illustrate the spatial relationship between existing oil and gas licences, agreements for lease (AfL) for carbon capture and storage and gas storage, the relevant European sites, as well as the 30th Round Blocks (with those screened in identified). Existing controls on exploration and appraisal operations, and their likely intensity as outlined in Section 2, suggest that significant in-combination effects of existing licensed areas and those proposed for licensing in the 30th Seaward Licensing Round on European sites are not likely. The only extant CO_2 appraisal and storage licence (CS001) and AfL are held by National Grid for the 5/42 candidate CO_2 storage site in the southern North Sea, which wholly or partly overlaps Blocks in Quadrants 42 and 43 (including 42/20a, 42/30d, 43/16, 43/26c and 43/27b). The licence and AfL have end dates of 01 January 2021, inclusive. The 5/42 site was appraised under the CCS Commercialisation Competition. Despite having not been developed to date, the technical and economic learning developed through the CCS Commercialisation Competition, and proximity to existing emissions sources, means 5/42 will remain of high interest to prospective CO_2 storage operators into the future. The government has recently published its revised approach to Carbon Capture, Usage and Storage (CCUS) through the Clean Growth Strategy, which includes commitments to set out a deployment pathway during 2018 and to work with prospective CCUS developers to test the potential for deployment of the technology. Depending upon the outcome of this work, prospective storage operators may seek that the 5/42 site is licensed for potential CO_2 storage beyond 01 January 2021.

Three gas storage AfLs (Gateway, Rough and Deborah) are adjacent to (47/3f, 47/7, 47/8f, 48/29, 48/30b and 48/30c) or overlap (110/3b) with 30th Round Blocks and relevant sites (Southern North Sea cSAC and Liverpool Bay SPA). At present, the timescales of any development of the Gateway (Irish Sea) and Deborah (southern North Sea) storage projects are uncertain, and the Rough facility (southern North Sea) is in the process of closure following technical and economic review[42]. In view of the likely scale of exploration activity that could result from 30th Round licensing, and the lack of firm project timescales for new offshore storage projects, likely significant in-combination effects are not considered likely. In all cases Blocks coinciding with such areas have been screened in to the second stage of HRA where the potential for significant cumulative and in-combination effects on European sites would be assessed.

Figures 5.8 and 5.9 illustrate existing oil and gas infrastructure, relevant European sites and the 30th Round Blocks. Based on the lack of or limited spatial overlap, documented scale of effects from production operations together with existing controls on exploration and appraisal operations, significant in-combination effects on European sites are not likely to occur because of the application of existing controls and mandatory assessments. Operators are planning for the decommissioning of a number of fields in 30th Round areas, or are implementing decommissioning plans which involve offshore activities (e.g. for well plug and abandonment and facility removal)[43]. This includes plans for fields and related infrastructure in quadrants 3, 13, 14, 15, 16, 20, 48, 49 and 211, coinciding with the Braemar Pockmarks SAC, Southern North Sea cSAC and North Norfolk Sandbanks and Saturn Reef SCI. 30th Round Blocks coinciding with these areas have already been screened in to the second stage of HRA when the potential for significant cumulative and in-combination effects on European sites would be assessed.

Figures 5.10 and 5.11 show marine renewable energy development and development zones, relevant European sites and the 30th Round Blocks. A number of Blocks overlap with renewable energy developments, with a number also coinciding with European sites. For example Blocks overlap with the Dogger Bank (Creyke Beck A and B and Teesside Lackenby B), Hornsea (Projects One (Heron West) Two and Four), Race Bank and Lincs, East Anglia (Projects One, One North, Three, One West, One East and North) and the West of Duddon Sands and North Hoyle development zones, which also overlap the Dogger Bank SAC, Southern North Sea cSAC, Inner Dowsing, Race Bank and North Ridge SCI, the Greater Wash pSPA and the Liverpool Bay SPA. In all cases these Blocks have been screened in to the second stage of HRA when the potential for significant in-combination effects on European sites would be assessed.

Marine aggregate extraction areas relevant European sites and the 30th Round Blocks are shown in Figures 5.10 and 5.11. A number of Blocks overlap licensed aggregate extraction areas or those which are presently under consideration as option or application areas, with a

[42] https://www.centrica.com/news/cessation-storage-operations-rough
[43] See: https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines and https://itportal.ogauthority.co.uk/eng/fox/path/PATH_REPORTS/pdf

number also coinciding with European sites (specifically Blocks 47/18, 47/19, 47/23 and 47/24 lie within the Inner Dowsing, Race Bank and North Ridge SCI, Blocks 49/7 and 49/12c lie within the North Norfolk Sandbanks and Saturn Reef SCI and Southern North Sea cSAC, and 52/15 and 53/11 lie within the Haisborough, Hammond and Winterton SCI). In all cases these Blocks have been screened in to the second stage of HRA when the potential for significant cumulative and in-combination effects on European sites would be assessed.

Figures 5.12 and 5.13 illustrate the spatial relationship between the density of navigation in UK waters, relevant European sites and the 30th Round Blocks. The 30th Round Blocks coincident with areas of elevated navigation density in or in proximity to European sites (where potential significant in-combination effects could occur) have been screened in to the second stage of HRA where this consideration will be made.

Commercial fishing occurs throughout UK waters and effort data provides a strategic level proxy of fisheries activity across the UKCS. However, it is noted that activity is seasonally and annually variable, and collated data includes most but not all fishing activity. Fishing and particularly bottom trawling has historically contributed to seabed disturbance over extensive areas, and was identified as an ongoing problem in the UK initial assessment for MSFD[44]. It was also noted that depending on the nature of future measures (e.g. in relation to MPA management in the wider environment and within MPAs[45]), such effects are likely to be reduced and therefore some improvement in benthic habitats could be expected[46]. The management of fisheries in relation to Article 6 of the Habitats Directive is fundamentally different to other activities such as offshore energy development, and a revised approach to the management of commercial fisheries in European sites[47] has sought to implement steps to ensure that they are managed in accordance with Article 6. Similarly, NRW has been working with the Welsh Government to evaluate the impacts of fishing on features of Marine Protected Areas, including Natura 2000 sites, to inform their future management[48].

In England, management is coordinated between the Inshore Fisheries and Conservation Authorities and the Marine Management Organisation for sites within 12nm (note that any measure which may influence vessels of other member states can only be adopted after consultation with the Commission, other Member States and the Regional Advisory Councils), and by Scottish Ministers in Scottish waters. For offshore sites, measures are required to be proposed by the European Commission in accordance with the Common Fisheries Policy[49]. In relation to specific sites of relevance to this HRA, management proposals for the Dogger Bank

[44] https://www.gov.uk/government/publications/marine-strategy-part-one-uk-initial-assessment-and-good-environmental-status
[45] For example, see the MMO strategic management table for MPAs: https://www.gov.uk/government/publications/marine-protected-areas-strategic-management-table
[46] https://www.gov.uk/government/publications/marine-strategy-part-three-uk-programme-of-measures
[47] https://www.gov.uk/government/publications/revised-approach-to-the-management-of-commercial-fisheries-in-european-marine-sites-overarching-policy-and-delivery
[48] https://naturalresources.wales/about-us/our-projects/marine-projects/assessing-welsh-fishing-activities/?lang=en
[49] Also refer to Regulation (EU) No. 1380/2013 on the Common Fisheries Policy.

have been drawn up by the Dogger Bank Steering Group which includes a number of zones which would be closed for beam trawl, bottom/otter trawl, dredges and semi-pelagic trawl fisheries. A fisheries joint management proposal was agreed in early 2017 with the next step to be a formal six-month Joint Recommendation process submission to the European Commission. Similarly, proposals have been made to prohibit all demersal fishing gears within the Braemar Pockmarks SAC and Scanner Pockmark SAC[50].

Whilst fishing may be linked to historical disturbance to site features, and presents an ongoing risk to these, future management measures should limit the potential for in-combination effects with other activities, particularly when considered in addition to mitigation which is available to avoid effects on sites from exploration activity (see Section 4), and other activities including offshore renewables which are subject to statutory environmental impact assessment and where appropriate, an HRA.

For activity specific assessments, it is the licensee's responsibility to identify potential in-combination effects and undertake early engagement with other stakeholders.

[50] http://www.gov.scot/Topics/marine/marine-environment/mpanetwork/SACmanagement

Figure 5.1: Physical and drilling effects – Blocks and SPAs screened in

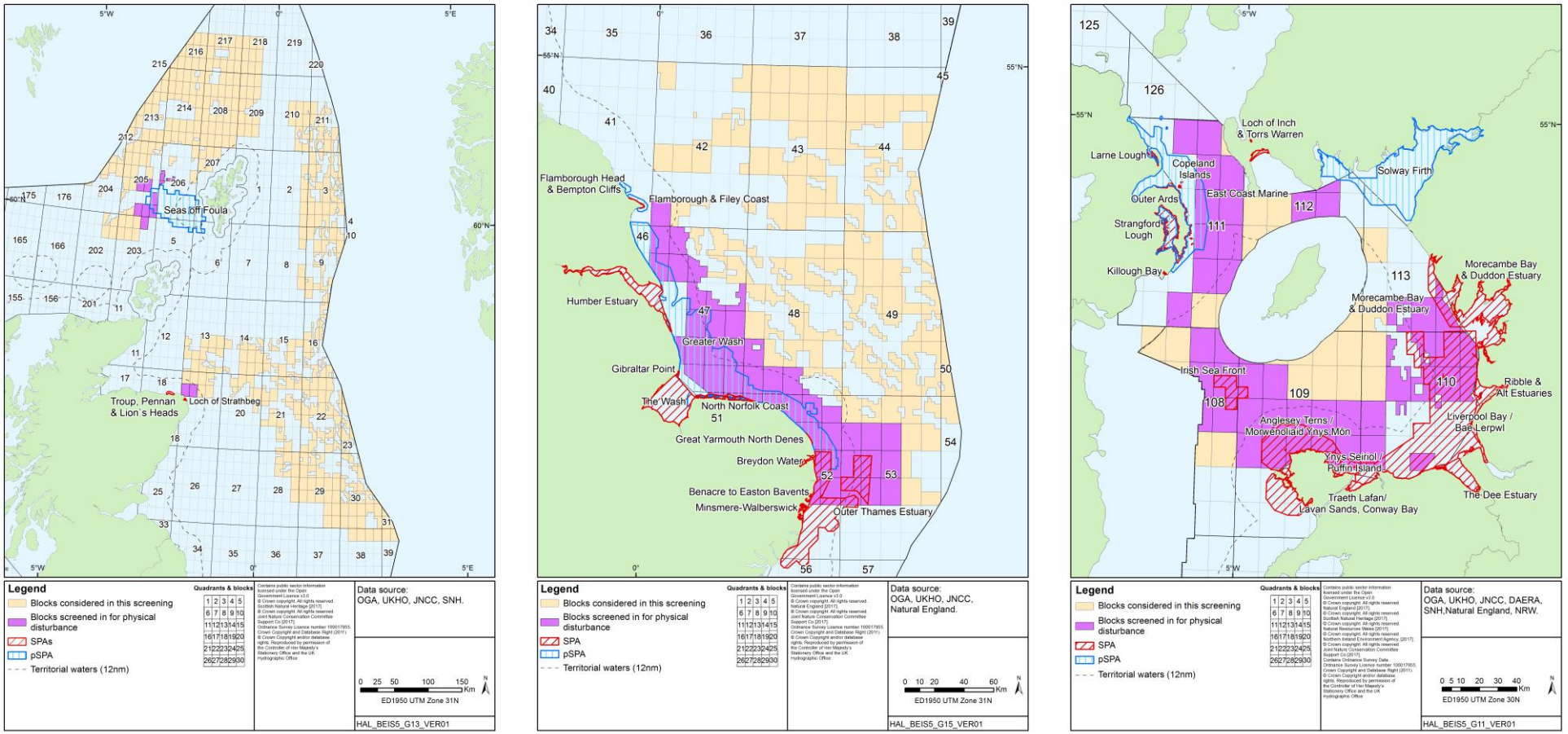
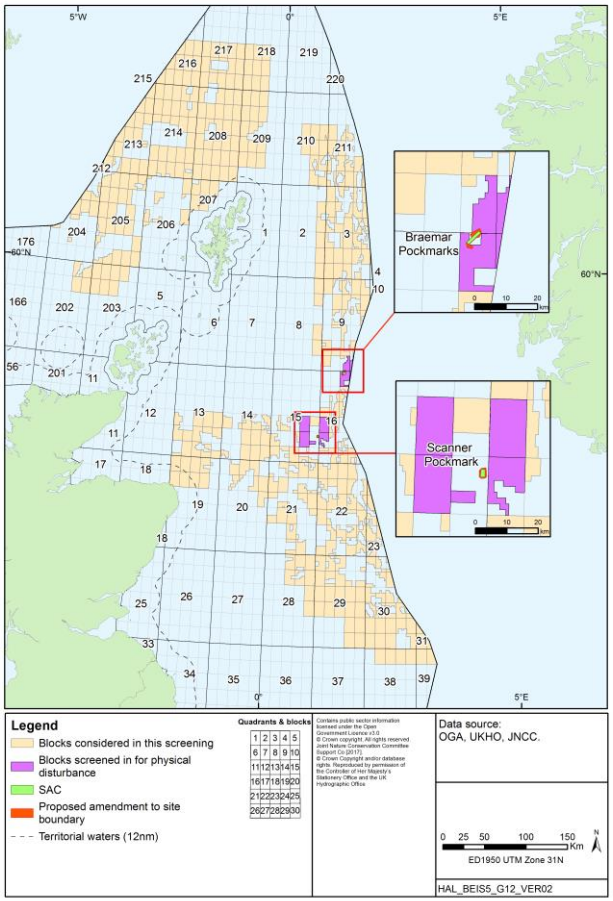
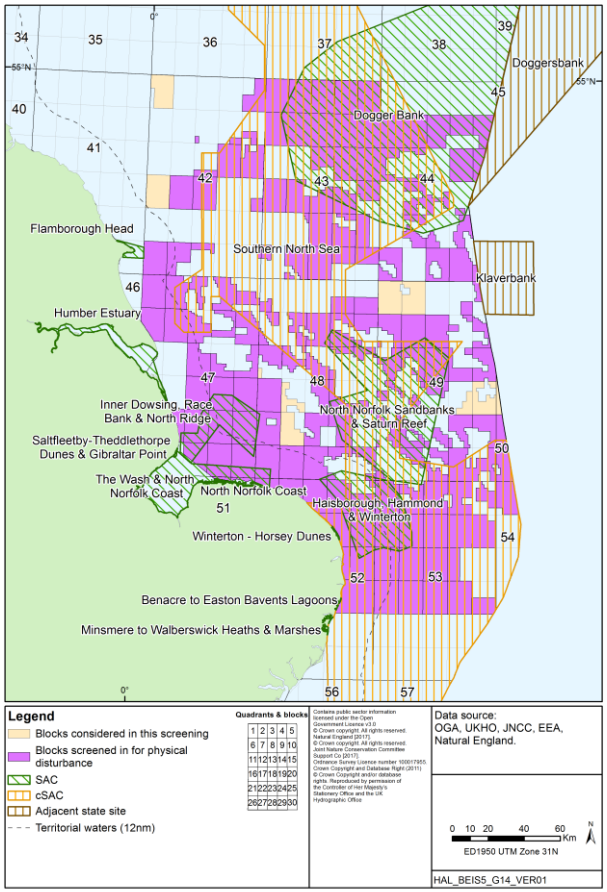


Figure 5.2: Physical and drilling effects – Blocks and SACs screened in





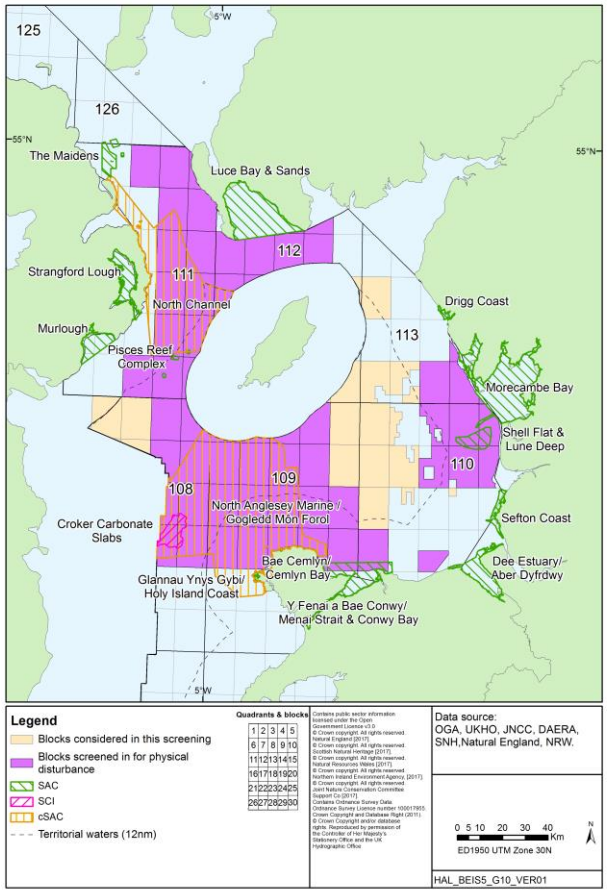


Figure 5.3: Acoustic disturbance effects – Blocks and SPAs screened in

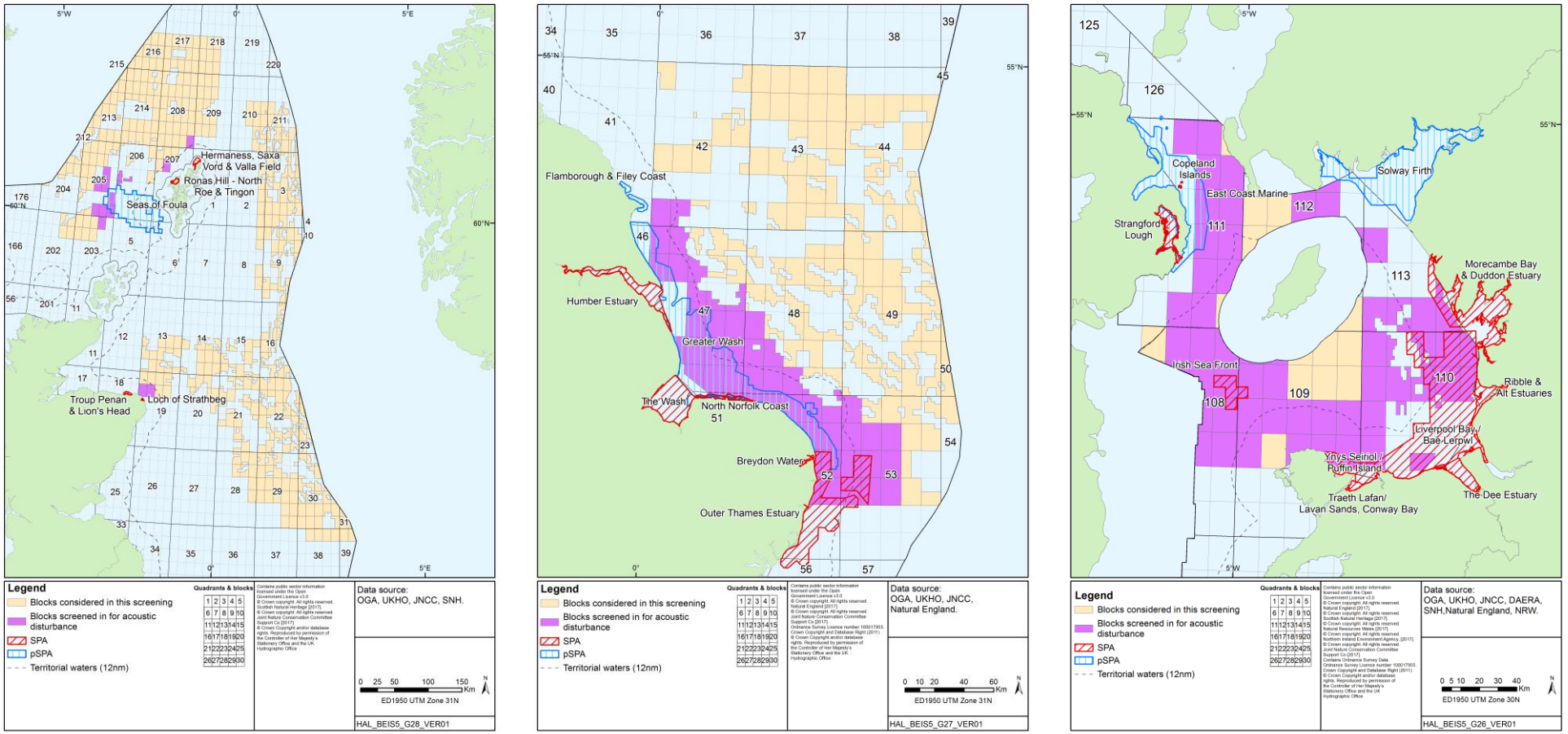
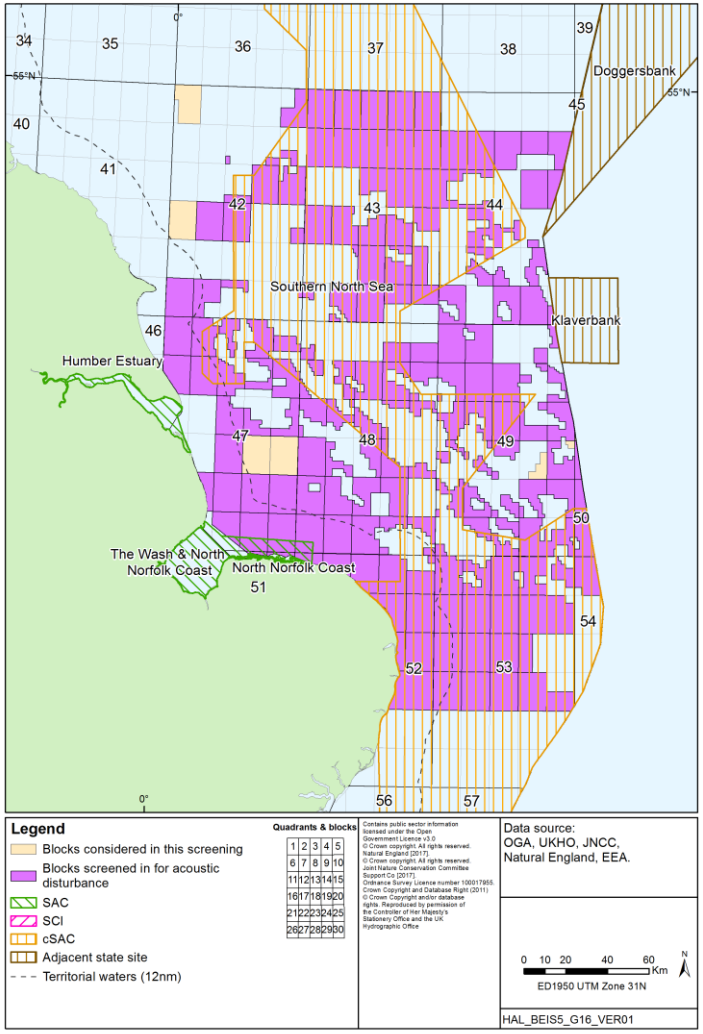
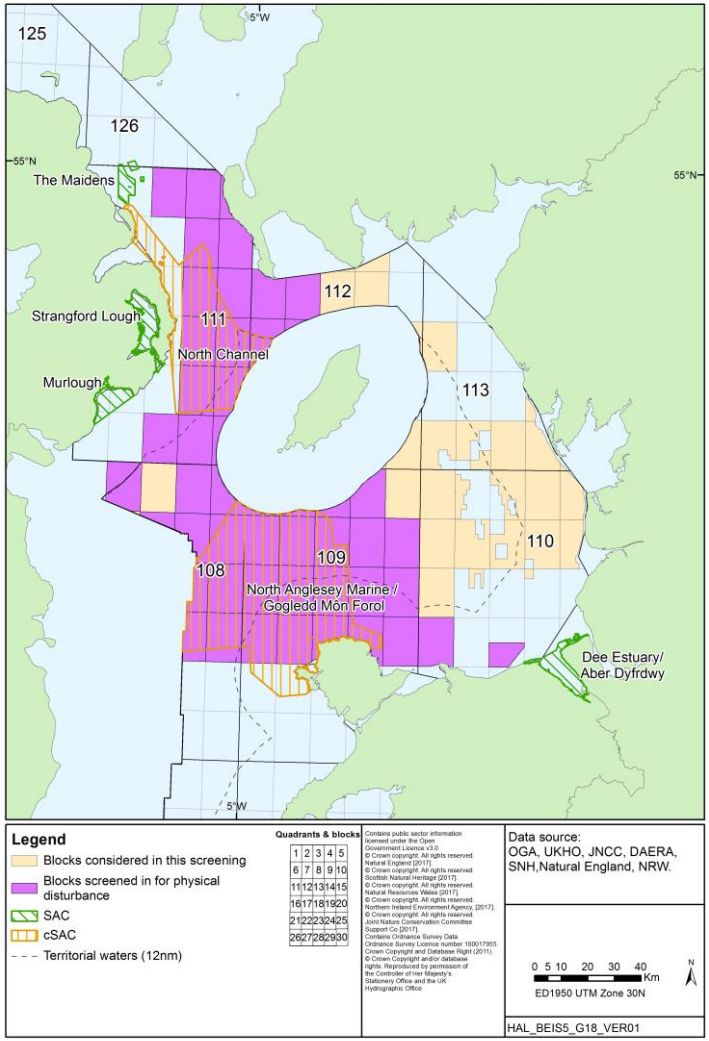


Figure 5.4: Acoustic disturbance effects – Blocks and SACs screened in





Note: No Blocks were screened in for acoustic disturbance effects to SACs in the West of Shetland or Central and Northern North Sea regions.

Figure 5.5: Estimated total density of harbour seals in UK waters

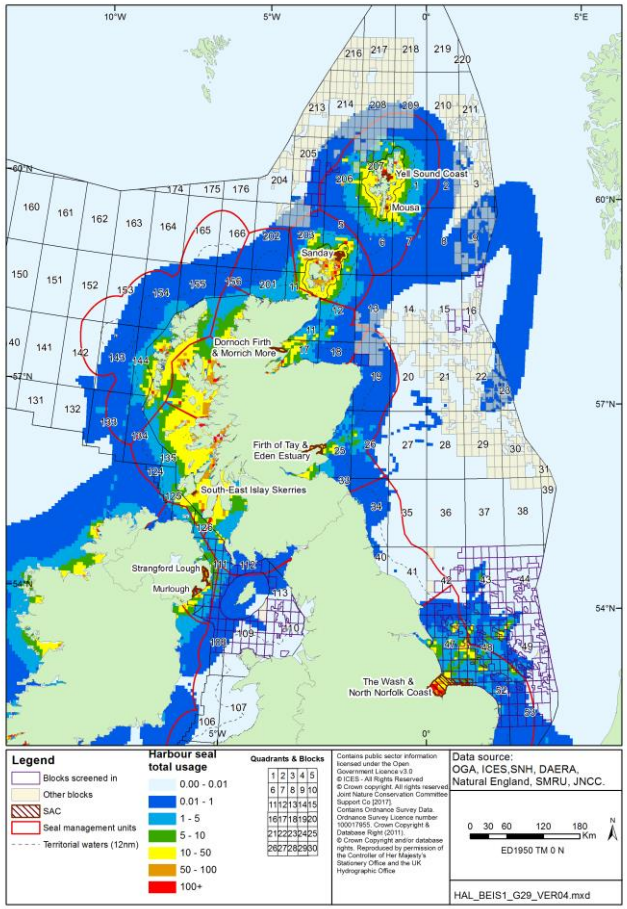


Figure 5.6: Estimated total density of grey seals in UK waters

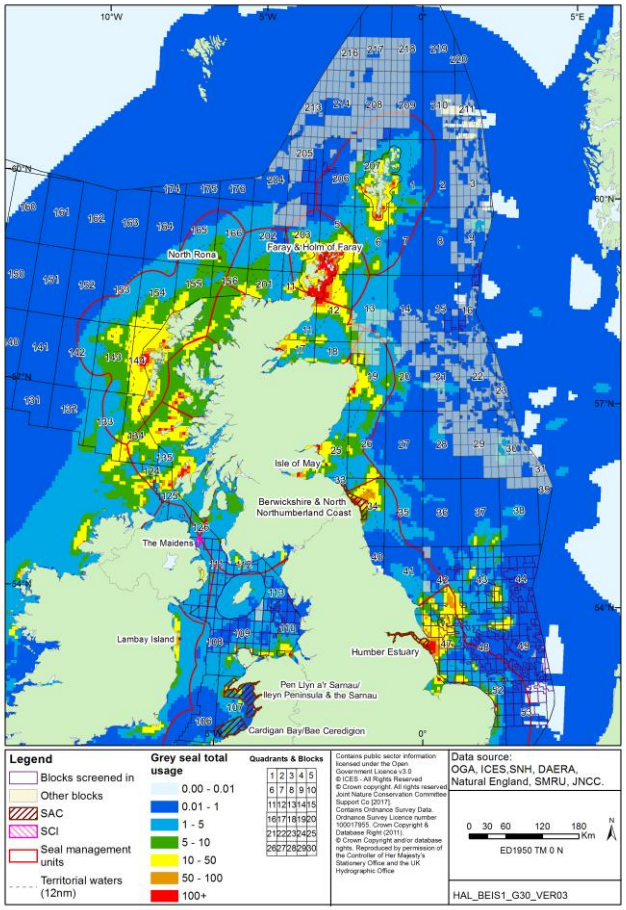


Figure 5.7: Bottlenose dolphin management units in the UK

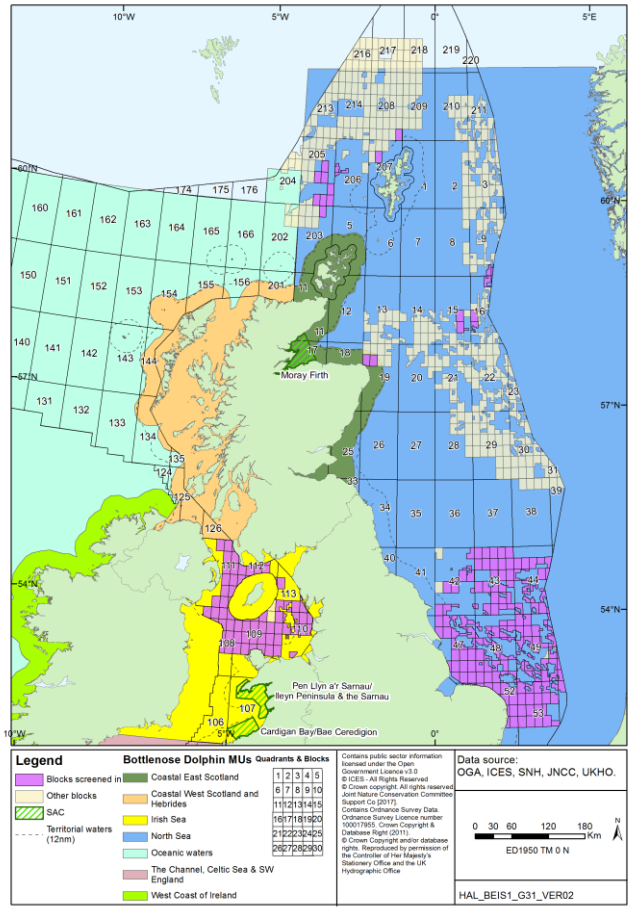


Figure 5.8: Existing oil and gas licences and infrastructure, Agreements for Lease, SPAs and 30th Round Blocks

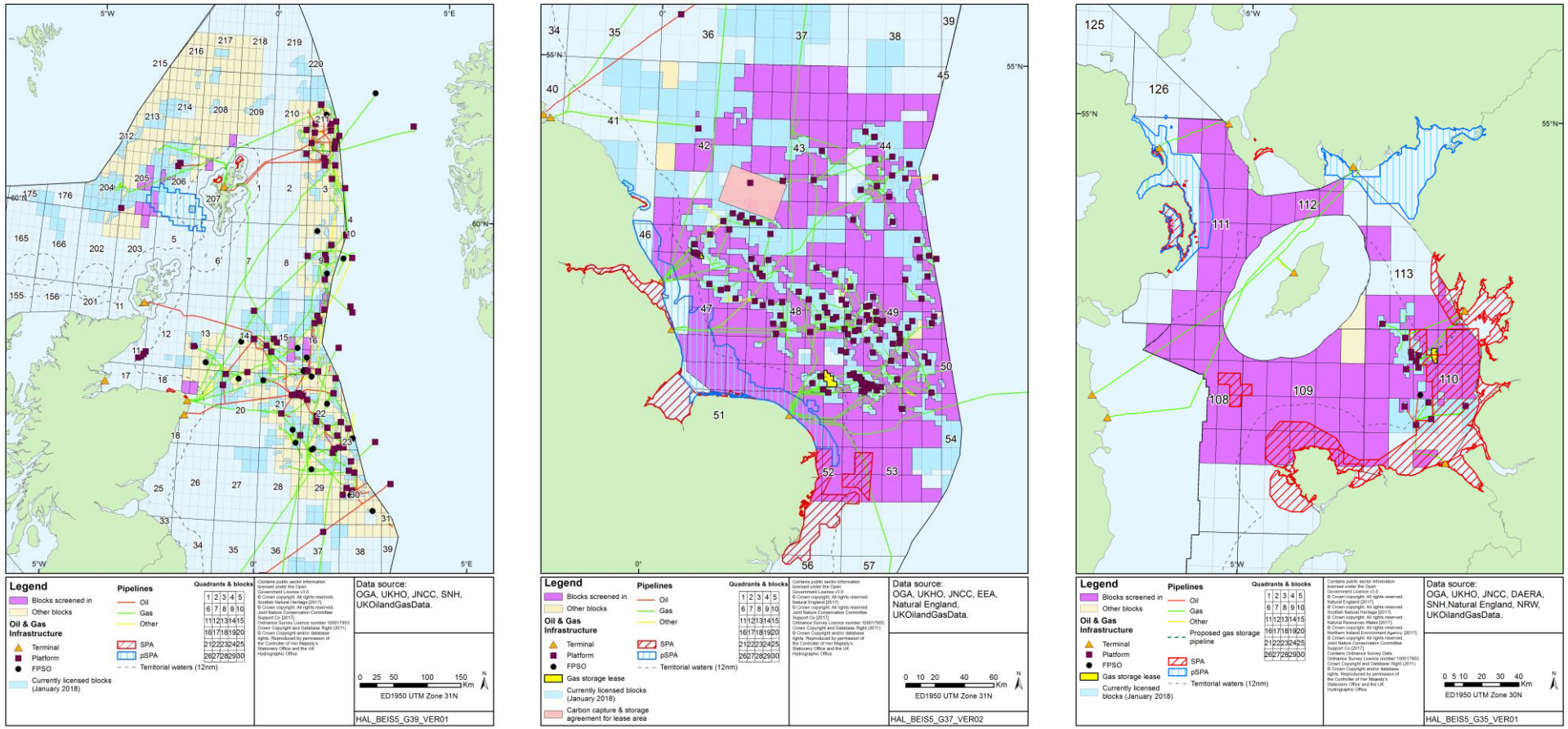


Figure 5.9: Existing oil and gas licences and infrastructure, Agreements for Lease, SACs and 30th Round Blocks

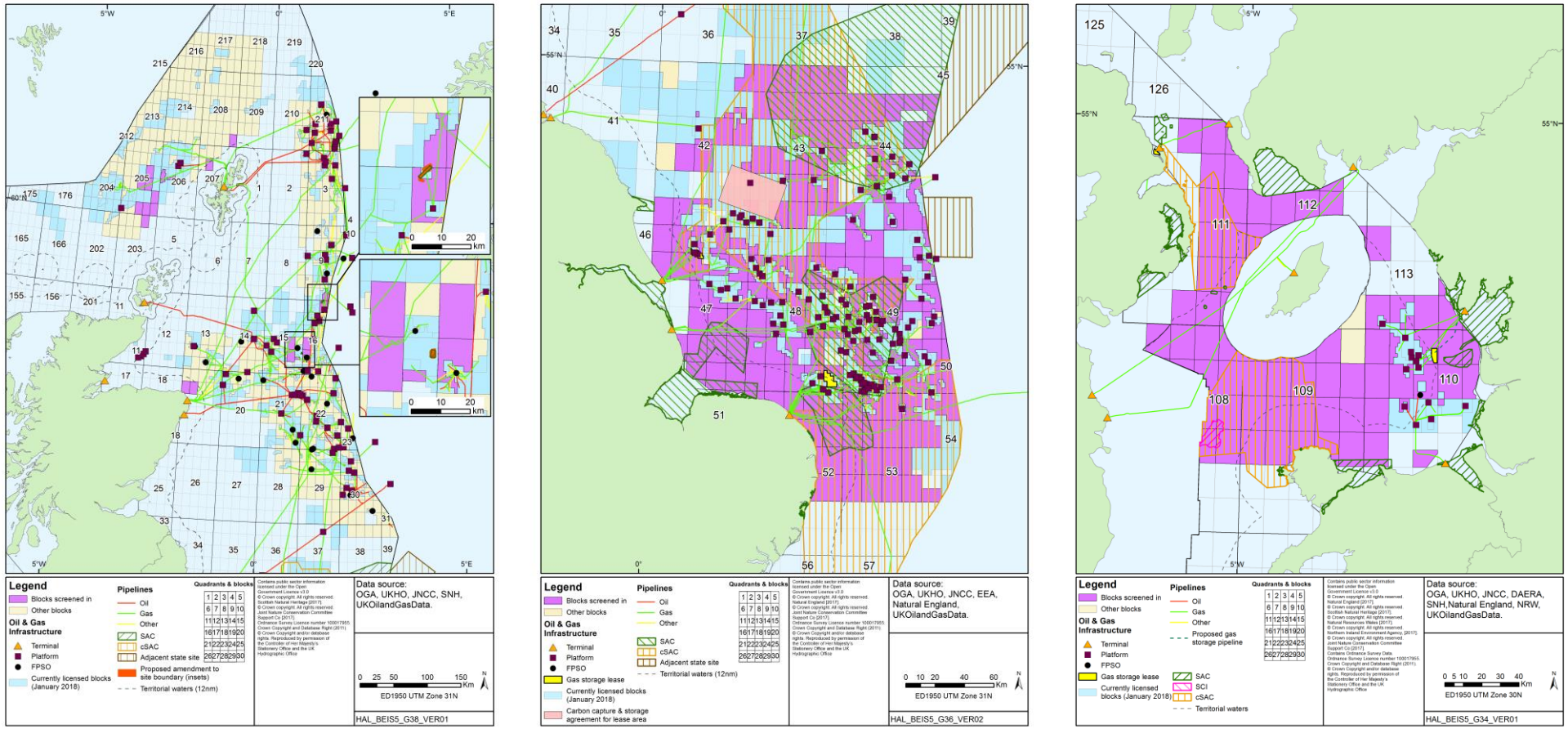


Figure 5.10: Marine renewable energy, aggregate extraction, SPAs and 30th Round Blocks

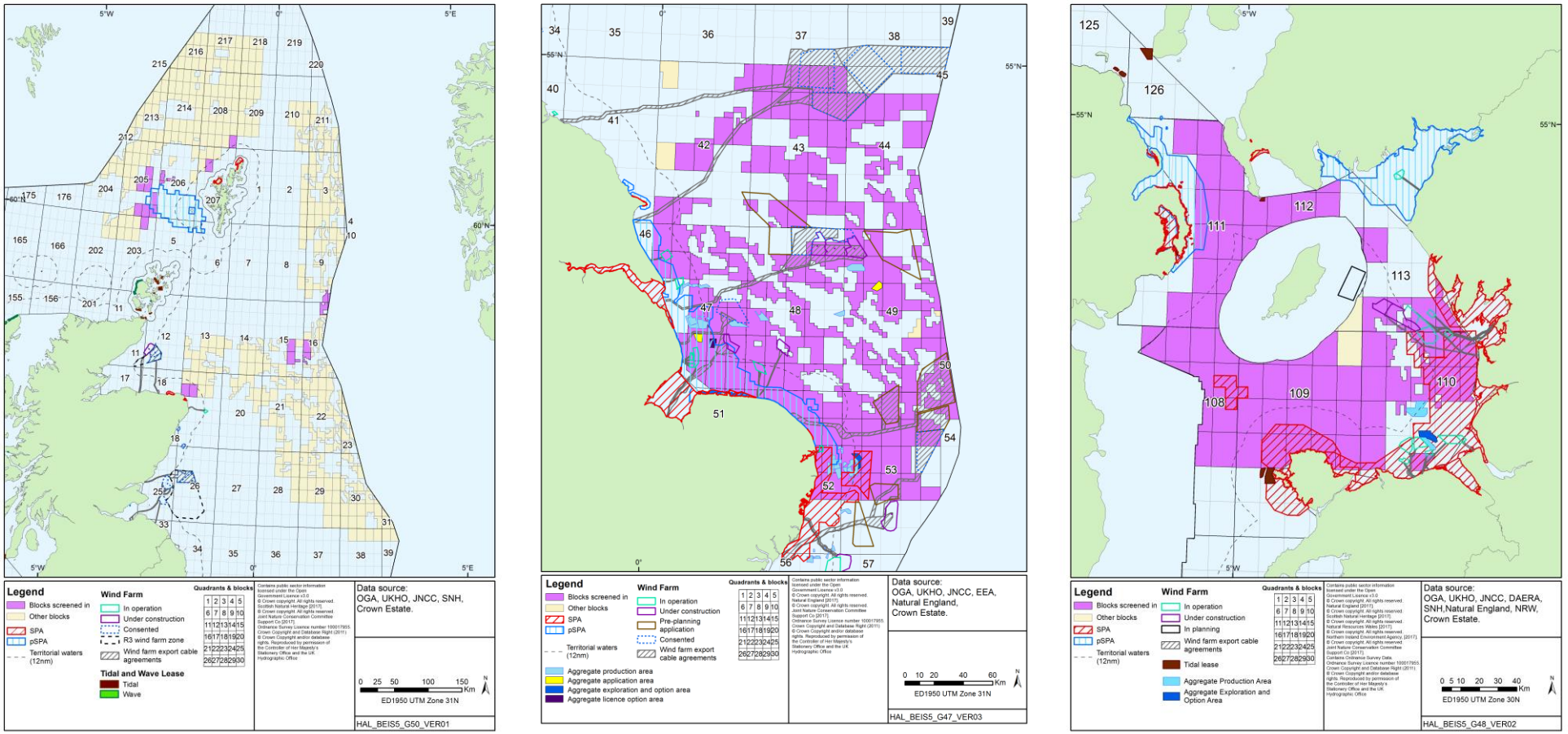


Figure 5.11: Marine renewable energy, aggregate extraction, SACs and 30th Round Blocks

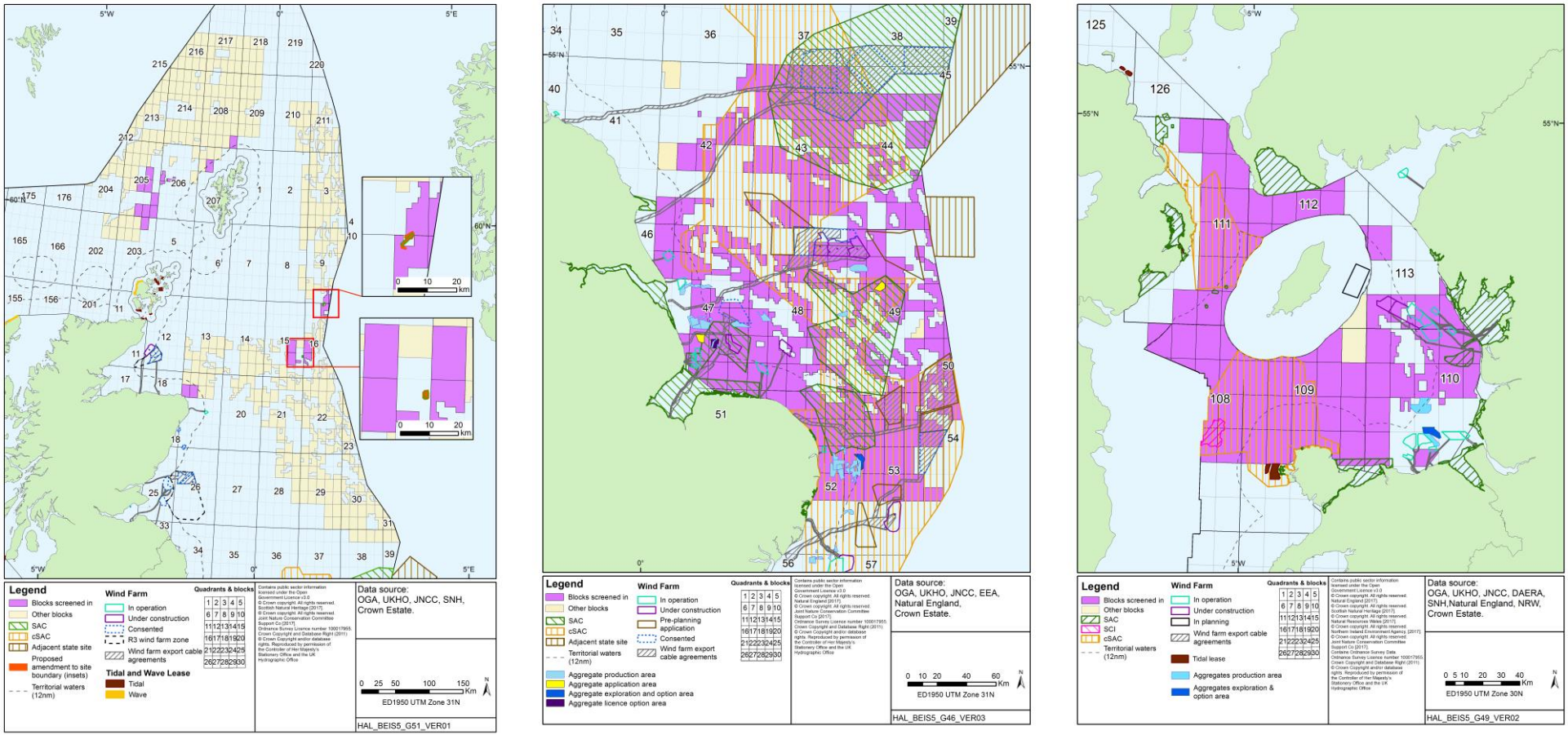


Figure 5.12: Navigation density, SPAs and 30th Round Blocks

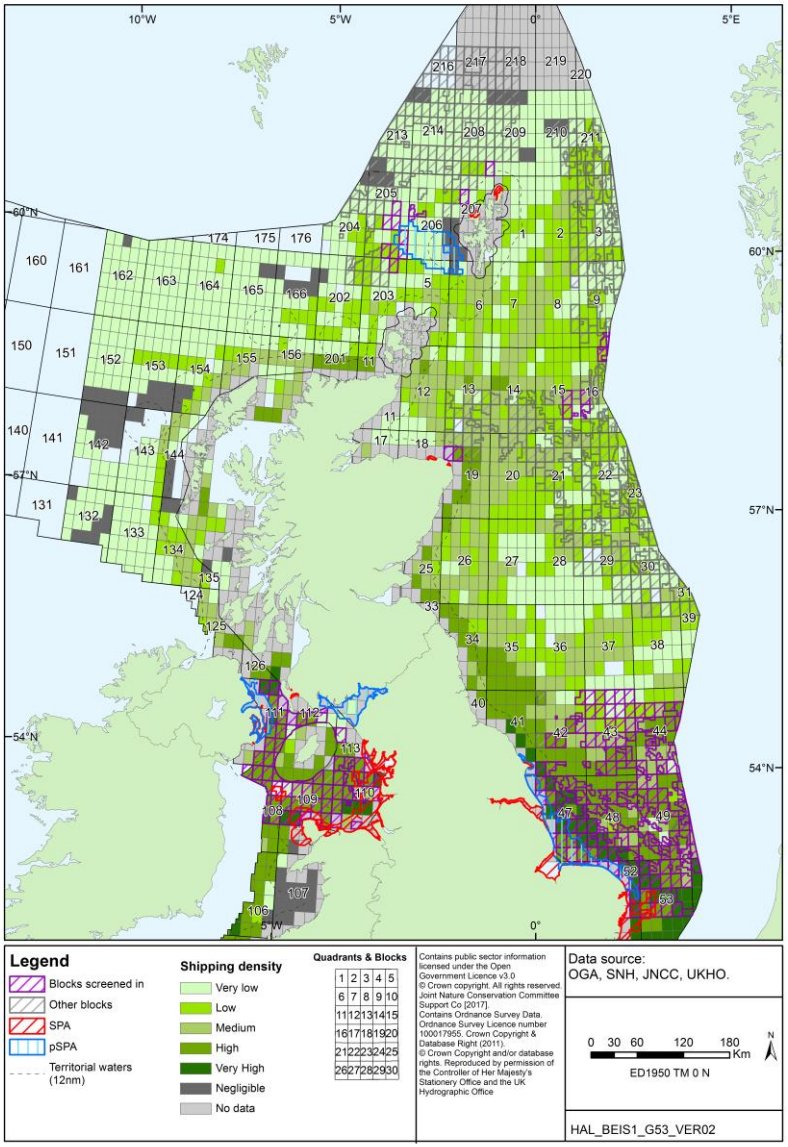
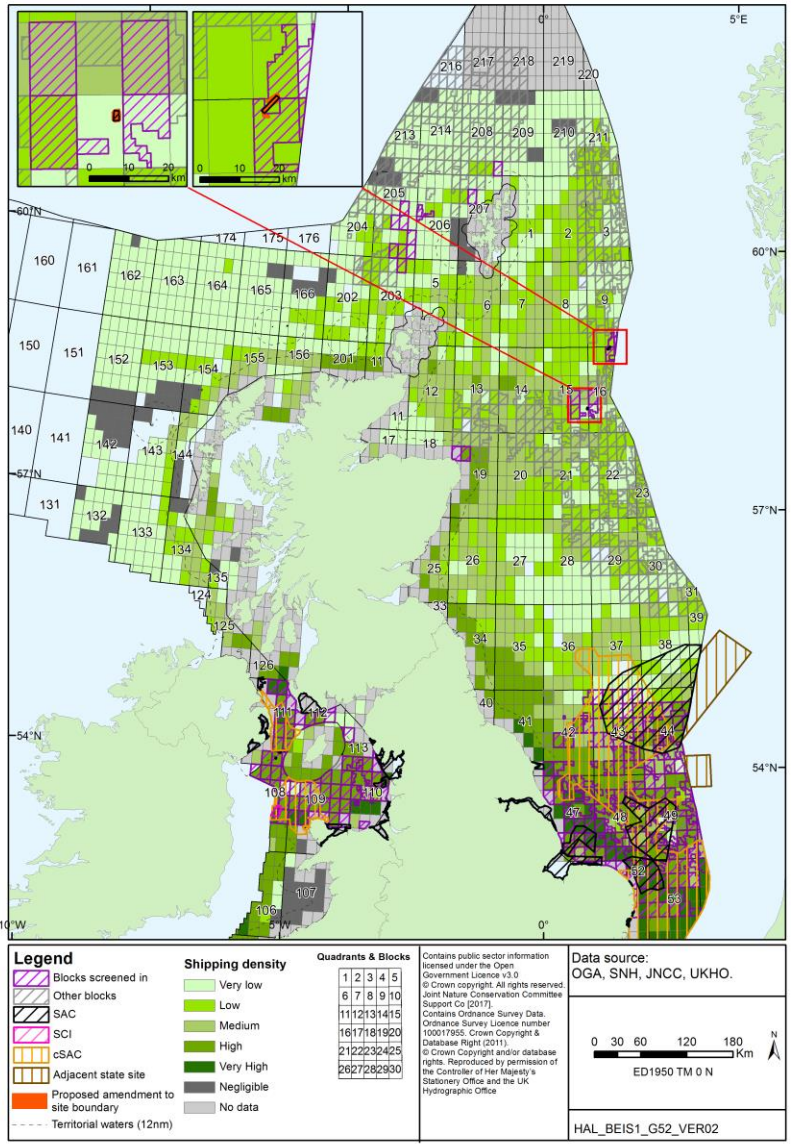


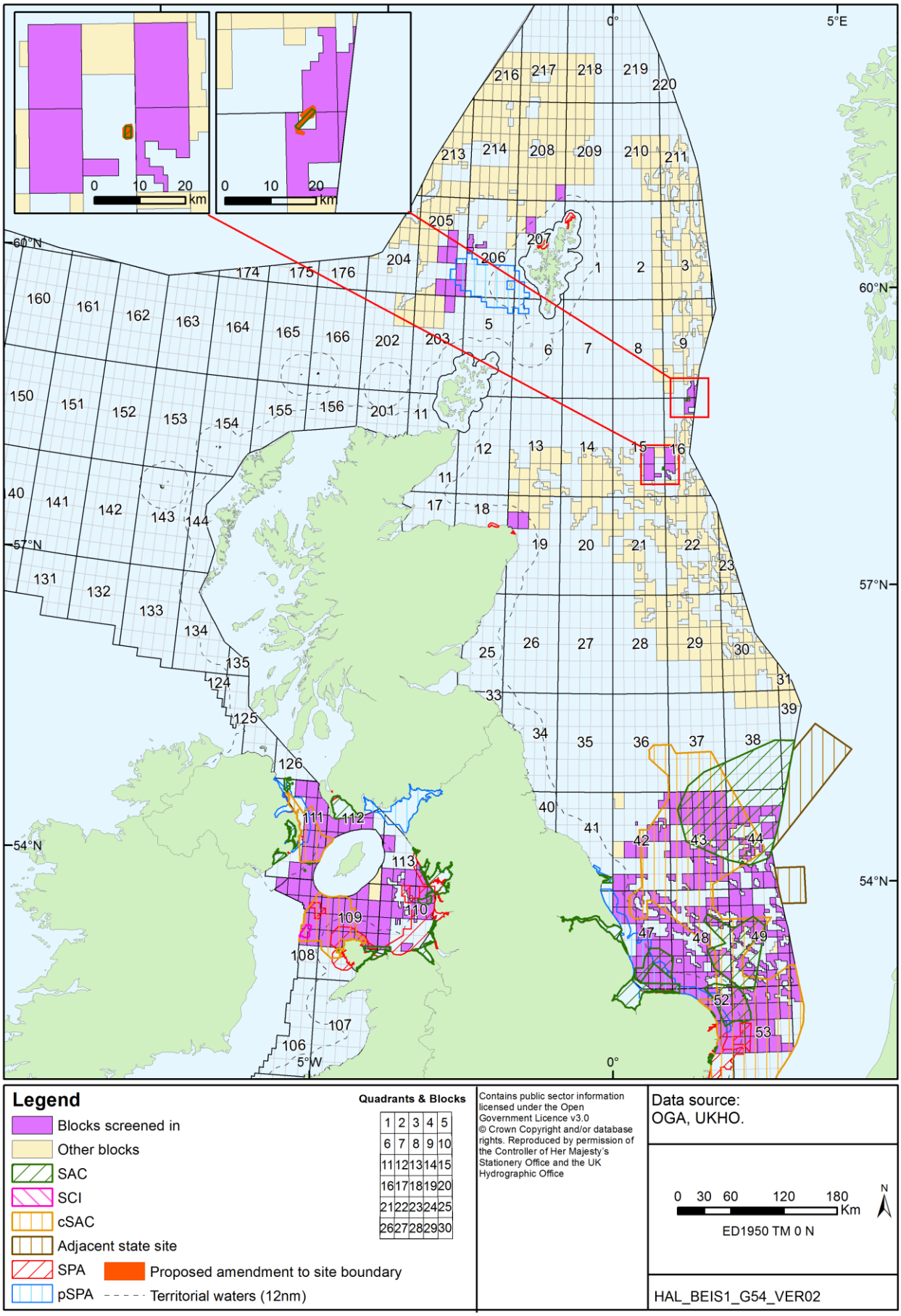
Figure 5.13: Navigation density, SACs and 30th Round Blocks



6 Conclusion

This screening assessment is based on the Blocks offered in the 30th Round and has considered the likelihood for significant effects on Natura 2000 sites from exploration/appraisal activities that could follow licensing of Blocks. The screening concluded that for the majority of the Blocks, licensing would not have the potential to cause significant effects on Natura 2000 site(s), on the understanding that subsequent offshore activities following licensing will be subject to activity specific assessment and where appropriate an HRA to ensure appropriate mitigation measures are applied to planned operations including measures to prevent potential accidents, and that activities do not proceed where this would not be in accordance with the relevant permitting regimes. However, based on the screening results a number of Blocks which are being offered and relevant sites may be subject to a second stage of HRA, Appropriate Assessment, if licences are applied for and prior to decisions on the grant of such licences. These Blocks are listed in Table 5.1 and Appendix B (which lists the Blocks and relevant sites according to the criteria by which they were screened in) and are shown in Figure 6.1 with relevant sites.

Figure 6.1: 30th Round Blocks and sites for which a 2nd Stage of HRA may be undertaken



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Appendix A – The Designated Sites

A1 Introduction

The following maps and tables show the locations of potentially relevant European sites and their qualifying features with respect to the Blocks offered as part of the 30th Seaward Licensing Round.

The primary sources of site data were the latest JNCC SAC[51] and SPA summary data[52] and interest features and site characteristics were filtered for their coastal and marine relevance. The websites of the relevant Statutory Nature Conservation Bodies (SNCBs) were also reviewed to verify and augment site information including Scottish Natural Heritage (SNH)[53], Natural England[54,55], Natural Resources Wales (NRW)[56], and the Department of Agriculture, Environment and Rural Affairs (DAERA) [57].

The sites in this Appendix are ordered thus:

A2 Coastal and marine Special Protection Areas

A3 Coastal and marine Special Areas of Conservation

A4 Sites in the adjacent waters of other member states

A5 Ramsar sites

[51] Version as of 30th January 2017 - http://jncc.defra.gov.uk/page-1461

[52] Version as of 30th June 2017 - http://jncc.defra.gov.uk/page-1409

[53] http://gateway.snh.gov.uk/sitelink/index.jsp

[54] http://publications.naturalengland.org.uk/category/6490068894089216

[55] https://www.gov.uk/government/collections/conservation-advice-packages-for-marine-protected-areas

[56] http://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/designated-sites/?lang=en

[57] https://www.daera-ni.gov.uk/topics/biodiversity-land-and-landscapes/protected-areas

A2 Coastal and Marine Special Protection Areas

Special Protection Areas (SPAs) are protected sites classified in accordance with Article 4 of the EC Birds Directive (2009/147/EC). Sites are classified for rare and vulnerable birds and for regularly occurring migratory birds. The SPAs included in this section are coastal sites selected for the presence of one or more of the bird species listed in Box A.1 (below).

A number of marine SPAs, some of which provide marine extensions to existing sites, are presently at the proposed stage in Scottish inshore and offshore waters having undergone public consultation in 2016 and early 2017[58]. Additionally, pSPAs are also present in English and Northern Irish waters as well as in offshore waters around Wales, and those of relevance to this screening are tabulated and shown in relevant maps below. Relevant SPAs in the adjacent waters of another Member State (Republic of Ireland (RoI), see Map A.3) are listed in Table A.1 and described separately in Section A4. All relevant SPAs are included on Maps A.1 to A.3.

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

Divers and grebes

Great northern diver *Gavia immer*
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 *Stercorarius skua*
Mediterranean gull *Larus melanocephalus*

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*

[58] http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/proposed-marine-spas/

Black-headed gull *Chroicocephalus 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 *Thalasseus sandvicensis*
Roseate tern *Sterna dougallii*
Common tern *Sterna hirundo*
Arctic tern *Sterna paradisaea*
Little tern *Sternula albifrons*

Crakes and rails

Corncrake *Crex crex*

Birds of prey and owls

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*

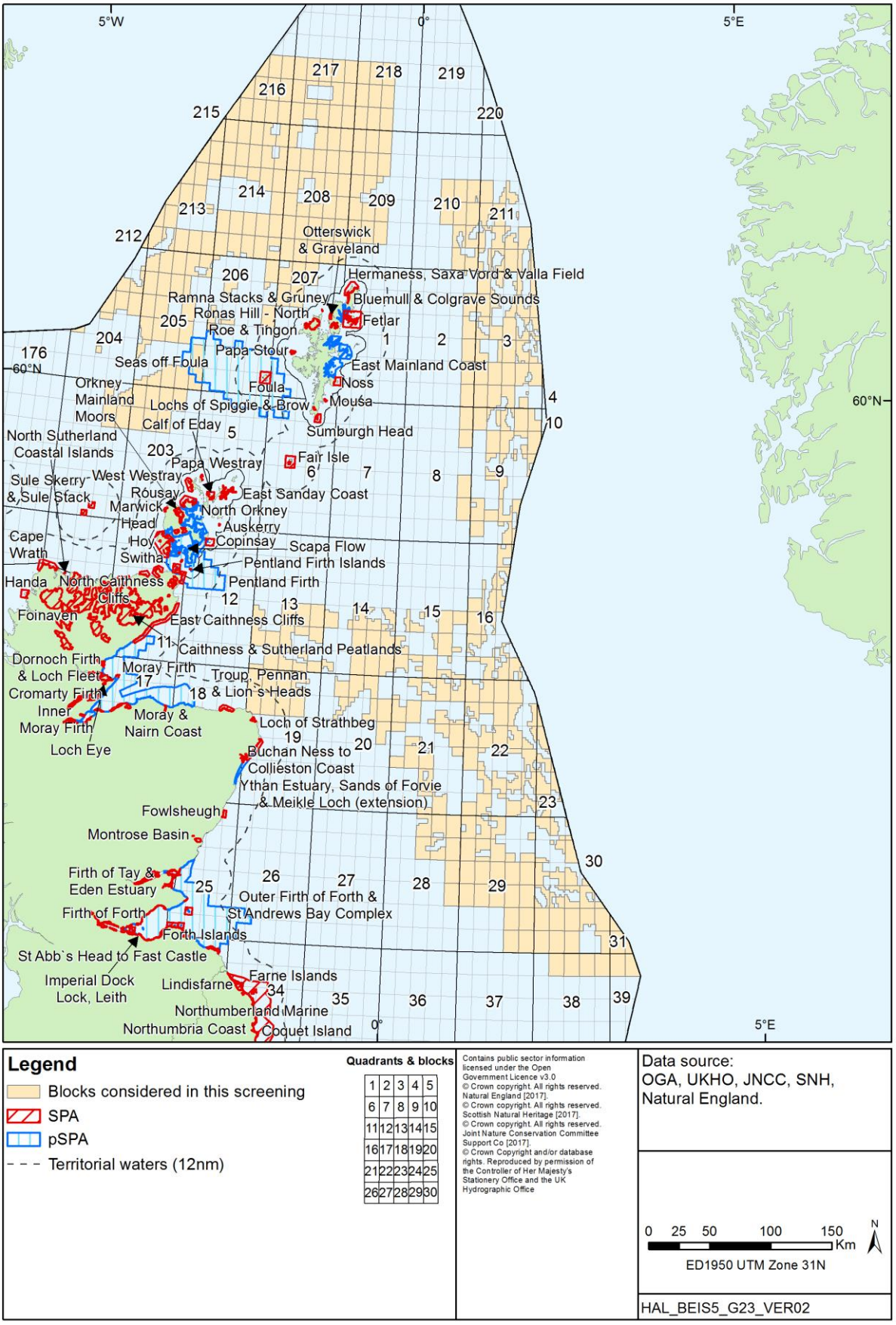
Other bird species

Fair Isle wren *Troglodytes troglodytes fridariensis*
Chough *Pyrrhocorax pyrrhocorax*

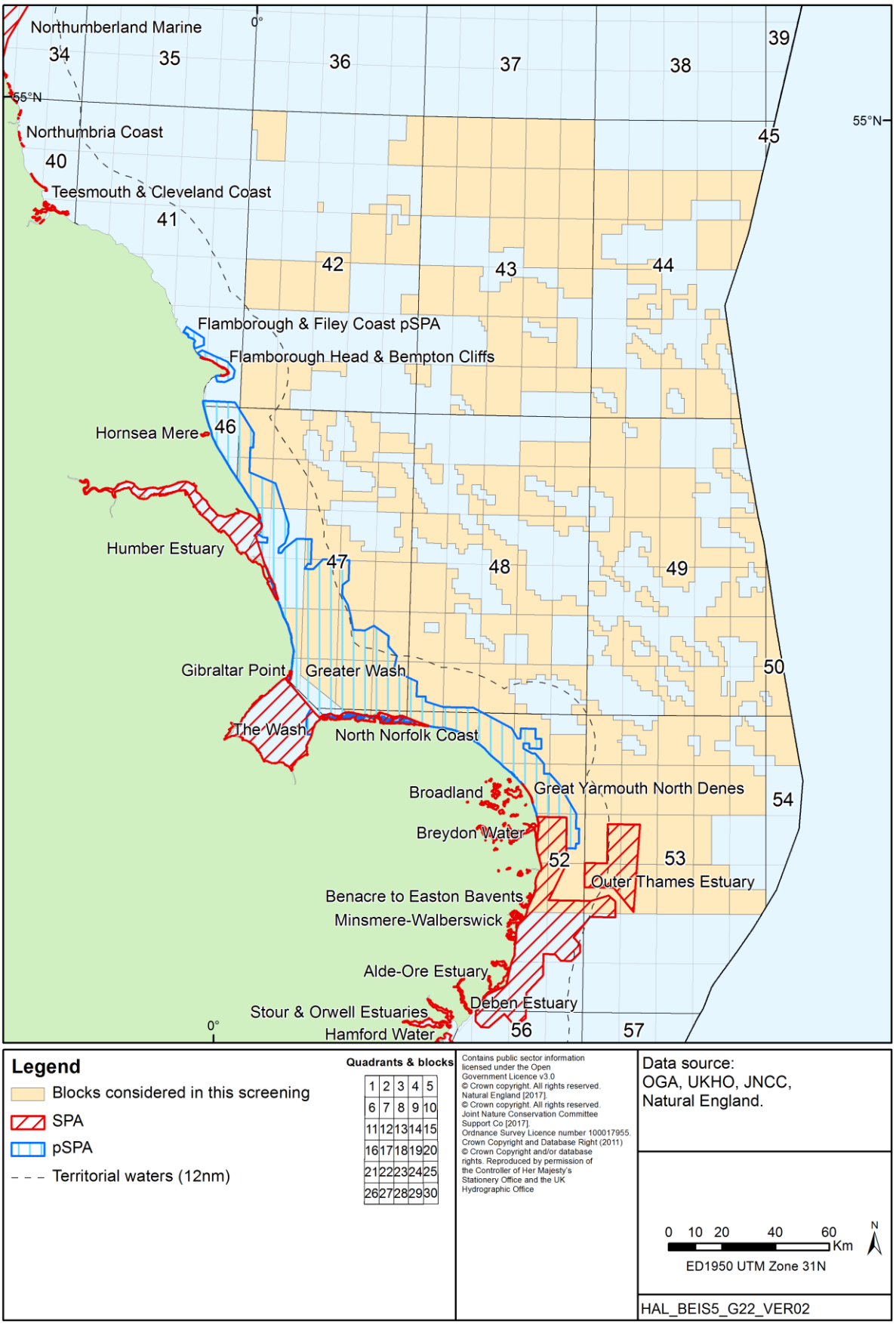
Waterfowl

Bewick's swan *Cygnus columbianus bewickii*
Whooper swan *Cygnus cygnus*
Pink-footed goose *Anser brachyrhynchus*
Greenland white-fronted goose *Anser albifrons flavirostris*
Greater white-fronted goose *Anser albifrons albifrons*
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*

Map A.1: Location of SPAs – West of Shetland and central and northern North Sea



Map A.2: Location of SPAs – Southern North Sea



Map A.3: Location of SPAs – Irish Sea

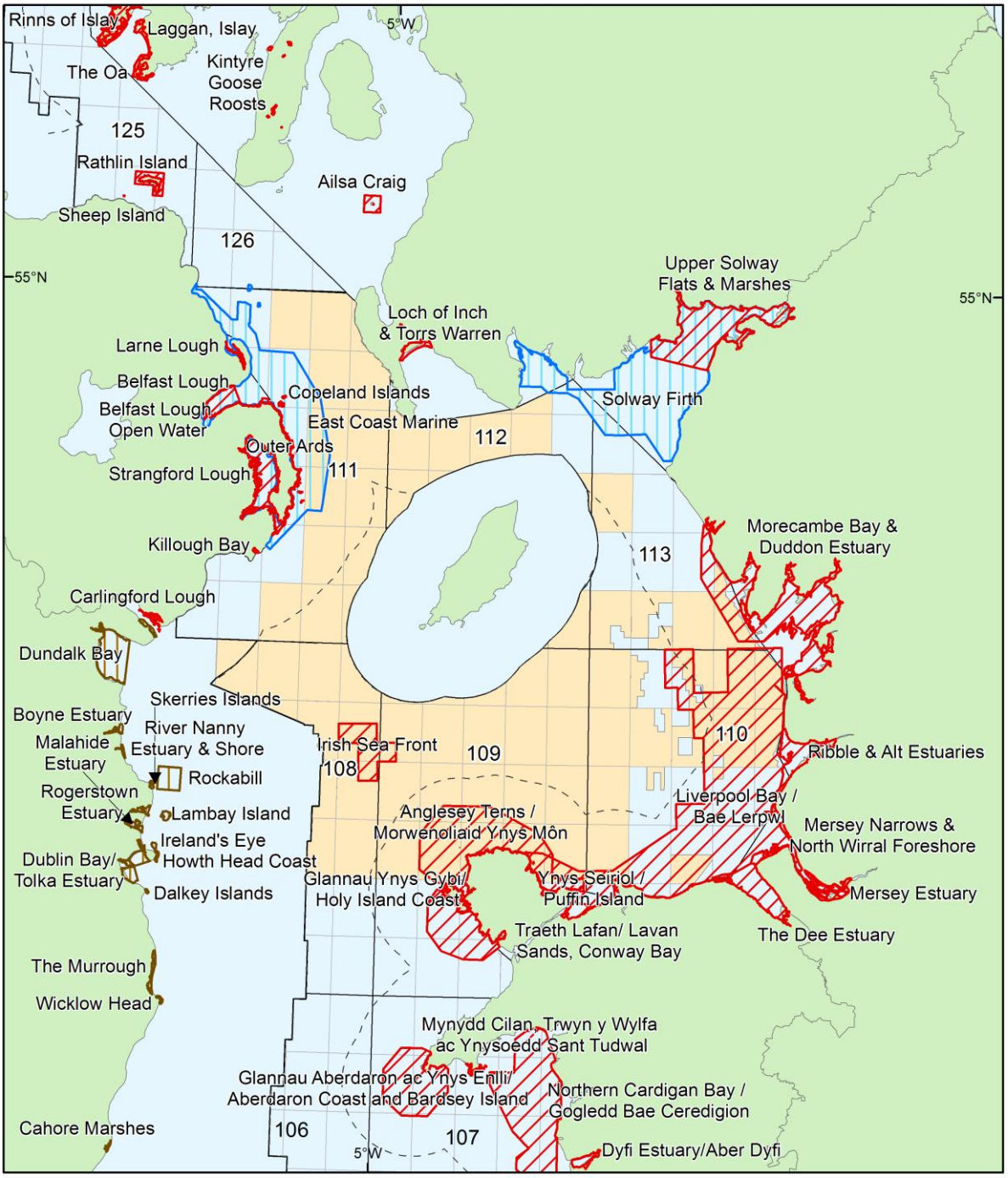


Table A.1: SPAs and their Qualifying Features

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
WEST OF SHETLAND				
Hermaness, Saxa Vord and Valla Field SPA	6832.36	Breeding: Red-throated diver	Breeding: Gannet Great skua Puffin	Breeding: Seabirds
Bluemull and Colgrave Sounds pSPA	3823.27	Breeding: Red-throated diver	N/A	N/A
Fetlar SPA	16964.69	Breeding: Arctic tern Red-necked phalarope	Breeding: Dunlin Great skua Whimbrel	Breeding: Seabirds
Otterswick and Graveland SPA	2239.59	Breeding: Red-throated diver	N/A	N/A
Ramna Stacks and Gruney SPA	11.66	Breeding: Leach's petrel	N/A	N/A
Ronas Hill-North Roe and Tingon SPA	5474.35	Breeding: Red-throated diver	Breeding: Great skua	N/A
Papa Stour SPA	569.6	Breeding: Arctic tern	N/A	N/A
East Mainland Coast, Shetland pSPA	25646.67	Breeding: Red-throated diver Over winter: Great northern diver Slavonian grebe	Over winter: Eider Long-tailed duck Red-breasted merganser	N/A
Seas off Foula pSPA	341215	N/A	Breeding: Great skua	Breeding: Seabirds Over winter: Seabirds
Foula SPA	7985.49	Breeding: Arctic tern Leach's storm petrel Red-throated diver	Breeding: Great skua Guillemot Puffin Shag	Breeding: Seabirds
Noss SPA	3338.38	N/A	Breeding: Gannet Great skua Guillemot	Breeding: Seabirds
Mousa SPA	196.85	Breeding: Arctic tern Storm petrel	N/A	N/A
Lochs of Spiggie and Brow SPA	140.66	Over winter: Whooper swan	N/A	N/A
Sumburgh Head SPA	2478.91	Breeding: Arctic tern	N/A	Breeding: Seabirds
Fair Isle SPA	6825.1	Breeding: Arctic tern Fair Isle wren	Breeding: Guillemot	Breeding: Seabirds

[59] A seabird assemblage of international importance: the area regularly supports at least 20,000 seabirds. Or, a wetland of international importance: the area regularly supports at least 20,000 waterfowl.

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Papa Westray (North Hill and Holm) SPA	245.94	Breeding: Arctic tern	N/A	N/A
West Westray SPA	3780.16	Breeding: Arctic tern	Breeding: Guillemot	Breeding: Seabirds
East Sanday Coast SPA	1508.2	N/A	Over winter: Purple sandpiper Turnstone	N/A
Calf of Eday SPA	2671.77	N/A	N/A	Breeding: Seabirds
Rousay SPA	5480.84	Breeding: Arctic tern	N/A	Breeding: Seabirds
North Orkney pSPA	22695.17	Breeding: Red-throated diver Over winter: Great northern diver Slavonian grebe	Over winter: Eider Long-tailed duck Velvet scoter Red-breasted merganser Shag	N/A
Marwick Head SPA	475.54	N/A	Breeding: Guillemot	Breeding: Seabirds
Orkney Mainland Moors SPA	5342.44	Breeding: Hen harrier Red-throated diver Short-eared owl Over winter: Hen harrier	N/A	N/A
Auskerry SPA	103.11	Breeding: Arctic tern Storm petrel	N/A	N/A
Copinsay SPA	3607.7	N/A	N/A	Breeding: Seabirds
Sule Skerry & Sule Stack SPA	3909.45	Breeding: Leach's storm petrel Storm petrel	Breeding: Gannet Puffin	Breeding: Seabird
Hoy SPA	18123.91	Breeding: Peregrine Red-throated diver	Breeding: Great skua	Breeding: Seabirds
Switha SPA	57.0	Over winter: Barnacle goose	N/A	N/A
Scapa Flow pSPA	37065.53	Breeding: Red-throated diver Over winter: Great northern diver Black-throated diver Slavonian grebe	Over winter: Shag Eider Long-tailed duck Goldeneye Red-breasted merganser	N/A
Pentland Firth Islands SPA	170.0	Breeding: Arctic tern	N/A	N/A
Pentland Firth pSPA	97325	Breeding: Arctic tern	N/A	Breeding: Seabirds
CENTRAL AND NORTHERN NORTH SEA				
Handa SPA	3205.61	N/A	Breeding: Guillemot Razorbill	Breeding: Seabirds
Cape Wrath SPA	6734.48	N/A	N/A	Breeding: Seabirds

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
North Sutherland Coastal Islands SPA	223.46	Over winter: Barnacle goose	N/A	N/A
Caithness & Sutherland Peatlands SPA	145312.97	Breeding: Black-throated diver Golden eagle Golden plover Hen harrier Merlin Red-throated diver Short-eared owl Wood sandpiper	Breeding: Dunlin	N/A
North Caithness Cliffs SPA	14628.77	Breeding: Peregrine	Breeding: Guillemot	Breeding: Seabird
East Caithness Cliffs SPA	11696.37	Breeding: Peregrine	Breeding: Razorbill Herring gull Shag Kittiwake Guillemot	Breeding: Seabird
Moray Firth pSPA	176235.95	Over winter: Great northern diver Red-throated diver Slavonian grebe	Breeding: Shag Over winter: Scaup Eider Long-tailed duck Common scoter Velvet scoter Common goldeneye Red-breasted merganser Shag	N/A
Dornoch Firth and Loch Fleet SPA	7856.54	Breeding: Osprey Over winter: Bar-tailed godwit	Over winter: Greylag goose Wigeon	Over winter: Waterfowl
Loch Eye SPA	204.88	Over winter: Whooper swan	Over winter: Greylag goose	N/A
Cromarty Firth SPA	3247.95	Breeding: Common tern Osprey Over winter: Bar-tailed godwit Whooper swan	Over winter: Greylag goose	Over winter: Waterfowl
Inner Moray Firth SPA	2290.25	Breeding: Common tern Osprey Over winter: Bar-tailed godwit	Over winter: Greylag goose Red-breasted merganser Redshank	N/A
Moray and Nairn Coast SPA	2325.67	Breeding: Osprey Over winter: Bar-tailed godwit	Over winter: Greylag goose Pink-footed goose Redshank	Over winter: Waterfowl
Troup, Pennan and Lion's Heads SPA	3365.2	N/A	Breeding: Guillemot	Breeding: Seabirds

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Loch of Strathbeg SPA	616.26	Breeding: Sandwich tern Over winter: Whooper swan	Over winter: Teal Greylag goose Pink-footed goose Goldeneye	Over winter: Waterfowl
Buchan Ness to Collieston Coast SPA	5400.76	N/A	N/A	Breeding: Seabirds
Ythan Estuary, Sands of Forvie and Meikle Loch SPA	1014.62	Breeding: Common tern Little tern Sandwich tern	Over winter: Pink-footed goose	Over winter: Waterfowl
Ythan Estuary, Sands of Forvie and Meikle Loch pSPA	6051.39	Breeding: Sandwich tern Common tern Little tern	Over winter: Pink-footed goose	Over winter: Waterfowl
Fowlsheugh SPA	1303.23	N/A	Breeding: Guillemot Kittiwake	Breeding: Seabirds
Montrose Basin SPA	981.19	N/A	Over winter: Greylag goose Knot Pink-footed goose Oystercatcher Redshank	Over winter: Waterfowl
Firth of Tay and Eden Estuary SPA	6947.62	Breeding: Little tern Marsh harrier Over winter: Bar-tailed godwit	Over winter: Greylag goose Pink-footed goose Redshank	Over winter: Waterfowl
Outer Firth of Forth and St Andrews Bay Complex pSPA	272068.09	Breeding: Common tern Arctic tern Over-winter: Red-throated diver Little gull Slavonian grebe	Breeding: Shag Gannet Over-winter: Eider	Breeding: Seabirds Over winter: Seabirds Waterfowl
Forth Islands SPA	9795	Breeding: Roseate tern Common tern Sandwich tern Arctic tern	Breeding: Puffin Lesser black-backed gull Gannet Shag	Breeding: Seabirds
Firth of Forth SPA	6317.69	Over winter: Red-throated diver Bar-tailed godwit Golden plover Slavonian grebe Oystercatcher On passage: Sandwich tern	Over winter: Pink-footed goose Turnstone Knot Shelduck Redshank	Over winter: Waterfowl
Imperial Dock Lock, Leith SPA	0.11	Breeding: Common tern	N/A	N/A
St Abb's Head to Fast Castle SPA	1736.75	N/A	N/A	Breeding: Seabirds

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Lindisfarne SPA	3671.03	Breeding: Little tern Roseate tern Over winter: Bar-tailed godwit Golden plover Whooper swan	On passage: Ringed plover Over winter: Grey plover Greylag goose Light-bellied brent goose Sanderling Wigeon Dunlin Ringed plover Long-tailed duck Red-breasted merganser Eider Shelduck	N/A
Farne Islands SPA	101.23	Breeding: Arctic tern Common tern Sandwich tern	Breeding: Guillemot	Breeding: Seabirds
Northumberland Marine SPA	88687	Breeding: Sandwich tern Common tern Arctic tern Roseate tern Little tern	Breeding: Puffin Guillemot	Breeding: Seabirds
Northumbria Coast SPA	1097.44	Breeding: Little tern Arctic tern	Over winter: Purple sandpiper Turnstone	N/A
Coquet Island SPA	19.78	Breeding: Arctic tern Common tern Roseate tern Sandwich tern	N/A	Breeding: Seabirds
SOUTHERN NORTH SEA				
Teesmouth and Cleveland Coast SPA	1251.51	Breeding: Little tern On passage: Sandwich tern	On passage: Redshank Over winter: Knot	Over winter: Waterfowl
Flamborough and Filey Coast pSPA	8039.6	N/A	Breeding: Kittiwake Gannet Guillemot Razorbill	Breeding: Seabirds
Flamborough Head and Bempton Cliffs SPA	207.17	N/A	Breeding: Kittiwake	N/A
Hornsea Mere SPA	232.25	N/A	Breeding: Mute swan Over winter: Gadwall	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Humber Estuary SPA	37630.24	Breeding: Bittern Marsh harrier Avocet Little tern Over winter: Bittern Avocet Hen harrier Bar-tailed godwit Golden plover On passage: Ruff	Over winter: Dunlin Knot Shelduck Black-tailed godwit Redshank On passage: Knot Dunlin Black-tailed godwit Redshank	Non-breeding: Waterfowl
Gibraltar Point SPA	422.2	Breeding: Little tern Over winter: Bar-tailed godwit	Over winter: Grey plover Sanderling	
The Wash SPA	62044.14	Breeding: Common tern Little tern Over winter: Bewick's swan Bar-tailed godwit	Over winter: Pintail Wigeon Gadwall Pink-footed goose Turnstone Dark-bellied brent goose Goldeneye Sanderling Dunlin Knot Oystercatcher Black-tailed godwit Common scoter Curlew Grey plover Shelduck Redshank	Over winter: Waterfowl
Greater Wash pSPA	344267	Breeding: Little tern Sandwich tern Common tern Over winter: Little gull Red-throated diver	Over winter: Common scoter	N/A
North Norfolk Coast SPA	7862.27	Breeding: Avocet Bittern Common tern Little tern Marsh harrier Sandwich tern Over winter: Avocet	Over winter: Wigeon Pink-footed goose Dark-bellied brent goose Knot	Over winter: Waterfowl
Broadland SPA	5508.88	Breeding: Bittern Marsh harrier Over winter: Hen harrier Bewick's swan Whooper swan	Over winter: Gadwall	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Great Yarmouth North Denes SPA	160.37	Breeding: Little tern	N/A	N/A
Outer Thames Estuary SPA	392451.66	Breeding: Little tern Common tern Over winter: Red-throated diver	N/A	N/A
Breydon Water SPA	1203.5	Breeding: Common tern Over winter: Bewick's swan Avocet Golden plover On passage: Ruff	Over winter: Lapwing	Over winter: Waterfowl
Benacre to Easton Bavents SPA	470.6	Breeding: Bittern Little tern Marsh harrier	N/A	N/A
Minsmere-Walberswick SPA	2019.11	Breeding: Bittern Nightjar Marsh harrier Avocet Little tern Over winter: Hen harrier	Breeding: Shoveler Teal Gadwall Over winter: Shoveler Gadwall Greater white-fronted goose	N/A
Alde-Ore Estuary SPA	2403.5	Breeding: Marsh harrier Avocet Little tern Sandwich tern Over winter: Ruff Avocet	Breeding: Lesser black-backed gull Over winter: Redshank	N/A
Deben Estuary SPA	981.08	Over winter: Avocet	Over winter: Dark-bellied brent goose	N/A
Stour and Orwell Estuaries SPA	3667.37	Breeding: Avocet	Over winter: Pintail Dark-bellied brent goose Dunlin Knot Black-tailed godwit Grey plover Redshank On passage: Redshank	Over winter: Waterfowl
Hamford Water SPA	3532.55	Breeding: Little tern Over winter: Avocet	Over winter: Teal Dark-bellied brent goose Ringed plover Black-tailed godwit Grey plover Shelduck Redshank	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
IRISH SEA				
Carlingford Lough SPA	826.91	Breeding: Common tern Sandwich tern	Over winter: Canadian light-bellied brent goose	N/A
Killough Bay SPA	132.71	N/A	Over winter: Canadian light-bellied brent goose	N/A
East Coast Marine pSPA	96668.34	Breeding: Sandwich tern Common tern Arctic tern Over winter: Red-throated diver	Breeding: Manx shearwater Over winter: Great crested grebe Eider	N/A
Strangford Lough SPA	15564.4	Breeding: Arctic tern Common tern Sandwich tern	Over winter: Canadian light-bellied brent goose Knot Redshank	Over winter: Waterfowl
Outer Ards SPA	1394.8	Breeding: Arctic tern Over winter: Golden plover	Over winter: Turnstone Canadian light-bellied brent goose Ringed plover	N/A
Copeland Islands SPA	200.19	Breeding: Arctic tern	Breeding: Manx shearwater	N/A
Belfast Lough Open Water SPA	5591.73	N/A	Over winter: Great crested grebe	N/A
Belfast Lough SPA	428.64	N/A	Over winter: Redshank	N/A
Larne Lough SPA	391.48	Breeding: Common tern Roseate tern Sandwich tern	Over winter: Canadian light-bellied brent goose	N/A
Rathlin Island SPA	3342.8	Breeding: Peregrine	Breeding: Guillemot Razorbill Kittiwake	N/A
Sheep Island SAC	3.39	N/A	Breeding: Cormorant	N/A
Rinns of Islay SPA	9434.09	Breeding: Chough Corncrake Hen harrier On passage: Whooper swan Over winter: Greenland white-fronted goose	Breeding: Common scoter	N/A
Laggan, Islay SPA	1225.62	Over winter: Barnacle goose Greenland white-fronted goose	N/A	N/A
The Oa SPA	1930.84	Breeding: Chough	N/A	N/A
Kintyre Goose Roosts SPA	409.2	Over winter: Greenland white-fronted goose	N/A	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Ailsa Craig SPA	2759.57	N/A	Breeding: Gannet Lesser black-backed gull	Breeding: Seabirds
Loch of Inch and Torrs Warren SPA	2110.5	Over winter: Greenland white-fronted goose Hen harrier	N/A	N/A
Solway Firth pSPA	135749.35	Over winter: Red-throated diver Whooper swan Barnacle goose Golden plover Bar-tailed godwit	On passage: Ringed plover Over winter: Pink-footed goose Pintail Scaup Oystercatcher Knot Curlew Redshank	Over winter: Waterfowl
Upper Solway Flats and Marshes SPA	43678.26	Over winter: Bar-tailed godwit Barnacle goose Golden plover Whooper swan	Over winter: Pintail Shoveler Teal Pink-footed goose Turnstone Scaup Goldeneye Sanderling Dunlin Knot Oystercatcher Curlew Grey plover Shelduck Redshank	Over winter: Waterfowl
Morecambe Bay & Duddon Estuary SPA	66899	Breeding: Common tern Sandwich tern Little tern Over winter: Whooper swan Little egret Golden plover Ruff Bar-tailed godwit Mediterranean gull	Breeding: Lesser black-backed gull Herring gull On passage: Pink-footed goose Shelduck Oystercatcher Ringed plover Grey plover Knot Sanderling Dunlin Black-tailed godwit Curlew Pintail Turnstone Redshank Lesser black-backed gull	Any season: Seabird Any season: Waterfowl

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Ribble and Alt Estuaries SPA	12449.92	Breeding: Common tern Ruff Over winter: Bar-tailed godwit Bewick's swan Golden plover Whooper swan	Breeding: Lesser black-backed gull Black-headed gull On passage: Ringed plover Sanderling Redshank Whimbrel Over winter: Pintail Teal Wigeon Pink-footed goose Scaup Sanderling Dunlin Knot Oystercatcher Black-tailed godwit Common scoter Curlew Cormorant Grey plover Shelduck Redshank Lapwing	Breeding: Seabirds Over winter: Waterfowl
Mersey Narrows and North Wirral Foreshore SPA	2078.36	Breeding: Common tern On passage: Little gull Common tern Over winter: Bar-tailed godwit	Over winter: Knot	Over winter: Waterfowl
Mersey Estuary SPA	5023.35	Over winter: Golden plover	On passage: Redshank Ringed plover Over winter: Dunlin Pintail Redshank Shelduck Teal Lapwing Great crested grebe Grey plover Curlew Black-tailed godwit Wigeon	N/A
Liverpool Bay SPA	252757.73	Breeding: Little tern Common tern Over winter: Red-throated diver Little gull	Over winter: Common scoter	Any season: Waterfowl

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
The Dee Estuary SPA	14294.95	Breeding: Common tern Little tern On passage: Sandwich tern Over winter: Bar-tailed godwit	On passage: Redshank Over winter: Pintail Teal Dunlin Knot Oystercatcher Black-tailed godwit Curlew Grey plover Shelduck Redshank	Over winter: Waterfowl
Traeth Lafan/ Lavan Sands, Conway Bay SPA	2703.13	N/A	Over winter: Oystercatcher Curlew Redshank Red-breasted merganser On passage: Great crested grebe	N/A
Ynys Seiriol / Puffin Island SPA	31.32	N/A	Breeding: Cormorant	N/A
Anglesey Terns / Morwenoliaid Ynys Môn SPA	101931.08	Breeding: Roseate tern Common tern Arctic tern Sandwich tern	N/A	N/A
Irish Sea Front SPA	18000	N/A	Breeding: Manx shearwater	N/A
Glannau Ynys Gybi/Holy Island Coast SPA	604.39	Over winter: Chough	N/A	N/A
Glannau Aberdaron and Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA	33942.42	Breeding: Chough Over winter: Chough	Breeding: Manx shearwater	N/A
Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal / Mynydd Cilan, Trwyn y Wylfa and the St Tudwal Islands SPA	372.94	Breeding: Chough Over winter: Chough	N/A	N/A
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA	82312.9	Over winter: Red-throated diver	N/A	N/A
Dyfi Estuary / Aber Dyfi SPA	2056.5	Over winter: Greater white-fronted goose	N/A	N/A
Cahore Marshes SPA (RoI)	191.61	Over winter: Golden plover	Over winter: Greenland white-fronted goose Wigeon Lapwing	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Wicklow Head SPA (RoI)	195.13	N/A	Breeding: Kittiwake	N/A
The Murrough SPA (RoI)	941.19	Breeding: Little tern Over winter: Red-throated diver	Over winter: Greylag goose Light-bellied brent goose Wigeon Teal Black-headed gull Herring gull	N/A
Dalkey Islands SPA (RoI)	83.08	Breeding: Roseate tern Common tern Arctic tern	N/A	N/A
South Dublin Bay/Tolka Estuary SPA (RoI)	2194.11	On passage: Common tern Roseate tern Arctic tern Over winter: Bar-tailed godwit	Over winter: Light-bellied brent goose Oystercatcher Ringed plover Grey plover Knot Sanderling Dunlin Redshank Black-headed gull	N/A
North Bull Island SPA (RoI)	1944.3	Over winter: Bar-tailed godwit Golden plover	Over winter: Light-bellied brent goose Black-tailed godwit Bar-tailed godwit Shelduck Teal Pintail Shoveler Oystercatcher Grey plover Knot Sanderling Dunlin Curlew Redshank Turnstone Black-headed gull	Over winter: Waterfowl
Howth Head Coast SPA (RoI)	207.82	N/A	Breeding: Kittiwake	N/A
Ireland's Eye SPA (RoI)	214.52	N/A	Breeding: Cormorant Herring gull Kittiwake Guillemot Razorbill	N/A
Baldoyle Bay SPA (RoI)	262.77	Over winter: Golden plover Bar-tailed godwit	Over winter: Light-bellied brent goose Shelduck Ringed plover Grey plover	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Malahide Estuary SPA (RoI)	764.96	Over winter: Golden plover Bar-tailed godwit	Over winter: Great crested grebe Light-bellied brent goose Shelduck Pintail Goldeneye Red-breasted merganser Oystercatcher Grey plover Knot Dunlin Black-tailed godwit Redshank	N/A
Rogerstown Estuary SPA (RoI)	645.62	N/A	Over winter: Light-bellied brent goose Greylag goose Shelduck Shoveler Oystercatcher Ringed plover Grey plover Knot Dunlin Black-tailed godwit Redshank	N/A
Lambay Island SPA (RoI)	599.56	N/A	Breeding: Fulmar Cormorant Shag Kittiwake Guillemot Razorbill Puffin Lesser black-backed gull Herring Gull Over winter: Greylag goose	Breeding: Seabird
Skerries Islands SPA (RoI)	217.21	N/A	Breeding: Cormorant Shag Herring gull Over winter: Light-bellied brent goose Purple sandpiper Turnstone	N/A
Rockabill SPA (RoI)	5229.32	Breeding: Roseate tern	Over winter: Purple sandpiper	N/A
River Nanny Estuary and Shore SPA (RoI)	229.78	Over winter: Golden plover	Over winter: Oystercatcher Ringed plover Knot Sanderling Herring gull	N/A
Boyne Estuary SPA (RoI)	593.68	Breeding: Little tern Over winter: Golden plover	Over winter: Shelduck Oystercatcher Grey plover Lapwing Knot Sanderling Black-tailed godwit Redshank Turnstone	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[59]
Dundalk Bay SPA (RoI)	13243.53	Over winter: Golden plover Bar-tailed godwit	Over winter: Great crested grebe Greylag goose Light-bellied brent goose Shelduck Teal Mallard Pintail Common scoter Red-breasted merganser Oystercatcher Ringed plover Grey plover Lapwing Knot Dunlin Black-tailed godwit Curlew Redshank Black-headed gull Common gull Herring gull	Over winter: Waterfowl
Carlingford Lough SPA (RoI)	595.37	N/A	Over winter: Light-bellied brent goose	N/A

A3 Coastal and marine Special Areas of Conservation

This section includes coastal and marine Special Areas of Conservation (SAC) which contain one or more of the Annex I habitats listed in Box A.2 (below) or Annex II qualifying marine species. Relevant offshore (out with or crossing the 12nm boundary) SACs are also included in Table A.2 as are riverine/freshwater SACs which are designated for migratory fish and/or freshwater pearl mussel. Relevant SACs in the waters of adjacent Member States (the Netherlands, Germany and the Republic of Ireland) are listed in Table A.2 and described separately in Section A4. All relevant SACs are included on Maps A.4 to A.6.

Abbreviations for the Annex I habitats used in SAC site summaries (Tables A.2 to A.4) are listed in Box A.2. Common names of Annex II species are used in SAC site summaries with corresponding scientific names listed in Box A.3.

Box A.2: Annex I habitat abbreviations used in site summaries

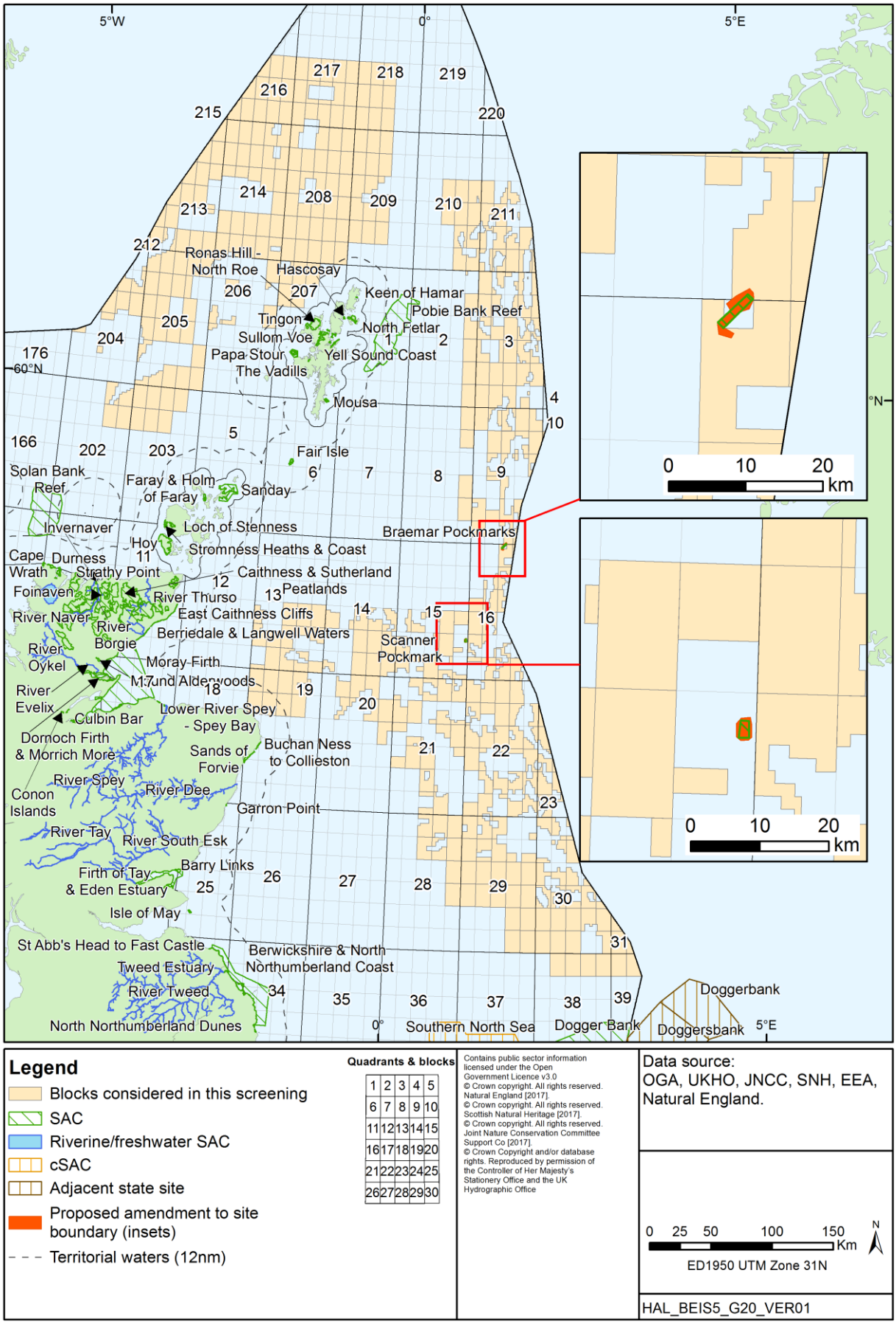
Annex I habitat (abbreviated)	Annex I habitat(s) (full description)
Bogs	Blanket bogs * Priority feature Transition mires and quaking bogs Depressions on peat substrates of the *Rhynchosporion* Active raised bogs * Priority feature Degraded raised bogs still capable of natural regeneration Bog Woodland * Priority feature
Coastal dunes	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") Fixed coastal dunes with herbaceous vegetation ("grey dunes") * Priority feature Humid dune slacks Embryonic shifting dunes Decalcified fixed dunes with *Empetrum nigrum* * Priority feature Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) * Priority feature Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) Coastal dunes with *Juniperus* spp. Dunes with *Hippophae rhamnoides* Fixed dunes with herbaceous vegetation (`grey dunes`) * Priority feature
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	Western acidic oak woodland Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature *Taxus baccata* woods of the British Isles *Priority feature *Tilio-Acerion* forests of slopes, screes and ravines * Priority feature Old sessile oak woods and *Ilex* and *Blechnum* in the British Isles Old sessile oak woods with *Quercus robur* on sandy plains

Annex I habitat (abbreviated)	Annex I habitat(s) (full description)
Grasslands	Alpine and subalpine calcareous grasslands Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels Siliceous alpine and boreal grasslands Species-rich *Nardus* grassland, on siliceous substrates in mountain areas (and submountain areas in continental Europe) * Priority feature Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* * Priority feature Calaminarian grasslands of the *Violetalia calaminariae* *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
Heaths	Northern Atlantic wet heaths with *Erica tetralix* European dry heaths Alpine and Boreal heaths Dry Atlantic coastal heaths with *Erica vagans*
Inlets and bays	Large shallow inlets and bays
Limestone pavements	Limestone pavements * Priority feature
Machairs	Machairs
Mudflats and sandflats	Mudflats and sandflats not covered by seawater at low tide
Reefs	Reefs
Rocky slopes	Calcareous rocky slopes with chasmophytic vegetation Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) Siliceous rocky slopes with chasmophytic vegetation
Running freshwater	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
Saltmarsh 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	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)
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	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* Natural dystrophic lakes and ponds Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
Vegetation of drift line	Annual vegetation of drift lines
Vegetation of stony banks	Perennial vegetation of stony banks

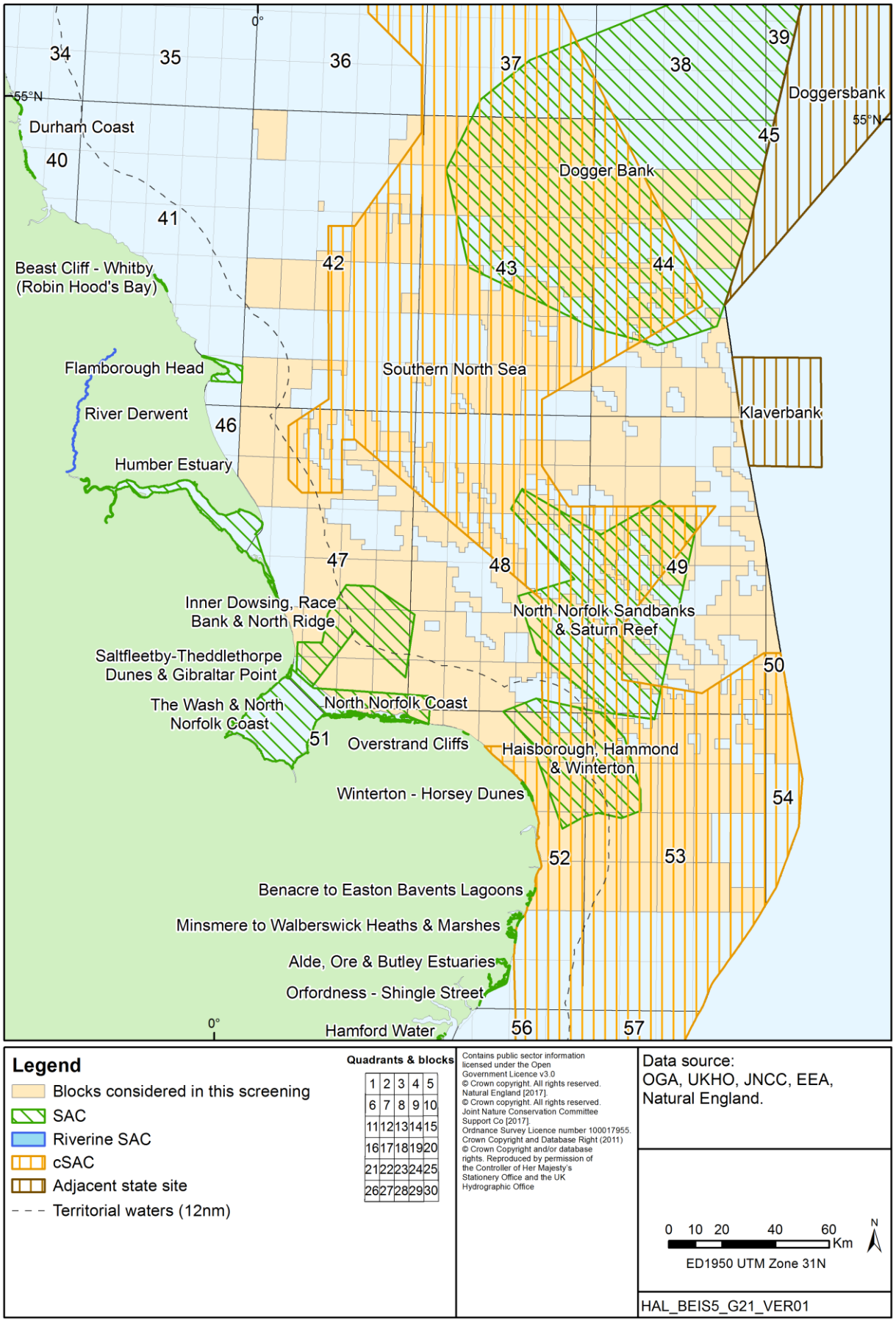
Box A.3: Annex II species common names used in site summaries and scientific names

Group	Annex II species common name (scientific name)
Plants	marsh saxifrage (*Saxifraga hirculus*) petalwort (*Petalophyllum ralfsii*) floating water-plantain (*Luronium natans)* shore dock (*Rumex rupestris)*
Invertebrates	marsh fritillary butterfly (*Euphydryas (Eurodryas, Hypodryas) aurinia*) freshwater pearl mussel (*Margaritifera margaritifera*) slender naiad (*Najas flexilis*) narrow-mouthed whorl snail (*Vertigo angustior*) white-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*) Fisher's estuarine moth (*Gortyna borelii lunata)*
Amphibians	great crested newt (*Triturus cristatus)*
Fish	sea lamprey (*Petromyzon marinus)* brook lamprey (*Lampetra planeri)* river lamprey (*Lampetra fluviatilis)* Atlantic salmon (*Salmo salar)* bullhead (*Cottus gobio)*
Mammals	grey seal (*Halichoerus grypus*) harbour seal (*Phoca vitulina*) otter (*Lutra lutra*) harbour porpoise (*Phocoena phocoena*) bottlenose dolphin (*Tursiops truncatus*)

Map A.4: Location of SACs – West of Shetland and central and northern North Sea



Map A.5: Location of SACs – Southern North Sea



Map A.6: Location of SACs – Irish Sea

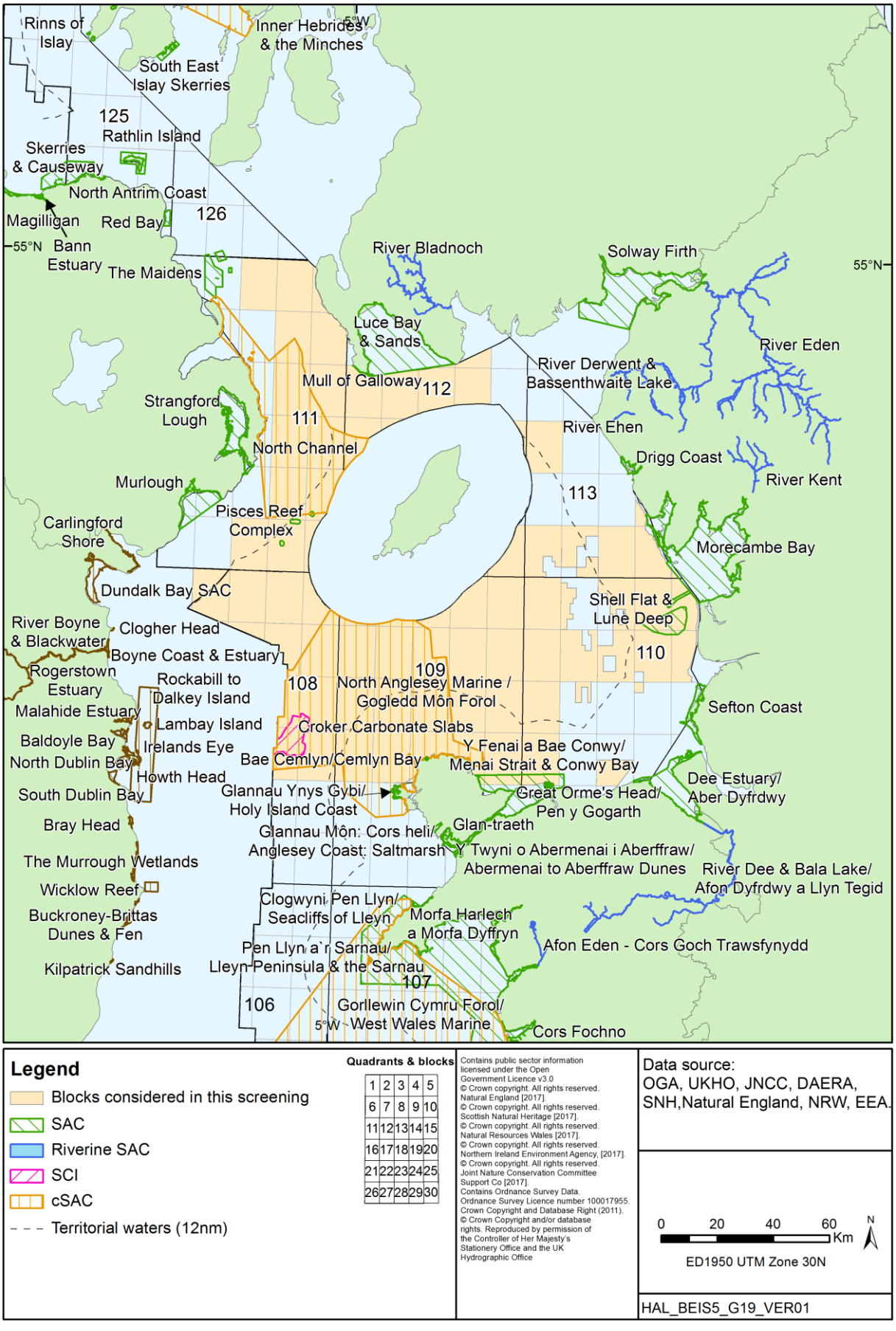


Table A.2: SACs and their Qualifying Features

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
WEST OF SHETLAND					
Keen of Hamar SAC	39.87	Grasslands Scree	Heaths	N/A	N/A
Pobie Bank Reef SAC	96575	Reefs	N/A	N/A	N/A
Hascosay SAC	164.19	Bogs	N/A	N/A	Otter
North Fetlar SAC	1585.18	Heaths Fens	N/A	N/A	N/A
Ronas Hill – North Roe SAC	4903.57	Standing freshwater Heaths Bogs	Heaths Scree	N/A	N/A
Yell Sound Coast SAC	1544.44	N/A	N/A	Otter Harbour seal	N/A
Sullom Voe SAC	2691.43	Inlets and bays	Coastal lagoons Reefs	N/A	N/A
Mousa SAC	529.74	N/A	Reefs Sea caves	Harbour seal	N/A
Papa Stour SAC	2072.9	Reefs Sea caves	N/A	N/A	N/A
The Vadills SAC	62.42	Coastal lagoons	N/A	N/A	N/A
Fair Isle SAC	561.05	Sea cliffs	Heaths	N/A	N/A
Sanday SAC	10976.97	Reefs	Sandbanks Mudflats and sandflats	Harbour seal	N/A
Faray and Holm of Faray SAC	781.33	N/A	N/A	Grey seal	N/A
Stromness Heaths and Coast SAC	638.26	Sea cliffs Heaths	Fens	N/A	N/A
Loch of Stenness SAC	792.59	Coastal lagoons	N/A	N/A	N/A
Hoy SAC	9501.27	Sea cliffs Standing freshwater Heaths Bog	Heaths Fens Rocky slopes	N/A	N/A
Solan Bank Reef SAC	85593	Reefs	N/A	N/A	N/A
CENTRAL AND NORTHERN NORTH SEA					
Braemar Pockmarks SAC	1143 (includes proposed extension)	Submarine structures made by leaking gases	N/A	N/A	N/A
Scanner Pockmark SAC	674 (includes proposed extension)	Submarine structures made by leaking gases	N/A	N/A	N/A
Cape Wrath SAC	1009.75	Sea cliffs	N/A	N/A	N/A
Durness SAC	1213.8	Coastal dunes Standing freshwater Grasslands Limestone pavements	Coastal dunes Heaths Grasslands Fens	N/A	Otter
Foinaven SAC	14853.66	Standing freshwater Heaths Grasslands Scree Rocky slopes	Grasslands Bogs Rocky slopes	N/A	Freshwater pearl mussel Otter

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Invernaver SAC	287.67	Coastal dunes Heaths Grasslands	Coastal dunes Fens	N/A	N/A
River Borgie SAC	33.92	N/A	N/A	Freshwater pearl mussel	Atlantic salmon Otter
River Naver SAC	1044.15	N/A	N/A	Freshwater pearl mussel Atlantic salmon	N/A
Strathy Point SAC	207	Sea cliffs	N/A	N/A	N/A
East Caithness Cliffs SAC	457.48	Sea cliffs	N/A	N/A	N/A
Berriedale and Langwell Waters SAC	58.25	N/A	N/A	Atlantic salmon	N/A
Moray Firth SAC	151273.99	N/A	Sandbanks	Bottlenose dolphin	N/A
Mound Alderwoods SAC	299.52	Forests	N/A	N/A	N/A
Conon Islands SAC	120.64	Forests	N/A	N/A	N/A
River Oykel	921.46	N/A	N/A	Freshwater pearl mussel	Atlantic salmon
River Evelix	23.6	N/A	N/A	Freshwater pearl mussel	N/A
Dornoch Firth and Morrich More SAC	8701.22	Estuaries Mudflats and sandflats Saltmarsh and salt meadows Coastal dunes	Sandbanks Reefs	Otter Harbour seal	N/A
Culbin Bar SAC	580.99	Vegetation of stony banks	Saltmarsh and salt meadows Coastal dunes	N/A	N/A
Lower River Spey - Spey Bay SAC	654.26	Vegetation of stony banks Forests	N/A	N/A	N/A
River Spey SAC	5759.72	N/A	N/A	Freshwater pearl mussel Sea lamprey Atlantic salmon Otter	N/A
Buchan Ness to Collieston SAC	206.03	Sea cliffs	N/A	N/A	N/A
Sands of Forvie SAC	735.48	Coastal dunes	N/A	N/A	N/A
River Dee SAC	2334.48	N/A	N/A	Freshwater pearl mussel Atlantic salmon Otter	N/A
Garron Point SAC	15.01	N/A	N/A	Narrow-mouthed whorl snail	N/A
River South Esk SAC	471.85	N/A	N/A	Freshwater pearl mussel Atlantic salmon	N/A
Barry Links SAC	770.44	Coastal dunes	N/A	N/A	N/A
River Tay SAC	9461.63	N/A	Standing freshwater	Atlantic salmon	Sea lamprey Brook lamprey River lamprey Otter
Firth of Tay and Eden Estuary SAC	15441.63	Estuaries	Sandbanks Mudflats and sandflats	Harbour seal	N/A
Isle of May SAC	356.64	N/A	Reefs	Grey seal	N/A

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
St Abb's Head to Fast Castle SAC	122.63	Sea cliffs	N/A	N/A	N/A
River Tweed SAC	3742.65	Running freshwater	N/A	Atlantic salmon Otter	Sea lamprey Brook lamprey River lamprey
Tweed Estuary SAC	156.24	Estuaries Mudflats and sandflats	N/A	N/A	Sea lamprey River lamprey
Berwickshire and North Northumberland Coast SAC	65226.12	Mudflats and sandflats Inlets and Bays Reefs Sea caves	N/A	Grey seal	N/A
North Northumberland Dunes SAC	1127.27	Coastal dunes	N/A	Petalwort	N/A
Doggerbank SAC (Germany)	169895	Sandbanks	N/A	Harbour porpoise Harbour seal	N/A
SOUTHERN NORTH SEA					
Southern North Sea cSAC	3695054	N/A	N/A	Harbour porpoise	N/A
Dogger Bank SAC	1233115	Sandbanks	N/A	N/A	N/A
Doggersbank SAC (Netherlands)	473500	Sandbanks	N/A	Grey seal Harbour seal Harbour porpoise	N/A
Klaverbank SAC (Netherlands)	153900	Reefs	N/A	Grey seal Harbour seal Harbour porpoise	N/A
Durham Coast SAC	389.61	Sea cliffs	N/A	N/A	N/A
Beast Cliff - Whitby (Robin Hood's Bay) SAC	265.48	Sea cliffs	N/A	N/A	N/A
Flamborough Head SAC	6320.87	Reefs Sea cliffs Sea caves	N/A	N/A	N/A
River Derwent SAC	397.87	Running freshwater	N/A	River lamprey	Sea lamprey Bullhead Otter
Humber Estuary SAC	36657.15	Estuaries Mudflats and sandflats	Sandbanks Saltmarsh and salt meadows Coastal lagoons Coastal dunes	N/A	River lamprey Sea lamprey Grey seal
Inner Dowsing, Race Bank and North Ridge SAC	84514	Sandbanks Reefs	N/A	N/A	N/A
Saltfleetby - Theddlethorpe Dunes and Gibraltar Point SAC	967.65	Coastal dunes	Coastal dunes	N/A	N/A
The Wash and North Norfolk Coast SAC	107718	Sandbanks Mudflats and sandflats Inlets and bays Reefs Saltmarsh and salt meadows	Coastal lagoons	Harbour seal	Otter
North Norfolk Coast SAC	3148.6	Coastal lagoons Vegetation of stony banks Saltmarsh and salt meadows Coastal dunes	N/A	N/A	Otter Petalwort

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Overstrand Cliffs SAC	30.02	Sea cliffs	N/A	N/A	N/A
North Norfolk Sandbanks and Saturn Reef SAC	360341	Sandbanks Reefs	N/A	N/A	N/A
Haisborough, Hammond and Winterton SAC	146759	Sandbanks Reefs	N/A	N/A	N/A
Winterton - Horsey Dunes SAC	426.96	Coastal dunes	Coastal dunes	N/A	N/A
Benacre to Easton Bavents Lagoons SAC	326.7	Coastal lagoons	N/A	N/A	N/A
Minsmere to Walberswick Heaths and Marshes SAC	1256.57	Vegetation of drift lines Heaths	Vegetation of stony banks	N/A	N/A
Alde, Ore and Butley Estuaries SAC	1632.63	Estuaries	Mudflats and sandflats Saltmarsh and salt meadows	N/A	N/A
Orfordness-Shingle Street SAC	888	Coastal lagoons Vegetation of drift lines Vegetation of stony banks	N/A	N/A	N/A
Hamford Water SAC	50.34	N/A	N/A	Fisher's estuarine moth	N/A
IRISH SEA					
Murlough SAC	11902.03	Coastal dunes	Sandbanks Mudflats and sandflats Saltmarsh and salt meadows Coastal dunes	Marsh fritillary butterfly	Harbour seal
Pisces Reef Complex SAC	873	Reefs	N/A	N/A	N/A
North Channel cSAC	160367	N/A	N/A	Harbour porpoise	N/A
Strangford Lough SAC	15398.54	Mudflats and sandflats Coastal lagoons Inlets and bays Reefs	Vegetation of drift lines Vegetation of stony banks Saltmarsh and salt meadows	N/A	Harbour seal
The Maidens SCI	7461.36	Reefs Sandbanks	N/A	N/A	Grey seal
Red Bay SCI	965.54	Sandbanks	N/A	N/A	N/A
North Antrim Coast SAC	314.59	Sea cliffs	Vegetation of drift lines Saltmarsh and salt meadows Coastal dunes Grasslands	Narrow-mouthed whorl snail	N/A
Rathlin Island SAC	3344.62	Reefs Sea cliffs Sea caves	Sandbanks Vegetation of drift lines	N/A	N/A
Skerries and Causeway SCI	10862	Reefs Sandbanks Sea caves	N/A	N/A	Harbour porpoise *Phocoena phocoena*

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Bann Estuary SAC	347.94	Coastal dunes	Saltmarsh and salt meadows Coastal dunes	N/A	N/A
Magilligan SAC	1058.22	Coastal dunes	Coastal dunes	N/A	Marsh fritillary butterfly Petalwort
Rinns of Islay SAC	1149.7	N/A	N/A	Marsh fritillary butterfly	N/A
South East Islay Skerries SAC	1498.3	N/A	N/A	Harbour seal	N/A
Inner Hebrides and the Minches cSAC	1380199	N/A	N/A	Harbour porpoise	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
River Bladnoch SAC	272.6	N/A	N/A	Atlantic salmon	N/A
Solway Firth SAC	43636.72	Sandbanks Estuaries Mudflats and sandflats Saltmarsh and salt meadows	Reefs Vegetation of stony banks Coastal dunes	Sea lamprey River lamprey	N/A
River Eden SAC	2430.39	Standing freshwater Running freshwater Forests	N/A	White-clawed (or Atlantic stream) crayfish Sea lamprey Brook lamprey River lamprey Atlantic salmon Bullhead Otter	N/A
River Derwent and Bassenthwaite Lake SAC	1793.8	Standing freshwater	Running freshwater	Marsh fritillary butterfly Sea lamprey Brook lamprey River lamprey Atlantic salmon Otter Floating water-plantain	N/A
River Ehen SAC	23.33	N/A	N/A	Freshwater pearl mussel	Atlantic salmon
Drigg Coast SAC	1397.44	Estuaries Coastal dunes	Mudflats and sandflats Saltmarsh 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 Saltmarsh and salt meadows Coastal dunes	Sandbanks Coastal lagoons Reefs Coastal dunes	Great crested newt	N/A
River Kent	88.9	N/A	Running freshwater	White-clawed (or Atlantic stream) crayfish	Freshwater pearl mussel Bullhead
Shell Flat and Lune Deep SAC	10565	Sandbanks Reefs	N/A	N/A	N/A

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Sefton Coast SAC	4563.97	Coastal dunes	Coastal dunes	Petalwort	Great crested newt
Dee Estuary/ Aber Dyfrdwy SAC	15805.89	Mudflats and sandflats Saltmarsh and salt meadows	Estuaries Sea cliffs Vegetation of drift lines Coastal dunes	N/A	River lamprey Sea lamprey Petalwort
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid SAC	1308.93	Running freshwater	N/A	Atlantic salmon Floating water-plantain	Sea lamprey Brook lamprey River lamprey Bullhead Otter
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
North Anglesey Marine / Gogledd Môn Forol cSAC	324949	N/A	N/A	Harbour porpoise	N/A
Croker Carbonate Slabs SCI	6,591	Submarine structures made by leaking gases	N/A	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	Saltmarsh and salt meadows	Estuaries Mudflats and sandflats	N/A	N/A
Glan-traeth SAC	14.1	N/A	N/A	Great crested newt	N/A
Y Twyni o Abermenai i Aberffraw/ Abermenai to Aberffraw Dunes SAC	1871.03	Coastal dunes	Standing freshwater	Petalwort Shore dock	N/A
Clogwyni Pen Llyn/ Seacliffs of Lleyn SAC	1048.4	Sea cliffs	N/A	N/A	N/A
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	146023.48	Sandbanks Estuaries Coastal lagoons Inlets and bays Reefs	Mudflats and sandflats Saltmarsh and salt meadows Sea caves	N/A	Bottlenose dolphin Otter Grey seal
Morfa Harlech a Morfa Dyffryn SAC	1062.57	Coastal dunes	N/A	Petalwort	N/A
West Wales Marine / Gorllewin Cymru Forol cSAC	737614	N/A	N/A	Harbour porpoise	N/A
Afon Eden - Cors Goch Trawsfynydd SAC	280.65	N/A	Bogs	Freshwater pearl mussel Floating water-plantain	Atlantic salmon Otter
Cors Fochno SAC	653.02	Bogs	Bogs	N/A	N/A
Kilpatrick Sandhills SAC (RoI)	39.71	Vegetation of drift line Coastal dunes	N/A	N/A	N/A

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Buckroney-Brittas Dunes and Fen SAC (RoI)	320.79	Vegetation of drift line Vegetation of stony banks Saltmarsh and salt meadows Coastal dunes Fens	N/A	N/A	N/A
Wicklow Reef SAC (RoI)	1533.23	Reefs	N/A	N/A	N/A
The Murrough Wetlands SAC (RoI)	606.12	Vegetation of drift line Vegetation of stony banks Saltmarsh and salt meadows Fens	N/A	N/A	N/A
Bray Head SAC (RoI)	264.3	Sea cliffs Heaths	N/A	N/A	N/A
South Dublin Bay SAC (RoI)	742.12	Mudflats and sandflats Vegetation of drift line Saltmarsh and salt meadows Coastal dunes	N/A	N/A	N/A
North Dublin Bay SAC (RoI)	1474.99	Mudflats and sandflats Vegetation of drift line Saltmarsh and salt meadows Coastal dunes	N/A	Petalwort	N/A
Howth Head SAC (RoI)	374.88	Sea cliffs Heaths	N/A	N/A	N/A
Ireland's Eye SAC (RoI)	41.83	Vegetation of stony banks Sea cliffs	N/A	N/A	N/A
Baldoyle Bay SAC (RoI)	538.93	Mudflats and sandflats Saltmarsh and salt meadows	N/A	N/A	N/A
Malahide Estuary SAC (RoI)	809.69	Mudflats and sandflats Saltmarsh and salt meadows Coastal dunes	N/A	N/A	N/A
Lambay Island SAC (RoI)	405.3	Reefs Sea cliffs	N/A	Grey seal Harbour seal	N/A
Rockabill to Dalkey Island SAC (RoI)	27325.56	Reefs	N/A	Harbour porpoise	N/A
Rogerstown Estuary SAC (RoI)	586.47	Estuaries Mudflats and sandflats Saltmarsh and salt meadows Coastal dunes	N/A	N/A	N/A
River Boyne and River Blackwater SAC (RoI)	2320.86	Fens Forests	N/A	River lamprey Atlantic salmon Otter	N/A
Boyne Coast and Estuary SAC (RoI)	629.51	Estuaries Mudflats and sandflats Vegetation of drift line Saltmarsh and salt meadows Coastal dunes	N/A	N/A	N/A
Clogher Head SAC (RoI)	23.75	Sea cliffs Heaths	N/A	N/A	N/A

Site Name	Area (ha)	Annex I Habitat Primary	Annex I Habitat Qualifying	Annex II Species Primary	Annex II Species Qualifying
Dundalk Bay SAC (RoI)	5236.27	Estuaries Mudflats and sandflats Vegetation of stony banks Saltmarsh and salt meadows	N/A	N/A	N/A
Carlingford Shore SAC (RoI)	526.28	Vegetation of drift line Vegetation of stony banks	N/A	N/A	N/A

A4 Sites in waters of other member states

Relevant sites in adjacent states are highlighted in the previous Tables A.1 and A.2 as well as listed separately in Tables A.3 and A.4 below. Coastal sites in the Republic of Ireland (RoI; shown on Maps A.3 and A.6) and offshore sites in the Netherlands and Germany (shown on Maps A.4 and A.5) were considered in this screening assessment.

Table A.3: SPA sites in the adjacent waters of other Member States

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[60]
IRISH SEA				
Cahore Marshes SPA (RoI)	191.61	Over winter: Golden plover	Over winter: Greenland white-fronted goose Wigeon Lapwing	N/A
Wicklow Head SPA (RoI)	195.13	N/A	Breeding: Kittiwake	N/A
The Murrough SPA (RoI)	941.19	Breeding: Little tern Over winter: Red-throated diver	Over winter: Greylag goose Light-bellied brent goose Wigeon Teal Black-headed gull Herring gull	N/A
Dalkey Islands SPA (RoI)	83.08	Breeding: Roseate tern Common tern Arctic tern	N/A	N/A
South Dublin Bay/Tolka Estuary SPA (RoI)	2194.11	On passage: Common tern Roseate tern Arctic tern Over winter: Bar-tailed godwit	Over winter: Light-bellied brent goose Oystercatcher Ringed plover Grey plover Knot Sanderling Dunlin Redshank Black-headed gull	N/A
North Bull Island SPA (RoI)	1944.3	Over winter: Bar-tailed godwit Golden plover	Over winter: Light-bellied brent goose Black-tailed godwit Bar-tailed godwit Shelduck Teal Pintail Shoveler Oystercatcher Grey plover	Over winter: Waterfowl

[60] A seabird assemblage of international importance: the area regularly supports at least 20,000 seabirds. Or, a wetland of international importance: the area regularly supports at least 20,000 waterfowl.

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[60]
			Knot Sanderling Dunlin Curlew Redshank Turnstone Black-headed gull	
Howth Head Coast SPA (RoI)	207.82	N/A	Breeding: Kittiwake	N/A
Ireland's Eye SPA (RoI)	214.52	N/A	Breeding: Cormorant Herring gull Kittiwake Guillemot Razorbill	N/A
Baldoyle Bay SPA (RoI)	262.77	Over winter: Golden plover Bar-tailed godwit	Over winter: Light-bellied brent goose Shelduck Ringed plover Grey plover	N/A
Malahide Estuary SPA (RoI)	764.96	Over winter: Golden plover Bar-tailed godwit	Over winter: Great crested grebe Light-bellied brent goose Shelduck Pintail Goldeneye Red-breasted merganser Oystercatcher Grey plover Knot Dunlin Black-tailed godwit Redshank	N/A
Rogerstown Estuary SPA (RoI)	645.62	N/A	Over winter: Light-bellied brent goose Greylag goose Shelduck Shoveler Oystercatcher Ringed plover Grey plover Knot Dunlin Black-tailed godwit Redshank	N/A
Lambay Island SPA (RoI)	599.56	N/A	Breeding: Fulmar Cormorant Shag Kittiwake Guillemot Razorbill Puffin Lesser black-backed gull Herring Gull Over winter: Greylag goose	Breeding: Seabird
Skerries Islands SPA (RoI)	217.21	N/A	Breeding:	N/A

Site Name	Area (ha)	Article 4.1 Species	Article 4.2 Migratory Species	Article 4.2 Assemblages[60]
			Cormorant Shag Herring gull Over winter: Light-bellied brent goose Purple sandpiper Turnstone	
Rockabill SPA (RoI)	5229.32	Breeding: Roseate tern	Over winter: Purple sandpiper	N/A
River Nanny Estuary and Shore SPA (RoI)	229.78	Over winter: Golden plover	Over winter: Oystercatcher Ringed plover Knot Sanderling Herring gull	N/A
Boyne Estuary SPA (RoI)	593.68	Breeding: Little tern Over winter: Golden plover	Over winter: Shelduck Oystercatcher Grey plover Lapwing Knot Sanderling Black-tailed godwit Redshank Turnstone	N/A
Dundalk Bay SPA (RoI)	13243.53	Over winter: Golden plover Bar-tailed godwit	Over winter: Great crested grebe Greylag goose Light-bellied brent goose Shelduck Teal Mallard Pintail Common scoter Red-breasted merganser Oystercatcher Ringed plover Grey plover Lapwing Knot Dunlin Black-tailed godwit Curlew Redshank Black-headed gull Common gull Herring gull	Over winter: Waterfowl
Carlingford Lough SPA (RoI)	595.37	N/A	Over winter: Light-bellied brent goose	N/A

Table A.4: SAC sites in the adjacent waters of other Member States

Site Name	Area (ha)	Annex 1 Habitat	Annex II Species
SOUTHERN NORTH SEA			
Doggerbank SAC (Germany)	169895	Sandbanks	Harbour porpoise Harbour seal
Doggersbank SAC (Netherlands)	473500	Sandbanks	Grey seal Harbour seal Harbour porpoise
Klaverbank SAC (Netherlands)	153900	Reefs	Grey seal Harbour seal Harbour porpoise
IRISH SEA			
Kilpatrick Sandhills SAC (RoI)	39.71	Vegetation of drift line Coastal dunes	N/A
Buckroney-Brittas Dunes and Fen SAC (RoI)	320.79	Vegetation of drift line Vegetation of stony banks Saltmarsh and salt meadows Coastal dunes Fens	N/A
Wicklow Reef SAC (RoI)	1533.23	Reefs	N/A
The Murrough Wetlands SAC (RoI)	606.12	Vegetation of drift line Vegetation of stony banks Saltmarsh and salt meadows Fens	N/A
Bray Head SAC (RoI)	264.3	Sea cliffs Heaths	N/A
South Dublin Bay SAC (RoI)	742.12	Mudflats and sandflats Vegetation of drift line Saltmarsh and salt meadows Coastal dunes	N/A
North Dublin Bay SAC (RoI)	1474.99	Mudflats and sandflats Vegetation of drift line Saltmarsh and salt meadows Coastal dunes	Petalwort
Howth Head SAC (RoI)	374.88	Sea cliffs Heaths	N/A
Ireland's Eye SAC (RoI)	41.83	Vegetation of stony banks Sea cliffs	N/A
Baldoyle Bay SAC (RoI)	538.93	Mudflats and sandflats Saltmarsh and salt meadows	N/A
Malahide Estuary SAC (RoI)	809.69	Mudflats and sandflats Saltmarsh and salt meadows Coastal dunes	N/A
Lambay Island SAC (RoI)	405.3	Reefs Sea cliffs	Grey seal Harbour seal
Rockabill to Dalkey Island SAC (RoI)	27325.56	Reefs	Harbour porpoise
Rogerstown Estuary SAC (RoI)	586.47	Estuaries Mudflats and sandflats Saltmarsh and salt meadows Coastal dunes	N/A
River Boyne and River Blackwater SAC (RoI)	2320.86	Fens Forests	River lamprey Atlantic salmon Otter
Boyne Coast and Estuary SAC (RoI)	629.51	Estuaries Mudflats and sandflats Vegetation of drift line Saltmarsh and salt meadows Coastal dunes	N/A
Clogher Head SAC (RoI)	23.75	Sea cliffs Heaths	N/A

Site Name	Area (ha)	Annex 1 Habitat	Annex II Species
Dundalk Bay SAC (RoI)	5236.27	Estuaries Mudflats and sandflats Vegetation of stony banks Saltmarsh and salt meadows	N/A
Carlingford Shore SAC (RoI)	526.28	Vegetation of drift line Vegetation of stony banks	N/A

A5 Ramsar sites

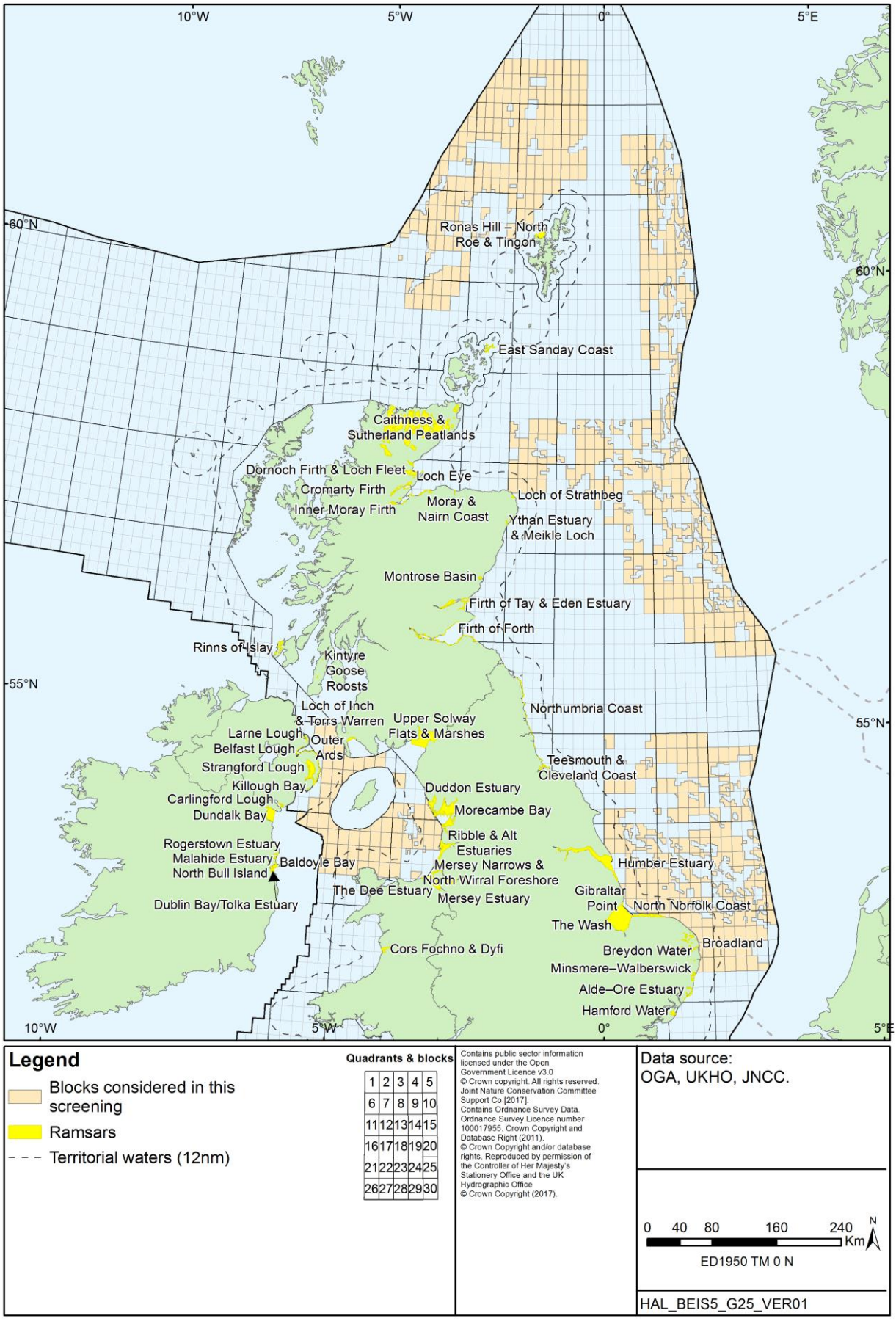
The coastal Ramsar sites listed in Table A.5 and shown on Map A.7 are also SPAs and/or SACs (although site boundaries are not always strictly coincident and a Ramsar site may comprise one or more Natura 2000 sites), see tabulation below.

Table A.5: Coastal Ramsar sites and corresponding Natura 2000 sites

Ramsar Name	SPA Name	SAC Name
WEST OF SHETLAND		
Ronas Hill – North Roe & Tingon	Ronas Hill – North Roe and Tingon	Ronas Hill – North Roe Tingon
East Sanday Coast	East Sanday Coast	Sanday
CENTRAL AND NORTHERN NORTH SEA		
Caithness & Sutherland Peatlands	Caithness and Sutherland Peatlands	
Dornoch Firth and Loch Fleet	Dornoch Firth and Loch Fleet	Dornoch Firth and Morrich More Moray Firth Mound Alderwoods
Loch Eye	Loch Eye	
Cromarty Firth	Cromarty Firth	Conon Islands Moray Firth
Inner Moray Firth	Inner Moray Firth	Moray Firth
Moray and Nairn Coast	Moray and Nairn Coast	Culbin Bar Lower River Spey – Spey Bay Moray Firth River Spey
Loch of Strathbeg	Loch of Strathbeg	
Ythan Estuary and Meikle Loch	Ythan Estuary, Sands of Forvie and Meikle Loch	Sands of Forvie
Montrose Basin	Montrose Basin	
Firth of Tay & Eden Estuary	Firth of Tay & Eden Estuary	Barry Links Firth of Tay & Eden Estuary
Firth of Forth	Firth of Forth	
Lindisfarne	Lindisfarne Northumbria Coast	Berwickshire and North Northumberland Coast North Northumberland Dunes
Northumbria Coast	Northumbria Coast Teesmouth and Cleveland Coast	Berwickshire and North Northumberland Coast Durham Coast North Northumberland Dunes
SOUTHERN NORTH SEA		
Teesmouth and Cleveland Coast	Northumbria Coast Teesmouth and Cleveland Coast	Durham Coast
Humber Estuary	Humber Estuary	Humber Estuary Saltfleetby-Theddlethorpe Dunes and Gibraltar Point
Gibraltar Point	Gibraltar Point The Wash	Saltfleetby–Theddlethorpe Dunes and Gibraltar Point The Wash and North Norfolk Coast
The Wash	Gibraltar Point North Norfolk Coast The Wash	The Wash and North Norfolk Coast

Ramsar Name	SPA Name	SAC Name
North Norfolk Coast	North Norfolk Coast The Wash	North Norfolk Coast The Wash and North Norfolk Coast
Broadland	Broadland	The Broads
Breydon Water	Breydon Water	
Minsmere-Walberswick	Minsmere–Walberswick	Minsmere to Walberswick Heaths and Marshes
Alde-Ore Estuary	Alde–Ore Estuary	Alde, Ore and Butley Estuaries Orfordness – Shingle Street
Hamford Water	Hamford Water	Hamford Water
IRISH SEA		
Carlingford Lough	Carlingford Lough	
Killough Bay	Killough Bay	
Strangford Lough	Outer Ards Strangford Lough	Strangford Lough
Outer Ards	Belfast Lough Outer Ards Strangford Lough	Strangford Lough
Belfast Lough	Belfast Lough Belfast Lough Open Water Outer Ards	
Larne Lough	Larne Lough	
Rinns of Islay	Rinns of Islay	Glac na Criche Rinns of Islay
Kintyre Goose Roosts	Kintyre Goose Roosts	
Loch of Inch and Torrs Warren	Loch of Inch and Torrs Warren	Luce Bay and Sands
Upper Solway Flats and Marshes	Upper Solway Flats and Marshes Solway Firth pSPA	River Eden Solway Firth
Duddon Estuary	Morecambe Bay & Duddon Estuary	Morecambe Bay
Morecambe Bay	Morecambe Bay & Duddon Estuary	Morecambe Bay
Ribble and Alt Estuaries	Ribble and Alt Estuaries	Sefton Coast
Mersey Estuary	Mersey Estuary	
Mersey Narrows and North Wirral Foreshore	Mersey Narrows and North Wirral Foreshore	
The Dee Estuary	The Dee Estuary	Dee Estuary/ Aber Dyfrdwy
Cors Fochno and Dyfi	Dyfi Estuary / Aber Dyfi	Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau
Dublin Bay/Tolka Estuary (RoI)	South Dublin Bay/Tolka Estuary	South Dublin Bay
North Bull Island (RoI)	North Bull Island	North Dublin Bay
Baldoyle Bay (RoI)	Baldoyle Bay	Baldoyle Bay
Malahide Estuary (RoI)	Malahide Estuary	Malahide Estuary
Rogerstown Estuary (RoI)	Rogerstown Estuary	Rogerstown Estuary
Dundalk Bay (RoI)	Dundalk Bay	Dundalk Bay

Map A.7: Location of coastal Ramsar sites



Appendix B – Blocks and sites screened in

B1 Introduction

The following tables list those 30th Round Blocks and sites which have been screened in following application of the screening process described in Section 4. The Blocks and sites are listed according to the criteria by which they were screened in:

- Physical disturbance and drilling (Section 4.4, also see Figures 5.1 and 5.2)
- Underwater noise (Section 4.5, also see Figures 5.3 and 5.4)

These Blocks and sites will be subject to a second stage of HRA, Appropriate Assessment, if Blocks are applied for and before licensing decisions are taken.

B2 Physical disturbance and drilling

West of Shetland								
SPAs								
Seas off Foula pSPA	203/4	205/18	205/19	205/25	205/28	205/29	205/30	206/11d
	206/11e	206/12b	206/16a					
SACs								
None								
Central and northern North Sea								
SPAs								
Loch of Strathbeg SPA	19/6	19/7						
Troup, Pennan and Lion's Heads SPA	19/6							
SACs								
Braemar Pockmarks SAC	9/28c	9/29b	16/3e	16/4				
Scanner Pockmark SAC	15/19	15/24	15/25e	16/16	16/21e			
Southern North Sea								
SPAs								
Flamborough & Filey Coast pSPA	42/26							
Flamborough Head and Bempton Cliffs SPA	42/26							
Humber Estuary SPA	47/6	47/7	47/18	47/22	47/23			
Gibraltar Point SPA	47/22	47/23	47/28					
The Wash SPA	47/22	47/23	47/28	47/29	51/4			
Greater Wash pSPA	42/26	47/1	47/2d	47/6	47/7	47/8f	47/13c	47/14c
	47/15c	47/18	47/19	47/20	47/22	47/23	47/24	47/25
	47/28	47/29	47/30	48/21b	48/26	48/27	48/28b	48/29c
	51/4	51/5	52/1	52/2	52/3	52/4b	52/5b	52/8
	52/9	52/10	52/14	52/15	52/19	52/20	53/6	53/11
	53/16							
North Norfolk Coast SPA	47/28	47/29	47/30	48/26	48/27	51/4	51/5	52/1
	52/2							
Great Yarmouth North Denes SPA	52/3	52/4b	52/8	52/9	52/10	52/14	52/15	
Breydon Water SPA	52/9	52/10	52/14	52/15				
Benacre to Easton Bavents SPA	52/19	52/20						
Minsmere-Walberswick SPA	52/19	52/20						
Outer Thames Estuary SPA	52/9	52/10	52/14	52/15	52/19	52/20	53/6	53/7
	53/8	53/11	53/12	53/13	53/16	53/17	53/18	
SACs								
Southern North Sea	42/5b	42/8a	42/9a	42/10c	42/13b	42/14	42/15b	42/17

cSAC	42/18	42/20a	42/26	42/27b	42/28f	42/30d	43/1	43/2
	43/3	43/4	43/5	43/6	43/7	43/8	43/9	43/10
	43/13a	43/14	43/15	43/16	43/17a	43/18a	43/19c	43/20a
	43/22c	43/23	43/24b	43/24c	43/25a	43/26c	43/27b	43/27c
	43/28	43/29b	43/30a	44/6	44/7	44/8b	44/11d	44/12d
	44/12e	44/14	44/17d	44/18g	44/19c	44/22d	44/22e	44/23h
	44/24d	44/26b	47/1	47/2d	47/3f	47/3j	47/4e	47/5f
	47/6	47/7	47/8f	47/9e	47/10d	47/13c	47/15c	48/1e
	48/4c	48/5b	48/6b	48/6d	48/7d	48/8b	48/9b	48/10c
	48/10d	48/11c	48/12b	48/12f	48/13c	48/14b	48/14c	48/15d
	48/18b	48/19b	48/20c	48/23d	48/24a	48/28b	48/29b	48/28c
	48/30b	48/30c	49/6b	49/6c	49/7	49/8b	49/9e	49/10e
	49/11c	49/12c	49/13	49/14a	49/14c	49/15b	49/16b	49/16d
	49/17c	49/17d	49/17e	49/18b	49/18c	49/21e	49/21f	49/22b
	49/23b	49/23c	49/24b	49/24c	49/25c	49/26b	49/27c	49/28c
	49/28e	49/29b	49/30f	50/21	50/26b	52/2	52/3	52/4b
	52/5b	52/5c	52/8	52/9	52/10	52/14	52/15	52/19
	52/20	53/1b	53/2c	53/3a	53/4a	53/5d	53/6	53/7
	53/8	53/9	53/10b	53/11	53/12	53/13	53/14b	53/16
	53/17	53/18	53/19	53/20b	54/1a			
Dogger Bank SAC	42/5b	43/1	43/2	43/3	43/4	43/5	43/6	43/7
	43/8	43/9	43/10	43/13a	43/14	43/15	43/16	43/17a
	43/18a	43/19c	43/20a	43/23	43/24c	43/25a	44/6	44/7
	44/8b	44/9b	44/10b	44/11d	44/12d	44/12e	44/14	44/15
	44/17d	44/18g	44/19c	44/22d	44/22e	44/23h	44/24d	44/25
	44/28c							
Flamborough Head SAC	42/26	47/1						
Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC	47/18	47/22	47/23	47/28				
Humber Estuary SAC	47/6	47/7	47/22					
Inner Dowsing, Race Bank and North Ridge SAC	47/14c	47/15c	47/18	47/19	47/20	47/22	47/23	47/24
	47/25	47/28	47/29	47/30	48/16	48/21b	48/26	
The Wash and North Norfolk Coast SAC	47/22	47/23	47/28	47/29	47/30	48/26	48/27	51/4
	51/5	52/1	52/2					
North Norfolk Coast SAC	47/28	47/29	47/30	48/26	48/27	51/4	51/5	52/1
	52/2							
North Norfolk Sandbanks and Saturn Reef SAC	48/4c	48/8b	48/9b	48/10c	48/10d	48/13c	48/14b	48/14c
	48/15d	48/18b	48/19b	48/20c	48/23d	48/24a	48/28b	48/29b
	48/30b	48/30c	49/6b	49/6c	49/7	49/8b	49/11c	49/12c
	49/13	49/14a	49/14c	49/16b	49/16d	49/17c	49/17d	49/17e
	49/18b	49/18c	49/21e	49/21f	49/22b	49/23b	49/23c	49/24b
	49/24c	49/26b	49/27c	49/28c	49/28e	52/5c	53/1b	53/2c
	53/3a							
Haisborough,	48/27	48/28b	48/29b	48/29c	48/30b	48/30c	49/26b	52/2

Hammond and Winterton SAC	52/3	52/4b	52/5b	52/5c	52/8	52/9	52/10	52/14
	52/15	53/1b	53/2c	53/3a	53/6	53/7	53/8	53/11
	53/12	53/13						
Winterton - Horsey Dunes SAC	52/3	52/4b	52/8	52/9	52/10	52/14	52/15	
Benacre to Easton Bavents Lagoons SAC	52/19	52/20						
Minsmere to Walberswick Heaths and Marshes SAC	52/19	52/20						
Doggersbank SAC (NL)	44/9b	44/10b	44/14	44/15	44/19c	44/24d		
Klaverbank SAC (NL)	44/24d	44/25	44/29a	44/30b	49/4e	49/5d	49/9f	49/10e
Irish Sea								
SPAs								
Killough Bay SPA	111/28							
East Coast Marine SPA	111/3	111/4	111/9	111/10	111/14	111/15	111/19	111/20
	111/24	111/25						
Strangford Lough SPA	111/14	111/19	111/24					
Outer Ards SPA	111/9	111/14	111/19	111/24				
Copeland Islands SPA	111/9	111/14						
Larne Lough SPA	111/3							
Loch of Inch and Torrs Warren SPA	110/10							
Solway Firth pSPA	112/8	112/9	112/13	112/14				
Morecambe Bay & Duddon Estuary pSPA	110/3b	110/4	110/5	110/10	113/24	113/27e	113/28	113/29
	113/30							
Liverpool Bay / Bae Lerpwl SPA	109/14	109/15	109/18	109/19	109/20	110/2d	110/3b	110/4
	110/5	110/7b	110/8b	110/9c	110/10	110/11	110/12c	110/14e
	110/16	110/14e	110/18a	113/27e	113/27f	113/28	113/29	113/30
Ribble and Alt Estuaries SPA	110/5	110/9c	110/10					
The Dee Estuary SPA	110/18a							
Traeth Lafan/ Lavan Sands, Conway Bay SPA	109/20	110/16						
Ynys Seiriol / Puffin Island SPA	109/20	110/16						
Anglesey Terns / Morwenoliaid Ynys Môn SPA	109/11	109/12	109/13	109/14	109/15	109/16	109/17	109/18
	109/19	109/20	110/16					
Irish Sea Front SPA	108/4	108/5	108/9	108/10	108/14	108/15	109/1	109/6
	109/7	109/11	109/12					
SACs								
Pisces Reef Complex SAC	108/4	111/24	111/25	111/28	111/29	111/30		
Murlough SAC	111/28							
North Channel cSAC	111/3	111/4	111/9	111/10	111/14	111/15	111/19	111/20
	111/24	111/25	111/28	111/29	111/30	112/11	112/12	112/16

	112/17	112/21						
Strangford Lough SAC	111/14	111/19	111/24					
The Maidens SCI	111/3							
Luce Bay and Sands SAC	111/5	111/10	111/15	112/8	112/9	112/11	112/12	112/13
	112/14							
Drigg Coast SAC	113/24							
Morecambe Bay SAC	110/4	110/5	110/10	113/24	113/28	113/29	113/30	
Shell Flat and Lune Deep SAC	110/3b	110/4	110/5	110/8b	110/9c	110/10	113/29	113/30
Sefton Coast SAC	110/9c	110/10						
Dee Estuary/ Aber Dyfrdwy SAC	110/18a							
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	109/19	109/20	110/16					
North Anglesey Marine / Gogledd Môn Forol cSAC	108/4	108/5	108/9	108/10	108/14	108/15	108/19	108/20
	109/1	109/2	109/3	109/4	109/6	109/7	109/8	109/9
	109/11	109/12	109/13	109/14	109/15	109/16	109/17	109/18
	109/19	109/20						
Bae Cemlyn/ Cemlyn Bay SAC	109/13	109/17	109/18	109/19				
Glannau Ynys Gybi/ Holy Island Coast SAC	109/16	109/17	109/18					
Croker Carbonate Slabs SCI	108/14	108/15	108/19	108/20	109/11	109/16		

B3 Underwater noise

West of Shetland								
SPAs								
Seas off Foula pSPA	203/4	205/14	205/18	205/19	205/25	205/28	205/29	205/30
	206/11d	206/11e	206/12b	206/16a				
Hermaness, Saxa Vord and Valla Field SPA	208/30							
Ronas Hill - North Roe and Tingon SPA	207/7							
SACs								
None								
Central and northern North Sea								
SPAs								
Troup, Pennan and Lion`s Heads SPA	19/6							
Loch of Strathbeg SPA	19/6	19/7						
SACs								
None								
Southern North Sea								
SPAs								
Flamborough & Filey Coast pSPA	42/26	47/1						
Humber Estuary SPA	47/7	47/13c	47/18	47/22	47/23	47/6		
Greater Wash pSPA	42/26	42/27b	47/1	47/2d	47/6	47/7	47/8f	47/13c
	47/14c	47/15c	47/18	47/19	47/20	47/22	47/23	47/24
	47/25	47/28	47/29	47/30	48/16	48/21b	48/22d	48/26
	48/27	48/28b	48/29c	48/30c	51/4	51/5	52/1	52/2
	52/3	52/4b	52/5b	52/5c	52/8	52/9	52/10	52/14
	52/15	52/19	52/20	53/1b	53/6	53/11	53/16	
The Wash SPA	47/22	47/23	47/28	47/29	51/4			
North Norfolk Coast SPA	48/27	47/28	47/29	47/30	48/26	51/4	51/5	52/1
	52/2							
Breydon Water SPA	52/9	52/10	52/14	52/15	52/19	52/20		
Outer Thames Estuary SPA	52/9	52/10	52/14	52/15	52/19	52/20	53/6	53/7
	53/8	53/11	53/12	53/13	53/16	53/17	53/18	
SACs								
Southern North Sea cSAC	42/5b	42/8a	42/9a	42/10c	42/13b	42/14	42/15b	42/17
	42/18	42/20a	42/26	42/27b	42/28f	42/30d	43/1	43/2
	43/3	43/4	43/5	43/6	43/7	43/8	43/9	43/10
	43/13a	43/14	43/15	43/16	43/17a	43/18a	43/19c	43/20a
	43/22c	43/23	43/24b	43/24c	43/25a	43/26c	43/27b	43/27c
	43/28	43/29b	43/30a	44/6	44/7	44/8b	44/9b	44/11d

	44/12d	44/12e	44/14	44/15	44/17d	44/18g	44/19c	44/22d
	44/22e	44/23h	44/24d	44/26b	44/28c	47/1	47/2d	47/3f
	47/3j	47/4e	47/5f	47/6	47/7	47/8f	47/9e	47/10d
	47/13c	47/14c	47/15c	48/1e	48/4c	48/5b	48/6b	48/6d
	48/7d	48/8b	48/9b	48/10c	48/10d	48/11c	48/11d	48/12b
	48/12f	48/13c	48/14b	48/14c	48/15d	48/16	48/17d	48/18b
	48/19b	48/20c	48/23d	48/24a	48/27	48/28b	48/29b	48/29c
	48/30b	48/30c	49/1b	49/2b	49/4e	49/6b	49/6c	49/7
	49/8b	49/9e	49/9f	49/10e	49/11c	49/12c	49/13	49/14a
	49/14c	49/15b	49/16b	49/16d	49/17c	49/17d	49/17e	49/18b
	49/18c	49/20c	49/21e	49/21f	49/22b	49/23b	49/23c	49/24b
	49/24c	49/25c	49/26b	49/27c	49/28c	49/28e	49/29b	49/30f
	50/16	50/21	50/26b	52/2	52/3	52/4b	52/5b	52/5c
	52/8	52/9	52/10	52/14	52/15	52/19	52/20	53/1b
	53/2c	53/3a	53/4a	53/5d	53/6	53/7	53/8	53/9
	53/10b	53/11	53/12	53/13	53/14b	53/16	53/17	53/18
	53/19	53/20b	54/1a					
Humber Estuary SAC	47/6	47/7	47/13c	47/18	47/22	47/23		
The Wash and North Norfolk Coast SAC	47/22	47/23	47/24	47/25	48/21b	48/22d	48/27	47/28
	47/29	47/30	48/26	51/4	51/5	52/1	52/2	
North Norfolk Coast SAC	48/27	47/28	47/29	47/30	48/26	51/4	51/5	52/1
	52/2							
Doggersbank SAC (NL)	44/9b	44/10b	44/14	44/15	44/18g	44/19c	44/24d	
Klaverbank SAC (NL)	44/24d	44/25	44/28c	44/29a	44/30b	49/4e	49/5d	49/9f
	49/10e							
Irish Sea								
SPAs								
East Coast Marine pSPA	111/3	111/4	111/9	111/10	111/14	111/15	111/19	111/20
	111/24	111/25	111/28	111/29				
Strangford Lough SPA	111/19	111/24	111/28					
Copeland Islands SPA	111/3	111/9	111/14					
Solway Firth pSPA	112/8	112/9	112/13	112/14	112/20	113/16		
Morecambe Bay and Duddon Estuary pSPA	110/3b	110/4	110/5	110/9c	110/10	113/24	113/27e	113/28
	113/29	113/30						
Liverpool Bay / Bae Lerpwl SPA	109/13	109/14	109/15	109/18	109/19	109/20	110/1	110/3b
	110/2d	110/4	110/5	110/6	110/7b	110/8b	110/9c	110/10
	110/11	110/12c	110/14e	110/16	110/18a	113/26c	113/27e	113/27f
	113/28	113/29	113/30					

Ribble and Alt Estuaries SPA	110/4	110/5	110/9c	110/10				
The Dee Estuary SPA	110/18a							
Ynys Seiriol / Puffin Island SPA	109/19	109/20	110/16					
Traeth Lafan/ Lavan Sands, Conway Bay SPA	109/19	109/20	110/16					
Irish Sea Front SPA	108/3	108/4	108/5	108/8	108/9	108/10	108/14	108/15
	108/19	108/20	109/1	109/2	109/6	109/7	109/11	109/12
	109/16							
SACs								
Murlough SAC	108/2							
Strangford Lough SAC	111/19	111/24	111/28					
North Channel cSAC	111/3	111/4	111/5	111/9	111/10	111/14	111/15	111/19
	111/20	111/24	111/25	111/28	111/29	111/30	112/11	112/12
	112/16	112/17	112/21					
The Maidens SCI	111/3	111/28						
Dee Estuary/ Aber Dyfrdwy SAC	110/18a							
North Anglesey Marine / Gogledd Môn Forol cSAC	108/4	108/5	108/8	108/9	108/10	108/14	108/15	108/20
	109/2	109/3	109/4	109/6	109/7	109/8	109/9	109/10
	109/11	109/12	109/13	109/14	109/15	109/16	109/17	109/18
	109/19	109/20						

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