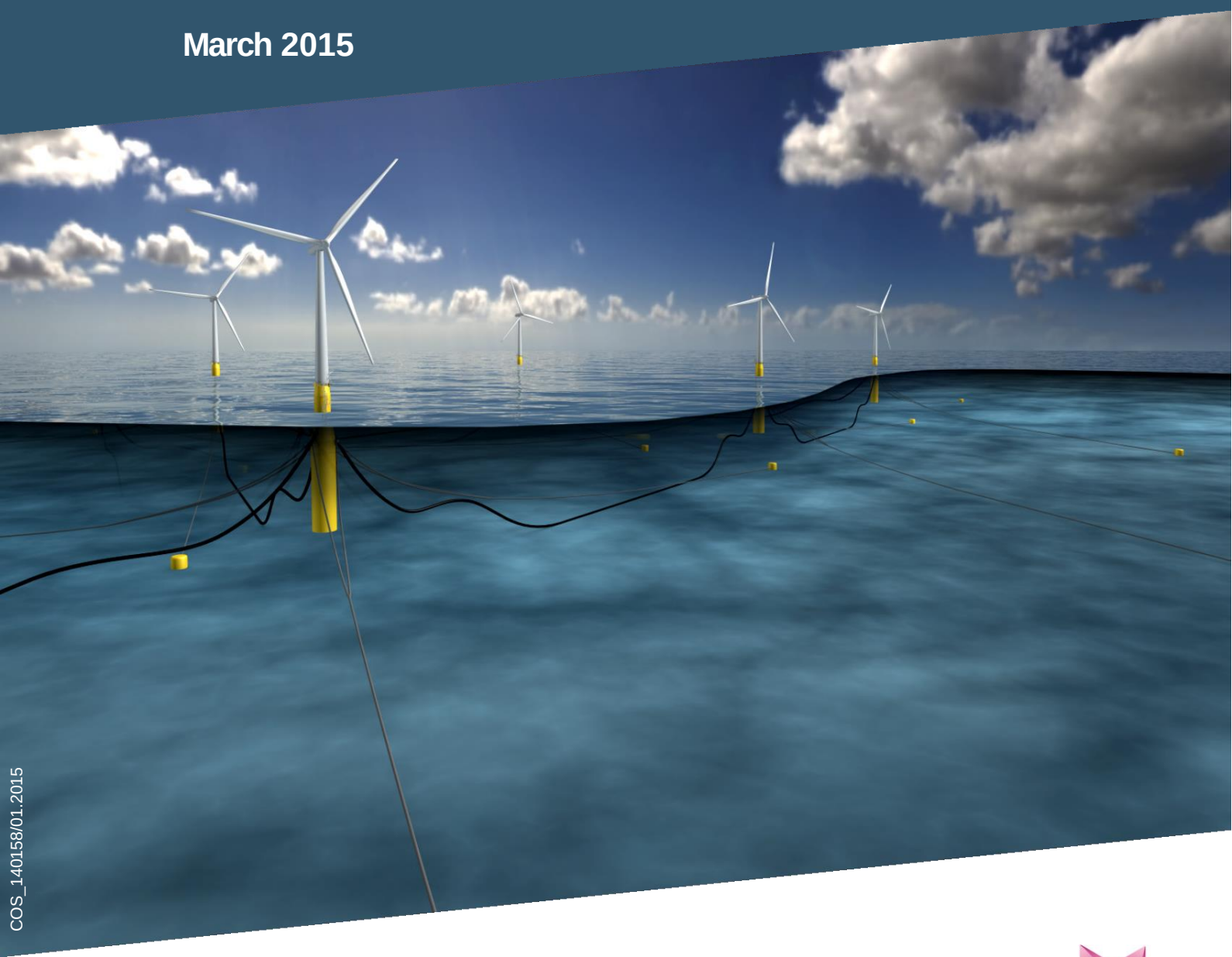
Hywind Scotland Pilot Park

Environmental Statement
Habitats Regulations Assessment

March 2015



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1 INTRODUCTION

1.1 Background

This report has been produced to inform the Habitat Regulations Assessment (HRA) process for the proposed Hywind Scotland Pilot Park Project (the Project). This report should be used in conjunction with the accompanying documents supplied, in particular the Hywind Environmental Statement (ES) (Statoil, 2015) as part of the application for a Marine Licence under the Marine and Coastal Access Act 2009 and Marine (Scotland) Act 2010.

The proposed Project is described in detail in the project description (Chapter 4) of the ES (Statoil, 2014). In summary, the Project is to install and operate five floating Hywind Wind Turbine Generator (WTG) Units with a total maximum capacity of 30 MW in an area within the Buchan Deep. The WTG Units will be connected via a single export cable into the electricity grid at Peterhead (Figure 1.1).

This report sets out the HRA process and outlines supporting information gathered to inform that process. It considers the potential for the Hywind project to have a Likely Significant Effect (LSE) on relevant sites of international nature conservation importance and provides information to inform an Appropriate Assessment that may be carried out by Marine Scotland (MS) (with Scottish Natural Heritage and the Joint Nature Conservation Committee as their statutory advisors) as the competent authority.

The legal basis and background for HRA is detailed in Section 1.2 of this report. A detailed description of the Hywind project is presented in Chapter 4 of the ES. This information is summarised in Section 1.3 Overview of Project.

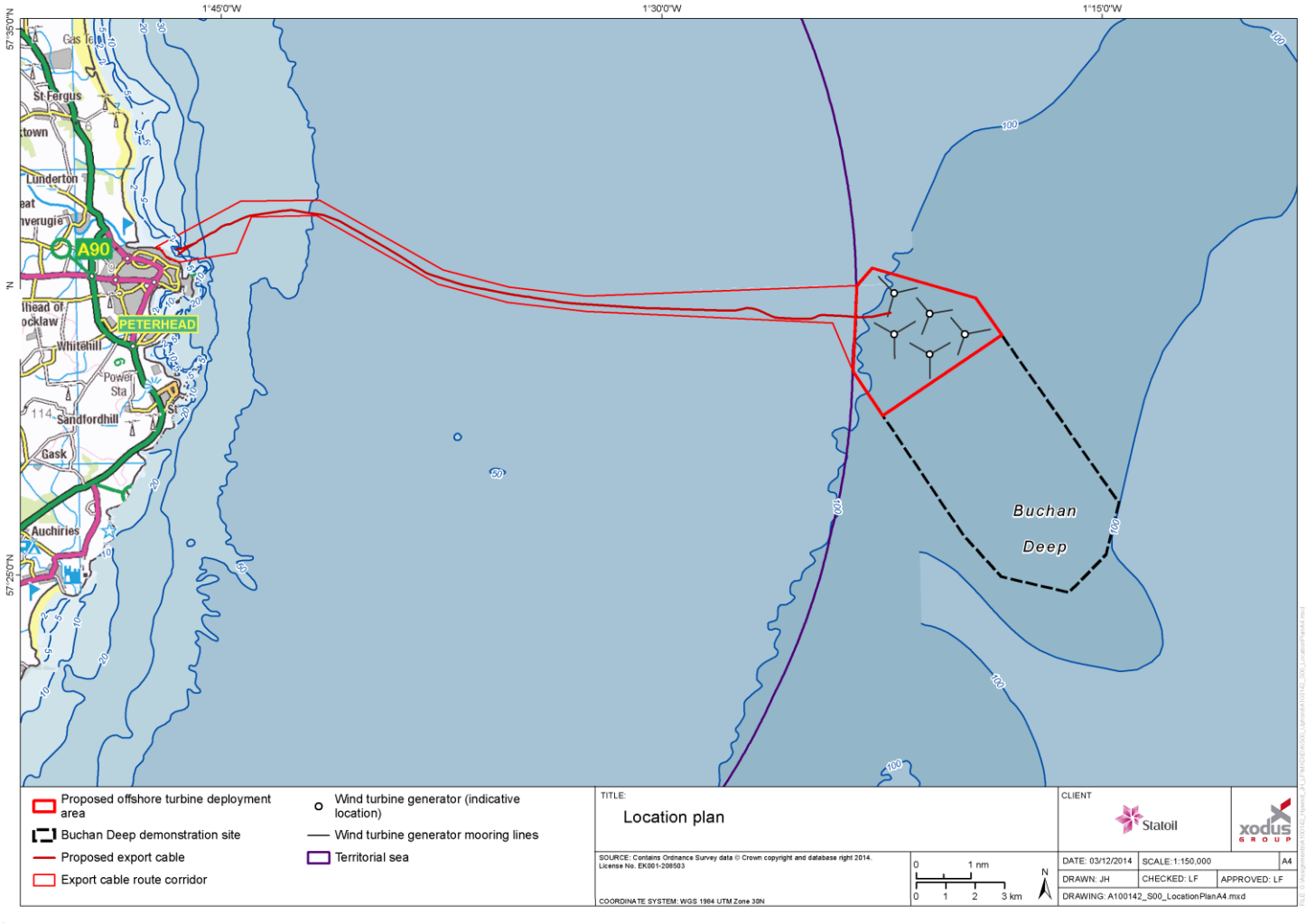
1.2 Legislative framework

This HRA Report takes into account the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), which transposes the requirements of EC Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (Habitats Directive) into Scottish law in the terrestrial environment and territorial waters out to 12 nm. It also takes into account the requirements of the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended), which transposes the requirements the Habitats Directive into UK law for territorial waters beyond 12 nm.

The Habitats Directive affords protection to European sites designated under the Habitats Directive (Special Areas of Conservation (SACs)) and the Birds Directive (Special Protection Areas (SPAs)), collectively referred to as Natura 2000 or European sites. Under Article 6(3) of the Habitats Directive "*any plan or project which is not directly connected with or necessary to the management of a European site but would be likely to have a significant effect on such a site, either individually or in-combination with other plans and projects, shall be subject to an Appropriate Assessment of its implications for the European site in view of the site's conservation objectives*."

The Habitats Directive applies the precautionary principle to these sites and projects can only be permitted when it is ascertained that there will be no adverse effect on the integrity of the site(s) in question. Where adverse effects are identified, a project may only be permitted in the absence of alternative solutions if there is an Imperative Reason of Overriding Public Interest (IROPI) in favour of the Project. Where this is the case, Member States are required to take all compensatory measures necessary to ensure that the overall coherence of the Natura 2000 network is protected.

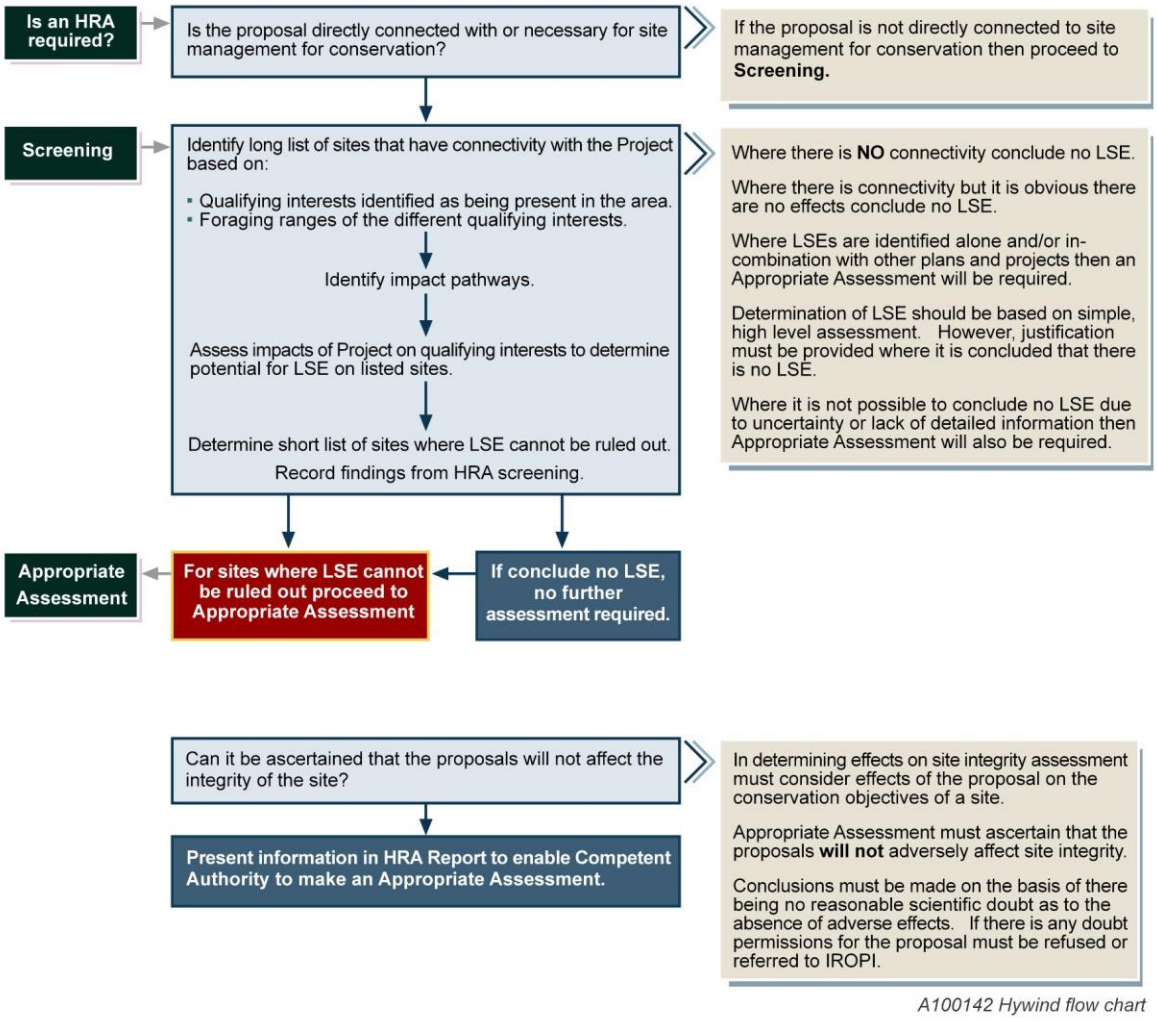
Figure 1-1 Location of the Hywind Pilot Park Project



1.3 Approach to HRA

The approach to this HRA is illustrated in Figure 1.2 below. The approach is based on guidance issued by Scottish Natural Heritage (SNH). In addition, there has been consultation with Marine Scotland and their statutory advisors throughout the EIA on HRA related issues, in particular in relation to the data required to support the assessment of impacts on Special Protection Areas (SPAs).

Figure 1.2 Approach to HRA (adapted from SNH, 2011)



A100142 Hywind flow chart

1.3.1 HRA screening

The main objective of HRA screening is to conclude whether there will or will not be LSEs on a European site. The assessment of LSE is based on a coarse, high level filtering of qualifying interests and associated European sites based on:

- Presence of qualifying interest(s) in the Project area / zone of impact associated with the Project;
- Whether there is connectivity between the Project and the qualifying interests of a European site based on:
- Foraging distances (seabirds) based on most up to date mean max foraging information available for species of concern e.g. Thaxter *et al.,* 2012;
- Migration routes (migratory wildfowl);

- Foraging, breeding and migratory behaviour (marine mammals and fish); and
- Indirect connectivity with other qualifying interests e.g. fresh-water pearl mussel due to life cycle ecology of salmonids.
- The range of impacts that the Project could have on qualifying interest(s) of a site (impact pathways); and
- Whether that qualifying interest(s) would, by virtue of its behavioural and foraging characteristics, be affected by a particular impact (species sensitivity).

Where potential impacts on a qualifying interest are identified, further evaluation is undertaken to determine whether or not the Project (alone or in-combination with other Projects) will or will not have LSEs on the site taking into account appropriate mitigation (conclusion of LSE or no LSE). Where it is obvious that there is no connectivity or impact pathway between the Project and a site it should be concluded that there is no LSE. No LSE should also be concluded for trivial effects (minor effects on qualifying interests that will not have a significant effect on a site) despite there being connectivity providing there is sufficient evidence to support this conclusion.

1.3.2 Appropriate Assessment

For sites where it cannot be concluded that there is no LSE an Appropriate Assessment is required to ascertain whether the Project will have an adverse effect on the integrity of a European site in view of the sites conservation objectives.

The Appropriate Assessment will be carried out by the Competent Authority (CA) (in this case Marine Scotland) based on information provided in the HRA Report. The HRA Report is therefore required to contain the following information:

- Details on the conservation objectives for all sites where an LSE on the qualifying interests has been identified;
- Apportioning impacts to sites/specific populations; and
- Assessment of the proportion (%) of a site population or habitat that would be affected by the Project based on importance of the site population in context of regional populations.

1.4 Types of European site included in the HRA based on qualifying features

Based on information included in the EIA Scoping Report and additional information included in the ES the following types of sites have been considered:

Table 1.1 European sites included in the HRA

Designation	Qualifying interest(s) (type) – offshore
Special Protection Area (SPA)	Seabirds
Special Area of Conservation (SAC)	Marine mammals Migratory fish

Given that this HRA focuses on the offshore components of the Project only, onshore SACs (designated for terrestrial habitats and species) have not been included.

On the basis that there are no sites designated for benthic or intertidal habitats or species located within the Project area or potential zone of impact from the Project, SACs designated for these features are also not included in this HRA.

1.5 Summary of studies / surveys carried out to inform the EIA and HRA

A series of studies were undertaken to characterise the baseline environment and inform the assessment of impacts on ornithology, marine mammals and fish ecology. These are summarised below.

1.5.1 Seabird and marine mammal surveys

Surveys were undertaken during a one-year programme of boat-based baseline European Seabirds at Sea (ESAS) surveys. Details of the survey design, survey methods, survey results and supporting contextual information are presented in NRP 2015.

The surveys were conducted following the ESAS method (Camphuysen *et al.*, 2004) and involved a team of three accredited surveyors on board a survey vessel collecting data on all birds and marine mammals seen in a 300 m wide survey corridor in a format that is suitable for distance sampling analysis.

Two survey days of effort (i.e. surveying each transect once) were scheduled at monthly intervals from June 2013 to May 2014. A total of 20 surveys (days) were undertaken over the year. Distance sampling analysis was used to derive estimates of abundance and density with associated confidence limits (Caloo 2014a).

Eight additional surveys were undertaken between July and September 2014 (Year 2) using the same survey design and methods. Analyses of these additional surveys are reported separately (Caloo 2014c) and the results are used as additional evidence to characterise the ornithology of the survey area.

1.5.2 Migratory fish

The fish ecology assessment was based on information gathered from a comprehensive desk-based study, surveys of large fish species and consultation with relevant organisations.

2 HRA SCREENING – SPECIAL PROTECTION AREAS (SPAS)

2.1 Seabird populations in the Project study area

Table 2.1 below summarises the use of wind farm area (the turbine deployment area buffered to 1 km, WT+1 km) by regularly occurring seabird species. The mean number of birds in WT+1 km area and 95% upper confidence limit are calculated by Distance analysis of the Year 1 baseline (Year 1) survey results and based on the density across the whole area surveyed.

Table 2.1 Summary of the use of wind farm area (the turbine deployment area buffered to 1 km, WT+1 km) by regularly occurring seabird species

Species	Season	Estimated mean abundance in WT+1 km area (birds)	95% UCL of estimated mean abundance in WT+1 km area (birds)
Fulmar	Breeding season (May – Sep)	30	40
	Autumn & winter (Oct – April)	20	25
Manx shearwater	Summer (non-breed) and migration (May - Sep)	0.7	1.3
European storm-petrel	Migration (May - Oct)	0.6	1.1
Gannet	Breeding season (Apr - Sep)	10	13
	Autumn & winter (Oct - Mar)	4	5
Arctic skua	Summer (non-breed) and autumn migration (Jun - Nov)	0.1	0.4
Great skua	Autumn migration (Jul - Nov)	0.5	0.9
Herring gull	Breeding season (Apr - Aug)	1	1
	Autumn & winter (Sep - Mar)	12	17
Great black-backed gull	Breeding season (Apr - Aug)	<1	1
	Autumn & winter (Sep - Mar)	11	13
Kittiwake	Breeding season (Apr - Aug)	81	112
	Autumn & winter (Sep - Mar)	3	4
Arctic tern	Breeding season (May - July)	(3)[a]	n/a
	Migration season (Aug)	50	128
Guillemot	Colony attendance (Apr - July)	249	295
	Chicks at sea (August)	2,136	3,169
	Autumn & winter (Sep - Mar)	40	52
Razorbill	Colony attendance (April - July)	30	40
	Chicks at sea (August)	719	1,085
	Autumn & winter (Sep - Mar)	10	16
Puffin	Colony attendance (Apr - Aug)	119	138
	Post-breeding (Sep)	85	104
	Autumn & winter (Oct - Mar)	21	26

a. Arctic tern abundance during the breeding season actually represents a single observation of 3 birds outside the WT+1 km area.

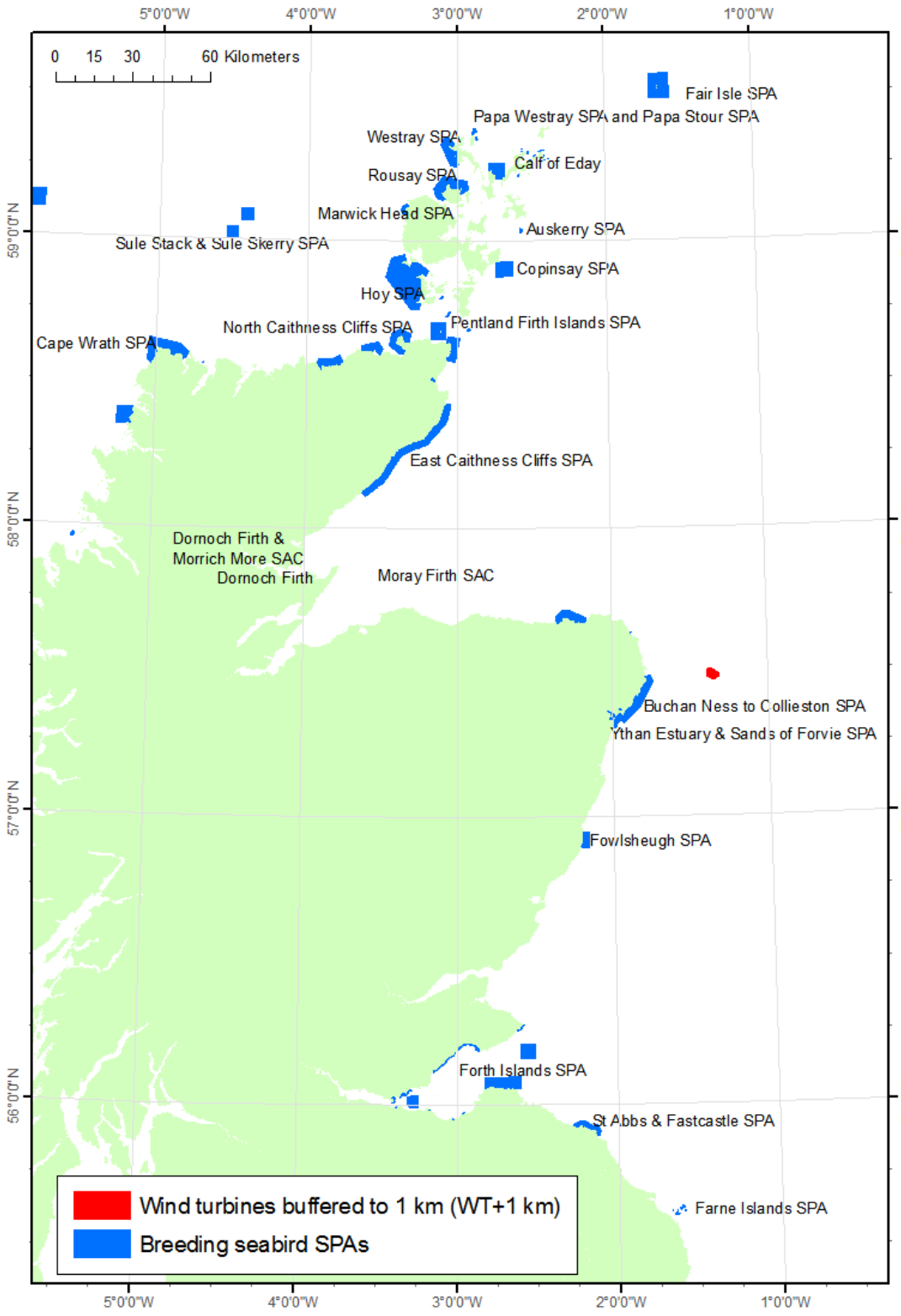


Figure 2-1 **Special Protection Areas (SPAs) for breeding seabirds within approximately 250 km of the Hywind Scotland windfarm**

2.2 Long list of SPAs requiring consideration in the HRA

This section presents a long list of sites requiring consideration in the HRA based on the existence of ecological connectivity between those sites and the Project area.

2.2.1 Identification of relevant SPAs

SPAs are designated for the protection of rare, threatened or vulnerable bird species listed in Annex I of the Birds Directive, and also for regularly occurring migratory species. In terms of identifying SPAs that are capable of being affected by the offshore components of the Project, this assessment focuses specifically on SPAs where breeding, seabirds are the qualifying interest, where these birds use the waters in and around the Project area for foraging or other activities. As SPA qualifying interests are protected year-round potential impacts on these populations during the post-breeding and non-breeding seasons are considered as well. In addition, consideration is given to migratory waterfowl and wader species.

Breeding season

Qualifying breeding seabird species for all SPAs and Ramsar sites were screened for potential connectivity with the Hywind site and its vicinity (3 km buffer). The locations of SPAs within approximately 250 km of the Hywind site are shown in Fig. 2-1. More distant SPAs were also considered in the screening for species with foraging ranges that exceed 250 km. Theoretical connectivity was determined using breeding season foraging range metrics for each species as reviewed by Thaxter *et al.* (2012). If the closest distance between the designated site and the Hywind 3 km buffer was less than the mean foraging range distance, the theoretical level of connectivity was rated as High. If the separation distance was greater than the mean distance but less than the mean maximum foraging range distance (MMFR), the theoretical level of connectivity was rated as Medium. If the separation distance was greater than the MMFR distance but less than the maximum foraging range distance, the theoretical level of connectivity was rated as Low and if it exceeded the maximum range then no connectivity was assumed.

No foraging range metrics are available for great black-backed gull and for this species the metric for herring gull are used instead. Herring gull is considered to be an appropriate surrogate because it has a similar breeding ecology.

The ratings of theoretical breeding season connectivity are presented for all qualifying breeding species at SPAs and Ramsar sites where at least one species has at least low connectivity. However, for the sake of brevity, beyond 150 km distance from the Hywind site only truly long-ranging species of qualifying interest (fulmar, gannet, great skua, lesser black-blacked gull and Atlantic puffin) are considered.

The approach taken to the HRA Stage 1 screening aims to combine ecologically realistic yet sufficiently precautionary considerations to outline the potential for LSE. For the breeding season this was achieved through classifying connectivity potential, site density/abundance and species vulnerability to impacts and considering the likelihood of a significant effect on a given SPA.

As part of the baseline description of the seabird species that use the site, the vulnerability of each species to the main impacts is determined according to the methods used by Furness *et al.* (2012) and Furness *et al.* (2013) to assess vulnerability to impacts and the resulting species-specific vulnerability scores for disturbance by vessels, displacement by structures and collision risk to offshore wind turbines are considered to be appropriate for the Project's assessments.

In Furness *et al.* (2013) **collision risk vulnerability** index values range between 0 and 1,306. For ease of use these values are categorised and described in the screening process here as very low (<200), low (200-400), moderate (400-600), high (600-1000) and very high (>1000). Displacement/disturbance index values range between 0 and 32 and are categorised and described as very low (≤5), low (6-10), moderate (11-15), high (16-20) and very high (>20).

Furthermore, for ease of use the 95% UCL of the mean seasonal density for the WT+1km area has been classified as follows: very low (0.01 – 0.99 birds/km^2), low (1 – 1.99 birds/km^2), moderate (2 – 4.99 birds/km^2) and high (5+ birds/km^2).

The following screening rules were defined for the breeding season:

> SPA qualifying features with a 'High' estimated potential for connectivity with the study area were automatically screened in, regardless of density or vulnerability;

- SPA qualifying features with any other level of connectivity where the mean foraging range overlaps with the study area were automatically screened in;
- SPA qualifying features with a 'Very high' level of vulnerability to either collision risk or disturbance / displacement were automatically screened in, regardless of connectivity or density;
- SPA qualifying features with a 'High' density in the study area were screened in, unless connectivity was defined as 'Low' and impact vulnerability was 'Low' to 'Very low';
- SPA qualifying features with a 'Moderate' density in the study area were screened in, but only if connectivity was defined as 'Moderate' or 'Low' and vulnerability for at least one impact source was 'High' or 'Moderate';
- SPA qualifying features with a 'Low' to 'Very low' density in the study area were screened in, but only if connectivity was defined as 'Moderate' and vulnerability for at least one impact source was 'High' or 'Moderate'; and,
- SPA qualifying features with a 'Low' to 'Very low' density in the study area and a 'Low' level of connectivity were screened out, regardless of vulnerability levels (but see above).

All birds in the WT+ 1 km area are assumed to be breeding adult birds, a highly precautionary approach, as most seabird populations are characterised by very substantial immature and non-breeding adult cohorts.

It is acknowledged that such rules are through necessity arbitrary, but it is considered that a substantial amount of precaution has been built into these. For each qualifying feature a common sense check was undertaken to ascertain ecological relevance of the screening decision. This included considerations of colony size, known distribution, foraging range and behaviour.

Post-breeding season and chicks-at-sea period

In lieu of a connectivity parameter (as outside the breeding season) guillemot and razorbill in the chicks-at-sea period were considered for screening in if the estimated population in the WT+1km area exceeded a 1% SPA population threshold and if species were considered to be at least moderately vulnerable to at least one potential impact source. Considerations of likelihood and ecological behaviour were used to make a conclusion with respect to LSE.

Non-breeding season

Similarly, seabirds in the non-breeding season were considered for screening in if the estimated population in the WT+ 1km area exceeded the 1% threshold and if species were considered to be at least moderately vulnerable to at least one potential impact source. Considerations of likelihood and ecological behaviour were used to make the final decision with respect to LSE.

Wintering and passage waterfowl and wader qualifying species were screened in if the baseline survey programme (Hywind Ornithology Technical Report, NRP 2015) showed it to make use of the airspace over the survey area or if their migration flyway included the airspace over the survey area (according to maps in Scottish Government, 2014).

2.2.2 Long list of SPAs

Seabirds in the breeding season

Appendix A, Table A.1 provides an overview of the HRA screening results for seabird qualifying interests in the breeding season. Included is information on foraging ranges (mean, mean maximum +10% and maximum, Thaxter *et al.* 2012), classification of potential connectivity, 95% UCL of the mean seasonal bird density and impact vulnerability. An outline rationale accompanies the LSE determination for the project in isolation and in combination with other offshore wind developments (operational, consented and planned).

Seabirds in the non-breeding season

Appendix A, Table A.2 provides an overview of the HRA screening results for seabird qualifying interests in the non-breeding season. The listed SPAs are largely the same as for the breeding season with the exception of those SPAs or qualifying interests between Caithness and Berwickshire for which breeding season connectivity was considered unlikely, but for which it is expected that during the non-breeding season species are likely to occur in the Project study area (no longer constrained by the need for colony attendance) have been listed. This includes the addition of

St. Abb's to Fast Castle SPA and the addition of qualifying interests for the Forth Islands, East Caithness Cliffs and North Caithness Cliffs SPAs. In reality birds originate from a much wider area, including Orkney, Shetland and Northern Europe and therefore this approach is considered particularly precautionary.

Those SPAs or qualifying interests in Orkney and Shetland which represent true migratory seabird species, i.e. Arctic skua, great skua and Arctic tern, as it is known that a substantial proportion of these species migrate along the Scottish east coast during spring and / or autumn.

Following published data from Furness (2014) the tabulated data provides for each SPA and qualifying feature an overview of:

1 - the relevant geographical area:

2 - the total number of breeding adults in that area:

3 – the number of breeding adults from SPAs:

4 – the number of breeding adults from the individual SPA in question:

5 – the 95% UCL of the mean species abundance in the Hywind wind turbine deployment area + 1 km buffer (WT+1 km); and

6 – the likely number of birds from the on-site population which originates from the individual SPA.

In addition, information on vulnerability to disturbance, displacement and collision risk is presented, as is the LSE conclusion and associated rationale. All birds in the WT+1 km are assumed to be breeding adult birds, a highly precautionary approach, as most seabird populations are characterised by very substantial immature and non-breeding adult cohorts.

Note that parameters 2 and 3 follow Furness (2014) which is based on the most recent colony counts available, whereas colony counts in the breeding season screening are based on Mitchell *et al.* 2004 and adjusted where appropriate by recent population trends (JNCC, 2014) which at times leads to different population sizes. In practice this is not an issue, but readers should refrain from comparing screening information for the breeding and non-breeding season.

As foraging range cannot be used as a measure for connectivity out with the breeding season, Furness (2014) devised a number of species-specific geographical areas and associated population estimates based on colony counts (SPAs and non-SPAs), seasonality and known migratory and dispersal movements. These form the basis for allocating birds in the WT+1 km area to SPAs under the assumption that birds from all relevant SPAs are distributed across a geographical area (i.e. are fully mixed with population from non-SPAs). Therefore, parameter 6 is based on the ratio between parameters 4 and 3, i.e. the proportion of breeding adults from the individual SPA in relation to the total number of breeding adults from SPAs in the same region. This proportion is subsequently used to allocate the 95% UCL of the mean abundance within the WT+1 km to individual SPAs.

As the 95% UCL of the mean abundance of all species on site during the non-breeding season is exceedingly small, all SPAs and qualifying interests were screened out. Even if assuming that – in the unlikely event - all on-site birds originate from the nearest SPA (Buchan Ness to Collieston Coast), no species would exceed 1% of the SPA population.

Seabirds in the chicks-at-sea period (common guillemot, razorbill)

Appendix A, Table A.3 provides an overview of the HRA screening results for seabird qualifying interests in the chicks-at-sea period for common guillemot and razorbill. The listed SPAs are largely the same as for the breeding season with the exception of:

Those SPAs between Caithness and Berwickshire for which connectivity was considered unlikely during the colony-attendance part of the breeding season, but for which it is expected that during the chicks-at-sea period guillemot and razorbill are likely to occur in the Project study area (no longer constrained by the need for colony attendance) have been listed. This includes the addition of the Forth Islands SPA and East Caithness Cliffs SPA. In reality birds may originate from a wider area and therefore this approach is considered precautionary as it likely to result in an overestimation of the strength of connectivity to the SPAs within this area (see discussion of this in NRP 2015). Were

some birds to originate from further afield also then this could mean there is connectivity with some additional more distant SPAs. However it is apparent from the analyses undertaken using the recommended apportioning method (SNH 2014) that the at most the potential strength of connectivity to any additional SPAs would very weak due to the effect of the distance weighting (inverse of distance squared) and the further dilution of numbers that would be caused by consideration of a larger population.

Data are presented in Appendix A, Table A.3. For guillemot and razorbill the mean on-site populations (based on the 95% UCL of the mean) were assigned to different SPAs following SNH guidance (SNH, 2014). Details of apportioning results are presented in Appendix A, Tables A.5 to A.12. Using distance to site and colony size, appropriately weighted, results in proportions which represent the theoretical number of birds originating from each SPA. Non-SPAs are included in the analysis as well. Population estimates for guillemot and razorbill during the chicks-at-sea period are based on colony counts from Mitchell *et al.* (2004).

For both auks Buchan Ness to Collieston Coast SPA (common guillemot) and Fowlsheugh and Troup, Pennan and Lion's Heads SPA (common guillemot, razorbill) were screened out. Although >1% of each of these breeding populations is likely to be present in the WT+1 km area during the chicks-at-sea period, it is considered that given the transient nature of parent-chick dispersal, with birds travelling very large distances into the central North Sea covering as much as 50 km per day (Camphuysen 2002), the lack of a nest attendance constraint and the relatively small size of the proposed Project area in relation to the available foraging habitat, that no LSE is likely for these qualifying interests.

Geese and swans

Appendix A, Table A.4 provides an overview of the HRA screening results for non-breeding goose and swan SPA qualifying interests. Species are listed here if their migration flyway included the airspace over the Hywind survey area (according to maps in Scottish Government, 2014) and the flight path to a qualifier's designated site could potentially result in any proportion of the population over-flying the Hywind survey area.

Joint advice from SNH and JNCC (letter, 2 September 2013) indicated that "[..] Due to the size and scale of the proposed Project, the results of the desktop study indicate that it seems proportionate to only consider further the potential impacts to Svalbard barnacle geese, a species whose main migration front crosses through the Project area. [..]". As a result all qualifying features but Svalbard barnacle goose has been screened out of the HRA process. For the sake of completeness all SPAs with the potential to be affected by the proposed Project have been listed.

Waders

Collision risk modelling for SPA wader species indicated that due to broad migration fronts, large to very large receptor populations, the location, limited size and scale of the proposed Project with only five wind turbines, estimated collision rates were exceedingly low. Any potential impact is therefore considered entirely negligible for all SPAs for which wader species are qualifying features. For the sake of brevity these species have not been tabulated.

2.3 Potential impacts on seabirds (impact pathways)

Following establishment of the baseline conditions of the Project and surrounding areas, and an understanding of the Project activities it is possible to assess the potential impacts from the Project. The range of impacts that has been considered is based on impacts identified during EIA scoping and any further potential impacts that have been identified as the EIA progressed. The impacts assessed are summarised below. It should be noted that not all impacts are relevant to all phases of the Project.

- Disturbance by vessels (all stages);
- Displacement caused by presence of fixed infrastructure, in particular the WTG Units (O&M stage);
- Mortality from collisions with wind turbine rotor blades (O&M stage);
- Barrier effects to the free movement of birds (O&M stage);
- Indirect effects from changes in habitat and distribution of on prey species (all stages); and
- Accidental release of contaminants, either from vessels or wind turbines (all stages).

Of these impact sources it is considered that collision risk and contaminant release could have an effect on qualifying interests through increased mortality. For all other impact sources (disturbance, displacement, barrier and indirect effects) it is considered likely that any effect on qualifying interests could – at worst - involve a reduction in breeding success for one or more seasons. For ease of reference the report refers to two overarching impact sources: "disturbance / displacement" and "collision".

2.4 Assessment of LSE

Table 2.2 provides an overview of the SPA qualifying features for which it is considered LSE for one or more potential effect (e.g., collision, displacement, disturbance) exists or cannot be ruled out. For each feature the colony count or waterfowl count has been provided as well as the current site condition and the season(s) for which LSE is considered. These features will be taken to the next stage which requires the consideration of impacts on site integrity. Note, the potential for LSE to be caused by both collision and disturbance/displacement effects was not identified for any qualifying feature (Appendices A.1 to A.4). Therefore there is negligible potential for in-combination effects (the sum of collision and disturbance/displacement effects) to arise. In any case, a disturbance/displacement effect will act antagonistically to the potential for collision, such that were individuals of a qualifying species to be displaced or disturbed from the wind farm there would be a corresponding decrease in the potential for collision strikes because there would be fewer birds flying in the vicinity of the turbines.

Appendices A.1 to A.4, which contain the SPA long list and associated LSE rationale (both for the project in isolation as well as in-combination) need to be considered in conjunction with Table 2.2, which merely summarises the information contained in the appendices.

Table 2.2. Summary of SPA qualifying interests for which the potential for an LSE has been identified or cannot be ruled out for the project in isolation and in-combination with other OWF developments

Qualifying feature	Colony (breeding adults) or waterfowl count (5 yr average) [(1)]	Site condition	Season for which LSE potential considered (B=breeding, NB=non-breeding)	Impact Source for which LSE potential identified	OWFs expected to contribute to cumulative impact
Buchan Ness to Collieston Coast SPA					
Kittiwake	25,084	Unfavourable, no change	B	Collision	Aberdeen, Inch Cape, FoF (R3)
Guillemot	25,820	Favourable, declining	B	Disturbance / displacement	Aberdeen, Inch Cape, FoF (R3)
Herring gull	6,158	Unfavourable, no change	B	Collision	All Forth & Tay OWFs
Forth Islands SPA					
Atlantic puffin	124,462	Favourable, maintained	B	Disturbance / displacement	All Forth & Tay OWFs
Gannet	110,964	Favourable, maintained	B	Collision	All Forth & Tay OWFs, all Moray Firth OWFs, Blyth OWF
Fowlsheugh SPA					
Kittiwake	18,674	Favourable, maintained	B	Collision	All Forth & Tay OWFs
Guillemot	60,193	Favourable, maintained	B	Disturbance / displacement	All Forth & Tay OWFs

Qualifying feature	Colony (breeding adults) or waterfowl count (5 yr average) [1]	Site condition	Season for which LSE potential considered (B=breeding, NB=non-breeding)	Impact Source for which LSE potential identified	OWFs expected to contribute to cumulative impact
Herring gull	518	Unfavourable, declining	B	Collision	All Forth & Tay OWFs
Razorbill	7,048	Favourable, maintained	B	Disturbance / displacement	All Forth & Tay OWFs
Loch of Strathbeg SPA					
Barnacle goose (Svalbard)	85	Favourable, maintained	NB	Collision	All Forth & Tay OWFs
Troup, Pennan and Lion`s Heads SPA					
Kittiwake	29,792	Unfavourable, no change	B	Collision	All Moray Firth OWFs
Guillemot	21,876	Unfavourable, declining	B	Disturbance / displacement	All Moray Firth OWFs
Herring gull	3,194	Unfavourable, no change	B	Collision	All Moray Firth OWFs
Razorbill	3,485	Unfavourable, declining	B	Disturbance / displacement	Moray Firth (R3)
Upper Solway Flats and Marshes SPA					
Barnacle goose (Svalbard)	25,979	Favourable maintained	NB	Collision	All Forth & Tay OWFs
Note [1] Colony counts derived from JNCC Seabird Monitoring Programme database, goose counts from Austin *et al.* 2014.					

2.5 Assessment of impacts on site integrity

In determining where a project could affect the integrity of an SPA the judgement is made against the stated Conservation Objectives of the SPA. These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive.

The Conservation Objectives must be considered when a competent authority is required to make a 'Habitats Regulations Assessment', under the relevant parts of this legislation. Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving the aims of the Wild Birds Directive. With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features'), and subject to natural change.

In undertaking an assessment of impacts on site integrity for the SPA qualifying features where LSE has not been ruled out, it is considered that information on the following topics are relevant and should therefore be taken into account:

- The condition of the qualifying feature, i.e. the current conservation status of qualifying feature;
- Connectivity between the qualifying feature (in this case the population of individuals forming a SPA qualifying feature) and the area potentially affected by the Project;
- The importance of the area potentially affected for supporting the qualifying feature (i.e. an SPA population);
- The sensitivity of the qualifying feature to the effects predicted to arise from the Project;
- Any other aspect of the ecology of the qualifying feature that is relevant to evaluating the likely impacts to it from the Project.

Information on sensitivity to potential effects, importance as a supporting habitat and connectivity are used to establish the potential magnitude of an effect to arise during project construction, operation and decommissioning on the features screened in at Stage 1 of the HRA process.

The assessment of impacts on ornithology is based on project-specific survey data (NRP, 2015) supported by published contextual information. Where possible, assessment is based on a quantified evaluation of the impact on a receptor population. The assessment of collision risk is based on the results of collision rate modelling (Caloo, 2014b and d) following SNH guidance and recent SNCB Joint Guidance (25th November 2014).

In the cases of vessel disturbance, displacement by structures, indirect effects and direct habitat loss, the assessment considers the effect on receptor populations of the loss of foraging habitat (or time) that may result because of these impacts. Where possible, consideration is given to quantitative assessment of impacts on productivity of breeding populations.

For the purpose of HRA these impact categories are grouped under disturbance / displacement for which the assessment considers the effect on receptor populations of a decrease in productivity.

In the cases of collision strike the assessment considers the effect on receptor populations of additional mortality that may be caused by this impact source.

2.5.1 Conservation objectives for SPAs

Conservation Objectives follow a standard format requiring protection of the qualifying bird interests and protection of the habitat in the SPA which supports them. These are as follows:

To ensure that site integrity is maintained by:

(i) Avoiding deterioration of the habitats of the qualifying species; and,

(ii) Avoiding significant disturbance to the qualifying species;

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

(iii) Population of the bird species as a viable component of the SPA;

(iv) Distribution of the bird species within the SPA;

(v) Distribution and extent of habitats supporting the species; and,

(vi) Structure, function and supporting processes of habitats supporting the species.

It is important to recognise that the Conservation Objectives primarily offer site-based protection and that some of them will not directly apply to species when they are out with the boundaries of the SPA. This is particularly true of objectives (i), (v) and (vi) which relate to the supporting habitats within the SPA. In rare circumstances, it is possible that factors outside site boundaries may have the capacity to affect the long term distribution of bird species within the SPA – see objective (iv).

Objective (iii) however – maintenance of the population of the bird species as a viable component of the SPA – will be relevant in most cases because: it encompasses direct impacts to the species, such as significant disturbance to qualifying bird interests when out with the SPA. It addresses indirect impacts such as the degradation or loss of supporting habitats which are out with the SPA but which help to maintain the population of the bird species of the SPA in the long-term.

Given that the Project does not physically overlap with any designated site – with the nearest SPA (Buchan Ness to Collieston Coast) at 20 km distance – it is considered that only Conservation Objective ii (avoiding significant disturbance to the qualifying species) and iii (maintaining a population of the bird species as a viable component of the SPA) are relevant in the context of the assessment.

In order for the viability of an SPA population (Conservation Objective iii) to be significantly affected would require the Project to cause change to the population's productivity or mortality. Typically these parameters would need to change by at least 1% of their baseline rate for the change to be considered significant. For this Project, the only realistic way for causing such change is through the potential for turbine collision risk with flying birds to cause

additional mortality or for displacement from the anticipated impact footprint (i.e. WT+1 km) to cause a reduction in breeding success.

2.5.2 Collision risk

Project in isolation

Seabird collision rate estimates for the breeding and non-breeding season were calculated using the basic Band model (Option 1) and are described in detail in Caloo (2014b and d) as well as the Technical Report (the latter contains estimates based on the most recently recommended avoidance rates). Table 2.3 below provides an overview of this information for those species which have been screened in during the HRA process, using recommended avoidance rates (SNCB Joint Guidance, 25 November 2014). For Svalbard barnacle goose an avoidance rate of 99.8% has been used as per recent guidelines (SNH 2013). Seabird collision estimates for the non-breeding seasons are presented for completeness, although no qualifying interests were screened in for those periods.

Table 2.3 Collision risk estimates for screened in seabird and goose SPA species using the basic Band model (Option 1)

Species	Season	Predicted number of collisions per year under different avoidance rates (rounded up to nearest whole bird)				
		0%	**98%**	**98.7%**	**98.9%**	**99.1%**
Gannet	Breeding	512	11	7	6	5
	Non-breeding	145	3	2	2	2
Kittiwake	Breeding	1510	76	20	17	14
	Non-breeding	33	2	1	1	1
		0%	**95%**	**98.4%**	**99.5%**	**99.6%**
Herring gull	Breeding	114	5	1	1	1
	Non-breeding	1,553	78	10	8	7
		0%	**95%**	**98%**	**99%**	**99.8%**
Barnacle goose (Svalbard)	Migration	4	0.2	0.07	0.04	0.02
Note: these estimates are derived from the CRM summary in the Technical Report (NRP 2015, based on Joint Guidance)), full modelling output provided in Caloo 2014b and d (pre-dating Joint Guidance).						

Table 2.4 provides an overview of the estimated increase in annual breeding adult mortality rate (AMR) for each qualifying interest as a result of the Hywind project in isolation. Total estimated collisions were attributed to individual SPAs using SNH guidance on apportioning impact on breeding seabirds across multiple SPAs using foraging range and colony size (column 5). Note that the percentage in the fifth column – showing the percentage of collisions attributed to individual SPAs – does not add up to 100% for each species as non-SPA colonies are included in the apportioning analysis, yet not tabulated here for the sake of brevity. For Svalbard barnacle goose, in lieu of a foraging range, the total collision estimate was superimposed on both SPAs for comparison.

For none of the qualifying interests does the estimated increase in AMR exceed or even approach the 1% threshold.

Table 2.4 Collision risk estimates for individual SPAs and related change in adult mortality rates of qualifying interests

Qualifying interest and annual adult mortality rate (AMR)[1]	SPA	Colony (breeding adults) or waterfowl count (5 yr average) [2]	Total estimated collisions per year at Hywind site (breeding season)	% collisions attributed to individual SPA	Total collisions attributed to individual SPA	Increase in AMR (%)
Kittiwake (12.0%)	Buchan Ness to Collieston Coast	25,084	17	56.3	9.6	0.32%
	Fowlsheugh	18,674		18.3	3.1	0.14%
	Troup, Pennan and Lion's Heads	29,792		17.5	3	0.08%
Herring gull (12.0%)	Buchan Ness to Collieston Coast	6,158	1	54.4	0.5	0.07%
	Fowlsheugh	518		3.5%	0.003	0.01%
	Troup, Pennan and Lion's Heads	3,194		7.3%	0.007	0.002%
Gannet (8.1%)	Forth Islands	110,964	6	71.7	4	0.04%
Svalbard barnacle goose (5.0%)	Upper Solway Flats and Marshes	25,979	0.007	100%	0.07	<0.01%
	Loch of Strathbeg	85		100%	0.02	0.05%

Note [1] – AMR for seabirds sourced from BTO website / Firth of Forth Appropriate Assessment, AMR for Svalbard barnacle goose from Trinder *et al.* (2005)

Note [2] Colony counts derived from JNCC Seabird Monitoring Programme database, goose counts from Austin *et al.* 2014.

Project in-combination

Information on cumulative collision risk effects has been used to provide some detail for the in-combination assessment. This is not always possible for all species as different EIAs have approached certain topics differently or do not provide sufficient background information to enable use of data. Where possible more recent information gleaned from EIA Consent Decisions and Appropriate Assessments has been used in the rationale.

Buchan Ness to Collieston:

- Kittiwake: the Appropriate Assessment for the four Firth of Forth offshore wind farm developments (http://www.scotland.gov.uk/Resource/0046/00460528.pdf) considered a cumulative mortality impact of collision and displacement of 17 birds annually, with a threshold of 602 birds below which site integrity is likely to be maintained. Specifically, the impact of the Firth of Forth and Inch Cape OWFs on the Buchan Ness to Collieston Coast SPA colonies was estimated to result in 0.1% increase in AMR (sum of collision and displacement). This impact was considered below the acceptable population threshold of 2.4% in terms of AMR increase. Estimates for Aberdeen OWF amounted to a further 19 annual breeding season collisions at 98% avoidance. Collision estimates for the Hywind project indicate that the Project could result in 9.6 further casualties annually during the breeding season;

- Herring gull: no Appropriate Assessment was required for either the Moray Firth or the Firth of Forth OWF developments for this qualifying interest. Essentially the SPA has only low to no connectivity with these developments. Collision estimates for the Aberdeen OWF amounted to 2 collisions annually for the species, with 0.5 annual collisions estimated for the Hywind project. The cumulative impact would therefore increase the adult mortality rate by approximately 0.3%, under the precautionary assumption that all collision victims are breeding adults.

Forth Islands:

- Gannet: the Appropriate Assessment for the four Firth of Forth offshore wind farm developments (http://www.scotland.gov.uk/Resource/0046/00460528.pdf) considered a cumulative mortality impact of collision and displacement of 1,169 birds annually, with a threshold of 1,300 birds below which site integrity is likely to be maintained. Estimates for Aberdeen OWF amounted to a further 17 annual breeding season collisions at 98% avoidance. As the Aberdeen assessment used the basic Band model it is possible to adjust the original estimate with the currently recommended avoidance rate of 98.9%, leading to an estimate of 9.3 collisions. Collision estimates for the Hywind project indicate that the Project could result in four further casualties annually during the breeding season.

Fowlsheugh:

- Kittiwake: the Appropriate Assessment for the four Firth of Forth offshore wind farm developments (http://www.scotland.gov.uk/Resource/0046/00460528.pdf) considered a cumulative mortality impact of collision and displacement of 212 birds annually, with a threshold of 317 birds below which site integrity is likely to be maintained. Specifically, the impact of the Firth of Forth and Inch Cape OWFs on the Fowlsheugh SPA was estimated to result in 1.1% increase in AMR (sum of collision and displacement). This impact was considered below the acceptable population threshold of 1.3%. Estimates for Aberdeen OWF amounted to a further 6 annual breeding season collisions. Collision estimates for the Hywind project indicate that the Project could result in 3.1 further collisions annually during the breeding season;

- Herring gull: no Appropriate Assessment was required for the Firth of Forth developments for this qualifying interest. For the SPA specifically the nearest offshore wind farms estimated 0 collisions (Inch Cape), 0.8 collisions (Firth of Forth, Alpha and Bravo combined) and 1 collision (Aberdeen OWF) during the breeding season. Collision estimates for the Hywind project indicate that the Project would result in 0.003 additional annual casualties during the breeding season.

Troup, Pennan and Lion's Heads:

- Kittiwake: no Appropriate Assessment was required for the Moray Firth developments for this qualifying interest (or for that matter the SPA at large). Moray Firth OWF estimated a 0.5% chance of 10% population reduction for the Troup Head SPA colonies, an effect judged to be minor. No clear cut information appears available on the apportioning of collision estimates from these developments. Collision estimates for the Hywind project indicate that the Project could result in three further collisions annually during the breeding season;

- Herring gull: no Appropriate Assessment was required for the Moray Firth developments for this qualifying interest (or for that matter the SPA at large). No information appears available on the apportioning of collision estimates from these developments. Aberdeen OWF estimated <1 bird collision annually. Collision estimates for the Hywind project indicate that the Project would result in 0.007 additional casualties during the breeding season.

Upper Solway Flats and Marshes:

- Svalbard barnacle goose: Estimates of breeding season collision mortality for Svalbard barnacle goose during spring and autumn migration at 99% avoidance are available from six other offshore wind farm developments: Moray Firth Eastern Development Area (0 geese); Aberdeen Offshore Wind Farm (7.1); Beatrice Offshore Wind Farm (0 geese) Firth of Forth Phase 1: (0.78 geese, adjusted to 99% avoidance), Inch Cape (7 collisions, adjusted to 4 as consented turbine numbers halved) and Neart na Gaoithe Offshore Wind Farm (22 collisions, adjusted for flyway approach). This leads to a cumulative annual estimate of 30 collisions. However, since the publication of these EIAs, SNH guidance has readjusted the goose avoidance rate to 99.8%. On that basis the cumulative impact is reduced to seven birds, including the <0.01 annual collision estimate for the Hywind project

(rounded up to one individual). With a background population of 25,979 birds (5 year average, maximum 35,640) at the Solway Firth in 2009 - 2010 (of which 10.8% are juveniles, Holt *et al.* 2012, Austin *et al.* 2014) this leads to an increase in annual adult mortality of 0.6% assuming all collisions involve adult birds.

Loch of Strathbeg:

> No cumulative impact available for marine developments in the Moray Firth offshore wind developments estimated 0 collisions (and lie out with the regular migratory flyway anyhow) or the Firth of Forth developments as this SPA is substantially further north than any of these wind farms. Estimates for Aberdeen OWF amount to 1.4 collisions annually (adjusted to 99.8% avoidance), leading to a cumulative total of 1.402 collisions annually when adding the Hywind estimate. In theory this would increase the adult annual mortality rate by approximately 33%.

2.5.3 Disturbance / displacement

Project in isolation

Table 2.5 presents information on the estimated total number of birds that might be displaced from the WT+1 km area during the breeding season. A displacement rate of 50% has been assumed, a highly precautionary assumption given available monitoring data (e.g. Robbin Rigg OWF) which indicates auk displacement levels to be substantially lower – in the order of 30%.

Table 2.5 Estimated number of birds displaced from WT+1 km area during the breeding season

Species	Season	Mean abundance (95% UCL) at WT+ 1km (number of birds)	Number of birds displaced from WT+ 1km assuming 50% displacement
Atlantic puffin	Breeding	138	69
Guillemot	Breeding	295	148
Razorbill	Breeding	40	20

For the purposes of evaluating the possible consequence of displacement, it is assumed that all birds displaced are breeding adults, each representing a single pair, and that the breeding attempt of each displaced bird fails. These assumptions are highly precautionary; in reality it is likely that some displaced birds will be non-breeding birds and that some breeding individuals would forage elsewhere and be able to breed successfully, and in any case a proportion are likely to fail to breed for other (natural) reasons. Table 2.6 below provides an overview of the estimated maximum decrease in breeding success for each qualifying interest as a result of displacement from the WT+ 1km area of the Hywind project in isolation. For example if 50 individuals are predicted to be displaced by the project from a colony of 10,000 breeding pairs, it is assumed that this would cause 50 pairs to fail, thus leading to a theoretical maximum decrease in breeding success of 0.5% (i.e., 50/10,000). Total estimated displacement numbers were attributed to individual SPAs using SNH guidance on apportioning impact on breeding seabirds across multiple SPAs using foraging range and colony size (SNH, 2014) (details of apportioning are presented in Appendix A Tables A.5 to A.12). Note that the percentage in the fifth column of Table 2.6 – showing the percentage of displacement attributed to individual SPAs – does not add up to 100% for each species as non-SPA colonies are included in the apportioning analysis yet are not tabulated here for the sake of brevity.

For none of the qualifying interests does the estimated decrease in breeding success exceed or even approach the 1% threshold, in fact the largest predicted impact amounts to a reduction in annual breeding success of 0.4%.

Table 2.6 Displacement estimates for individual SPAs and related change in breeding success of qualifying interests

Species and breeding success (number of fledged chicks per pair)[1]	SPA	Colony count (breeding adults)	Total estimated number of birds displaced from WT+1 km (50%)	Theoretical maximum % displaced birds attributed to individual SPA	Total number of displaced birds attributed to individual SPA	Theoretical maximum decrease in breeding success (%)
Atlantic puffin (0.60 chicks / pair)	Forth Islands	124,462	69	64.0%	44	0.07%
Guillemot (0.66 chicks / pair)	Buchan Ness to Collieston Coast	25,820	148	57.2%	85	0.7%
	Fowlsheugh	60,193		20.9%	31	0.1%
	Troup, Pennan and Lion's Heads	21,876		20.8%	31	0.3%
Razorbill (0.6 chicks / pair)	Fowlsheugh	7,048	20	20.0%	4	0.1%
	Troup, Pennan and Lion's Heads	3,485		19.4%	4	0.2%

Note [1] - Breeding success of puffin at the Isle of May (part of the regional breeding population) between 2007 and 2012 was 0.60 chicks per pair, for guillemot 0.66 chicks per pair and for razorbill 0.6 chicks per pair (CEH, 2012).

Project in-combination

Information on cumulative displacement effects has been used to provide some detail for the in-combination assessment. This is not always possible for all species as different EIAs have approached certain topics differently or do not provide sufficient background information to enable use of data. Where possible more recent information gleaned from EIA Consent Decisions and Appropriate Assessments has been used in the rationale.

Buchan Ness to Collieston:

> Guillemot: the Appropriate Assessment for the Firth of Forth OWF developments indicated a zero cumulative impact through displacement during the breeding season, while specifying an acceptable threshold for the annual reduction in adult survival of -0.5%. The Aberdeen OWF estimates displacing between 30 and 298 guillemots during the breeding season. For the Hywind project it is estimated up to 85 guillemots will be displaced annually, resulting in a cumulative effect of 249 displaced birds (when taking the mid-point of the estimated range for the Aberdeen OWF). This equates to a reduction in breeding success of 1.9%.

Forth Islands:

> Puffin: the Appropriate Assessment for the Firth of Forth OWF developments indicated a cumulative impact through displacement of 1,251 birds during the breeding season, although without specifying an acceptable biological threshold. Displacement estimates for the Hywind project indicate a further 44 birds to be displaced during this time of year.

Fowlsheugh:

> Guillemot: the Appropriate Assessment for the Firth of Forth OWF developments indicated no cumulative impact through displacement during the breeding season. The Aberdeen OWF estimates displacing between 9 and 88

guillemots during the breeding season. Displacement estimates for the Hywind project indicate a further 31 birds to be displaced during this time of year, resulting in a cumulative effect of 80 displaced birds (when taking the mid- point of the estimated range for the Aberdeen OWF). This equates to a reduction in breeding success of 0.3%.

- Razorbill: the Appropriate Assessment for the Firth of Forth OWF developments indicated no cumulative impact through displacement during the breeding season. The Aberdeen OWF estimates displacing between 3 and 30 guillemots during the breeding season. Displacement estimates for the Hywind project indicate a further 4 birds to be displaced during this time of year, resulting in a cumulative effect of 21 displaced birds (when taking the middle point of the estimated range for the Aberdeen OWF). This equates to a reduction in breeding success of 0.6%.

Troup, Pennan and Lion's Head's:

- Guillemot: no Appropriate Assessment was required for the Moray Firth developments for this qualifying interest. No clear cut information appears available on the apportioning of displacement estimates from these developments to this SPA. Displacement estimates for the Hywind project indicate 31 birds to be displaced during the breeding season, representing an exceedingly small effect in the context of 21,876 breeding guillemots at the SPA.
- Razorbill: no Appropriate Assessment was required for the Moray Firth developments for this qualifying interest – due to the distance to the SPA connectivity was considered to be very low to non-existent. No clear cut information appears available on the apportioning of displacement estimates from these developments to this SPA. Displacement estimates for the Hywind project indicate 4 birds to be displaced during the breeding season.

2.5.4 Conclusions with respect to SPA site integrity

As five out of six Conservation Objectives (i, ii, iv, v and vi) are directly related to the physical extent of an SPA, and that the nearest SPA lies at 20 km distance it is considered that the proposed Project will not significantly affect said objectives at all four SPAs under consideration. Objective iii represents maintaining a qualifying interest as a viable component of an SPA. The rationale in Table 2.7 below focuses on that objective to outline the site integrity decision – i.e. whether a given impact has a significantly adverse effect on a Conservation Objective to affect site integrity.

On the basis of the information in Table 2.7 it is concluded that the potential impacts of the Project alone or in-combination with other projects will not have a significantly adverse effect on Conservation Objective iii (maintaining a qualifying interest as a viable component of an SPA) at all six SPAs under consideration and therefore that site integrity will be maintained.

Table 2.7 Considerations of site integrity for SPA qualifying features

Qualifying feature	Rationale	Site integrity maintained?
Buchan Ness to Collieston Coast SPA		
Kittiwake	Collision risk estimates from the project alone (9.6 birds per year during the breeding season) would increase the AMR by 0.32% annually and is not considered to significantly affect the population viability of the kittiwake SPA population (acceptable threshold: 2.4% increase in AMR, Forth and Tay AA). The Appropriate Assessment for the Firth of Forth OWFs considered a cumulative mortality impact of collision and displacement of 17 birds annually (an increase in AMR of 0.1%), with a threshold of 602 birds below which site integrity is likely to be maintained. Estimates for Aberdeen OWF amounted to a further 19 annual breeding season collisions. Cumulatively these estimates amount to 45.6 collisions or approximately 7.5% of the quoted acceptable threshold. The addition of estimates for Aberdeen and Hywind result in an AMR increase of 0.95%. Although the SPA site condition is Unfavourable, it is considered that the cumulative impact (1.05%) is sufficiently below the threshold to not significantly affect population viability.	Yes

Qualifying feature	Rationale	Site integrity maintained?
	Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the kittiwake qualifying interest from the Project alone or in-combination with other projects.	
Guillemot	Displacement estimates for the project alone would result in a reduction in breeding success of 0.7%, which is not considered to significantly affect the population viability of the very large SPA population. Cumulative displacement results in an estimated 1.9% reduction in breeding success. Site condition is Favourable and therefore it is not considered likely that a very modest reduction in productivity, based on particularly precautionary assumptions, will significantly affect population viability. Therefore no reduction in the viability of the SPA population is predicted in relation to disturbance / displacement for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Herring gull	Collision risk estimates from the project alone (0.5 bird per year during the breeding season) would increase the AMR by 0.07% annually which is not considered to significantly affect the population viability of the SPA population. Cumulative collision estimates amount to 2.5 collisions annually in the breeding season, increasing AMR by 0.34%. Although site condition is Unfavourable, it is not considered likely that a minor addition of mortality, using highly precautionary assumptions, will significantly affect population viability. SNCB advice for Neart na Gaoithe (NNG) proposed offshore wind farm on 6 June 2014 indicated an acceptable threshold of 1.9% increase in AMR. Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Forth Islands SPA		
Atlantic puffin	Displacement estimates for the project alone would result in a reduction in breeding success of 0.07%, which is not considered to significantly affect the population viability of the very large SPA population. Cumulative displacement estimates amount to 1,290 birds annually in the breeding season, decreasing breeding success by 2%. However, site condition is Favourable, species vulnerability to disturbance and displacement is very low and assumptions used were highly precautionary. It is therefore not considered likely that cumulative displacement will significantly affect population viability. Therefore no reduction in the viability of the SPA population is predicted in relation to disturbance / displacement for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Gannet	Collision risk estimates from the project alone (4 birds per year during the breeding season) would increase the AMR by 0.04% annually which is not considered to significantly affect the population viability of the gannet SPA population. The Appropriate Assessment for the Firth of Forth OWFs (http://www.scotland.gov.uk/Resource/0046/00460528.pdf) considered a cumulative mortality impact of collision and displacement of 1,169 birds annually, with a threshold of 1,300 birds below which site integrity is likely to be maintained. Estimates for Aberdeen OWF amounted to a further 17 annual breeding season collisions. Cumulatively these estimates amount to 1,190 collisions. Although this represent a substantial proportion of the quote threshold, the SPA site condition is Favourable, and it is therefore considered that the cumulative impact is sufficiently below the threshold to not significantly affect population viability.	Yes

Qualifying feature	Rationale	Site integrity maintained?
	Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the qualifying interest from the Project alone or in-combination with other projects.	
Fowlsheugh SPA		
Kittiwake	Collision risk estimates from the project alone (3.1 bird per year during the breeding season) would increase the AMR by 0.14% annually which is not considered to significantly affect the population viability of the kittiwake SPA population. The Appropriate Assessment for the Firth of Forth OWFs considered a cumulative mortality impact of collision and displacement of 212 birds annually, with a threshold of 317 birds below which site integrity is likely to be maintained. Estimates for Aberdeen OWF amounted to a further 6 annual breeding season collisions. Cumulatively these estimates amount to 221.1 collisions or approximately 69% of the quoted acceptable threshold. Although this represent a substantial proportion of the quote threshold, the SPA site condition is Favourable, and it is considered that the cumulative impact is sufficiently below the threshold to not significantly affect population viability. Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the kittiwake qualifying interest from the Project alone or in-combination with other projects.	Yes
Guillemot	Displacement estimates for the project alone would result in a reduction in breeding success of 0.1%, which is not considered to significantly affect the population viability of the very large SPA population. Cumulative displacement results in an estimated 0.3% reduction in breeding success. Site condition is Favourable and therefore it is not considered likely that a very modest reduction in productivity will significantly affect population viability. Therefore no reduction in the viability of the SPA population is predicted in relation to disturbance / displacement for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Herring gull	Collision risk estimates from the project alone (0.0035 birds per year during the breeding season) would have a negligible effect on the AMR and therefore have no effect on population viability of the herring gull SPA population. SNCB advice regarding NNG proposed wind farm on 6 June 2014 indicated an acceptable threshold of 2.0% increase in AMR. Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the herring gull qualifying interest from the Project alone or in-combination with other projects.	Yes
Razorbill	Displacement estimates for the project alone would result in a reduction in breeding success of 0.1%, which is not considered to significantly affect the population viability of the very large SPA population. Cumulative displacement results in an estimated 0.6% reduction in breeding success. Site condition is Favourable and therefore it is not considered likely that a very modest decrease in productivity will significantly affect population viability. Therefore no reduction in the viability of the SPA population is predicted in relation to disturbance / displacement for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Loch of Strathbeg SPA		
Barnacle goose (Svalbard)	Collision risk estimates from the project alone (0.002 bird per year during the non-breeding season) would increase the adult annual mortality rate (AMR) by 0.05% annually which is not considered to significantly affect the population viability of the SPA population.	Yes

Qualifying feature	Rationale	Site integrity maintained?
	Cumulatively a total of 1.402 birds are estimated to be killed annually, representing an increase in AMR of 33% as the SPA population is small. Given the Favourable site condition and the secure status of the international population - showing sustained growth since 2005 - it is considered that the predicted in-combination mortality would not lead to a significant impact on the viability of the SPA population of qualifying interest in the long term.	
Troup, Pennan and Lion`s Heads SPA		
Kittiwake	Collision risk estimates from the project alone (3 bird per year during the breeding season) would increase the AMR by 0.08% annually which is not considered to significantly affect the population viability of the kittiwake SPA population. Insufficient information was available to quantify the cumulative collision impact. However, in the context of a population of 29,792 breeding adults, albeit with an Unfavourable site condition, it is considered exceedingly unlikely that the addition of a single collision annually (through Hywind) to an unknown cumulative total would significantly affect the population viability of the population. Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the kittiwake qualifying interest from the Project alone or in-combination with other projects.	Yes
Guillemot	Displacement estimates for the project alone would result in a reduction in breeding success of 0.3%, which is not considered to significantly affect the population viability of the large SPA population. Insufficient information was available to quantify the cumulative displacement impact. However, in the context of a population of 21,876 breeding adults, albeit with an Unfavourable (declining) site condition, it is considered unlikely that the addition of a very small reduction in breeding success (through Hywind) to an unknown cumulative total would significantly affect the population viability of the population. Therefore no reduction in the viability of the SPA population is predicted in relation to disturbance / displacement for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Herring gull	Collision risk estimates from the project alone (0.007 birds per year during the breeding season) would have a negligible effect on the AMR and therefore have no effect on population viability of the herring gull SPA population. Although the estimated impact of the Moray Firth OWFs is not clear it is considered unlikely that the predicted Hywind collisions would significantly alter the population viability of this colony. Therefore no reduction in the viability of the SPA population is predicted in relation to collision risk for the herring gull qualifying interest from the Project alone or in-combination with other projects.	Yes
Razorbill	Displacement estimates for the project alone would result in a reduction in breeding success of 0.2%, which is not considered to significantly affect the population viability of the very large SPA population. Insufficient information was available to quantify the cumulative displacement impact. However, in the context of a population of 3,485 breeding adults, albeit with an Unfavourable (declining) site condition, it is considered unlikely that the addition of a very small reduction in breeding success (through Hywind) to an unknown cumulative total would significantly affect the population viability of the population. Therefore no reduction in the viability of the SPA population is predicted in relation to disturbance / displacement for the qualifying interest from the Project alone or in-combination with other projects.	Yes
Upper Solway Flats and Marshes SPA		

Qualifying feature	Rationale	Site integrity maintained?
Barnacle goose (Svalbard)	Collision risk estimates from the project alone (0.002 bird per year during the non-breeding season) would increase the AMR by <0.01% annually which is not considered to significantly affect the population viability of the SPA population. Cumulatively a total of 7 birds are estimated to be killed annually, representing an increase in AMR of 0.6% as the SPA population is small. Given the Favourable site condition and the secure status of the international population - showing sustained growth since 2005 - it is considered that the predicted in-combination mortality would not lead to a significant impact on the viability of the SPA population of qualifying interest in the long term.	Yes

3 HRA SCREENING – SPECIAL AREAS OF CONSERVATION (SACS) FOR MARINE MAMMALS

3.1 Marine mammals in the Project study area

As part of the Environmental Impact Assessment (EIA) a baseline description of the use of the Project site and surrounding area by marine mammals was produced, comprising information gleaned from a detailed desk-based review and marine mammal observations made during Project specific boat-based European Seabirds at Sea (ESAS) surveys, undertaken on a monthly basis between June 2013 and May 2014. It was determined that harbour porpoise is by far the most commonly occurring species in the Project area. Three other cetacean species and two species of seal were also observed during the boat based surveys: white-beaked dolphin, minke whale, Risso's dolphin, grey seal and harbour seal.

A total of 328 marine mammal observations were made over the course of the ESAS surveys, of which 229 were harbour porpoise, representing 70% of all observations. Recordings of both individuals and groups were made, and no hotspots of activity were noted. The preponderance of harbour porpoise in the Project area concurs with the findings of the desk-based survey, which revealed that harbour porpoises are prevalent along the east coast of Scotland, occurring in highest densities in the north western North Sea in waters shallower than 100 m. Harbour porpoise were observed during all of the ESAS surveys, although numbers peaked between July and September. This conforms with expectations based on the literature, which states that harbour porpoise are observed in UK waters throughout the year (e.g. Evans *et al.,* 2003).

White-beaked dolphin was the second most commonly recorded species with a total of 39 observations recorded during the ESAS surveys. This is unsurprising considering it is one of the most abundant dolphin species in Scottish shelf waters, commonly recorded within the western sector of the central and northern North Sea. White-beaked dolphins were predominately observed in groups, with an average group size of four and a maximum group size of six. Sightings of the species in the UK are known to peak in between June and October, although they are present throughout the year (Reid *et al.,* 2003). All sightings of the white-beaked dolphin occurred in June and August.

The remaining two cetacean species were recorded in low numbers. Sixteen minke whale were observed, all of which were solitary. All sightings were made in spring or summer, with three quarters of sightings occurring in July or August. One observation of a pair of Risso's dolphins was made during November.

Grey seal was the third most commonly observed marine mammal species during the ESAS surveys, and therefore, also the most commonly observed seal species. Thirty eight animals were observed, most often as individuals, but sometimes in groups up to a maximum size of four. They were observed during every survey month except March. No particular hotspots of seal observations were recorded, though they were notably largely absent from the north east of the survey area. Throughout the ESAS surveys, four harbour seals were observed, making them the second least sighted marine mammal and there was not apparent pattern in their distribution.

A summary of marine mammal observations recorded during the ESAS surveys, together with calculated observations rates is presented in Table 3-1 Following the desk-based review, it was revealed that a further seven species of cetacean have the potential to occur in the Project study area:

- Bottlenose dolphin *Tursiops truncatus;*
- Humpback whale *Megaptera novaeangliae*;
- Fin whale *Balaenoptera physalus*;
- Atlantic white-sided dolphins *Lagenorhynchus acutus*;
- Killer whales *Orcinus orca*;
- Common dolphin *Delphinus delphis*; and
- Long-finned pilot whale *Globicephala melas*.

No bottlenose dolphin were observed during the ESAS surveys, but there is a large aggregation approximately 92 km northwest of the Project in the Moray Firth, for which an SAC has been designated. For the purposes of initial

screening it has been assumed that individuals from this aggregation may occur in the Project area; thus, they have been included in Table 3-1. The SNCBs (2013) state that there are relatively few reported sightings of bottlenose dolphin in the North Sea marine mammal management unit (MMMU), and that these are thought to be individuals belonging to the coastal population. On the advice of Marine Scotland, the coastal east Scotland management unit (195) has been used as a reference population for bottlenose dolphin in the Project area, although in general the species is most commonly found within the 20 m depth so will have little overlap.

Table 3-1 Special Areas of Conservation (SACs) and their qualifying interests that could potentially be affected by the proposed Project

Species	ESAS survey results				Foraging range	SACs within foraging range from Project study area where species is a qualifying interest
	Animals observed	Animals per hour	Animals per km	% of total encounters		
Harbour porpoise	229	1.765	0.091	69.8	Not defined	Only two SACs presently designated for this species, one in Ireland, one in Northern Ireland, both of which fall into the Celtic and Irish Seas (CIS) marine mammal management unit (MMMU). The harbour porpoises in the Project study area fall within the North Sea MMMU, which is separated from the CIS MMU by the West Scotland MMMU. As such, animals from the SACs and those that occur in the Project study area can safely be assumed to belong to distinct biogeographical populations.
White-beaked dolphin	39	0.301	0.016	11.9	Not defined	Not a qualifying interest of any UK SACs.
Minke whale	16	0.123	0.006	4.9	N/A	Not a qualifying interest of any UK SACs.
Risso's dolphin	2	0.015	0.001	0.6	Not defined	Not a qualifying interest of any UK SACs.
Grey seal	38	0.293	0.091	11.6	200 km from haul out sites	Berwickshire and North Northumberland SAC, Isle of May SAC
Harbour seal	4	0.031	0.002	1.2	50 km from haul out sites (SCOS, 2013)	None - the closest SAC with Harbour seal as a qualifying interest is the Firth of Tay and Eden Estuary SAC, which is approximately 132 km from the AfL area.
Bottlenose dolphin	No encounters but presence assumed for initial screening				Not defined	Moray Firth SAC

3.2 Long list of SACs requiring consideration in the HRA

This section presents a long list of sites requiring consideration in the HRA based on the existence of ecological connectivity between those sites and the Project area.

Of the species that may occur in the Project area the following are qualifying interests of SACs on the east coast of the UK:

- Bottlenose dolphin;
- Grey seal; and
- Harbour seal.

Although minke whale, white-beaked dolphin and Risso's dolphin were also identified as being present in the Project area, they are not listed as qualifying features of any SAC in the UK and therefore have not been considered further

is this HRA report. The SACs located within the known foraging ranges of the three qualifying interests listed above are shown in Table 3-2 and illustrated in Figure 3-1. Although harbour seal have been observed in the Project area, they are unlikely to be individuals from an SAC population, since the closest harbour seal SAC is approximately 160 km from the Project area, and they are known to generally forage at a maximum of 50 km from their haul out sites. The four SACs identified in Table 3-2 require further consideration as part of the HRA on the basis that there is potential ecological connectivity between them and the Project, and therefore potential for the Project to have an adverse effect on their conservation objectives.

There are a number of other SACs where grey and harbour seal are qualifying interests located along to the east coast of the UK and around the northern Scottish coast. Although these sites are outside the foraging range for both species they are shown in Figure 3-1 in order to highlight that they have been considered as part of the HRA process.

Table 3-2 Special Areas of Conservation (SACs) and their qualifying interests that could potentially be affected by the Project

SAC name	Qualifying interests (marine mammals)	Foraging range	Minimum distance from Project
Moray Firth	Bottlenose dolphin	Not defined. Assume distribution along UK east coast and connectivity with the Moray Firth population for purpose of initial screening.	115 km
Isle of May	Grey seal	200 km	153 km
Berwickshire and North Northumberland coast	Grey seal	200 km	170 km
Faray and Holm of Faray	Grey seal	200 km	205 km (included in initial screening since it is only marginally outside the foraging range)

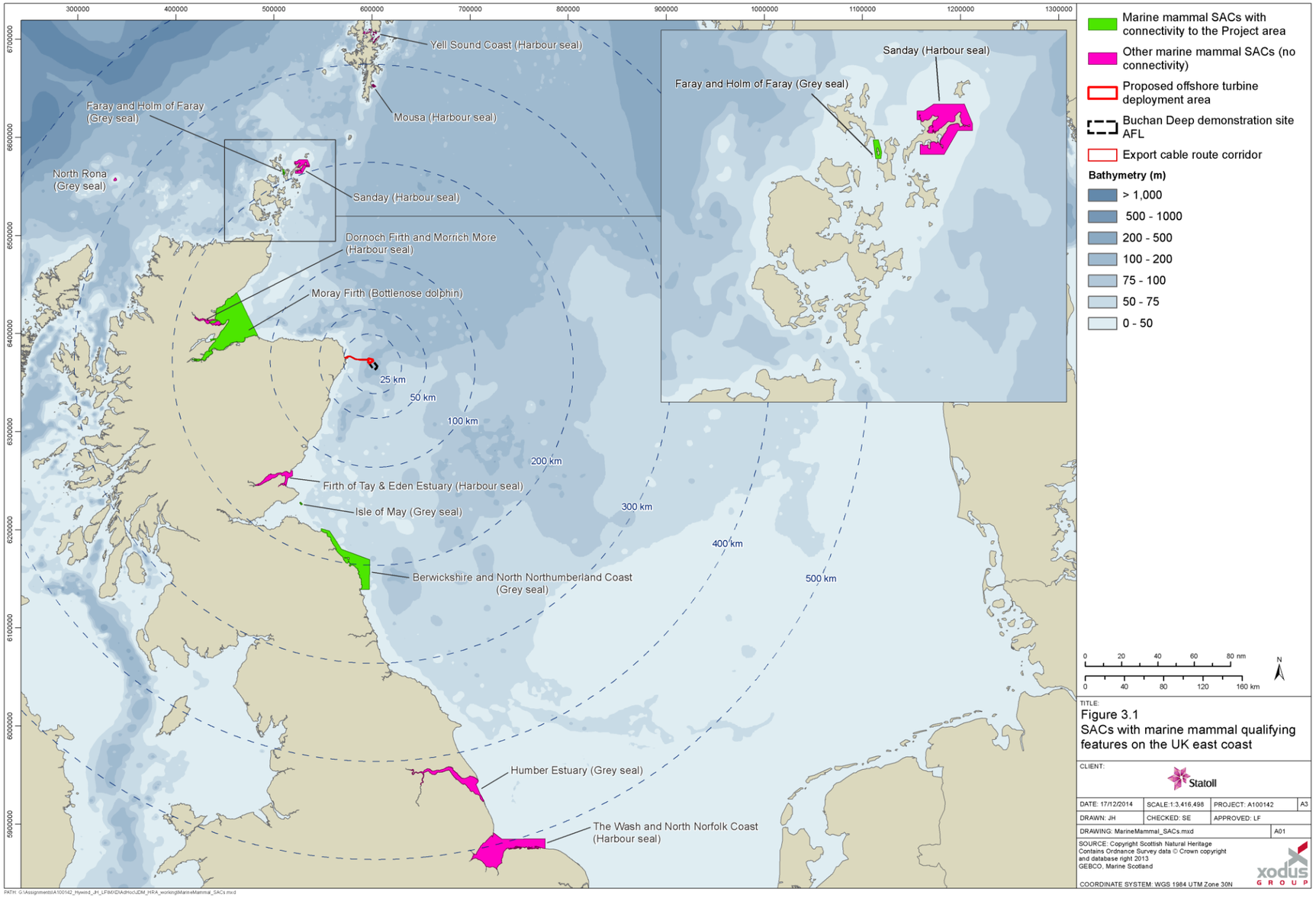


Figure 3-1 SACs with marine mammals as qualifying features on the UK east coast

3.3 Potential impacts on marine mammals (impact pathways)

Table 3-3 identifies the potential impacts of the Project on the three main marine mammal species identified in Section 3.1. This is based on information from Chapter 12 of the Environmental Statement (ES).

Table 3-3 Potential marine mammal impact pathways

Potential impact	Relevant Project phase			Description of potential impact on conservation objectives and site integrity
	C/I	O/M	D	
Noise (vessels, anchoring and other operations)	✓	✓	✓	There is potential for noise from the Project to cause disturbance to marine mammals, potentially affecting foraging, breeding or migration. Sensitivity to noise differs between species, but all species using the Project area will sensitive be to some degree. Potential effects on SACs will depend on whether there is potential for individuals from an SAC population to be affected by noise.
Physical disturbance due to vessel presence near seal haul outs	✓	✓	✓	The physical presence of installation, maintenance and decommissioning activities close to seal haul outs could disturb animals at those haul outs. Should this disturbance occur for extended periods of time or at important parts of the species' life cycle (e.g. pupping) then this disturbance could affect the population of that species. Where these seal haul outs are part of an SAC this could impact the SAC seal population.
Corkscrew injury	✓	✓	✓	The use of ducted propellers has been implicated in so-called 'corkscrew' injury to marine mammals. Records of these fatal injuries are limited in number, but concerns have been raised that the true scale may be greater. Should vessels with ducted propellers be used in the Project then seals and small cetaceans would be expected to be most sensitive to impact. Potential effects on SACs will depend on whether there is potential for individuals from an SAC population to be affected by corkscrew injuries.
Entanglement in turbine moorings	×	✓	×	Feedback from Marine Scotland and their statutory advisors during EIA Scoping indicated the mooring lines and cables present in the water column may represent an entanglement risk for large marine mammals. Entanglement risk could be associated with the following: • WTG Unit mooring lines; • Inter array cables; and • Entanglement of fishing gear with the Project infrastructure which may represent a secondary entanglement risk to marine mammals. Potential effects on SACs will depend on whether there is potential for individuals from an SAC population to be affected by entanglement.
Accidental contamination	✓	✓	✓	There is potential for accidental contamination from vessels to occur as a result of collision during installation activities. The total oil inventory for the large installation vessels that may be required for the installation activities is likely to be in the region of 6 – 8 million litres of marine diesel stored in a number of separate tanks. The worst case spill from a single tank rupture is likely to be 600,000 litres. A leak of contained liquids could directly impact upon species using the site at the time of the release through toxic effect or indirectly through a negative impact on the habitat and prey species of the area. Effects on an SAC will depend on whether there is potential for individuals from an SAC population to be indirectly affected through changes in abundance and distribution of prey species etc.
C/I = construction / installation, O/M = operations and maintenance and D = decommissioning				

3.4 Assessment of Likely Significant Effects (LSE)

Table 3-4 presents the results from an assessment of LSE of the Project on all marine mammals that are qualifying features of SACs identified as having connectivity with the Project study area. For marine mammal species where LSEs cannot be ruled out, assessment is required on the impacts on site integrity.

Table 3-4 Assessment of LSE (by qualifying feature)

Qualifying feature	SAC	Potential for impact on SAC population	Assessment
Bottlenose dolphin	Moray Firth SAC	No bottlenose dolphins were observed in the Project area during the ESAS surveys, which took place on two consecutive days each month over the course of a year. This is consistent with recent work conducted by Quick *et al.,* (2014) aimed at improving understanding of the ecology of the east coast bottlenose dolphin population outside of the Moray Firth. They reported that almost all observations were made in water depths less than 30 m, and generally between 2 m and 20 m. With the exception of some observations made at St. Andrews Bay and the Firth of Tay, all observations were made within 2 km of shore. This corroborates the findings of other studies looking specifically at the Moray Firth population (e.g. Thompson, 2011). The almost exclusively coastal distribution of the bottlenose dolphin population means that they are very unlikely to occur within the Project area and are therefore at a very low risk of entanglement. Bottlenose dolphin are not known to be susceptible to corkscrew injury. Clearly, physical disturbance at haul out sites does not apply to bottlenose dolphins, since this impact specifically refers to the disturbance of seals whilst at breeding haul outs on shore. The presence of bottlenose dolphin the coastal part of the Project footprint (the near-shore section of the cable route) means that only two of the potential impact mechanisms apply, noise and pollution. Since Project activity this close to shore will be extremely limited in both spatial and temporal extent (ca. 1 – 2 days), their exposure to these potential impacts will be limited to this short time period during installation. Furthermore, noise modelling work conducted in support of the EIA (presented in Chapter 12 of the ES) concluded that less than one individual (0.27% of the Moray Firth MMMU) may be disturbed by the noisiest vessel on site (cable lay vessel), and that there was no risk of fatality or injury. Disturbance during operation was predicted to be much more limited at approximately 0.0009% of the Moray Firth MMMU. The ecological importance of disturbing less than one individual is extremely limited, particularly considering the wide ranging nature of this species across much of the UK east coast, and the probably prevalence of suitable alternative areas for this individual to relocate to. This high mobility and abundance of suitable alterative areas to occupy also means that a relatively short-lived and localised contamination event is also extremely unlikely to affect the Moray Firth SAC population. Thus, it is concluded that there will be no Likely Significant Effects.	No LSE

Grey seal	Isle of May SAC Berwickshire and North Northumberland coast SAC Faray and Holm of Faray SAC	The ESAS surveys determined that the Project study area is used by grey seals and this is supported by studies of their UK wide distribution (e.g. Jones *et al.,* 2013; Matthiopoulos *et al.,* 2004). Grey seals tend to forage within 100 km of their haul-out sites (SCOS 2013; McConnell *et al.,* 1999). Satellite telemetry studies undertaken by Cronin *et al.* (2013) have shown that whilst mean foraging distance was 50.85 km, maximum distance varies widely, with the greatest distance travelled being 511 km (Cronin *et al.* 2013). Similarly, there is evidence that grey seals may move long distances between pairs of SACs (SCOS 2013) and that between 21 % and 58% of seals breeding at a given SAC site foraged in a different region (Russell *et al.,* 2013). The Russell *et al.,* (2013) study determined that marine developments on the UK east coast have the potential to impact the two regional SACs (Isle of May SAC and Berwickshire and North Northumberland coast SAC), as well as between 9% (ca. 242) and 49% (ca. 1,374) of females that breed at the Faray and Holm of Faray SAC, but venture south to the east coast to forage (Russell *et al.,* 2013). Grey seal SACs are located between 153 and 205 km from the Hywind project area. Therefore some individuals from these SACs could be present in the vicinity of the Project on occasions, although the Project area will not be a key foraging area for SAC individuals. Based on the information above, grey seals from populations associated with the three SACs listed to the left may, at times, occur within the Project area. However based on the long distances that separate grey seal SACs from the Project area, the fact that the UK grey seal population is still increasing (albeit at a slower rate than in the past) and the overall conclusion that there will be no significant impacts on seals from the Project, it can be concluded that there will be no Likely Significant Effects on grey seal SAC populations.	No LSE

3.5 Conclusion from assessment of LSE

Results from the site surveys and supporting desk studies indicated that seven species of marine mammal are likely to be present in the Project area and surrounding waters and of those, only four are likely to present with any regularity – harbour porpoise, white-beaked dolphin, grey seal and minke whale.

Grey seal was the most frequently observed seal and third most frequently observed marine mammal during the Project specific ESAS surveys. Grey seal is a qualifying feature of three SACs located sufficiently close that individuals from those populations may forage within the Project area, namely the Isle of May SAC, Berwickshire and North Northumberland coast SAC and the Faray and Holm of Faray SAC. However based on the large distances between these SACs and the Project area (over 150 km) there is little chance that individuals from SAC populations will be present in the Project area and therefore impacted by the Project.

White-beaked dolphin and minke whale were both screened out because they are not qualifying features of any UK SACs. Harbour porpoise was also screened out since there are presently only two SACs for this species, one in Ireland and one in Northern Ireland. There are several SACs designated for harbour seal along the east coast, all of which are located sufficiently far from the project Study area that there is very little chance that individuals from the SAC populations would be impacted by the Project.

The Moray Firth SAC, located approximately 115 km from the AfL is one of two sites in the UK designated to protect resident/semi-resident populations of bottlenose dolphin. Whilst 115 km is well within the foraging range of this highly mobile species, long-term studies conducted in the area suggest the species is primarily distributed along the near-shore, with the majority of sightings occurring in depths of less than 20 m and within 2 km of the coast. This observation was borne out in the site-specific ESAS surveys, during which no bottlenose dolphin were observed. As such, it is very unlikely that the Project area and surrounding wasters where there could be impacts on mammals are used by this species, and thus, very unlikely that they may be impacted by it.

4 HRA SCREENING – SPECIAL AREAS OF CONSERVATION (SACS) FOR MIGRATORY FISH

4.1 Migratory fish in the Project study area

The baseline characterisation study carried out as part of the fish ecology ES chapter (Chapter 10) found that there is potential for three species of fish to occur in the Project area on an occasional basis:

Atlantic salmon *Salmo salar;*

Sea lamprey *Petromyzon marinus;*

River lamprey *Lampetra fluviatilis.*

Atlantic salmon and both species of lamprey are anadromous, meaning they spend the majority of their adult lives in seawater (or estuarine water in the case of river lamprey) but return to freshwater to reproduce. There is limited information available on the at-sea migrations of these species because studies of movements in open water are technically challenging and expensive. The baseline study concluded that the relative proximity of several diadromous fish rivers to the Project means that the Project area may be used by salmon and lamprey as they migrate between their freshwater spawning grounds and foraging areas at sea.

Atlantic salmon are widely distributed in Scotland and their populations are recognised as features of national and international importance. The closest SACs with Atlantic salmon as a qualifying feature are the River Dee and the River South Esk, located 53 km and 103 km from the AfL area, respectively.

Salmon spawn in freshwater, where the juvenile life stage (referred to as parr) is spent. Parr remain in freshwater for between one and four years, after which they migrate to the sea as smolts, which head out to sea in shoals in late spring and travel thousands of kilometres to their feeding grounds in cold northern waters. Adults feed at sea for between one and five years before returning to their natal rivers to spawn. Migratory movement of smolts and adults to and from natal rivers tends to peak between March and June. Salmon from rivers on the east coast of Scotland and England migrate north to feeding grounds around west Greenland and the Faroe islands (Malcolm *et al.,* 2010), so salmon from rivers on the northeast UK coast, as well as those further south, may transit the Project area as they depart and return to natal rivers.

Sea lamprey spawn in gravel beds of freshwater streams and mature in the open sea. Relatively little is known about the precise habitats occupied by adult sea lampreys (Maitland, 2003) as it is uncommon in the UK (DECC, 2009), but the main population of this species are found in the Bristol Channel and adjacent offshore waters (DECC, 2009). The rarity of capture in coastal and estuarine waters suggests that marine lampreys are solitary hunters and widely dispersed at sea. Sea lamprey have been caught at considerable depth (up to 4,099 m) suggesting that they can feed in deeper offshore waters (Haedrich, 1977). Homing behaviour is not apparent in this species. However they are selective in their choice of spawning streams and are thought to favour sites where ammocoete larvae are present due to olfactory cues (OSPAR, 2008). Their distribution in Scotland is more limited than Atlantic salmon, since many northern Scottish rivers are considered to be unsuitable for the species due to their high flow rates. However, there are a number of rivers in southern Scotland and the UK east coast that have been designated as SACs with sea lamprey as a qualifying feature, the closest being the River Spey, located ca. 50 km north east of the AfL area.

River lamprey are generally found no further north than the Great Glenn and primarily inhabit estuarine waters, where they feed on a variety of fish species before migrating upriver to spawn (Maitland, 2003); hence, they are unlikely to be found within the Project area. The closest SAC with River Lamprey as a qualifying feature in the River Tay, located ca. 141 km south of the Project area. Considering that adults of species tend to be restricted to estuaries close to their natal rivers, they are extremely unlikely to occur in the Project area.

Long list of SACs requiring consideration in HRA

Table 4-1 lists all of the SACs on the UK coast with migratory fish as qualifying features which have the potential to be affected by the Project. The location of these SACS in relation to the Project is displayed in Figure 4-1.

On the basis that seaward salmon migration on the east coast of Scotland occurs in a northerly direction (Malcolm *et al.,* 2010), only salmon associated with rivers to the south of the Project area have the potential to transit the area during migration to and from natal rivers. It has therefore been concluded that for the purpose of this HRA, only SACs with Atlantic salmon with qualifying features located on the east coast of Scotland and the east and south coast of England have the potential to be affected by the Project. The River Spey, which enters the Moray Firth on the south side, has also been included because evidence presented in in Malcolm *et al.,* (2010) suggests that salmon entering and exiting the Moray Firth may track along the north Aberdeenshire coast, which could bring them within close proximity of the Project area (Annex I).

Relatively little is known about the migratory patterns of sea lamprey, except that they disperse widely into open water environment, and that by virtue of the parasitic nature of adults at sea, their distribution is primarily dictated by their hosts, which include a variety of marine and anadromous fishes, including shad, herring, pollock, salmon, mullets, cod, haddock, greenland sharks and basking sharks (OSPAR, 2008; Gallant et al. 2006). Thus, in line with a precautionary approach, all SACs on the east and south coast of the UK have been included. Since all river lamprey SACs across this area coincide with those designated for sea lamprey, these have also been identified in the long list, their primarily estuarine distribution means that they are extremely unlikely to occur in the Project area.

Table 4-1 SACs on the UK east/south coast with migratory fish as qualifying features

Site	Atlantic salmon	Sea lamprey	River lamprey	Distance from AfL area (km)	Location
River Dee	✓✓	×	×	53	East Scotland (Aberdeenshire)
River South Esk	✓✓	×	×	103	East Scotland (Angus)
River Spey	✓✓	✓✓	×	110	East Scotland (Highland, Moray, Perthshire)
River Tay	✓✓	✓	✓	141	East Scotland (Angus, Argyll and Bute, Perth & Kinross, Stirling)
River Tweed	✓✓	✓	✓	186	England/Scotland (Northumberland, Scottish Borders)
Tweed Estuary	×	✓	✓	186	East England (Northumberland)
River Moriston	✓	×	×	224	Scotland (Highland)
River Teith	✓	✓✓	✓✓	237	East Scotland (Stirling)
Humber Estuary	×	✓	✓	431	East England (Yorkshire & the Humber)
River Derwent	×	✓	✓✓	480	East England (Yorkshire)
River Itchen	✓	×	×	980	South England (Hampshire)
River Avon	✓✓	✓✓	×	1,000	South England (Dorset, Hampshire, Wiltshire)
Dartmoor	✓	×	×	1,100	South England (Devon)
River Axe	×	✓	×	1,170	South England (Devon, Dorset)
(✓✓ = primary reason for site selection, ✓ = qualifying feature but not primary reason for site selection). Distances calculated based on shortest route via sea.					

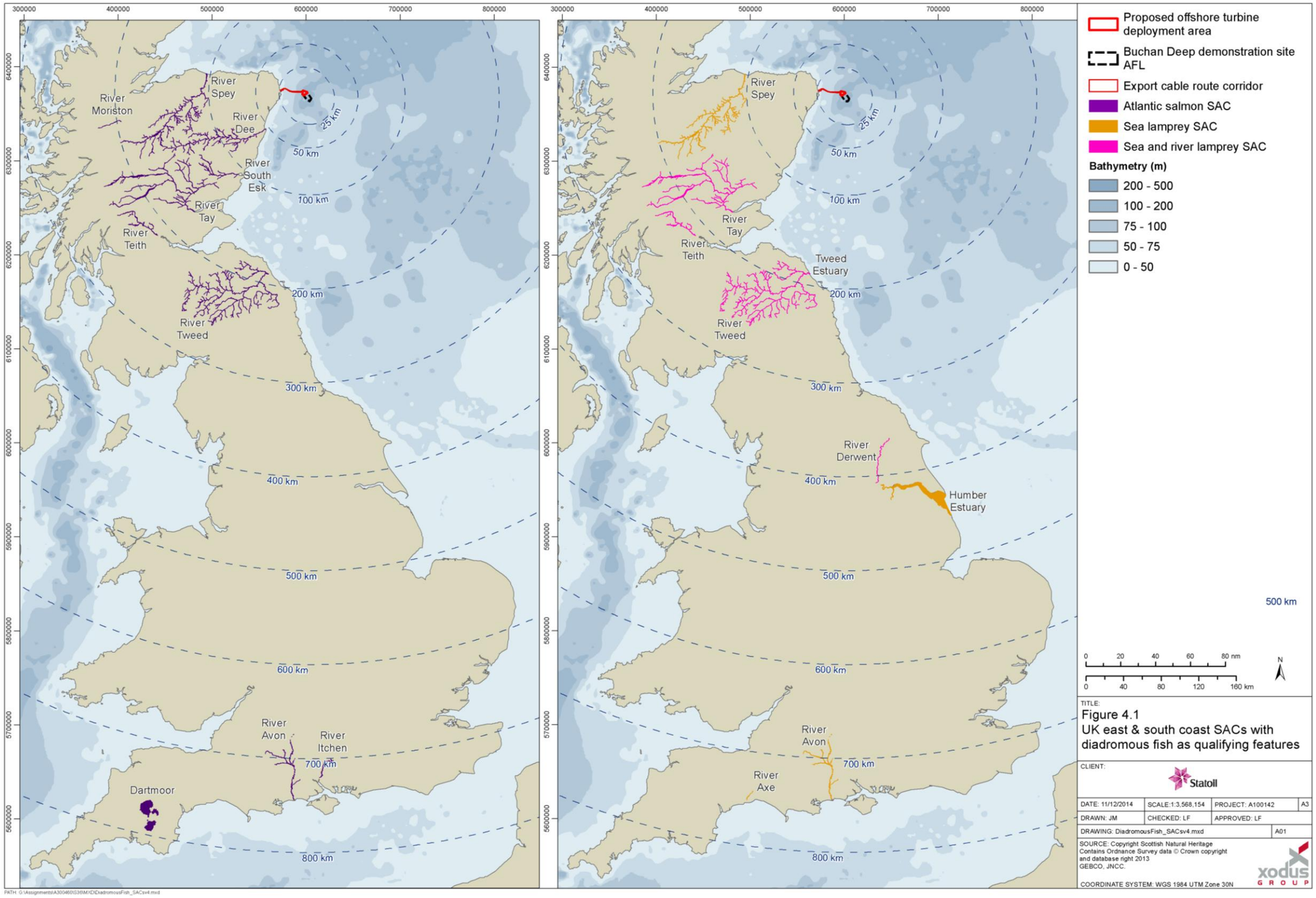


Figure 4-1 UK east ans south coast SACs with diadromous fish as qualifying features

4.2 Potential impacts on migratory fish (impact pathways)

Table 4-2 below identifies the potential impacts of the Project on migratory fish during all stages of the Project.

Table 4-2 Potential impacts of migratory fish

Potential impact	Relevant Project phase			Description of potential impact on conservation objectives and site integrity
	C/I	O/M	D	
Increased turbidity	✓	×	×	There is the potential for increased turbidity due to sediment release during anchor placement and cable trenching. Increased turbidity has the potential to impact migratory fish by fragmenting populations and altering migration patterns by eliciting avoidance behaviour (Thorstad *et al.,* 2005).
Noise (vessels, anchoring and other activities)	✓	✓	✓	There is potential for noise associated with the Project to cause disturbance to diadromous fish during their migration to and from their natal rivers. Sensitivity to noise differs between species, but all species using the Project area will be sensitive to some degree. Potential effects on SACs will depend on whether there is potential for individuals from an SAC population to be affected by noise. Very loud noise emissions also have the potential to cause physical injury or mortality.
Electromagnetic fields (EMF)	×	✓	×	There is the potential for EMF from the export cables to interfere with navigation (orientation and direction of travel) of diadromous fish as they migrate through the Project area.
Heat emissions	n/a	n/a	n/a	Heat emissions from power cables have the potential to directly affect the distribution of demersal fish species and indirectly affect benthivorous fish species by altering the distribution of their prey items. Salmon and lamprey are neither demersal nor benthivorous, so this potential impact has not been considered further here. Small portions of the inter-array cables will be suspended in the water column, however, water movement will dissipate most heat generated by these, and the ecological importance of extremely localised and minor increases in water temperature to migrating fish are negligible.
Entanglement risk	n/a	n/a	n/a	The risk of entanglement is only relevant to large fish such as basking shark so has not been considered further here.
Accidental contamination	✓	✓	✓	There is potential for accidental contamination from vessels to occur as a result of collision during installation activities. The total oil inventory for the large installation vessels that may be required for the installation activities is likely to be in the region of 6 – 8 million litres of marine diesel stored in a number of separate tanks. The worst case spill from a single tank rupture is likely to be 600,000 litres. A leak of contained liquids could directly impact upon species using the site at the time of the release through toxic effect or indirectly through a negative impact on the habitat and prey species of the area. The significance of these impacts varies according to the volume and type of fuel and weather conditions/tides/location.
C/I = construction / installation, O/M = operations and maintenance and D = decommissioning				

4.3 Assessment of Likely Significant Effects (LSE)

Table 4-3 presents the results from the assessment of LSE of the Project on SACs where migratory fish are a qualifying feature.

Table 4-3 Assessment of LSE by qualifying feature

Qualifying feature	SAC	Potential for impact on SAC population				Assessment
		Increased turbidity	Noise	EMF	Accidental contamination	
Atlantic salmon	River Dee, River South Esk, River Spey, River Tay, River Tweed, River Moriston, River Teith, River Itchen, River Avon, Dartmoor.	**No LSE.** Increased turbidity will be localised and temporary. The highly dynamic environment in the Project area will rapidly disperse sediment generated during trenching and anchor placement. During this time, turbidity levels are likely to be within the bounds of natural variability in this dynamic environment so it is extremely unlikely that foraging or migration of salmon from any of the listed SACs will be affected. Even if salmon do show an aversive response, the small affected areas will be easily circumvented.	**No LSE.** The marine noise study carried out to inform the EIA identified that noise generated by construction vessels will be temporally and spatially restricted, and at worst evoke an avoidance response in hearing 'specialists' such as herring. No piling will be undertaken so this does not present an issue. Operational noise was assessed as negligible in the context of background levels. Atlantic salmon are considered as hearing 'generalists' that are of low vulnerability to increases in underwater noise (Nedwell, 2003), so it is extremely unlikely that noise will have a significant impact on salmon from any of the listed SACs or otherwise.	**No LSE.** Migrating salmon spend the majority of their time in the upper water column (e.g. Godfrey *et al.* (2014) showed tagged adult salmon in Scottish waters and found that the median number of records at 0 – 5 m ranged from 72 – 85%), so are only likely to encounter cables in the very shallow near-shore section of the export cable route, and small sections of the inter-array cables where they are suspended close to the WTGs. It should be noted though, that diving behaviour varies widely between life-stages and salmon do intermittently dive to depths in excess of 100 m (Godfrey *et al.,* 2014). The area within which EMF may be detectable will be very small and the fields very weak and undetectable outside approximately 2 m. No negative effects of EMF from wind farm export cables on elasmobranch, which are more electro / magneto-sensitive than salmonids have been demonstrated (Cefas, 2010). This is borne out by the fact that many existing salmon migration routes cross existing subsea power cables (Malcolm *et al.,* 2010).	**NO LSE.** Accidental contamination events are extremely unlikely. Statoil will have measures in place to reduce the likelihood and impact of such events, for instance, an Oil Spill Response Pan, SOPEPS for vessels over 400 GRT, on-board spill and mop up kits, the restriction of marine operations outside suitable weather conditions. In the unlikely event that any pollution does occur, it is likely to be only small inventories that will be released and they will rapidly disperse in the dynamic offshore marine environment.	No LSE
Sea lamprey	River Spey, River Tay, River Tweed, Tweed Estuary, River Teith, Humber Estuary, River Derwent, River Avon, River Axe.	**No LSE.** As above. In fact, as occasional river fish, lamprey are likely to be even less sensitive to turbidity than salmon.	**No LSE.** As above. Sea lamprey lack specialist hearing structures and are considered hearing 'generalists'. Indeed, it is possible that sound in not a relevant part of their behavioural ecology at all (Popper, 2005).	**No LSE.** As above. In addition, although sea lamprey are known to use electro-magneto reception, its role in navigation is unclear, and may be more important for predation and mate detection than navigation.	**No LSE.** As above.	No LSE

4.4 Conclusion from assessment of LSE

Based on the results of the assessment of LSE presented in the previous section, it can be concluded that the Project will not have any LSE on SACs where migratory fish species are a qualifying interest. Hence, there is no need to further assessment.

To summarise, both Atlantic salmon and sea lamprey are wide ranging species with long migration routes and large, offshore, deep water foraging areas. By contrast, impacts associated with noise, increased turbidity and accidental contamination will be highly localised and short-lived. As such, they are predicted to have no impact on the successful migrations of the two species in question whilst transiting between SAC rivers and their offshore feeding grounds.

With respect to EMF emissions from cables, no significant effects on the two species are expected. Cables on the seabed will be trenched and buried or protected with rock where possible. Inter-array cables in the water column will be armoured. Both these measures will increase the distance between the cables and the receptors, thereby reducing the potentially affected area. Furthermore, Atlantic salmon's preference for primarily occupying the upper regions of the water column suggests that they may only encounter cables across a narrow shallow band very close to shore and in very small areas close to the WTGs, where the inter-array cables are suspended in the water column. No evidence to date suggests encountering such cables negatively affects the migration of salmon and lamprey, whose migration routes already cross areas containing subsea electrical cabling.

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APPENDIX A ORNITHOLOGY HRA SCREENING AND SPA PROPORTIONING

Table A.1 HRA screening results for breeding seabirds in relation to seabird SPAs

Qualifying feature	Seasonality	Mean foraging range MFR (km)	Mean maximum foraging range MMFR (km) (+10%)	Maximum foraging range (km)	Estimated potential for connectivity	Bird density at WT+ 1km area based on baseline survey results (95% UCL of mean seasonal density)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Buchan Ness to Collieston Coast SPA (20 km away)											
European shag	Breeding	6 (7)	15 (17)	17	Above max	Not recorded using Hywind site	Moderate	Very low	No	No	Distance to site beyond maximum foraging range, species prefers inshore habitat.
Kittiwake	Breeding	25	60 (66)	120	High	High density (8.56 birds/km^2)	Low	Moderate	Yes	Yes	High connectivity, distance to study area overlaps with MFR. Overlap exists with other OWF developments.
Guillemot	Breeding	38	84 (93)	135	High	High density (22.63 birds/km^2)	Moderate	Very low	Yes	Yes	High connectivity, distance to study area overlaps with MFR. Overlap exists with other OWF developments.
Herring gull	Breeding	11	61 (67)	92	Moderate	Very low density (0.10 birds/km^2)	Very low	Very high	Yes	Yes	Very high vulnerability to collision risk. Overlap exists with other OWF developments.
Fulmar	Breeding	48	400 (440)	580	High	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	High connectivity, distance to study area overlaps with MFR. Overlap exists with other OWF developments. However, rather limited importance of study area, very large foraging range, very low vulnerability levels.
Loch of Strathbeg SPA (27 km away)											
Sandwich tern*	Breeding	12	49 (54)	54	Moderate	Not recorded using Hywind site	Low	Low	No	No	Not recorded, despite deploying appropriate survey effort.
Ythan Estuary, Sands of Forvie and Meikle Loch SPA (32 km away)											
Sandwich tern*	Breeding	12	49 (54)	54	Moderate	Not recorded using Hywind site	Low	Low	No	No	Not recorded, despite deploying appropriate survey effort.
Common tern	Breeding	5 (6)	15 (17)	30	Above max	Recorded in very small numbers (n=3 individuals). Insufficient records to reliably estimate density.	Low	Low	No	No	Distance to site beyond maximum foraging range, exceedingly small bird numbers recorded.
Troup, Pennan and Lion`s Heads SPA (50 km away, direct distance of 47 km used for herring gull)											
Kittiwake	Breeding	25	60 (66)	120	Moderate	High density (8.56 birds/km^2)	Low	Moderate	Yes	Yes	Distance to study area falls well within MMFR. Overlap exists with other OWF developments.
Guillemot	Breeding	38	84 (93)	135	Moderate	High density (22.63 birds/km^2)	Moderate	Very low	Yes	Yes	Distance to study area falls well within MMFR. Overlap exists with other OWF developments.
Herring gull*	Breeding	11	61 (67)	92	Moderate	Very low density (0.10 birds/km^2)	Very low	Very high	Yes	Yes	Very high vulnerability to collision risk; distance to study area falls well within MMFR. Overlap exists with other OWF developments.
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Moderate connectivity, distance to study area overlaps with MFR. Overlap exists with other OWF developments. However, rather limited importance of study area, very large foraging range, very low vulnerability levels
Razorbill	Breeding	24	49 (54)	95	Moderate	Moderate density (3.07 birds/km^2)	Moderate	Very low	Yes	Yes	Distance to study area falls well within MMFR. Overlap exists with other OWF developments.
Fowlsheugh SPA (71 km away)											
Kittiwake	Breeding	25	60 (66)	120	Low	High density (8.56 birds/km^2)	Low	Moderate	Yes	Yes	Distance to study area only marginally above MMFR. Overlap exists with other OWF developments.
Guillemot	Breeding	38	84 (93)	135	Moderate	High density (22.63 birds/km^2)	Moderate	Very low	Yes	Yes	Distance to study area falls well within MMFR. Overlap exists with other OWF developments.
Herring gull	Breeding	11	61 (67)	95	Low	Very low density (0.10 birds/km^2)	Very low	Very high	Yes	Yes	Very high vulnerability to collision risk; distance to study area only marginally above MMFR. Overlap exists with other OWF developments.
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels.

Qualifying feature	Seasonality	Mean foraging range MFR (km)	Mean maximum foraging range MMFR (km) (+10%)	Maximum foraging range (km)	Estimated potential for connectivity	Bird density at WT+ 1km area based on baseline survey results (95% UCL of mean seasonal density)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Razorbill	Breeding	24	49 (54)	95	Low	Moderate density (3.07 birds/km^2)	Moderate	Very low	Yes	Yes	Distance to study area above MMFR, although within MMFR+1s.d. (moderate confidence, Thaxter *et al.* 2013); moderately vulnerable; relatively few colonies on NE Scottish coastline, therefore strong likelihood significant number of birds originate from Fowlsheugh
East Caithness Cliffs SPA (138 km away)											
Atlantic puffin	Breeding	4	105 (116)	200	Low	High density (10.58 birds/km^2)	Low	Very low	No	No	Distance to study area substantially higher than MMFR
Kittiwake	Breeding	25	60 (66)	120	Low	High density (8.56 birds/km^2)	Low	Moderate	No	No	Distance to study area exceeds maximum range
Guillemot	Breeding	38	84 (93)	135	Above max	High density (22.63 birds/km^2)	Moderate	Very low	No	No	Known connectivity with study area (RSPB tracking), though distance to study area essentially at maximum range. Overlap exists with other OWF developments though Hywind site unlikely to be of importance to breeding birds from this colony at such a distance.
Great black-backed gull	Breeding	Not known	40	Not known	Above likely range	Very low density (0.08 birds/km^2)	Low	Very high	No	No	Species known to have a short foraging range, although limited data available. Even if herring gull range were used as a surrogate the distance to study area is substantially larger than maximum range.
Herring gull	Breeding	11	61 (67)	92	Above max	Very low density (0.10 birds/km^2)	Very low	Very high	No	No	Despite very high vulnerability to collision, distance to study area much larger than maximum range, and species occurs at very low density on site
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Razorbill	Breeding	24	49 (54)	95	Above max	Moderate density (3.07 birds/km^2)	Moderate	Very low	No	No	Distance to study area substantially above maximum range
North Caithness Cliffs SPA (150 km away)											
Guillemot	Breeding	38	84 (93)	135	Above max	High density (22.63 birds/km^2)	Moderate	Very low	No	No	Distance to study area just above maximum range. Hywind site unlikely to be of importance to breeding birds from this colony at such a distance.
Atlantic puffin	Breeding	4	105 (116)	200	Low	High density (10.58 birds/km^2)	Low	Very low	No	No	Distance to study area substantially higher than MMFR
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Forth Islands SPA (153km away)											
Atlantic puffin	Breeding	4	105 (116)	200	Low	High density (10.58birds/km^2)	Low	Very low	Yes	Yes	Distance to study area substantially higher than MMFR, and on outer edge of MMFR+1s.d. (low confidence, Thaxter et al. 2013). However, large number of birds on site during breeding season likely originate from this SPA, LSE cannot be ruled out. Overlap exists with other OWF developments.
Lesser black-backed gull	Breeding	72	141 (155)	181	Moderate	Recorded in very small numbers (n=4 individuals). Insufficient records to reliably estimate density.	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area substantially higher than MMFR, exceedingly small numbers recorded.
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Gannet	Breeding	93	229 (252)	590	Moderate	Very low density (0.97 birds/km^2)	Very low	High	Yes	Yes	Distance to study area falls well within MMFR, high vulnerability to collision risk. Overlap exists with other OWF developments.
Copinsay SPA (170 km away)											
Fulmar	Breeding	48	400 (440)	480	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels

Qualifying feature	Seasonality	Mean foraging range MFR (km)	Mean maximum foraging range MMFR (km) (+10%)	Maximum foraging range (km)	Estimated potential for connectivity	Bird density at WT+ 1km area based on baseline survey results (95% UCL of mean seasonal density)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Hoy SPA (177 km away, direct distance of 176 km used for great skua)											
Atlantic puffin	Breeding	4	105 (116)	200	Low	High density (10.58 birds/km^2)	Low	Very low	No	No	Distance to study area significantly higher than MMFR.
Great Skua*	Breeding	36	86 (95)	219	Low	Present in small numbers during the breeding season, Very low density (0.07 birds/km^2)	Very low	Low	No	No	Overlap exists with other OWF developments. Distance to study area significantly higher than MMFR; Thaxter et al. (2013) indicate low level of confidence in MMFR and maximum range.
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Farne Islands (193 km away)											
Atlantic puffin	Breeding	4	105 (116)	200	Low	High density (10.58birds/km^2)	Low	Very low	No	No	Overlap exists with other OWF developments. Distance to study area significantly higher than MMFR, nearing maximum range
Calf of Eday SPA (203 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Rousay SPA (205 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
West Westray SPA (214 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Fair Isle SPA (220 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Gannet	Breeding	93	229 (252)	590	Moderate	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area falls within MMFR, though considered unlikely that birds from relatively small Fair Isle colony would need to range this far.
Sule Skerry and Sule Stack SPA (250 km away)											
Gannet	Breeding	93	229 (252)	590	Moderate	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area is at upper limit of MMFR; birds from these colonies much more likely to forage over the shelf edge in NW Scottish waters.
Cape Wrath SPA (258 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Sumburgh Head SPA (258 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Foula SPA (290 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Noss SPA (290 km away)											

Qualifying feature	Seasonality	Mean foraging range MFR (km)	Mean maximum foraging range MMFR (km) (+10%)	Maximum foraging range (km)	Estimated potential for connectivity	Bird density at WT+ 1km area based on baseline survey results (95% UCL of mean seasonal density)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Gannet	Breeding	93	229 (252)	590	Low	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area is above MMFR; birds from Noss more likely to forage in waters around Shetland
Handa SPA (300 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
North Rona and Sula Sgeir SPA (324 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Gannet	Breeding	48	229 (252)	590	Low	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area significantly above MMFR. Birds from these colonies much more likely to forage over the shelf edge in NW Scottish waters where particularly high densities occur during breeding season (Stone *et al.* 1995)
Fetlar SPA (339 km away)											
Fulmar	Breeding	48	400	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Flamborough Head and Bempton Cliffs SPA (364 km away)											
Gannet	Breeding	93	229 (252)	590	Low	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area significantly above MMFR. Birds from this colony are known to have a relatively restricted foraging range of the English east coast (Hamer *et al.* 2011)
Hermaness, Saxa Vord and Valla Field SPA (371 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Gannet	Breeding	93	229 (252)	590	Low	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area significantly above MMFR. Birds from these colonies more likely to forage in Shetland waters.
The Shiant Isles SPA (382 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Flannan Isles (426 km away)											
Fulmar	Breeding	48	400 (440)	580	Moderate	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
St Kilda SPA (494 km away)											
Fulmar	Breeding	48	400 (440)	580	Low	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels
Gannet	Breeding	93	229 (252)	590	Low	Very low density (0.97 birds/km^2)	Very low	High	No	No	Overlap exists with other OWF developments. Distance to study area exceedingly large. Colony birds likely to predominantly forage in rich waters around St. Kilda.
Mingulay and Berneray (535 km away)											

Qualifying feature	Seasonality	Mean foraging range MFR (km)	Mean maximum foraging range MMFR (km) (+10%)	Maximum foraging range (km)	Estimated potential for connectivity	Bird density at WT+ 1km area based on baseline survey results (95% UCL of mean seasonal density)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Fulmar	Breeding	48	400 (440)	580	Low	Moderate density (3.03 birds/km^2)	Very low	Very low	No	No	Overlap exists with other OWF developments. Limited importance of study area, very large foraging range, very low vulnerability levels

Distance between designated site and development site given is the minimum by-sea distance to the 3km Hywind buffer boundary from the potential nearest breeding location within an SPA boundary. For skuas, gulls (excluding kittiwake), and terns direct distance between these points is used and is indicated with an asterisk where this distance differs from the by-sea distance. Connectivity: **High** = designated SPA to buffer boundary <= mean foraging distance of qualifier, **Moderate** = designated SPA to buffer boundary > mean foraging distance <= MMFR+10%, **Low** = designated SPA to buffer boundary > mean foraging distance < MMFR+10% < Maximum foraging distance, **Above max** > maximum foraging distance. Foraging range information derived from Thaxter *et al.* (2012) and Ratcliffe *et al.* (2000), classification of connectivity potential described in Technical Report (NRP 2015).

Vulnerability to disturbance, displacement and collision derived from Furness *et al*. (2012), classification described in Technical Report (NRP 2015).

Note: for the sake of brevity above 150 km distance from the Hywind site only long-ranging qualifying interests are tabulated (fulmar, gannet, lesser black-backed gull, great skua, and Atlantic puffin)

Table A.2 HRA screening results for non-breeding seabirds in relation to seabird SPAs

Qualifying feature	Seasonality	BDMPS Area	Population (adults)	UK SPA birds in BDMPS (adults)	Individual SPA birds in BDMPS (adults)	Bird abundance at Hywind site + 1km buffer (95% UCL of seasonal mean, assumed all birds are adults)	Number of adults at Hywind site from individual SPAs (rounded up to whole individual birds)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Buchan Ness to Collieston Coast SPA (20 km away)												
European shag	Non-breeding	UK NW North Sea	18,033	6,033	662	Not recorded	0	Moderate	Very low	No	No	Overlap with other OWFs exists. Species either not recorded or likely SPA bird numbers exceedingly small irt adult population
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	15,050	4	1	Low	Moderate	No	No	
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	20,685	52	2	Moderate	Very low	No	No	
Herring gull	Non-breeding	UK North Sea & Channel	210,289	25,389	6,166	17	5	Very low	Very high	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	1,914	25	1	Very low	Very low	No	No	
Loch of Strathbeg SPA and Ramsar site (27 km away)												
Sandwich tern	Migration	UK North Sea & Channel	25,594	12,404	0	Not recorded	0	Low	Low	No	No	Not recorded
Ythan Estuary, Sands of Forvie and Meikle Loch SPA and Ramsar site (32 km away)												
Common tern	Migration	UK North Sea & Channel	88,154	4,604	6	Recorded in very small numbers (n=3 individuals). Insufficient data to reliably estimate abundance.	1	Low	Low	No	No	Overlap with other OWFs exists. Species either very scarce on site or not recorded
Sandwich tern	Migration	UK North Sea & Channel	25,594	12,404	1,130	Not recorded	0	Low	Low	No	No	
Troup, Pennan and Lion`s Heads SPA (50 km away)												
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	17,875	4	1	Low	Moderate	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	15,313	52	2	Moderate	Very low	No	No	
Herring gull	Non-breeding	UK North Sea & Channel	210,289	25,389	3,162	17	3	Very low	Very high	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	2,513	25	1	Very low	Very low	No	No	
Razorbill	Non-breeding	UK North Sea & Channel	106,183	28,321	1,046	16	1	Moderate	Very low	No	No	
Fowlsheugh SPA (71 km away)												
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	11,204	4	1	Low	Moderate	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	48,160	52	4	Moderate	Very low	No	No	
Herring gull	Non-breeding	UK North Sea & Channel	210,289	25,389	513	17	1	Very low	Very high	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	270	25	1	Very low	Very low	No	No	
Razorbill	Non-breeding	UK North Sea & Channel	106,183	28,321	2,114	16	2	Moderate	Very low	No	No	
Cromarty Firth SPA (168 km away)												
Common tern	Migration	UK North Sea & Channel	88,154	4,604	95	Recorded in very small numbers (n=3 individuals). Insufficient data to reliably estimate abundance.	1	Low	Low	No	No	Overlap with other OWFs exists. Species very scarce on site.
Inner Moray Firth SPA (169 km away)												
Common tern	Migration	UK North Sea & Channel	88,154	4,604	0	Recorded in very small numbers (n=3 individuals). Insufficient data to reliably estimate abundance.	0	Low	Low	No	No	Colony abandoned, species very scarce on site.
East Caithness Cliffs SPA (138 km away)												
Atlantic puffin	Non-breeding	UK North Sea & Channel	199,974	134,858	82	26	1	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	48,492	4	2	Low	Moderate	No	No	

Qualifying feature	Seasonality	BDMPS Area	Population (adults)	UK SPA birds in BDMPS (adults)	Individual SPA birds in BDMPS (adults)	Bird abundance at Hywind site + 1km buffer (95% UCL of seasonal mean, assumed all birds are adults)	Number of adults at Hywind site from individual SPAs (rounded up to whole individual birds)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	149,100	52	12	Moderate	Very low	No	No	site exceedingly small irt adult population. Great cormorant not recorded on site (species prefers inshore habitat)
Great black-backed gull	Non-breeding	UK North Sea	32,070	1,490	350	13	4	Low	Very high	No	No	
Great cormorant	Non-breeding	UK NW North Sea	2,719	579	104	Not recorded	0	Moderate	Very low	No	No	
Herring gull	Non-breeding	UK North Sea & Channel	210,289	25,389	6,718	17	5	Very low	Very high	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	19,883	25	3	Very low	Very low	No	No	
Razorbill	Non-breeding	UK North Sea & Channel	106,183	28,321	7,500	16	5	Moderate	Very low	No	No	
North Caithness Cliffs SPA (150 km away)												
Atlantic puffin	Non-breeding	UK North Sea & Channel	199,974	134,858	293	26	1	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	12,180	4	1	Low	Moderate	No	No	
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	65,800	52	6	Moderate	Very low	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	19,950	25	3	Very low	Very low	No	No	
Razorbill	Non-breeding	UK North Sea & Channel	106,183	28,321	1,020	16	1	Moderate	Very low	No	No	
Forth Islands SPA (153 km away)												
Atlantic puffin	Non-breeding	UK North Sea & Channel	199,974	134,858	62,231	26	1	Low	Very low	No	No	Overlap with other OWFs exists. Species either not recorded (shag, great cormorant preferring inshore habitat) or likely SPA bird numbers exceedingly small irt adult population
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	3,720	4	1	Low	Moderate	No	No	
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	26,413	52	3	Moderate	Very low	No	No	
Common tern	Migration	UK North Sea & Channel	88,154	4,604	36	Recorded in very small numbers (n=3 individuals). Insufficient data to reliably estimate abundance.	1	Low	Low	No	No	
European shag	Non-breeding	UK NW North Sea	18,033	6,033	1,700	Not recorded	0	Moderate	Very low	No	No	
Great cormorant	Non-breeding	UK NW North Sea	2,719	579	96	Not recorded	0	Moderate	Very low	No	No	
Herring gull	Non-breeding	UK North Sea & Channel	210,289	25,389	5,597	17	4	Very low	Very high	No	No	
Lesser black-backed gull	Non-breeding	UK North Sea & Channel	37,302	8,578	1,608	Recorded in very small numbers (n=4 individuals). Insufficient data to reliably estimate abundance.	1	Very low	High	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	1,165	25	1	Very low	Very low	No	No	
Gannet	Non-breeding	UK North Sea & Channel	163,701	146,422	77,675	5	3	Very low	High	No	No	
Razorbill	Non-breeding	UK North Sea & Channel	106,183	28,321	1,575	16	1	Moderate	Very low	No	No	
St. Abb's to Fast Castle SPA (179 km away)												
Kittiwake	Non-breeding	UK North Sea Waters	375,815	184,615	6,806	4	1	Low	Moderate	No	No	Overlap with other OWFs exists. Species either not recorded (shag preferring inshore habitat) or likely SPA bird numbers exceedingly small irt adult population
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	44,206	52	4	Moderate	Very low	No	No	
European shag	Non-breeding	UK NW North Sea	18,033	6,033	419	Not recorded	0	Moderate	Very low	No	No	
Herring gull	Non-breeding	UK North Sea & Channel	210,289	25,389	478	17	1	Very low	Very high	No	No	
Razorbill	Non-breeding	UK North Sea & Channel	106,183	28,321	2,438	16	2	Moderate	Very low	No	No	

Qualifying feature	Seasonality	BDMPS Area	Population (adults)	UK SPA birds in BDMPS (adults)	Individual SPA birds in BDMPS (adults)	Bird abundance at Hywind site + 1km buffer (95% UCL of seasonal mean, assumed all birds are adults)	Number of adults at Hywind site from individual SPAs (rounded up to whole individual birds)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Copinsay SPA (170 km away)												
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	2,282	25	1	Very low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Pentland Firth Islands SPA (166 km away)												
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	0	128	0	Low	Very low	No	No	Colony abandoned
Hoy SPA (177 km away)												
Arctic skua	Autumn / spring	UK North Sea Waters	3,872 / 990	282 / 188	14 / 10	0.1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Atlantic puffin	Non-breeding	UK North Sea & Channel	199,974	134,858	1,050	26	1	Low	Very low	No	No	
Great Skua	Autumn / spring	UK North Sea & Channel	11,436 / 5,718	6,584 / 3,292	1,615 / 808	1	1	Very low	Low	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	27,420	25	4	Very low	Very low	No	No	
Farne Islands SPA (193 km away)												
Atlantic puffin	Non-breeding	UK North Sea & Channel	199,974	134,858	39,962	26	8	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Guillemot	Non-breeding	UK North Sea & Channel	955,860	683,920	67,064	52	6	Moderate	Very low	No	No	
Auskerry SPA (175 km away)												
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	1,350	128	15	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Calf of Eday SPA (203 km away)												
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	2,579	25	1	Very low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Rousay SPA (205 km away)												
Arctic skua	Autumn / spring	UK North Sea Waters	3,872 / 990	282 / 188	44 / 30	0.1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	1,442	25	1	Very low	Very low	No	No	
West Westray SPA (214 km away)												
Arctic skua	Autumn / spring	UK North Sea Waters	3,872 / 990	282 / 188	32 / 22	0.1	1	Very low	Low	No	No	

Qualifying feature	Seasonality	BDMPS Area	Population (adults)	UK SPA birds in BDMPS (adults)	Individual SPA birds in BDMPS (adults)	Bird abundance at Hywind site + 1km buffer (95% UCL of seasonal mean, assumed all birds are adults)	Number of adults at Hywind site from individual SPAs (rounded up to whole individual birds)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	900	128	10	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	1,219	25	1	Very low	Very low	No	No	
Papa Westray SPA (228 km away)												
Arctic skua	Autumn / spring	UK North Sea Waters	3,872 / 990	282 / 188	26 / 18	0.1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	317	128	4	Low	Very low	No	No	
Fair Isle SPA (220 km away)												
Arctic skua	Autumn / spring	UK North Sea Waters	3,872 / 990	282 / 188	23 / 15	0.1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	52	128	1	Low	Very low	No	No	
Great Skua	Autumn / spring	UK North Sea & Channel	11,436 / 5,718	6,584 / 3,292	319 / 160	1	1	Very low	Low	No	No	
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	41,509	25	6	Very low	Very low	No	No	
Gannet	Non-breeding	UK North Sea & Channel	163,701	146,422	5,494	5	1	Very low	High	No	No	
Sule Skerry and Sule Stack SPA (250 km away)												
Gannet	Non-breeding	UK Western Waters and Channel	391,540	342,640	9,350	5	1	Very low	High	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Cape Wrath SPA (258 km away)												
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	85	25	1	Very low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Sumburgh Head SPA (258 km away)												
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	365	128	4	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	326	25	1	Very low	Very low	No	No	
Mousa SPA (295 km away)												
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	32	128	1	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Foula SPA (290 km away)												
Arctic skua	Autumn / spring	UK North Sea Waters	3,872 / 990	282 / 188	42 / 28	0.1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	36	128	1	Low	Very low	No	No	

Qualifying feature	Seasonality	BDMPS Area	Population (adults)	UK SPA birds in BDMPS (adults)	Individual SPA birds in BDMPS (adults)	Bird abundance at Hywind site + 1km buffer (95% UCL of seasonal mean, assumed all birds are adults)	Number of adults at Hywind site from individual SPAs (rounded up to whole individual birds)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Great Skua	Autumn / spring	UK North Sea & Channel	11,436 / 5,718	6,584 / 3,292	1,988 / 994	1	1	Very low	Low	No	No	SPA bird numbers on site exceedingly small irt adult population
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	27,661	25	4	Very low	Very low	No	No	
Papa Stour SPA (224 km away)												
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	2,110	128	23	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Noss SPA (290 km away)												
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	7,347	25	1	Very low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Gannet	Non-breeding	UK North Sea & Channel	163,701	146,422	13,674	5	1	Very low	High	No	No	
Handa SPA (300 km away)												
Great Skua	Autumn / spring	UK Western Waters	10,154 / 16,498	5,222 / 8,314	270 / 270	1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Fulmar	Non-breeding	UK Western Waters and Channel	363,383	162,063	2,618	25	1	Very low	Very low	No	No	
North Rona and Sula Sgeir SPA (324 km away)												
Fulmar	Non-breeding	UK Western Waters and Channel	363,383	162,063	7,000	25	2	Very low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site zero or exceedingly small irt adult population
Gannet	Non-breeding	UK North Sea & Channel	163,701	146,422	0	5	0	Very low	High	No	No	
Fetlar SPA (339 km away)												
Arctic tern	Migration	UK North Sea & Channel	115,968	12,128	38	128	1	Low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Great Skua	Autumn / spring	UK North Sea & Channel	11,436 / 5,718	6,584 / 3,292	702 / 351	1	1	Very low	Low	No	No	
Fulmar	Breeding	UK North Sea Waters	363,383	162,063	12,477	25	2	Very low	Very low	No	No	
Ronas Hill - North Roe and Tingon SPA (339 km away)												
Great Skua	Autumn / spring	UK North Sea & Channel	11,436 / 5,718	6,584 / 3,292	227 / 113	1	1	Very low	High	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Flamborough Head and Bempton Cliffs SPA (364 km away)												
Gannet	Non-breeding	UK North Sea & Channel	163,701	146,422	15,485	5	1	Very low	High	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Hermaness, Saxa Vord and Valla Field SPA (371 km away)												

Qualifying feature	Seasonality	BDMPS Area	Population (adults)	UK SPA birds in BDMPS (adults)	Individual SPA birds in BDMPS (adults)	Bird abundance at Hywind site + 1km buffer (95% UCL of seasonal mean, assumed all birds are adults)	Number of adults at Hywind site from individual SPAs (rounded up to whole individual birds)	Disturbance / displacement vulnerability	Collision vulnerability	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Great Skua	Autumn / spring	UK North Sea & Channel	11,436 / 5,718	6,584 / 3,292	1,175 / 587	1	1	Very low	Low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population
Fulmar	Non-breeding	UK North Sea Waters	408,808	184,608	9,800	25	2	Very low	Very low	No	No	
Gannet	Non-breeding	UK North Sea & Channel	163,701	146,422	34,094	5	2	Very low	High	No	No	
The Shiant Isles SPA (382 km away)												
Fulmar	Non-breeding	UK Western Waters and Channel	363,383	162,063	6,142	25	1	Very low	Very low	No	No	Overlap with other OWFs exists. Likely SPA bird numbers on site exceedingly small irt adult population

Table A.3 HRA screening results for chicks-at-sea period (guillemot, razorbill) in relation to seabird SPAs

Qualifying feature	Seasonality	Regional breeding population RBP (guillemot, razorbill)	Population (adults)	UK SPA birds in BDMPS / RBP (adults)	Individual SPA birds in BDMPS / RBP (adults)	Seasonal abundance (95% UCL of mean) at Hywind site + 1km buffer	Number of birds at Hywind site from individual SPAs (all assumed to be adults, rounded up to whole individual birds, % of adult SPA population between brackets)	Disturbance / displacement vulnerability	Collision vulnerability[1]	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Buchan Ness to Collieston Coast SPA (20 km away)												
Guillemot	Chicks-at-sea	Caithness to Firth of Forth	452,919	446,914	39,345	3,169	1,578 (4%)	Moderate	Very low	No	No	Estimated 4% of SPA population present on site during post-breeding. Given adult's tendency for swift post-breeding dispersal into offshore waters with fledged chicks any potential displacement effect at the site or in combination with the Forth and Tay OWFs is likely negligible.
Troup, Pennan and Lion`s Heads SPA (50 km away)												
Guillemot	Chicks-at-sea	Caithness to Firth of Forth	452,919	446,914	64,257	3,169	575 (0.9%)	Moderate	Very low	No	No	Site not of particular importance during post-breeding (estimated 0.9% of SPA population present). Correcting for presence of non-breeding adults would reduce numbers further. Given adult's tendency for swift post-breeding dispersal into offshore waters with fledged chicks any potential displacement effect at the site or in combination with the Forth and Tay OWFs is likely negligible.
Razorbill	Chicks-at-sea	Caithness to Firth of Forth	54,424	50,070	6,644	1,085	181 (3%)	Moderate	Very low	No	No	An estimated 3% of the SPA population is present on site during post-breeding. Given species' tendency for swift post-breeding dispersal into offshore waters with fledged chicks any potential displacement effect at the site or in combination with the Forth and Tay OWFs is likely negligible.
Fowlsheugh SPA (71 km away)												
Guillemot	Chicks-at-sea	Caithness to Firth of Forth	452,919	446,914	138,190	3,169	576 (0.6%)	Moderate	Very low	No	No	Site not of particular importance during post-breeding (estimated 0.6% and 2% of SPA population present respectively). Correcting for presence of non-breeding adults would reduce numbers further. Given species's tendency for swift post-breeding dispersal into offshore waters with fledged chicks any potential displacement effect at the site or in combination with the Forth and Tay OWFs is likely negligible.
Razorbill	Chicks-at-sea	Caithness to Firth of Forth	54,424	50,070	14,668	1,085	187 (2%)	Moderate	Very low	No	No	
East Caithness Cliffs SPA (138 km away)												
Guillemot	Chicks-at-sea	Caithness to Firth of Forth	452,919	446,914	213,067	3,169	351 (0.2%)	Moderate	Very low	No	No	Site not of particular importance during post-breeding (estimated 0.2% and 0.5% of SPA population present respectively). Correcting for presence of non-breeding adults would reduce numbers further. Given species'

Qualifying feature	Seasonality	Regional breeding population RBP (guillemot, razorbill)	Population (adults)	UK SPA birds in BDMPS / RBP (adults)	Individual SPA birds in BDMPS / RBP (adults)	Seasonal abundance (95% UCL of mean) at Hywind site + 1km buffer	Number of birds at Hywind site from individual SPAs (all assumed to be adults, rounded up to whole individual birds, % of adult SPA population between brackets)	Disturbance / displacement vulnerability	Collision vulnerability[1]	Potential for LSE: project in isolation	Potential for LSE: project in combination	Rationale
Razorbill	Chicks-at-sea	Caithness to Firth of Forth	54,424	50,070	35,738	1,085	121 (0.5%)	Moderate	Very low	No	No	tendency for swift post-breeding dispersal into offshore waters with fledged chicks any potential displacement effect at the site or in combination with the Forth and Tay OWFs is likely negligible.
Forth Islands SPA (153 km away)												
Guillemot	Chicks-at-sea	Caithness to Firth of Forth	452,919	446,914	37,658	3,169	58 (0.2%)	Moderate	Very low	No	No	Site not of particular importance during post-breeding (estimated 0.2% and 0.5% of SPA population present respectively). Correcting for presence of non-breeding adults would reduce numbers further. Given species' tendency for swift post-breeding dispersal into offshore waters with fledged chicks any potential displacement effect at the site or in combination with the Forth and Tay OWFs is likely negligible. Moreover, for guillemot substantial connectivity with Hywind site probably unlikely as dispersal tends to occur in eastern and south eastern direction into the central North Sea (Camphuysen 2002)
Razorbill	Chicks-on-sea	Caithness to Firth of Forth	54,424	50,070	23,944	1,085	26 (0.5%)	Moderate	Very low	No	No	

[1] Note that collision vulnerability for guillemot and razorbill is largely irrelevant in the post-breeding (chick) period as adult birds are undergoing moult and are therefore flightless during this time of year.

Table A.4 HRA screening results for non-breeding geese and swan qualifiers at SPA and Ramsar sites

(Species are listed here if their migration flyway included the airspace over the Hywind survey area (according to maps in Scottish Government 2014) and the flight path to a qualifiers designated site could potentially result in any proportion of the population over-flying the Hywind survey area.)

Qualifying feature	Seasonality	Justification notes	Potential for LSE (in isolation / in-combination
Cameron Reservoir SPA and Ramsar Site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Castle Loch, Lochmaben SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Din Moss ‐ Hoselaw Loch SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Fala Flow SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Firth of Forth SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Firth of Tay & Eden Estuary SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Gladhouse Reservoir SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greenlaw Moor SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Holburn Lake and Moss SPA			
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No

Qualifying feature	Seasonality	Justification notes	Potential for LSE (in isolation / in-combination
Lindisfarne SPA and Ramsar site			
Whooper Swan	Wintering	Not recorded in Hywind survey area	No / No
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Light-bellied brent goose (Svalbard)	Wintering	Not recorded in Hywind survey area	No / No
Loch Leven SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Loch of Kinnordy SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Loch of Lintrathen SPA and Ramsar site			
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Loch of Skene SPA and Ramsar site			
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Loch of Strathbeg SPA and Ramsar site			
Barnacle goose (Svalbard)	Wintering	Not recorded in Hywind survey area	**Yes / Yes**
Montrose Basin SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
Muir of Dinnet SPA and Ramsar site			
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
North Norfolk Coast SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No

Qualifying feature	Seasonality	Justification notes	Potential for LSE (in isolation / in-combination
Ouse Washes SPA and Ramsar site			
Whooper Swan	Wintering	Not recorded in Hywind survey area	No / No
Slamannan Plateau SPA and Ramsar site			
Bean goose (Taiga)	Wintering	Not recorded in Hywind survey area	No / No
South Tayside Goose Roosts SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Greylag goose (Icelandic)	Wintering	Single record of two greylag geese flying south 5/11/2013	No / No
The Wash SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Upper Solway Flats and Marshes SPA and Ramsar site			
Barnacle goose (Svalbard)	Wintering	Not recorded in Hywind survey area	**Yes / Yes**
Westwater SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No
Ythan Estuary, Sands of Forvie and Meikle Loch SPA and Ramsar site			
Pink-footed goose	Wintering	Not recorded in Hywind survey area	No / No

Table A5a The percentage of fulmars from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony attendance part of the breeding season

The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity). Where SPAs straddle more than one county or are geographically disjunct, separate estimates were initially derived for each part (i.e., rows in the table) and then the individual values summed to give estimate for the SPA as a whole.

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	1,258	30	13.74%	13.7%	Seabird assemblage component
Gordon	Buchan Ness to Collieston Coast SPA	866	37	6.41%	6.4%	Seabird assemblage component
Gordon	Ythan Estuary, Sands of Forvie and Meikle Loch SPA	151	41	0.90%	0.9%	Not a qualifying species
City of Aberdeen	Girdle Ness to Hare Ness	155	58	0.46%		
City of Aberdeen	Findon Ness - Hare Ness	70	61	0.19%		
Kincardine and Deeside	Findon Ness - Hare Ness	210	62	0.54%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	3,199	66	7.50%	7.5%	Seabird assemblage component
Kincardine and Deeside	Burn of Daff	60	67	0.14%		
Kincardine and Deeside	Newtonhill - Hall Bay	258	68	0.56%		
Kincardine and Deeside	Newton Hill	289	70	0.60%		
Banff and Buchan	Rosehearty to Bay of Cullen	480	71	0.96%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	189	76	0.33%		
Kincardine and Deeside	Fowlsheugh SPA	1,044	79	1.70%	1.7%	Seabird assemblage component
Kincardine and Deeside	Catterline to Inverbervie	989	84	1.40%		
Banff and Buchan	Portsoy to Cullen	209	92	0.25%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Kincardine and Deeside	Inverbervie to St Cyrus	91	97	0.10%		
Moray	Portknockie	63	98	0.07%		
Moray	Strathlene to Portknockie	188	99	0.19%		
Angus	Montrose to Lunan Bay	205	109	0.17%		
Angus	Lunan Bay to Arbroath	980	118	0.71%		
Moray	Covesea Bay	231	129	0.14%		
Moray	Hopeman Bay	87	130	0.05%		
North East Fife	Firth of Tay and Eden Estuary SPA	363	149	0.17%	0.2%	Not a qualifying species
East Coast Caithness	East Caithness Cliffs.Northeast SPA	5,164	150	2.31%	2.31%	Seabird assemblage component
North East Fife	Fife Ness to St Andrews	65	151	0.03%		
East Coast Caithness	East Caithness Cliffs.Mid SPA	3,127	154	1.33%	1.33%	Seabird assemblage component
East Coast Caithness	East Caithness Cliffs.Southwest SPA	6,046	156	2.52%	2.52%	Seabird assemblage component
North East Fife	Firth of Forth SPA	60	156	0.02%		Not a qualifying species
East Coast Ross and Cromarty	Shandwick to Portmahomack	203	157	0.08%		
East Coast Sutherland	East Caithness Cliffs.Southwest SPA	38	158	0.02%	0.02%	Seabird assemblage component
East Coast Ross and Cromarty	Dornoch Firth and Loch Fleet SPA	96	158	0.04%	0.04%	Not a qualifying species
North East Fife	Forth Islands SPA	369	158	0.15%	0.15%	Seabird assemblage component
East Coast Caithness	Caithness - Wick Bay to Freshwick Bay	1,294	159	0.51%		
North East Fife	North Fife	30	161	0.01%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
East Coast Ross and Cromarty	North Sutor to Shandwick	1,035	162	0.40%		
East Coast Ross and Cromarty	South Sutor	200	164	0.08%		
East Coast Caithness	North Caithness Cliffs.Duncansby SPA	4,638	168	1.67%	1.67%	Seabird assemblage component
Orkney	Pentland Skerries	50	168	0.02%		
Orkney	Little Pentland Skerry	49	168	0.02%		
East Coast Ross and Cromarty	Kilmuir to Eathie - Black Isle	52	169	0.02%		
East Coast Sutherland	Dornoch Firth and Loch Fleet SPA	31	173	0.01%	0.01%	Not a qualifying species
East Coast Ross and Cromarty	Inner Moray Firth SPA	52	174	0.02%	0.02%	Not a qualifying species
East Lothian	Forth Islands SPA	409	174	0.14%	0.14%	Seabird assemblage component
East Lothian	Firth of Forth SPA	538	175	0.18%	0.18%	Not a qualifying species
East Coast Sutherland	South East Sutherland / Alness Bay Ross-shire	67	176	0.02%		
North Coast Caithness	North Caithness Cliffs.Stroma SPA	300	176	0.10%	0.10%	Seabird assemblage component
Berwickshire	St Abb's Head to Fast Castle SPA	755	177	0.24%	0.24%	Not a qualifying species
Orkney	Pentland Firth Islands SPA	836	177	0.27%	0.27%	Not a qualifying species
Inland Sutherland	South East Sutherland / Alness Bay Ross-shire	114	177	0.04%		
East Lothian	Dunglass to Fast Castle	89	178	0.03%		
Berwickshire	Dunglass to Fast Castle	147	178	0.05%		
Berwickshire	St Abbs to Eyemouth	36	180	0.01%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Orkney	South Ronaldsay, Orkney	8,368	180	2.62%		
Orkney	South Ronaldsay	43	180	0.01%		
Berwickshire	Eyemouth to Burnmouth	44	181	0.01%		
Orkney	Copinsay SPA	2,261	183	0.68%	0.68%	Seabird assemblage component
Kirkcaldy	Firth of Forth SPA	20	184	0.01%	0.01%	Not a qualifying species
Berwickshire	Border to Burnmouth	78	184	0.02%		
Orkney	Burray	229	185	0.07%		
Orkney	Holm, Orkney	2,466	185	0.72%		
Orkney	Switha SPA	534	186	0.16%	0.16%	Not a qualifying species
Orkney	Hunda	184	187	0.05%		
Orkney	Glimps Holm	78	187	0.02%		
Northumberland	Berwick to Scottish Border	265	187	0.08%		
Orkney	Lamb Holm	52	187	0.01%		
Orkney	Flotta & Calf of Flotta	924	188	0.26%		
Orkney	Deerness	3,487	189	0.98%		
North Coast Caithness	Duncansby Head to Smoo (includes Stroma) - Highland	2,273	189	0.64%		
North Coast Caithness	North Caithness Cliffs.EastW SPA	5,310	190	1.49%	1.49%	Seabird assemblage component
Orkney	Hoy and Southwalls	2,056	190	0.58%		
Orkney	Mull Head	230	191	0.06%		
Orkney	Rerwick Head to Mirkady Point	81	192	0.02%		
Orkney	Fara	46	192	0.01%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Kirkcaldy	Bass Rock to Haystack	381	192	0.10%		
Orkney	Scapa Bay to St. Marys	1,209	193	0.33%		
Orkney	Auskerry SPA	153	193	0.04%	0.04%	Not a qualifying species
Orkney	Rysa Little and Cava	267	195	0.07%		
Orkney	Bay of Berstane to Rerwick Head Tankerness	101	195	0.03%		
Orkney	Bay of Meil, Head Of Holland	201	197	0.05%		
Northumberland	Lindisfarne SPA	165	198	0.04%	0.04%	Not a qualifying species
Orkney	Swanbister - Scapa Bay, West Mainland	579	198	0.15%		
City of Edinburgh	Forth Islands SPA	38	199	0.01%	0.01%	Seabird assemblage component
Dunfermline	Forth Islands SPA	149	199	0.04%	0.04%	Seabird assemblage component
Orkney	West Mainland (Houton - Stenness Hills)	72	199	0.02%		
Orkney	Hoy SPA	33,823	200	8.57%		Seabird assemblage component
Orkney	Shapinsay (Coastal)	898	201	0.23%		
Orkney	Stronsay	1,605	201	0.40%		
Northumberland	Farne Islands SPA	251	202	0.06%	0.06%	Not a qualifying species
North Coast Caithness	North Caithness Cliffs.MidW SPA	1,147	202	0.28%	0.28%	Seabird assemblage component
City of Edinburgh	Inchmickery, Inchgarvie, Forth Rail Bridge	190	204	0.05%		
Orkney	Graemsay - Orkney	126	204	0.03%		
Northumberland	Bamburgh Castle, Bamburgh	31	204	0.01%		
Orkney	Linga Holm	156	206	0.04%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Orkney	Tingwall to Hatston	277	206	0.07%		
Orkney	Papa Stronsay - Orkney	40	206	0.01%		
Orkney	Gairsay, Boray Holm, Grass Holm, Helliar Holm, Shapinsay, Taing Skerry, Eynhallow, Sweyn Holm	213	207	0.05%		
Orkney	Holm of Huip and Little Linga Holm - Orkney	117	209	0.03%		
Orkney	Green Holms - Orkney	201	209	0.05%		
Orkney	Yesnaby - Ness Point, Stromness (West Mainland)	1,493	211	0.34%		
Orkney	Mousland - Orkney	26	212	0.01%		
Orkney	Eday - Orkney	1,586	213	0.35%		
Orkney	Eday	21	213	0.00%		
Orkney	Point of Hisber to Woodwick House	42	214	0.01%		
Orkney	Egilsay	67	214	0.01%		
Orkney	West Mainland Orkney (Coastal Sites)	44	214	0.01%		
Orkney	Stove to Kettletoft, Sanday - Orkney	82	214	0.02%		
Orkney	Rousay Coast	150	215	0.03%		
Orkney	South East Rousay - Orkney	32	215	0.01%		
Orkney	East Sanday Coast SPA	313	216	0.07%	0.07%	Not a qualifying species
Orkney	Yesnaby to Marwick (West Mainland)	840	216	0.18%		
North Coast Caithness	North Caithness Cliffs.FarW SPA	658	217	0.14%	0.14%	Seabird assemblage component
Orkney	Sanday	3,126	217	0.67%		
Orkney	South and Central Rousay - Orkney	341	217	0.07%		
Orkney	Holm of Farray and Faray	393	218	0.08%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Orkney	Calf of Eday SPA	5,986	218	1.27%	1.27%	Seabird assemblage component
Orkney	Faray, Holm of Faray and Rusk Holm - Orkney	41	218	0.01%		
Orkney	Central Rousay - Orkney	121	219	0.03%		
Orkney	Saviskaill Bay Area, Rousay - Orkney	43	219	0.01%		
North-West Coast Sutherland	North Caithness Cliffs.FarW SPA	2,020	220	0.42%	0.42%	Seabird assemblage component
Orkney	Rousay SPA	1,073	220	0.22%	0.22%	Seabird assemblage component
Orkney	North Sanday and Holms of Ire - Orkney	28	221	0.01%		
Orkney	Costa Head - Orkney	2,989	222	0.61%		
Orkney	Marwick Head SPA	838	222	0.17%	0.17%	Not a qualifying species
Orkney	Point of Buckquoy to Latha Skerry to Marwick Head	88	223	0.02%		
Orkney	Birsay Cliffs - Point of Buckquoy to Loop of Cruie	486	223	0.10%		
Orkney	Birsay - Brough of Birsay	253	224	0.05%	0.1%	
Orkney	Swartmill to Rapness, Westray - Orkney	31	225	0.01%		
Orkney	North Ronaldsay	250	226	0.05%		
Orkney	Westray	2,403	228	0.47%		
Orkney	West Westray SPA	4,592	231	0.87%	0.87%	Seabird assemblage component
Orkney	Holm of Papay	34	232	0.01%		
Orkney	Papa Westray - Orkney	167	232	0.03%		
Northumberland	Northumbria Coast SPA	304	233	0.06%	0.06%	Not a qualifying species
Northumberland	Coquet Island SPA	46	233	0.01%		Not a qualifying species

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Orkney	North Hill and Loch of Burness, Westray - Orkney	58	234	0.01%		
Orkney	Papa Westray (North Hill and Holm) SPA	107	234	0.02%	0.02%	Not a qualifying species
Shetland	Fair Isle SPA	20,424	235	3.74%	3.74%	Seabird assemblage component
North-West Coast Sutherland	Duncansby Head to Smoo (includes Stroma) - Highland	6,044	245	1.01%	1.01%	
North-West Coast Sutherland	Eilean Nan Ron/Rabbit Islands/Neave Island	1,160	248	0.19%		
North-West Coast Sutherland	North Sutherland Coastal Islands SPA	779	252	0.12%	0.12%	Not a qualifying species
North-West Coast Sutherland	Caithness and Sutherland Peatlands SPA	1,431	256	0.22%	0.22%	Not a qualifying species
Orkney	Sule Skerry and Sule Stack SPA	471	263	0.07%	0.07%	Not a qualifying species
North-West Coast Sutherland	Eilean Hoan, Eilean Cluimhrig, An Dubh-Sgeir	29	265	0.00%		
Tyne and Wear	Northumbria Coast SPA	96	269	0.01%	0.01%	Not a qualifying species
North-West Coast Sutherland	Faraid Head/ Balnakeil	1,455	271	0.20%		
Shetland	Sumburgh Head SPA	2,134	271	0.29%	0.29%	Seabird assemblage component
Tyne and Wear	Marsden Bay	138	273	0.02%		
Shetland	Horse Island, Colsay, Little and Ladies Holm to Fitful Head - Shetland	1,177	275	0.16%		
Shetland	Sumburgh to Peerie Voe of Spiggie - Shetland	27,372	277	3.60%		
Shetland	Sumburgh	24	280	0.00%		
Shetland	Peerie Voe of Spiggie to St. Ninian's - Shetland	1,346	281	0.17%		
Shetland	Hallilee	26	281	0.00%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Shetland	No Ness to Levenwick and Boddam to Virkie	8,339	282	1.06%		
Shetland	St. Ninian's Isle - Shetland	3,191	283	0.40%		
Shetland	Bigton to Maywick - Shetland	2,190	286	0.27%		
Shetland	Ireland to Maywick - Shetland	1,197	286	0.15%		
Shetland	Mousa SPA	343	286	0.04%	0.04%	Not a qualifying species
Shetland	Deepdale	33	288	0.00%		
North-West Coast Sutherland	Cape Wrath SPA	3,071	290	0.37%	0.37%	Seabird assemblage component
Shetland	Maywick to Scalloway	4,114	290	0.49%		
Shetland	Cunningsburgh to Sandwick - Shetland	1,674	290	0.20%		
Shetland	Kettlaness - Shetland	291	292	0.03%		
Shetland	Trondra (East Side), East Burra and Houss Ness - Shetland	388	294	0.05%		
Shetland	Muskna	27	294	0.00%		
Shetland	West Burra - Shetland	571	295	0.07%		
Shetland	Tronda, East Burra and Houss Ness	23	297	0.00%		
North-West Coast Sutherland	Droman to Geodha Ruadh na Fola	1,550	297	0.18%		
Shetland	Gulberwick to Fladdabister - Shetland	915	297	0.10%		
Shetland	South Scalloway Islands	317	299	0.04%		
Shetland	Brindister	122	299	0.01%		
Shetland	West Burra and Trondra (West Side) - Shetland	45	299	0.01%		
Shetland	Lerwick to Gulberwick - Shetland	480	301	0.05%		
Shetland	Noss SPA	8,489	302	0.94%	0.94%	Seabird assemblage component

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Shetland	Bressay	4,354	303	0.48%		
Shetland	Scalloway Islands	246	304	0.03%		
Shetland	Foula SPA	21,106	305	2.29%	2.29%	Seabird assemblage component
Shetland	Skeld, Westerwick and Culswick - Shetland	3,254	305	0.35%		
Shetland	Bressay - Shetland	203	306	0.02%		
Shetland	Scalloway Islands North - Shetland	194	306	0.02%		
Shetland	Weisdale Voe to Skeld - Shetland	1,551	307	0.17%		
North-West Coast Sutherland	Loch Laxford	315	307	0.03%		
Shetland	Saltness to Skeld - Shetland	700	308	0.07%		
Shetland	Scalloway to Wormadale - Shetland	37	308	0.00%		
Shetland	Vaila - Shetland	1,549	309	0.16%		
Shetland	South Nesting to Lerwick	998	309	0.11%		
Shetland	Hagmark Hill	28	311	0.00%		
Shetland	Scalloway to Semblister - Shetland	142	312	0.01%		
Shetland	Walls to Dales - Shetland	1,594	312	0.17%		
North-West Coast Sutherland	Handa SPA	3,760	313	0.39%	0.39%	Seabird assemblage component
Shetland	Housabister to Catfirth	1,026	315	0.10%		
Shetland	Dale to Huxter	2,401	317	0.24%		
Cleveland	Hunt Cliff	140	318	0.01%		
North-West Coast Sutherland	Cnoc na Banaraich to Sound of Handa	139	318	0.01%		
Cleveland	Boulby Cliffs	79	320	0.01%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Shetland	Huxter to Brindister - Shetland	1,130	320	0.11%		
Shetland	Laxo to Housabister (Nesting) - Shetland	462	321	0.05%		
North-West Coast Sutherland	Eddrachillis Bay	31	322	0.00%		
Shetland	Nesting / Laxo to Housabister	148	322	0.01%		
Shetland	Vementry Region - Shetland	772	322	0.08%		
North-West Coast Sutherland	Tarbet, Badcail Bay and Edrachillis Bay	99	322	0.01%		
Shetland	Vementrey	363	322	0.04%		
Shetland	Papa Stour - Shetland	463	323	0.04%		
Shetland	Papa Stour SPA	1,808	324	0.17%	0.17%	Not a qualifying species
North Yorkshire	Staithes to Sandsend	108	325	0.01%		
Shetland	Whalsay - Shetland	155	325	0.01%		
Shetland	Aith to Brae - Shetland	120	325	0.01%		
Shetland	East Whalsay Islands - Shetland	26	326	0.00%		
Shetland	East Whalsay Skerries - Shetland	63	326	0.01%		
Shetland	West Whalsay Islands	61	327	0.01%		
Shetland	Lunning/Levaneap	793	327	0.07%		
Shetland	Muckle Roe - Shetland	3,011	328	0.28%		
North-West Coast Sutherland	East Loch Nedd to Rubha Creag Lomhair	45	328	0.00%		
Shetland	Muckle Roe Bridge to Mangaster - Shetland	105	330	0.01%		
North Yorkshire	Whitby to Robin Hood's Bay	134	331	0.01%		
North-West Coast Sutherland	Stoer Headland	1,141	332	0.10%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
North-West Coast Sutherland	Port a' Ghleannain to Bay of Culkein	66	332	0.01%		
Shetland	East Lunna Ness - Shetland	110	333	0.01%		
Shetland	Whalsay East Skerries - Shetland	71	333	0.01%		
Shetland	Out Skerries - Shetland	527	334	0.05%		
Shetland	Muckle Roe to Ura Firth - Shetland	1,079	334	0.10%		
Shetland	Sullom Voe - Shetland	215	336	0.02%		
Shetland	Hillswick - Shetland	1,178	338	0.10%		
Shetland	Hillswick to Stenness (Eshaness) - Shetland	29	339	0.00%		
Shetland	Stenness to Hillswick	1,367	340	0.12%		
North Yorkshire	Ravenscar to Robin Hood's Bay	23	340	0.00%		
Shetland	Heylor to Stenness - Shetland	435	340	0.04%		
North-West Coast Sutherland	Glasleac Island, Soyea Island, Rubha Rodha, Loch Roe	49	341	0.00%		
Shetland	Yell Sound Islands - Shetland	916	341	0.08%		
Shetland	Heylor to Stenness	3,387	343	0.29%		
Shetland	North Roe to Gluss Ayre - Shetland	1,261	345	0.11%		
Shetland	East Yell	1,800	346	0.15%		
Shetland	Ronas Hill - North Roe and Tingon SPA	3,739	347	0.31%	0.31%	Not a qualifying species
North Yorkshire	Scalby to Rocky Point	69	348	0.01%		
West Coast Ross and Cromarty	Rubha Coigeach	641	349	0.05%		
Shetland	Ulsta to Whalefirth (Yell) - Shetland	212	352	0.02%		
Shetland	Otterswick and Graveland SPA	3,446	353	0.28%	0.28%	Not a qualifying species

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Shetland	Ronas Voe to the Ness - Shetland	1,362	353	0.11%		
Shetland	Hascosay	132	354	0.01%		
Shetland	Fethaland to North Roe - Shetland	1,044	354	0.08%		
Shetland	Sandvoe to Uyea - Shetland	1,451	354	0.12%		
Shetland	Fetlar SPA	10,590	354	0.85%	0.85%	Seabird assemblage component
Shetland	Ronas Hill to Uyea - Shetland	1,205	355	0.10%		
North Yorkshire	Scarborough to Osgodby Point	24	355	0.002%		
Shetland	Sandvoe to Fethaland - Shetland	1,155	356	0.09%		
West Coast Ross and Cromarty	Summer Isles	757	357	0.06%		
Western Isles - Comhairle nan eilean	Butt of Lewis to Gress - Lewis	4,506	359	0.35%		
Shetland	Ramna Stacks and Gruney SPA	191	359	0.01%	0.01%	Not a qualifying species
Western Isles - Comhairle nan eilean	North Rona and Sula Sgeir SPA	3,520	360	0.27%	0.27%	Seabird assemblage component
North Yorkshire	Cayton Bay to Filey	243	362	0.02%		
West Coast Ross and Cromarty	Meall Mor and Isle Martin	69	363	0.01%		
Western Isles - Comhairle nan eilean	Lewis Peatlands SPA	4,187	363	0.32%	0.32%	Not a qualifying species
Shetland	Whalefirth to Aastack - Shetland	664	365	0.05%		
Shetland	NW Yell - Whale Firth to Gloup	1,864	365	0.14%		
West Coast Ross and Cromarty	Priest Island SPA	303	365	0.02%	0.02%	Not a qualifying species
Shetland	Gloup Ness to Gutcher (N.W. Yell) - Shetland	372	367	0.03%		

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Shetland	South East Unst - Shetland	32	369	0.002%		
Western Isles - Comhairle nan eilean	Eye Peninsula - Lewis	1,917	369	0.14%		
Shetland	South West Unst - Shetland	1,520	369	0.11%		
North Yorkshire	Flamborough Head & Bempton Cliffs SPA	121	370	0.01%	0.01%	Not a qualifying species
West Coast Ross and Cromarty	Gruinard Bay	35	371	0.003%		
Humberside	Flamborough Head & Bempton Cliffs SPA	1,234	374	0.09%	0.1%	Not a qualifying species
Shetland	Saxavord, Skaw, Haroldswick and Baltasound	152	377	0.01%		
Shetland	Hermaness, Saxa Vord and Valla Field SPA	12,801	377	0.91%	0.91%	Seabird assemblage component
West Coast Ross and Cromarty	Loch Ewe	31	379	0.002%		
Western Isles - Comhairle nan eilean	Crossbost to Arnish - Lewis	297	381	0.02%		
West Coast Ross and Cromarty	Rubha Reidh Peninsula	385	382	0.03%		
Western Isles - Comhairle nan eilean	Kebock Head - Lewis	448	390	0.03%		
Western Isles - Comhairle nan eilean	Tolsta Chaolais to Bragair - Lewis	2,608	393	0.17%		
West Coast Ross and Cromarty	Loch Gairloch	163	395	0.01%		
Western Isles - Comhairle nan eilean	Crossbost to Arnish - Lewis	91	398	0.01%		
Western Isles - Comhairle nan eilean	Shiant Isles SPA	4,387	399	0.28%	0.28%	Seabird assemblage component
Western Isles - Comhairle nan eilean	Bearasay - Lewis	313	403	0.02%	0.02%	

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Western Isles - Comhairle nan eilean	Old Hill - Lewis	763	403	0.05%		
West Coast Ross and Cromarty	Loch Torridon	112	411	0.01%		
Western Isles - Comhairle nan eilean	Brenish to Valtos - Lewis	3,482	413	0.21%		
Skye and Lochalsh	Rubha Hunish	1,549	415	0.09%		
Skye and Lochalsh	Staffin	159	416	0.01%		
Skye and Lochalsh	Rona	46	419	0.003%		
Western Isles - Comhairle nan eilean	North Harris Mountains SPA	53	425	0.003%	0.003%	Not a qualifying species
Skye and Lochalsh	East Trotternish	176	426	0.01%		

Table A.5b The estimated abundance of fulmars present in the WT+1 km area (wind turbines buffered to 1 km) from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	SPA popltn. size (breeding adults, AONs x2)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. birds from SPA popltn.	% of SPA popltn.	No. birds from SPA popltn.	% of SPA popltn.	No. birds from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	4,248	20.1%	6.0	0.140%	8.0	0.188%	39.2	0.923%
Hoy SPA	67,646	8.6%	2.5	0.000%	3.4	0.005%	16.7	0.025%
Troup, Pennan and Lion's Heads SPA	6,398	7.5%	2.2	0.001%	3.0	0.046%	14.6	0.228%
East Caithness Cliffs SPA	14,375	6.2%	1.8	0.001%	2.4	0.017%	12.0	0.084%
North Caithness Cliffs SPA	14,073	4.1%	1.2	0.002%	1.6	0.012%	8.0	0.057%

SPA	SPA popltn. size (breeding adults, AONs x2)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. birds from SPA popltn.	% of SPA popltn.	No. birds from SPA popltn.	% of SPA popltn.	No. birds from SPA popltn.	% of SPA popltn.
Fair Isle SPA	40,848	3.7%	1.1	0.000%	1.5	0.004%	7.3	0.018%
Foula SPA	42,212	2.3%	0.7	0.000%	0.9	0.002%	4.5	0.011%
Fowlsheugh SPA	2,088	1.7%	0.5	0.000%	0.7	0.032%	3.3	0.159%
Calf of Eday SPA	11,972	1.3%	0.4	0.050%	0.5	0.004%	2.5	0.021%
Noss SPA	16,978	0.9%	0.3	0.000%	0.4	0.002%	1.8	0.011%
Hermaness, Saxa Vord and Valla Field SPA	25,602	0.9%	0.3	0.002%	0.4	0.001%	1.8	0.007%
West Westray SPA	9,184	0.9%	0.3	0.001%	0.3	0.004%	1.7	0.018%
Fetlar SPA	21,180	0.9%	0.3	0.000%	0.3	0.002%	1.7	0.008%
Copinsay SPA	4,522	0.7%	0.2	0.008%	0.3	0.006%	1.3	0.029%
Handa SPA	7,520	0.4%	0.1	0.009%	0.2	0.002%	0.8	0.010%
Cape Wrath SPA	6,142	0.4%	0.1	0.000%	0.1	0.002%	0.7	0.012%
Forth Islands SPA	965	0.3%	0.1	0.115%	0.1	0.014%	0.6	0.067%
Sumburgh Head SPA	4,268	0.3%	0.1	0.002%	0.1	0.003%	0.6	0.013%
Shiant Isles SPA	8,774	0.3%	0.1	0.003%	0.1	0.001%	0.5	0.006%
North Rona and Sula Sgeir SPA	7,040	0.3%	0.1	0.000%	0.1	0.002%	0.5	0.008%
Rousay SPA	2,146	0.2%	0.1	0.004%	0.1	0.004%	0.4	0.020%
Estimated total from SPA colonies	**318,181**	**61.9%**						

Table A.6a The percentage of gannets from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Recent colony count [1] (AONs)	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	2,787	66	25.5%	25.5%	Not a qualifying species
East Lothian	Forth Islands SPA	55,482	174	71.7%	71.7%	Important migratory population
Shetland	Fair Isle SPA	3,924	235	2.8%	2.8%	Seabird assemblage component

[1] Recent counts from JNCC website, Troup Head 2010, Bass Rock 2009, Fair Isle 2013.

Table A.6b The estimated abundance of gannets present in the WT+1 km area (wind turbines buffered to 1 km) from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	SPA popltn. size (breeding adults, AONs x2)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. birds from SPA popltn.	% of SPA popltn.	No. birds from SPA popltn.	% of SPA popltn.	No. birds from SPA popltn.	% of SPA popltn.
Troup, Pennan and Lion's Heads SPA	5,574	25.5%	2.6	0.05%	3.2	0.06%	7.2	0.1%
Forth Islands SPA	110,964	71.7%	7.3	0.01%	9.1	0.01%	20.4	0.02%
Fair Isle SPA	7,848	2.8%	0.3	0.004%	0.4	0.005%	0.8	0.01%
Estimated total from SPA colonies	124,386	100.0%						

Table A.7a The percentage of herring gulls from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Peterhead	323	30	5.8%		
Banff and Buchan	Buchan Ness to Collieston Coast SPA	2,736	30	46.7%	54.4%	Seabird assemblage component
Gordon	Buchan Ness to Collieston Coast SPA	658	37	7.6%		
Gordon	Ythan Estuary, Sands of Forvie and Meikle Loch SPA	195	41	1.8%	1.8%	Not a qualifying species
Banff and Buchan	Fraserburgh	63	51	0.4%		
City of Aberdeen	Girdle Ness to Hare Ness	169	58	0.8%		
City of Aberdeen	Aberdeen City	3,350	59	15.0%		
City of Aberdeen	Findon Ness - Hare Ness	3	61	0.01%		
Kincardine and Deeside	Findon Ness - Hare Ness	41	62	0.2%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	2,001	66	7.3%	7.3%	Seabird assemblage component
Kincardine and Deeside	Burn of Daff	200	67	0.7%		
Kincardine and Deeside	Newtonhill - Hall Bay	127	68	0.4%		
Kincardine and Deeside	Newton Hill	255	70	0.8%		
Banff and Buchan	Rosehearty to Bay of Cullen	495	71	1.6%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	701	76	1.9%		
Banff and Buchan	Macduff	25	76	0.1%		
Banff and Buchan	Banff	33	78	0.1%		
Kincardine and Deeside	Fowlsheugh SPA	1,362	79	3.5%	3.5%	Seabird assemblage component
Kincardine and Deeside	Catterline to Inverbervie	1,533	84	3.4%		
Banff and Buchan	Portsoy to Cullen	994	92	1.9%		

Table A.7b The estimated abundance of herring gulls present in the WT+1 km area (wind turbines buffered to 1 km) from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	6,788	54.4%	0.5	0.008%	0.5	0.01%	2.7	0.04%
Ythan Estuary, Sands of Forvie and Meikle Loch SPA	390	1.8%	<0.1	0.005%	<0.1	0.00%	0.1	0.02%
Troup, Pennan and Lion's Heads SPA	4,002	7.3%	<0.1	0.002%	0.1	0.002%	0.4	0.01%
Fowlsheugh SPA	2,724	3.5%	<0.1	0.001%	<0.1	0.001%	0.2	0.01%
Estimated total from SPA colonies	13,904	67.0%						

Table A.8a The percentage of great-black backed gulls from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	14	30	54.9%	65.5%	Not a qualifying species
Gordon	Buchan Ness to Collieston Coast SPA	4	37	10.6%		
City of Aberdeen	Aberdeen City	9	59	9.3%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	8	66	6.7%	6.7%	Not a qualifying species
Kincardine and Deeside	Newton Hill	2	70	1.5%		
Banff and Buchan	Rosehearty to Bay of Cullen	2	71	1.4%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	4	76	2.5%		
Kincardine and Deeside	Fowlsheugh SPA	3	79	1.8%	1.8%	Not a qualifying species
Kincardine and Deeside	Catterline to Inverbervie	12	84	6.1%		
Banff and Buchan	Portsoy to Cullen	12	92	5.2%		

Table A.8b **The estimated abundance of great black-backed gulls present in the WT+1 km area (wind turbines buffered to 1 km) from each SPA population within foraging range and the value expressed as a percentage of the SPA population**

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	36	65.5%	0.7	1.8%	0.7	2%	2.2	6%
Troup, Pennan and Lion's Heads SPA	16	6.7%	<0.1	0.4%	0.1	0.4%	0.2	1%
Fowlsheugh SPA	6	1.8%	<0.1	0.3%	<0.1	0.3%	0.1	1%
Estimated total from SPA colonies	58	74.0%						

Table A.9a The percentage of kittiwakes from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Adjusted count (Seabird2000 x 0.55) (breeding adults)	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	10,782	30	46.3%	56.3%	Seabird assemblage component
Gordon	Buchan Ness to Collieston Coast SPA	3,441	37	10.0%		
Gordon	Ythan Estuary, Sands of Forvie and Meikle Loch SPA	119	41	0.3%	0.3%	Not a qualifying species
City of Aberdeen	Girdle Ness to Hare Ness	1,395	58	1.6%		
City of Aberdeen	Findon Ness - Hare Ness	300	61	0.3%		
Kincardine and Deeside	Findon Ness - Hare Ness	842	62	0.9%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	18,991	66	17.5%	17.5%	Seabird assemblage component
Kincardine and Deeside	Burn of Daff	450	67	0.4%		
Kincardine and Deeside	Newtonhill - Hall Bay	788	68	0.7%		
Kincardine and Deeside	Newton Hill	8	70	0.0%		
Banff and Buchan	Rosehearty to Bay of Cullen	303	71	0.2%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	898	76	0.6%		
Kincardine and Deeside	Fowlsheugh SPA	28,447	79	18.3%	18.3%	Important migratory population
Kincardine and Deeside	Catterline to Inverbervie	3,068	84	1.7%		
Banff and Buchan	Portsoy to Cullen	523	92	0.2%		
Moray	Portknockie	104	98	0.0%		
Angus	Montrose to Lunan Bay	384	109	0.1%		
Angus	Lunan Bay to Arbroath	2,542	118	0.7%		

Table A9b The estimated abundance of kittiwakes present in the WT+1 km area (wind turbines buffered to 1 km) from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	Adjusted count (Seabird 2000 x 0.55) (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	15,645	56.3%	45.6	0.29%	63.1	0.40%	320.0	2.0%
Ythan Estuary, Sands of Forvie and Meikle Loch SPA	3,916	0.3%	0.2	0.01%	0.3	0.01%	1.6	0.04%
Troup, Pennan and Lion's Heads SPA	1,665	17.5%	14.2	0.85%	19.6	1.18%	99.6	5.98%
Fowlsheugh SPA	1,865	18.3%	14.8	0.79%	20.5	1.10%	103.7	5.56%
Estimated total from SPA colonies	67,958	92.4%						

Table A.10a The percentage of common guillemots from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	26,017	30	52.6%	57.2%	Seabird assemblage component
Gordon	Buchan Ness to Collieston Coast SPA	3,345	37	4.6%		
City of Aberdeen	Girdle Ness to Hare Ness	75	58	0.0%		
City of Aberdeen	Findon Ness - Hare Ness	320	61	0.2%		
Kincardine and Deeside	Findon Ness - Hare Ness	102	62	0.05%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	47,953	66	20.8%	20.8%	Important migratory population
Kincardine and Deeside	Burn of Daff	37	67	0.02%		
Kincardine and Deeside	Newtonhill - Hall Bay	61	68	0.02%		
Kincardine and Deeside	Fowlsheugh SPA	69,095	79	20.9%	20.9%	Important migratory population
Kincardine and Deeside	Catterline to Inverbervie	2,884	84	0.8%		
Angus	Lunan Bay to Arbroath	1,002	118	100.0%		

Table A.10b The estimated abundance of common guillemots present in the WT+1 km area (wind turbines buffered to 1 km) during the colony-attendance period from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	39,345	57.2%	142.4	0.4%	168.9	0.4%	428.8	1.1%
Troup, Pennan and Lion's Heads SPA	64,257	20.8%	51.9	0.08%	61.5	0.10%	156.2	0.2%
Fowlsheugh SPA	92,587	20.9%	52.0	0.06%	61.7	0.07%	156.5	0.2%
Estimated total from SPA colonies	196,189	99.0%						

Table A.10c The percentage of common guillemots from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the chicks-on-sea part of the breeding season. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	26,017	30	45.8%	49.8%	Seabird assemblage component
Gordon	Buchan Ness to Collieston Coast SPA	3,345	37	4.0%		
City of Aberdeen	Girdle Ness to Hare Ness	75	58	0.04%		
City of Aberdeen	Findon Ness - Hare Ness	320	61	0.1%		
Kincardine and Deeside	Findon Ness - Hare Ness	102	62	0.04%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	47,953	66	18.1%	18.1%	Important migratory population
Kincardine and Deeside	Burn of Daff	37	67	0.01%		
Kincardine and Deeside	Newtonhill - Hall Bay	61	68	0.02%		
Kincardine and Deeside	Fowlsheugh SPA	69,095	79	18.2%	18.2%	Important migratory population
Kincardine and Deeside	Catterline to Inverbervie	2,884	84	0.7%		
Angus	Lunan Bay to Arbroath	1,002	118	0.1%		
East Coast Caithness	East Caithness Cliffs.Northeast SPA	77,423	150	5.6%	11.1%	Important migratory population
East Coast Caithness	East Caithness Cliffs.Mid SPA	4,510	154	0.3%		
East Coast Caithness	East Caithness Cliffs.Southwest SPA	77,072	156	5.2%		
North East Fife	Forth Islands SPA	28,103	158	1.8%	1.8%	Seabird assemblage component

Table A.10d **The estimated abundance of common guillemots present in the WT+1 km area (wind turbines buffered to 1 km) during the chicks-on-sea part of the breeding season from each SPA population within foraging range and the value expressed as a percentage of the SPA population**

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	39,345	49.8%	1062.9	3%	1577.4	4%	1107.6	3%
Troup, Pennan and Lion's Heads SPA	64,257	18.1%	387.2	0.6%	574.5	0.9%	403.4	0.6%
Fowlsheugh SPA	92,587	18.2%	388.1	0.4%	575.9	0.6%	404.4	0.4%
East Caithness Cliffs	213,067	11.1%	236.5	0.1%	351.0	0.2%	246.5	0.1%
Forth Islands SPA	37,658	1.8%	39.0	0.1%	57.9	0.2%	40.7	0.11%
Estimated total from SPA colonies	446,914	99%						

Table A.11a The percentage of razorbills from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	2,544	30	46.4%	53.1%	Not a qualifying species
Gordon	Buchan Ness to Collieston Coast SPA	547	37	6.8%		
City of Aberdeen	Girdle Ness to Hare Ness	56	58	0.3%		
City of Aberdeen	Findon Ness - Hare Ness	101	61	0.5%		
Kincardine and Deeside	Findon Ness - Hare Ness	236	62	1.0%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	4,958	66	19.4%	19.4%	Seabird assemblage component
Kincardine and Deeside	Burn of Daff	54	67	0.2%		
Kincardine and Deeside	Newtonhill - Hall Bay	112	68	0.4%		
Kincardine and Deeside	Newton Hill	58	70	0.2%		
Banff and Buchan	Rosehearty to Bay of Cullen	58	71	0.2%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	4	76	0.01%		
Kincardine and Deeside	Fowlsheugh SPA	7,334	79	20.0%	20.0%	Seabird assemblage component
Kincardine and Deeside	Catterline to Inverbervie	1,962	84	4.6%		
Banff and Buchan	Portsoy to Cullen	46	92	0.1%		

Table A.11b The estimated abundance of razorbills present in the WT+1 km area (wind turbines buffered to 1 km) during the colony-attendance period from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	4,142	53.1%	16.1	0.4%	21.3	0.5%	83.0	2%
Troup, Pennan and Lion's Heads SPA	6,644	19.4%	5.9	0.09%	7.8	0.12%	30.3	0.5%
Fowlsheugh SPA	9,828	20.0%	6.1	0.06%	8.0	0.08%	31.2	0.3%
Estimated total from SPA colonies	20,613	92.5%						

Table A.11c The percentage of razorbills from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the chicks-on-sea part of the breeding season. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	2,544	30	39.8%	45.6%	Not a qualifying species
Gordon	Buchan Ness to Collieston Coast SPA	547	37	5.8%		
City of Aberdeen	Girdle Ness to Hare Ness	56	58	0.2%		
City of Aberdeen	Findon Ness - Hare Ness	101	61	0.4%		
Kincardine and Deeside	Findon Ness - Hare Ness	236	62	0.9%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	4,958	66	16.7%	16.7%	Seabird assemblage component
Kincardine and Deeside	Burn of Daff	54	67	0.2%		
Kincardine and Deeside	Newtonhill - Hall Bay	112	68	0.3%		
Kincardine and Deeside	Newton Hill	58	70	0.2%		
Banff and Buchan	Rosehearty to Bay of Cullen	58	71	0.2%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	4	76	0.01%		
Kincardine and Deeside	Fowlsheugh SPA	7,334	79	17.2%	17.2%	Seabird assemblage component
Kincardine and Deeside	Catterline to Inverbervie	1,962	84	4.0%		
Banff and Buchan	Portsoy to Cullen	46	92	0.1%		
Angus	Montrose to Arbroath	562	118	0.6%		
East Coast Caithness	East Caithness Cliffs (Northeast) SPA	10,199	150	6.5%	11.1%	Important migratory population
East Coast Caithness	East Caithness Cliffs (Mid) SPA	1,368	154	0.8%		
East Coast Caithness	East Caithness Cliffs (Southwest) SPA	6,302	156	3.8%		
North East Fife	Forth Islands SPA	4,114	158	2.4%	2.4%	Seabird assemblage component

Table A.11d The estimated abundance of razorbills present in the WT+1 km area (wind turbines buffered to 1 km) during the chicks-on-sea part of the breeding season from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	4,142	45.6%	327.9	8%	494.8	12%	438.6	11%
Troup, Pennan and Lion's Heads SPA	6,644	16.7%	119.8	2%	180.8	3%	160.3	2%
Fowlsheugh SPA	9,828	17.2%	123.3	1.3%	186.1	2%	164.9	2%
East Caithness Cliffs	23,944	11.1%	80.1	0.3%	120.9	0.5%	107.1	0.4%
Forth Islands SPA	5,513	2.4%	17.1	0.3%	25.8	0.5%	22.9	0.4%
Estimated total from SPA colonies	50,070	93%						

Table A.12a The percentage of puffins from each breeding colony within foraging range estimated to make up the composition of birds in the Hywind survey area during the colony-attendance period. The estimate is based on the draft method proposed by SNH 2014, in which the contribution of each colony is weighted by colony size and the inverse of distance squared (a measure of connectivity)

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Banff and Buchan	Buchan Ness to Collieston Coast SPA	623	30	16.5%	27.6%	Not a qualifying species
Gordon	Buchan Ness to Collieston Coast SPA	619	37	11.1%		
City of Aberdeen	Girdle Ness to Hare Ness	3	58	0.0%		
City of Aberdeen	Findon Ness - Hare Ness	72	61	0.5%		
Kincardine and Deeside	Findon Ness - Hare Ness	31	62	0.2%		
Banff and Buchan	Troup, Pennan and Lion's Heads SPA	403	66	2.3%	2.3%	Not a qualifying species
Kincardine and Deeside	Burn of Daff	20	67	0.1%		
Kincardine and Deeside	Newtonhill - Hall Bay	3	68	0.0%		
Kincardine and Deeside	Newton Hill	17	70	0.1%		
Kincardine and Deeside	Crawton - Stonehaven (Fowlsheugh)	136	76	0.6%		
Kincardine and Deeside	Fowlsheugh SPA	217	79	0.9%	0.9%	Not a qualifying species
Kincardine and Deeside	Catterline to Inverbervie	344	84	1.2%		
Angus	Lunan Bay to Arbroath	190	118	0.3%		
East Coast Caithness	East Caithness Cliffs (Northeast) SPA	85	150	0.1%		
East Coast Caithness	East Caithness Cliffs (Mid) SPA	132	154	0.1%		
East Coast Caithness	East Caithness Cliffs (Southwest) SPA	58	156	0.1%	0.3%	Seabird assemblage component
North East Fife	Forth Islands SPA	42,000	158	41.1%		
East Lothian	Forth Islands SPA	28,412	174	22.9%		
City of Edinburgh	Forth Islands SPA	22	199	0.0%	64.0%	Important migratory population

County	Colony (SMP database site or stretch of coast)	Seabird 2000 colony count	Distance (km)	Estimated % from colony	Estimated % from SPA	Species SPA status
Dumfermline	Forth Islands SPA	40	199	0.0%		
East Coast Caithness	North Caithness Cliffs (Duncansby) SPA	221	168	0.2%	0.2%	Seabird assemblage component
Orkney	South Ronaldsay, Orkney	44	180	0.0%		
Berwickshire	Eyemouth to Burnmouth	21	181	0.0%		
Orkney	Copinsay SPA	350	183	0.3%	0.3%	Not a qualifying species
Orkney	Switha SPA	250	186	0.2%	0.2%	Not a qualifying species
Orkney	Deerness	16	189	0.0%		
Orkney	Mull Head	4	191	0.0%		
Kirkcaldy	Forth Islands - Haystack	1,641	192	1.1%		
Orkney	Auskerry SPA	187	193	0.1%	0.1%	Not a qualifying species
Orkney	Shapinsay (Coastal)	12	201	0.0%		

Table A.12b The estimated abundance of puffins present in the WT+1 km area (wind turbines buffered to 1 km) during the colony-attendance period from each SPA population within foraging range and the value expressed as a percentage of the SPA population

SPA	Count (breeding adults)	% of birds present assigned to SPA (Table 1)	Share of WT+1 km estimated mean abundance		Share of WT+1 km 95% UCL of estimated mean abundance		Share of WT+1 km estimated maximum abundance	
			No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.	No. from SPA popltn.	% of SPA popltn.
Buchan Ness to Collieston Coast SPA	2,484	27.6%	32.9	1%	38.1	2%	186.4	8%
Troup, Pennan and Lion's Heads SPA	806	2.3%	2.7	0.3%	3.2	0.4%	15.5	2%
Fowlsheugh SPA	24	0.9%	1.0	4%	1.2	5%	5.8	24%
East Caithness Cliffs	550	0.3%	0.3	0.06%	0.4	0.07%	1.9	0.4%
Forth Islands SPA	140,948	64.0%	76.2	0.05%	88.4	0.06%	432.4	0.3%
North Caithness Cliffs SPA	442	0.2%	0.2	0.05%	0.3	0.06%	1.3	0.3%
Copinsay SPA	700	0.3%	0.3	0.04%	0.4	0.05%	1.7	0.2%
Switha SPA	500	0.2%	0.2	0.04%	0.2	0.05%	1.2	0.2%
Auskerry SPA	374	0.1%	0.1	0.04%	0.2	0.05%	0.8	0.2%
Estimated total from SPA colonies	146,828	95.9%						

APPENDIX B ATLANTIC SALMON MIGRATIONS

Dominant directions of travel for Atlantic salmon in Scottish coastal waters based on tagging studies (from Malcolm *et al.,* 2010)