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Orkney's Community Wind Farm Project – Hoy: EIA Report

Appendix 7.4

Information to Inform Habitats Regulations Appraisal (HRA)

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1 INFORMATION TO INFORM HRA

1.1 INTRODUCTION

A Habitats Regulations Appraisal (HRA) has been undertaken for Orkney Islands Council's proposed 'Orkney's Community Wind Farm Project – Hoy' (the Project), located west of Lyness, Hoy, Orkney, to determine whether the proposal has the potential to affect Natura sites with ornithological interests (i.e. Special Protection Areas (SPAs) and proposed SPAs (pSPAs)).

A Scoping Report was submitted to the Orkney Islands Council in April 2018 for a larger development of up to 30 wind turbines across a much larger area than the current site and Scoping Opinion was received in August 2018. This process identified Natura sites with ornithological interests and qualifying features relevant to the proposed Project. Scoping advice from statutory stakeholders is detailed further in Section 1.4. Consultation responses.

1.2 REGULATORY BACKGROUND

In relation to wildlife and nature conservation, two key Directives have been adopted by the European Community, namely Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive; formerly 79/409/EEC).

The Habitats Directive requires Member States to take measures to maintain or restore natural habitats and wild species listed in the Annexes to the Directive at a favourable conservation status and to introduce robust protection for those habitats and species of European importance. There is an obligation to contribute to a coherent European ecological network of protected sites by designating SACs for habitats listed on Annex I and for species listed on Annex II. The Birds Directive gives Member States of the European Union the power and responsibility to classify SPAs to protect birds which are rare or vulnerable in Europe, as well as all migratory birds which are regular visitors. Together SACs and SPAs make up the Natura 2000 network of sites. It is Scottish Government policy to afford the same protection to proposed SPAs (pSPAs) and candidate SACs (cSACs) as if they were fully designated.

The Habitats and the Birds Directive are transposed into domestic law in Scotland by the 'Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)'; commonly known as the Habitats Regulations (UK Government, 1994). The Habitats Regulations require that an Appropriate Assessment is carried out by the competent authority if any Natura interests are likely to be significantly affected by a proposed development.

1.3 OVERVIEW OF HABITATS REGULATIONS APPRAISAL PROCESS

Where a plan or project could affect a Natura site, the Habitats Regulations require the competent authority to consider the provisions of regulation 61. This means that the competent authority has a duty to:

- determine whether the proposal is directly connected with or necessary to site management for conservation; and, if not
- determine whether the proposal is likely to have a significant effect (Likely Significant Effect) on the site either individually or in combination with other plans or projects; and, if so, then
- make an appropriate assessment of the implications (of the proposal) for the site in view of that site's conservation objectives.

This process is now commonly referred to as Habitats Regulations Appraisal (HRA). HRA applies to any plan or project which has the potential to affect the qualifying interests of a Natura site, even when those interests may be at some distance from that site. The competent authority will decide whether an appropriate assessment is necessary and carry it out (with advice provided by Scottish Natural Heritage) if required. It is the Applicant, in this instance Orkney Islands Council who is required to provide the information to inform the appropriate assessment.

The approach to HRA follows the three step process as detailed in SNH guidance (SNH, 2010). The information in this HRA is presented in a format to answer the following three questions:

- Step 1: Is the proposal directly connected with or necessary for site management for nature conservation of a Natura site?
- Step 2: Is the proposal likely to have a significant effect (LSE) on a qualifying feature of a Natura site either alone or in-combination with other plans or projects?
- Step 3: Can it be ascertained that the proposal will not adversely affect the integrity of a Natura site?

The Likely Significant Effect (LSE) test has been applied on a precautionary basis, following SNH advice. Effects were identified through any reasonable links between the Project's effects and the site's qualifying interests, and they were considered to trigger LSE unless they could be objectively ruled out with certainty.

1.4 CONSULTATION RESPONSES

Consultation feedback specific to the HRA was received during Scoping[1] process. Details of each of the comments received and how these have been incorporated into the assessment to allow completion of the HRA is presented in Table 1.1.

A screening exercise to identify sites and associated qualifying interests relevant to the Project was undertaken during the Scoping process. The Scoping Opinion confirmed that the following sites and qualifying interests should be considered in the HRA:

- Hoy SPA (red-throated diver (*Gavia stellata*); great skua (*Stercorarius skua*); Arctic skua (*Stercorarius parasiticus*) and great black-backed gull (*Larus marinus*));
- Switha SPA (Greenland barnacle goose (*Branta leucopsis*)); and
- Scapa Flow pSPA (breeding red-throated diver and wintering populations of black-throated diver (*Gavia arctica*); eider (*Somateria mollissima*); goldeneye (*Bucephala clangula*); great northern diver (*Gavia immer*); long-tailed duck (*Clangula hyemalis*); red-breasted merganser (*Mergus serrator*); shag (*Phalacrocorax aristotelis*) and Slavonian grebe (*Podiceps auritus*).

[1] The Scoping Report (April 2018) was for a larger development of up to 30 wind turbines across a much larger area than the current site.

Table 1.1 Consultation Responses Specific to the HRA

Stakeholder	Comment	Response/Action taken
SNH Scoping Opinion 6th June 2018	The proposed development is likely to have a significant effect on qualifying interests of Hoy SPA, Switha SPA and Scapa Flow proposed SPA (pSPA). The EIA must therefore provide sufficient information for Scottish Ministers to be able to undertake appropriate assessments in view of these sites' conservation objectives for their qualifying interests.	These sites have been considered in the HRA. The size of the Proposed Development has been reduced from 30 turbines to six turbines and the location of the turbines moved to the eastern extent of the site to reduce the effects on the qualifying interests of Hoy SPA.
	The development site borders Hoy SPA. The key issues are potential disturbance and/or displacement of breeding birds during the construction and operation of the wind farm, and the risk of birds colliding with the rotating turbine blades when flying through the development site. The qualifying species potentially affected are red-throated diver, great skua, Arctic skua and great black-backed gull, which should be targeted by the survey work and assessment. Red-throated divers are likely to be a particular issue as the development site is situated directly between breeding lochs within Hoy SPA and their main feeding areas within Scapa Flow pSPA. The turbines are likely to present a barrier and/or collision risk to divers commuting back and forth between the breeding lochs and feeding areas.	These four qualifying interests of Hoy SPA along with peregrine falcon, another qualifying interest of Hoy SPA also recorded at the Proposed Development, have been considered in the HRA in relation to impacts due to construction disturbance, operational displacement (including barrier effects for red-throated diver) and collision mortality due to collision with operating turbines.
	The development site borders Scapa Flow pSPA. The qualifying interest of the pSPA includes breeding red-throated diver, because of the important feeding areas within Scapa Flow used during the breeding season. Therefore, the potential onshore impacts on red-throated divers described above may also affect Scapa Flow pSPA. The EIA should also consider any disturbance or displacement of red-throated divers, and wintering bird interest of the pSPA, that may result from additional boat activity within Scapa Flow associated with construction phase of the development. This impact may be localised and less of an issue than the onshore impacts, if the additional boat activity isn't a significant increase in the traffic that already exists within Scapa Flow.	The onshore impacts on red-throated divers from Scapa Flow pSPA have been considered in the HRA. Disturbance or displacement of red-throated divers and wintering bird interests of Scapa Flow pSPA have been considered in the HRA.
	The development site is about 6 km north-west of Switha SPA that supports a winter roost of Greenland barnacle geese. We are not aware of any use of the development site by the geese, but the survey work in the winter needs to check this and if they are likely to be disturbed or displaced. It is perhaps more likely that, geese flying through the development site could be at risk from collision and the winter vantage point surveys work should assess this risk.	Greenland barnacle goose was included as a target species in winter vantage point surveys. No flight activity by this species was recorded at the site therefore this species was not considered further in the HRA.

Stakeholder	Comment	Response/Action taken
Royal Society for the Protection of Birds (RSPB) Scoping Opinion 22nd May 2018	RSPB Scotland has considerable concerns about the proposed scale and location of the proposed wind farm at this site, primarily in relation to potential impacts on the species associated with the adjacent Hoy Special Protection Area (SPA), as well as other sensitive species of conservation concern.	The size of the Proposed Development has been reduced from 30 turbines to six turbines and the location of the turbines moved to the eastern extent of the site to reduce the effects on the qualifying interests of Hoy SPA.
	The Hoy SPA is designated for a number of bird species including breeding Arctic skua, great skua, peregrine and red-throated diver. The EIA should fully consider the potential effects of the development on the SPA. It should be demonstrated that the proposed development would not affect the integrity of the SPA or undermine its conservation objectives.	The qualifying interests of Hoy SPA have been considered in the HRA.
	The EIA should consider impacts on the SPA's red-throated diver population, including as a consequence of collision with turbines, as well as disturbance and / or displacement from breeding lochs / lochans and from the effects of increased energetic demands arising from turbines acting as a barrier between the pSPA marine foraging areas and freshwater nesting sites during the breeding season.	The effects on the Hoy SPA red-throated diver population have been considered in the assessment in relation to impacts due to construction disturbance, operational displacement (including barrier effects for red-throated diver) and collision mortality due to collision with operating turbines.
	Switha SPA is designated for non-breeding barnacle geese, which are known to feed on Hoy and South Walls, and the proposed development site is well within the 15km core range foraging distance (and 25km maximum) identified by SNH for the species. The EIA should fully consider barnacle geese and whether the proposed windfarm will impact upon the SPA population though direct collision or by creating a barrier effect for birds flying between preferred feeding and roosting areas.	Greenland barnacle goose was included as a target species in winter vantage point surveys. No flight activity by this species was recorded at the site therefore this species was not considered further in the assessment.
	The EIA should fully consider the potential effects of the development on Scapa Flow pSPA. It should be demonstrated that the proposed development would not affect the integrity of the site or undermine its conservation objectives.	The onshore impacts on red-throated divers from Scapa Flow pSPA have been considered in the HRA Disturbance or displacement of red-throated divers and wintering bird interests of Scapa Flow pSPA have been considered in the HRA.

Stakeholder	Comment	Response/Action taken
	The Hoy SPA and Site of Special Scientific Interest (SSSI) are both designated for a number of bird species including breeding Arctic skua, great skua, peregrine and red-throated diver. The EIA should fully consider the potential effects of the development on the SPA and SSSI. It should be demonstrated that the proposed development would not affect the integrity of the SPA or undermine its conservation objectives.	The qualifying interests of Hoy SPA and notified interests of Hoy SSSI have been considered in the assessment. Information to inform appropriate assessments is presented in Appendix 7.4 HRA.

1.5 PROJECT LOCATION

The Proposed Development is located at Wee Fea, approximately 1.3 km to the west of Lyness on the island of Hoy, Orkney. The site is predominantly moorland with rough grassland in the eastern part and in areas throughout the site where the moorland has been ploughed out in the past. The Burn of Ore flows east through the site and the Burn of Longigill flows south through the mid-section of the site. Access to the site is via the existing track to Wee Fea off the B9047 road.

2 SPECIAL PROTECTION AREAS

2.1 STEP ONE: IS THE PROPOSAL DIRECTLY CONNECTED WITH OR NECESSARY TO THE CONSERVATION MANAGEMENT OF THE NATURA SITES?

No, the Project is not directly connected with or necessary to site management for the conservation of the SPAs or pSPA and therefore Step 2 needs to be considered.

2.2 STEP TWO: IS THE PROPOSAL LIKELY TO HAVE A SIGNIFICANT EFFECT (LSE) ON THE QUALIFYING INTERESTS OF THE SPAS/PROPOSED SPA EITHER ALONE OR IN-COMBINATION WITH OTHER PLANS OR PROJECTS?

2.2.1 Identification of sites relevant to the project

The Natura sites with ornithological interests identified in the Scoping Opinion as relevant to the Proposed Development are shown in Figure 4.1. A summary of the sites and qualifying interests are presented below.

Hoy SPA

Hoy SPA borders the western boundary of the Proposed Development and covers an area of 181 km^2. Hoy SPA is a moorland site covering two-thirds of the land mass of Hoy and a marine extension that extends approximately 2 km into the surrounding coastal waters (see Figure 4.1). This site holds internationally important breeding populations of moorland birds including red-throated diver, Arctic skua, great skua and great black-backed gull. The western cliffs hold breeding peregrine falcon and a number of breeding seabird species including fulmar, guillemot, kittiwake, puffin and breeding seabird assemblage. The population numbers at the time of classification as given in the SPA citation are shown in Table 2.1.

Table 2.1 Qualifying Interests of Hoy SPA

SPA Qualifying feature	Breeding / Non-breeding season interest	Population numbers at time of classification (SNH, 2009)
Red-throated diver	Breeding	58 territories
Peregrine falcon	Breeding	6 pairs
Great skua	Breeding	1,900 pairs
Arctic skua	Breeding	59 pairs
Great black-backed gull	Breeding	570 pairs
Black-legged kittiwake	Breeding	3,000 pairs
Atlantic puffin	Breeding	3,500 pairs
Northern fulmar	Breeding	35,000 pairs
Common guillemot	Breeding	13,400 pairs
Seabird assemblage	Breeding	120,000 individuals

Switha SPA

Switha SPA is a small grassy island off the east coast of South Walls to the south of Hoy, located approximately 5.5 km south-east of the Proposed Development (Figure 4.1). Switha SPA is designated for its internationally important wintering population of Greenland barnacle goose (on average 1,120 individuals (based on peak counts from the winters of 1993/94 to 1997/98)) (SNH, 2000).

Scapa Flow pSPA

Scapa Flow proposed SPA is located approximately 0.5 km to the east of the Proposed Development, at its closest point. Scapa Flow pSPA is an extensive area (370.66km^2) covering the enclosed marine waters of Scapa Flow and the nearshore waters to the east of Orkney extending from Deerness to South Ronaldsay (see Figure 4.1) (SNH, 2016a). Scapa Flow pSPA has been selected to provide protection to a range of marine bird species including wintering and breeding season interests (Table 2.2). These sheltered waters support internationally important populations of wintering birds including black-throated diver; eider; goldeneye; great northern diver; long-tailed duck; red-breasted merganser; shag and Slavonian grebe. During the breeding season, this site provides important foraging habitat for breeding red-throated divers that nest on small lochans on the surrounding land.

Table 2.2 Scapa Flow pSPA Qualifying Features

pSPA Qualifying feature	Breeding / Non-breeding season interest	Population size in Scapa Flow pSPA (SNH, 2016a)
Red-throated diver	Breeding	81 pairs
Great northern diver	Non-breeding	506
Black-throated diver	Non-breeding	57
Slavonian grebe	Non-breeding	135
Common eider	Non-breeding	1,994
Long-tailed duck	Non-breeding	1,393
Common goldeneye	Non-breeding	219
Red-breasted merganser	Non-breeding	539
European shag	Non-breeding	2,929

2.2.2 Likely Significant Effect Test

The Likely Significant Effect (LSE) test has been applied on a precautionary basis, following SNH advice[2]. Effects were identified through any reasonable links between the Project's effects and the site's qualifying interests, and they were considered to trigger LSE unless they could be objectively ruled out with certainty.

2.2.3 Baseline conditions

Details of all of the baseline bird surveys that have been undertaken to inform this assessment are given in Chapter 7: Ornithology and in Appendix 7.1: Ornithology Technical Report. All environmentally sensitive information is contained in a separate confidential annex (see Appendix 7.2: Ornithology Confidential Annex - Environmentally Sensitive Bird Information) (this information is available for statutory bodies but not for public release).

[2] https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-likely

Hoy SPA

Four of the Hoy SPA qualifying interests (red-throated diver, peregrine falcon, great skua and great black-backed gull) were regularly recorded during the 2018 - 2020 baseline surveys and therefore connectivity between the project site and designated site interests cannot be ruled out, even though some of the individual birds observed may not, in fact, be themselves connected with the SPA.

Two other qualifying interests (Arctic skua and fulmar were recorded so infrequently during the two full years of vantage point surveys (one sighting of Arctic skua each year and two records of fulmar from Year 1 and eight records from Year 2) that it is judged that there would not be any likely significant effects on either of these species as there is no potential for any of the conservation objectives of these qualifying interests to be undermined. None of the other breeding seabird interests of Hoy SPA including guillemot, kittiwake, puffin and breeding seabird assemblage were recorded during any of the surveys therefore it is judged that connectivity to these qualifying interests can reasonably be ruled out and consequently these interests have been screened out of further assessment as it is clear that there would not be any likely significant effects on these species.

Red-throated diver

The locations of breeding red-throated divers recorded during the 2018 and 2019 surveys are shown in Figure 2.53 in Appendix 7.2 Ornithology Confidential Annex. A total of 15 pairs were present in 2018 and 18 pairs were present in 2019 within the survey area that covered all lochans within 2 km of the Proposed Development and the two most important waters and lochan clusters to the west.

The closest red-throated diver breeding lochan is at 640 m from the nearest turbine position and 410 m from the nearest part of the access track. However, it is out of view of the whole of the Proposed Development footprint at ground level. The next closest breeding lochan is at more than 1,200 m from the nearest turbine and 950 m from the nearest part of the associated infrastructure (the access track).

The Project site was overflown by red-throated divers from these breeding areas and from others further west, as found during the VP surveys and confirmed by the focal diver surveys. Details of their flight lines are provided in Appendix 7.2: Ornithology Confidential Annex.

Red-throated diver flight lines were frequently recorded during VP surveys in both years between April and early September. There was a considerable difference in the level of flight activity recorded between years with a total of 44 flight lines (totalling 56 birds) recorded in 2018 compared to 189 flight lines (totalling 238 birds) in 2019. Across the season there were 39 VP hours in 2018 and 69 VP hours in 2019, giving flight rates of 1.44 and 3.45 birds per hour respectively.

Additional focal diver watches each year were concentrated on flights to and from the breeding sites around the Proposed Development. The majority of these watches were conducted in July and August each year, when activity tends to be highest as chicks are being fed. The focal diver VPs used varied each year with an emphasis on different areas, so the results are not directly comparable between years. Nevertheless, the rate of flights that could be attributed to specific lochans or clusters of lochans followed the same trend as the coverage from the main VPs, with 68 flights from about 83 hours of watching in 2018 and 94 flights from about 45 hours of watching in 2019, at 0.82 and 2.10 flights per hour respectively.

The general patterns of flights to the various breeding waters are shown in Appendix 7.2 Ornithology Confidential Annex. There were multiple routes to and from all sites, generally heading out eastwards to Mill Bay or Ore Bay, on either side of the Sky Fea-Wee Fea ridge, or out south-east along the Burn of Heldale. A small minority of birds

departed or arrived into the general area from the west or flew north-south across the ridges and valleys. The focal diver watches give an indication of the routes used from each breeding site, but do not give a quantitative measure of the use of each route because the views from the VPs generally tended to favour detection of birds arriving along the Burn of Ore (past the Proposed Development) rather than up from the Mill Burn (to the north of the Proposed Development). This is particularly the case for Site G, where it is known from previous experience that many flights use the northern route.

Data on the breeding red-throated divers for all of Hoy were obtained for the five-year period 2015 to 2019 (Table 2.3). For each year, this gave the total number of occupied sites (i.e. breeding pairs, plus pairs making a scrape but not laying eggs) and the total number of chicks fledged (i.e. the chicks known to have fledged plus the near-fledged chicks present on the last visit). Additionally, there were some smaller chicks present on the last visit for which the outcome was classed as 'unknown'. These numbers give a reasonable range for the minimum and maximum number of chicks to have fledged each year, although there sometimes remained sites where the outcome was not conjectured.

Table 2.3 Summary of Red-throated Diver Breeding Numbers and Success for Hoy

Year	No. Occupied Sites	No. Successful	No. Outcome Unknown	No. Failed	Minimum-Maximum No. Young Fledged	Range of productivity rate per site
2015	64	41	8	15	49 – 56	0.76 – 0.88
2016	66	29	6	31	37 – 43	0.56 – 0.65
2017	55	12	9	34	12 – 18	0.22 – 0.33
2018	49	15	3	31	17 – 20	0.35 – 0.41
2019	61	29	2	30	39 – 43	0.64 – 0.70
Five-year average	**59**	**25.2**	**5.6**	**28.2**	**31 – 36**	**0.53 – 0.61**

Three of these years (2015, 2016 and 2019) had good numbers (more than 60 occupied sites) and two of these years (2017 and 2018) were much poorer in terms of numbers. Productivity, in terms of numbers and rates also varied widely, with 2015 clearly better than any other year and 2017 faring the worst. In the comments provided by the data holders, it was stated that in 2019 there was a noticeable difference in the distribution of breeding pairs, possibly indicating that new birds were involved (Jim Williams, pers. comm.).

The lochans local to the Proposed Development (those within 2 km of the Proposed Development and also the two most important waters and lochan clusters to the west) were checked for breeding divers in 2018 and 2019 during raptor and skua surveys, and from focal diver watches (see Figure 2.53 in Appendix 7.2 Ornithology Confidential Annex).

Historic data for these lochans was also obtained for the three-year period 2015 to 2017. A summary of the breeding activity for these sites is shown in Table 2.4. Even though 2018 was generally poor for Hoy as a whole, the area closest to the Proposed Development did similarly well in 2018 and 2019. There was a bigger difference at the more distant waters to the west of the Proposed Development where there were six successful pairs in 2018 and ten in 2019, with four and three failed breeding attempts respectively. It is more difficult to get an estimate for the number of pairs present but not laying eggs, at these more distant waters, since some of the lochans are a focal point for non-breeders and failed breeders (including from elsewhere) that vary in their presence across the season.

Table 2.4 Summary of Red-throated Diver Breeding Activity at Lochans Local to the Proposed Development

Site	Status	2015	2016	2017	2018	2019
Sites A to F (within 2 km of the Proposed Development)	Successful pairs	2	1	1	1	1
	Unsuccessful pairs	0	2	1	0	1
	Pairs not laying eggs	0	1	2	3	2
	Total pairs here	**2**	**4**	**4**	**4**	**4**
Sites G and H (more than 2 km to the west of the Proposed Development)	Successful pairs	10	7	2	6	11
	Unsuccessful pairs	2	6	8	4	3
	Pairs not laying eggs (known for one lochan only)	0	0	0	1	0
	Total pairs here	**12**	**13**	**10**	**11**	**14**

In 2018, there were three lochans within 2 km of the Proposed Development where pairs appeared regularly but did not attempt to make a scrape; one of these pairs was on a recently used lochan, one on a lochan that had not been used for some years and one was the first record for that lochan. In 2019 these lochans were all occupied again, two of them progressing to making a scrape and the third successfully fledging a chick. This progress year-on-year, particularly at the long-disused and new lochans, indicates the arrival of new pairs in 2018, following on from the very poor year in 2017 and is part of the breeding distribution differences noted across the whole island.

The more than doubling in observed flight activity rates from 2018 to 2019 appears to be partly explicable by the increased breeding success at the more distant waters to the west of the Proposed Development, though the closer breeding sites were similarly occupied in each year. Large differences in flight rates between years have also been noted at other Orkney sites, where breeding success does not seem to be the full explanation. For example, at Hammars Hill (West Mainland, Orkney) the red-throated diver flight rates at the existing wind farm were nearly four times higher in 2016 than 2017; there had been two pairs nearby each year, both of them successful in 2016 and one in 2017 (Firth Ecology, 2020). Prevailing wind direction and possible inaccuracy in drawing flight lines were also potential factors at Hammars Hill but, even taken together with breeding success, these factors were not nearly enough to be an explanation for the very large difference in activity observed. There may be an element of individual preference in flight routes for different birds, perhaps changing between years; there will also be a random effect due to the relatively small number of hours sampled by VP watches, even when they are planned to capture data from all parts of the daylight hours each month.

The historic and recent red-throated diver data has been used to derive the five-year and two-year averages for various parameters for the local population around the Proposed Development (see Table 2.5). These data relate to the breeding sites in Table 2.4 i.e. all of those within 2 km of the Proposed Development, plus the two main lochan clusters further to the west.

In general terms, across the whole of Hoy, 2015, 2016 and 2019 were all good years, while 2017 and 2018 were both poor years (Table 2.3). However, in the more local area around the Proposed Development, 2016 and 2019 were good years, 2015 and 2018 were intermediate and only 2017 was a particularly poor year (Table 2.4). Overall, the five-year and two-year averages for various breeding parameters close to the Proposed Development were remarkably similar (Table 2.5).

Table 2.5 Comparison of Red-throated Diver Numbers around the Proposed Development: Five-year Average 2015 – 2019 and Two-year Average 2018 - 2019

Breeding parameter	Five-year Average 2015 – 2019	Two-year Average 2018 - 2019
Total number of occupied sites including successful and failed breeders, plus pairs not laying eggs (whether building a scrape or not)	15.6	16.5
Number of successful pairs	8.4	9.5
Minimum number of chicks fledged	9.6	10.0*
Potential maximum number of chicks fledged	10.8	11.0*

** Number of chicks in 2018 and 2019 in each category are minimum estimates (tending to reduce the two-year averages relative to the five-year averages)*

In terms of the overall numbers on Hoy, data from the Orkney Bird Reports show that the numbers present in 2015 and 2016 were approaching the former high population levels from the 1990s and early 2000s, which consistently had 60 or more occupied sites. This dropped in 2004 to around 55 occupied sites, as again in 2017 and even lower in 2018, which was the year with the lowest overall numbers for at least two decades (Williams 2001:2013; Williams and Branscombe 2014 and Branscombe 2015:2019).

Total Hoy productivity on a par with that in 2015 was last seen in 2009 and 2004. The c.50 % drop in chick production in 2017 and 2018 was another significant aspect of those seasons.

However, the most important factor from a population perspective was the number of dead adults found in the 2017 breeding season – five were found in that one year, compared to a normal average thought to be less than one a year (Jim Williams, pers. comm.). Food shortage was postulated as the cause of this additional mortality and also of the poor breeding condition of the surviving birds.

If it does show up as a population level effect, the two years drop in productivity will take some years to work through. Remarkably, the dramatic hit on adult survival in 2017 appears to have already been mostly recovered by 2019 in terms of the overall breeding numbers.

The vast majority of breeders on Hoy are within the Hoy SPA and all of them feed (at least partly) within the proposed Scapa Flow SPA. The Hoy SPA red-throated diver population at designation was 58 pairs (6 % of the GB population) and its latest SNH assessed condition was 'Favourable Maintained[3]' with no specific negative pressures identified. The Scapa Flow pSPA red-throated diver population is 81 pairs (SNH, 2016a). The pSPA population of red-throated divers is larger than that of the Hoy SPA as it includes all the birds from Hoy, plus those from the smaller islands in Scapa Flow and from Mainland parishes adjacent to Scapa Flow.

All red-throated divers at the Proposed Development are taken to be from the Hoy SPA and Scapa Flow pSPA populations.

[3] Last assessed on 30 August 2007 (SNH, Sitelink).

Peregrine

There are no peregrine breeding sites within 2 km of the Proposed Development. The closest breeding site is on the western cliffs of Hoy, at more than 4 km. SNH guidance suggests that the core hunting range for breeding peregrines is 2 km, but that birds have been recorded out to 18 km from their nests (SNH, 2016b).

Peregrines were seen occasionally and rather sporadically from the main VP watches, throughout the year. It was not usually possible to age the birds seen from VPs due to distance or light; of the total 23 individuals observed, six were identified as adults and the rest were unaged.

The peregrines recorded at the Proposed Development are most likely to be from the closest pair but will also include breeding birds from further away (though likely still to be Hoy SPA breeding birds) and non-breeders. During the winter, individuals from much further afield may contribute to the Hoy population, although they would probably be transient in their occurrence.

Great skua

Breeding skua surveys, covering out to 1 km from the Proposed Development, found similar numbers of apparently occupied territories (AOTs) in 2018 and 2019, with the same general distribution across the survey area each year as shown in Figures A.29 and A.30 in Appendix 7.1 Ornithology Technical Report. There were clear concentrations of AOTs on the low ground to the east of Binga Fea (outside of the Hoy SPA boundary) and along the south side of the upper Burn of Ore (within the Hoy SPA). Very few were on Wee Fea or within the footprint of the Proposed Development. The total within the 2019 skua 1 km buffer, which was covered in both years, was 266 AOTs in 2018 and 251 AOTs in 2019.

Great skuas were seen from every VP watch between April and September, with a few stragglers still present in October. They were by far the most frequent species in flight within the flight buffers, with a relatively constant presence in the air during the busiest period from June to August. There were far too many great skuas present to attempt standard flight path recording so an alternative method was used, wherein snapshot counts were carried out every five minutes.

Great skuas are spread across the moorlands on Hoy and in 2019 SNH and RSPB organised a survey of most of the island, to which the 2019 records from this survey work were contributed. Together with a survey of the south-west part of Hoy in 2018, the coverage on Hoy was effectively complete. The final results have not yet been officially compiled, but SNH have given an interim figure of 1,578 AOTs for the whole of Hoy, of which 1,415 AOTs were within the Hoy SPA (Kate Thompson, pers. comm.).

Great skuas recorded at the Proposed Development are taken to be from the Hoy SPA population.

Great black-backed gull

Two pairs of great black-backed gulls nested in the survey area each year, in the same locations both years (see Figures A.27 and A.28 in Appendix 7.1 Ornithology Technical Report). These were both well outside of the Hoy SPA boundary. The great black-backed gulls breeding in the survey area were not located on, nor linked to the SPA, being independent of it for breeding, foraging and resting. Nor are they likely to have regular interactions with birds from the SPA, since any remnants of the SPA colonies are several kilometres distant.

This species was recorded from VP watches using the snapshot count method in the 2018 and 2019 breeding seasons (April to August) and in the 2019/20 non-breeding season (September to March). It was treated as a non-target species in the 2018/19 non-breeding season.

During the breeding season a maximum of three great black-backed gulls were seen during any one snapshot count, but the majority of snapshots had zero birds. The gulls were recorded particularly infrequently from VP1, where less than half of the three-hour watches had any at all. They were more frequent from VP3, and recorded in all of the watches from there, producing a clear spatial distribution of breeding season activity that was evident in both years.

The birds seen flying in the survey area would have included the two local pairs, but the rates of activity clearly indicated additional birds from elsewhere. Only a small proportion of these additional birds were likely to have been from the SPA and many may not have been from Hoy at all, since this species also nests on the adjacent smaller islands in Scapa Flow.

Great black-backed gulls were less frequent overall in the non-breeding season. In the non-breeding season, great black-backed gulls are likely to be drawn from a much wider area beyond Orkney, and few, if any, would then be referable to the Hoy SPA breeding population.

Switha SPA

No Greenland barnacle geese were recorded during any of the field surveys therefore it is clear that there is no connectivity with the Proposed Development consequently Greenland barnacle goose has been screened out of further assessment as it is clear that there would not be any likely significant effects on these species.

Scapa Flow pSPA

Of the Scapa Flow pSPA qualifying interests, only red-throated diver was recorded at the Proposed Development. The red-throated divers were recorded over-flying the site from breeding grounds in the west to foraging areas within Scapa Flow therefore connectivity between the project site and designated site interests cannot be ruled out (see Section 2.2.3 above).

None of the wintering interests of Scapa Flow pSPA have connectivity with the Proposed Development as the additional vessel traffic required to deliver the components and materials to the port of Lyness from the Scottish Mainland is not considered likely to result in a significant increase in the vessel traffic that already exists within the busy Scapa Flow area which is part of Orkney Islands Council's harbour area and is regularly used by oil tankers visiting the nearby Flotta Oil Terminal, recreational dive boat traffic, fish farm vessels, inshore fishing vessels and inter-island ferry traffic. The eight wintering bird interests have been screened out of further assessment as it is clear that there would not be any likely significant effects on these species.

2.2.4 Determination of potential for likely significant effects

Based upon the information provided above, an assessment has been made to determine whether or not the Project is likely to have a significant effect on any of the qualifying interests with potential connectivity with the Project. A summary of the key reasons for connectivity and therefore assumed Likely Significant Effects is provided in Table 2.6.

Table 2.6 Determining Potential for Likely Significant Effects (LSE)

Qualifying interest	Site	Potential for LSE?
Red-throated diver	Hoy SPA Scapa Flow pSPA	Yes – birds originating from breeding lochans within Hoy SPA and foraging areas within Scapa Flow pSPA observed over-flying the Project.

Qualifying interest	Site	Potential for LSE?
Peregrine falcon	Hoy SPA	Yes – though the closest peregrine breeding site is > 4 km from the Proposed Development, the peregrines recorded at the Proposed Development are most likely to be from the closest pair but will also include breeding birds from further away (though likely still to be Hoy SPA breeding birds) and non-breeders.
Great skua	Hoy SPA	Yes – great skuas recorded at the Proposed Development are taken to be from the Hoy SPA population.
Great black-backed gull	Hoy SPA	Yes – a small proportion of the birds recorded flying over the site in the breeding season may originate from Hoy SPA.

2.3 STEP THREE: CAN IT BE ASCERTAINED THAT THE PROPOSAL WILL NOT ADVERSELY AFFECT THE INTEGRITY OF THE SITE?

As there is potential for Likely Significant Effects on four qualifying interests from Hoy SPA and one qualifying interest (red-throated diver) from Scapa Flow pSPA, the Competent Authority, must carry out an Appropriate Assessment to ascertain whether the proposal might adversely affect the integrity of the SPA and pSPA. Information is provided in this section to inform that Appropriate Assessment.

2.3.1 Potential impacts

When considering if the Project could adversely affect site integrity of Hoy SPA or Scapa Flow pSPA, the following potential impacts have been considered in relation to the four species:

- Disturbance (noise and visual) due to construction activities – red-throated diver (Hoy SPA) and great skua (Hoy SPA);
- Operational displacement - red-throated diver (Hoy SPA) and great skua (Hoy SPA); and
- Collision mortality – red-throated diver (Hoy SPA and Scapa Flow pSPA), peregrine (Hoy SPA), great skua (Hoy SPA) and great black-backed gull (Hoy SPA).

2.3.2 Conservation objectives

Hoy SPA

The conservation objectives of Hoy SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site.
  - Distribution of the species within site.
  - Distribution and extent of habitats supporting the species.
  - Structure, function and supporting processes of habitats supporting the species.
  - No significant disturbance of the species.

Of these, only two are relevant to the Project, these are:

- to avoid significant disturbance to the species; and
- to maintain the population of the species as a viable component of the SPA.

These two conservation objectives have been considered in the determination of the Project's effects on site integrity.

Scapa Flow pSPA

The draft conservation objectives of Scapa Flow pSPA are:

- To avoid significant mortality, injury and disturbance of the qualifying features so that the distribution of the species and ability to use the site are maintained in the long-term; and
- To maintain the habitats and food resources of the qualifying features in favourable condition.

Of these, only the first one is relevant to the Project and has been considered in the determination of the Project's effects on site integrity.

2.3.3 Disturbance (noise and visual) due to construction activities

Nature of impact

Disturbance is likely to be highest during construction owing to the increased activity of personnel and vehicles on site, which itself can be an important source of potential disturbance. The estimated on-site construction phase for the Proposed Development is expected to last approximately 18 months. The construction works will take place through the year, including the summer months when the weather is more favourable and ground conditions are drier. Noise and visual disturbance associated with construction activities could potentially affect breeding and foraging birds in the locality of the turbine positions, access tracks and other infrastructure components.

Birds that are disturbed at breeding sites are vulnerable to a variety of potential effects that could lead to a reduction in the productivity or survival of their populations; these include the chilling or predation of exposed eggs and chicks and damage of eggs and chicks due to panicked adults. Birds subject to disturbance outside the breeding season may also feed less efficiently which may reduce their survival prospects. The potential impact will vary between species according to each species' tolerance of disturbance from human activity and the availability of suitable alternative breeding and foraging habitat.

Disturbance impacts would be temporary but would last for the duration of the works therefore it is possible that two consecutive breeding seasons would be affected.

Mitigation

Table 2.7 Mitigation Measures Specific to Hoy SPA Qualifying Interests

Ref.	Title	Description
ORN1	Implementation of a Breeding Bird Protection Plan, including pre-construction breeding bird surveys to inform the need for mitigation to avoid disturbance and nest damage	A suitably qualified ECoW will be employed on site during the bird breeding season (April to August inclusive) to carry out pre-construction breeding bird surveys prior to commencement of works, to locate active nests and to inform how works can best be programmed to avoid disturbance. Any active nests will be cordoned off to a suitable distance (agreed in consultation with SNH) and construction operations delayed

Ref.	Title	Description
		within the cordon until the young have successfully fledged (or breeding has failed). The ECoW will also carry out a watching brief during works.
ORN2	Avoid disturbance to breeding red-throated divers: construction works to be constrained to safe working distance from any occupied red-throated diver lochan (500 m - 750 m to be agreed with SNH) during the breeding season (April to August).	During the breeding season (April – August) construction will not take place along the section of access track between T4, T5 and T6, nor installation of the turbine at T5, before mid-May. Construction may only occur within the aforementioned areas from mid-May onwards if pre-construction surveys indicate that the closest red-throated diver lochan is not occupied. If the lochan is occupied, construction of the aforementioned infrastructure will commence only after the breeding attempt is completed (young fledged) or has failed, or if no eggs are laid by mid-July.

Determination of effects on site integrity in relation to disturbance

Red-throated diver (Hoy SPA)

The closest potential red-throated diver breeding lochan is at 640 m from the nearest turbine position and 410 m from the nearest part of the access track. However, it is out of view of the whole of the Proposed Development footprint at ground level. The next closest potential breeding lochan is at more than 1,200 m from the nearest turbine and 950 m from the nearest part of the associated infrastructure (the access track).

Forestry Commission Scotland (FCS) Guidance gives a safe working distance of 300 m – 900 m from red-throated diver nest sites (Forestry Commission Scotland, 2006). Ruddock and Whitfield (2007) note that red-throated divers can be sensitive to human disturbance but would probably not be disturbed by someone on foot at 500 m – 750 m and that the large majority of breeding pairs are probably not disturbed when an observer is at 500 m. Line-of-sight affects this and, as long as over-flying birds do not detect an observer, birds at a breeding lochan will not be disturbed until a person comes in to view.

Since the closest lochan is out of view of the entire infrastructure at ground level, birds on the water or nest are not expected to be disturbed during any aspect of the construction, except possibly during installation of the nearest turbine. The next nearest turbine positions are at about 850 m and 950 m from this lochan. However, the pair from here will also be aware of other construction activities if they fly around the lochan (e.g. on take-off) or come in along the south side of the Wee Fea ridge; they may then be prompted to circle round in alarm rather than alighting directly. This is most likely to happen when construction is taking place along the western section of access track from T4 to T6 and along to T5.

This lochan has had a pair of red-throated divers on it for the past five years, although they did not lay eggs in 2018 or 2019. If they are present again it is expected that they would go on to lay eggs and would therefore constitute an active nesting attempt.

Species-specific mitigation will be required to avoid any possibility of disturbance to breeding red-throated divers (see ORN01 and ORN02 in Table 2.7). These mitigation measures will ensure that a suitably qualified ECoW will carry out pre-construction breeding bird surveys to locate any active red-throated nests prior to commencement of works. If any active red-throated diver nests are found within 500 m - 750 m, nests will be cordoned off and all works will be delayed within the cordon until the young have successfully fledged or the site is no longer in use.

During the breeding season (April – August) construction of the section of access track between T4, T5 and T6, and installation of turbine T5 will not take place before mid-May. Construction may only occur within the aforementioned

areas from mid-May onwards if pre-construction surveys indicate that the closest red-throated diver lochan is not occupied. If an active nest is found, construction will commence only after the breeding attempt is completed (young fledged) or has failed or if no eggs are laid by mid-July.

Implementation of these mitigation measures will ensure that no disturbance to breeding Hoy SPA red-throated divers would be likely to occur therefore there is no potential for the conservation objectives '*to avoid significant disturbance to the species*' or '*to maintain the population of the species as a viable component of the SPA*' to be undermined. There will be no adverse effects on site integrity.

Great skua (Hoy SPA)

There are no great skua nest sites within the Hoy SPA boundary sufficiently close to the Proposed Development such that any disturbance at the nest site would be expected. As a precautionary approach, the great skuas nesting outwith the SPA boundary are assumed to be part of the Hoy SPA population.

There is no mention of great skua within the FCS or RDD disturbance distance reviews. However, as an example from Hoy, a pair of great skuas was observed setting up territory near the Ore Brae Turbine whilst it was under construction in 2011 (Firth Ecology, 2012). This pair of skuas was little affected by elements of construction work involving both a digger and a crane, operating in view from their territory, and within 200 m of it.

Given the greater number of turbines (six) and greater length of associated access track at the Proposed Development (as compared to a single turbine), it is realistic to expect that any great skuas within the layout or close outside it (e.g. within about 200 m) would be disturbed during construction, leading to abandonment of nesting attempts or reduced breeding success. Beyond 200 m, it appears unlikely that there would be sufficient impact to compromise great skua breeding success. Therefore, the assessment here anticipates the loss of great skuas out to 200 m of all infrastructure elements during construction.

There were ten AOTs in 2018 within 200 m and just two AOTs in 2019, indicating that the Proposed Development is not a core area for great skuas. The proportion of the Hoy population (1,578 AOTs in 2019) represented by these numbers is 0.63 % and 0.13 %. This extent of loss for one – two years only will not undermine the conservation objectives '*to avoid significant disturbance to the species*' or '*to maintain the population of the species as a viable component of the SPA'*. There will be no adverse effects on site integrity.

2.3.4 Operational displacement

Nature of impact

The presence and operation of wind turbines could potentially displace birds from breeding and foraging areas. Birds may avoid the operational turbines and the surrounding area due to the visual appearance of large vertical structures in the landscape, the mechanical noises and wind noises of the blades, or the presence of periodic maintenance vehicles and personnel. Displacement may also include barrier effects in which birds are deterred from using normal routes to and from feeding sites.

Displacement due to operational turbines could force birds into less suitable habitat and this might reduce their ability to survive and reproduce. If not displaced, birds may experience reduced foraging success or reduced productivity. Displacement effects can vary over time as birds habituate to the presence of operating turbines or site-faithful birds are lost from the population.

Determination of effects on site integrity in relation to operational displacement

Red-throated diver (Hoy SPA) – breeding sites

It is only at the red-throated diver breeding lochan closest to the Proposed Development that displacement needs to be considered. This is at 410 m from the nearest part of the access track and 640 m from the nearest turbine position (the next closest potential breeding site is more than 1 km from the nearest turbine position and need not be considered in the assessment).

In Orkney, red-throated divers breed each year within 200 m of the turbines on Burgar Hill, where there has been at least one large turbine since before 2000. One pair also regularly nests close to the road and a lay-by on Hoy (Stuart Williams, pers. comm.) demonstrating habituation to road traffic and to occasional associated pedestrians.

Given that the closest breeding site to the Proposed Development is out of view of the access track at ground level, the movement of maintenance vehicles is not expected to cause any disturbance to nesting red-throated divers.

Since the turbines will be at more than 600 m, there are no displacement effects anticipated due to the presence and operation of the turbines. Therefore, there is no potential for the conservation objectives '*to avoid significant disturbance to the species*' or '*to maintain the population of the species as a viable component of the SPA*' to be undermined. There will be no adverse effects on site integrity.

Red-throated diver (Hoy SPA and Scapa Flow pSPA) – operational displacement – barrier effects

Red-throated diver flights in transit between the breeding lochans on Hoy and their main feeding grounds in Scapa Flow broadly follow an east-west alignment (see Appendix 7.2 Ornithology Confidential Annex). There are two main routes for birds to and from the breeding lochans to the west of the Proposed Development; these are: either to the north of Wee Fea, up from Mill Burn, or crossing the wind farm buffer (or to the south of it) along Burn of Ore. Some birds also approach from the south, probably having come from North Bay via Burn of Heldale, or from loafing on Heldale Water. A small minority approach from the west and depart in that direction.

Theoretically, the most likely lochan to be obstructed by the turbines is the one closest to it, since this would require the largest proportional changes to flight routes for those birds that were otherwise going to fly across the wind farm to fly around it. From this lochan (Site A), birds were seen to depart and arrive primarily from the north-east and from the south-east, those departing heading for Mill Bay or Ore Bay. Additionally, birds went to or from the west and south/south-west (see flight lines attributable to Site A in Figure 2.63 in Appendix 7.2 Ornithology Confidential Annex). From all fieldwork, 18 flights were observed to or from this potential breeding site, broken down into direction as follows:

- Seven out of 18 flights (39 %) to or from the north-east, away from the Proposed Development.
- Six out of 18 flights (33 %) to or from the south-east, across the Proposed Development.
- Three out of 18 flights (17 %) to or from the west, away from the Proposed Development.
- Two out of 18 flights (11 %) to or from the south/south-west, away from the Proposed Development.

One third of the observed flights would have traversed the Proposed Development. However, VP watches would not have detected arrivals from the north-east as readily as those from the south-east, so the proportion of flights crossing the wind farm buffer is likely to be overstated.

Of the birds flying across the wind farm, two were outgoing, departing after some initial looping around, and they could have readily avoided the wind farm area had turbines been present.

Of the lochans within 2 km, those increasingly distant from the Proposed Development had a steadily lower proportion of flights crossing the turbine positions (see Figures 2.64 to 2.68 in Appendix 7.2 Confidential Annex). A similar pattern in flight paths was evident at the two main lochan clusters further to the west (see Figures 2.56, 2.57, 2.60 and to 2.61 in Appendix 7.2 Confidential Annex). Outgoing and incoming birds from these sites could readily re-route to pass either to the north or south of the Proposed Development with minimal increase in flight distance.

The red-throated divers at Burgar Hill, Orkney, readily fly between the turbines there, even when there is no need for them to do so e.g. non-breeding birds that do not always alight but may spend some time looping around and between the turbines (Upton, 2012).

Given the alternative flight routes available to the north and south of the Proposed Development and the minimal increase in flight distance if birds were re-routed to avoid the turbines, there is no potential for the conservation objective of Hoy SPA '*to maintain the population of the species as a viable component of the SPA*' or the draft conservation objective of Scapa Flow pSPA '*to avoid significant mortality, injury and disturbance of the qualifying features so that the distribution of the species and ability to use the site are maintained in the long-term*' to be undermined. There will be no adverse effects on site integrity of either Hoy SPA or Scapa Flow pSPA due to barrier effects.

Great skua (Hoy SPA) – breeding sites

There appear to be no studies at wind farms that involve potential displacement impacts on great skuas. Some evidence is available from Stronsay where a single turbine now stands within the great skua colony on Rothiesholm Head (Andrew Upton, pers. comm.). The colony has been surveyed using a three-visit method for four years from 2015 to 2018. In that time a total of 200 great skua AOTs were recorded, of which 58 successfully fledged young at a success rate of 0.29. The skuas were spread fairly evenly across the central moorland including around the turbine. Within 250 m of the turbine there was a total of 18 AOTs, of which ten were successful at a success rate of 0.56. The closest great skua AOTs were at little more than 100 m from the turbine.

The turbines at the Proposed Development are considerably larger than the Stronsay turbine, so it may be expected that breeding great skuas may be displaced from a wider area around the turbines. The assessment here is made on the basis that half of the great skuas nesting within 250 m of a turbine or within 100 m of the access track will be displaced. In 2018, the number of AOTs within these distances was estimated at 11; in 2019 it was just two, implying losses of between one and six AOTs. These numbers represent 0.06 % and 0.38 % of the Hoy population numbers in 2019. None of these AOTs are located within the Hoy SPA boundary.

The locations of breeding great skuas recorded in 2018 and 2019 (see Figures A.29 to A.31 in Appendix 7.1 Ornithology Technical Report) indicate some variability in the AOT distribution between years, especially in the vicinity of the development footprint. The total number within the survey area was very similar (within 6 %) each year, implying that the ground that will be most affected by the development is not a core area for skuas. The losses above assume that there will be no redistribution away from the affected area, however there is similar ground to the west where skuas were only thinly spread, with more pairs in 2019 than in 2018, therefore there is suitable alternative habitat available nearby.

Given the size of the Hoy SPA population (1,415 AOTs in 2019), and that the birds likely to be affected are not breeding within the SPA, and the availability of similar alternative habitat nearby, there is no potential for the conservation objectives 'to avoid significant disturbance to the species' or '*to maintain the population of the species as a viable component of the SPA*' to be undermined. There will be no adverse effects on site integrity.

2.3.5 Collision mortality

Nature of impact

Birds that collide with a turbine blade are likely to be killed or fatally injured. Increased mortality rates from collision with turbines could potentially affect the maintenance of bird populations, particularly for species that are otherwise experiencing poor reproductive or survival levels due to other factors e.g. food availability. The frequency of collision with turbines is assumed to be dependent on the amount of flight activity across the site and the ability of birds to detect the rotating blades and take avoidance action.

Operational displacement and collision with turbines are spatially mutually exclusive (if a bird is displaced from the wind farm area it is not at risk of collision). However, displacement effects may change temporarily as birds that were at first displaced from an area may habituate to the presence of the operating turbines after a period of time and become exposed to the risk of collision.

Determination of effects on site integrity in relation to collision mortality

Red-throated diver (Hoy SPA and Scapa Flow pSPA)

The red-throated diver collision risk estimates for each year are summarised in Table 2.8 (there were no at-risk flights observed outside the April to mid-September breeding season).

Table 2.8 Calculated Red-throated Diver Collision Risk Estimates for the Proposed Development at 99.5 % Avoidance and 99.8 % Avoidance

Season	2018	2019	Overall Average
Breeding (April – mid-September) – 99.5 % avoidance	0.19	0.34	**0.265**
Breeding (April – mid-September) – 99.8 % avoidance	0.076	0.135	**0.106**

The comparison of the five-year and two-year averages for a number of variables pertaining to breeding numbers and breeding success at red-throated diver sites local to the Proposed Development (see Table 2.5) indicates that the two-year average collision risk based on the 2018 and 2019 data is likely to be representative of the recent longer-term average. The two-year average risk is 0.265 collisions per year at 99.5 % avoidance which is equivalent to the loss of one bird every three - four years or six - seven collisions over the 25-year period.

Population modelling was carried out based on the demographic rates in Furness (2015) for the Hoy SPA red-throated diver population, with separate models for 'good', 'average' and 'poor' years. The 'good' year figures are based on the number of birds present in recent good years on Hoy and on a slightly improved productivity rate compared to the average, with survival rates held the same as the long-term average. The 'poor' year figures are based on the number of birds present and the approximate productivity found in 2017 and 2018, with adjustment downwards of the adult survival rate to produce an approximate 10 % per annum rate of population decline, as observed from 2016 through to 2018.

The variables used to define each population are given in Table 2.9, along with the resultant changes in the model outputs in each case.

Table 2.9 Collision Risk Estimates in Context of the Hoy SPA Population Models for 'Good', 'Poor' and 'Average' Years for the Proposed Development at 99.5 % Avoidance Rate and an Average Year at 99.8 % Avoidance Rate

Parameter	'Good' Year at 99.5 % Avoidance (e.g. 2019)	'Poor' Year at 99.5 % Avoidance (e.g. 2018)	Long-term Average at 99.5 % Avoidance (e.g. 2018-2019 average)	Long-term Average at 99.8 % Avoidance (e.g. 2018-2019 average)
Adult survival rate	0.84	0.80	0.84	0.84
First year survival rate	0.72	0.72	0.72	0.72
Productivity	0.650	0.360	0.630	0.63
Number of breeding adults	120	100	110	110
Number of non-breeders	23	10	20	20
Calculated risk	0.34	0.19	0.265	0.106
Decline relative to the baseline after 25 years	**6.57%**	**5.07%**	**5.66%**	**2.30%**
Impacted rate of annual population change	+ 0.11%	-10.00%	- 0.23%	- 0.09%
Baseline annual rate of population change	+ 0.38%	- 9.80%	stable	stable
Baseline no. breeding adults after 25 years	132	7 – 8	110	110
Impacted no. breeding adults after 25 years	123	7	104	107 – 108

SNH have advised that a modelled decline greater than 5 % (relative to the baseline) over a 25-year period could be considered significant in terms of a population trend. All of the models for the Proposed Development exceed 5 % at 99.5 % avoidance (Table 2.9). However, the clear rally in numbers and productivity in 2019, back to near their long-term averages, from the low point in 2017 and 2018 shows emphatically that these deterministic models are very poor reflections of a real population.

The 2018-2019 average annual risk of 0.265 collisions per year at 99.5 % avoidance results in a modelled reduction of 5.66 % in the Hoy red-throated diver population (relative to the baseline) over a 25-year period, from 110 breeding birds down to 104 birds.

If the population was to have continued its dramatic decline of 10 % per year, the 2018 risk of 0.19 collisions per year at 99.5 % avoidance would result in a modelled reduction of 5.07 % in the red-throated diver population (relative to the baseline) over a 25-year period. However, according to this model, there would be only 7 – 8 breeding birds left by that stage under both the unimpacted and impacted scenarios.

If the population was to recover (as it seems to have done in 2019) and go on with improved productivity and no decline in adult survival, the 2019 risk of, 0.34 collisions per year at 99.5 % avoidance would result in a modelled reduction of 6.57 % in the red-throated diver population (relative to the baseline) over a 25-year period. However, this model still shows a positive trajectory, with three additional breeding birds after 25 years despite the collisions.

The average risk is also shown at 99.8 % avoidance (see Table 2.8), illustrating the very large effect that changing this parameter can have. The calculated collisions reduce to 0.106 per year, and when fed into the average population model, result in a 2.30 % decline relative to the baseline after 25 years (Table 2.9).

An assessment may be made based on the average 2018-2019 collision risk and the average population model. However, this is a very limited exercise if it takes no account of both (i.) the likelihood of the calculated collision rate and (ii.) the likelihood that the model reflects the actual behaviour of the population.

There is considerable evidence from Orkney that, firstly, the accepted avoidance rate of 99.5 % for red-throated diver is very precautionary and, secondly, that the simple deterministic population model bears little similarity to a real red-throated diver population, particularly in taking no account of population processes that can counteract negative pressures.

Intensive carcass searches have been carried out at operational wind turbines in Orkney, since 2007 at Burgar Hill (with high red-throated diver activity) and since 2012 at three smaller developments (with lower diver activity) (Upton, 2018). No red-throated diver fatalities have been found during any of these searches, during which an avoidance rate of 99.5 % implies that three or more would have occurred. It is therefore clear that a 99.5 % avoidance rate is of low to very low likelihood. At 99.8 % avoidance, one to two collisions would have been expected, so this rate appears to be of moderate likelihood. The 99.8 % avoidance rate is currently used on a precautionary basis for geese, for which the evidence initially presented suggested that a rate of more than 99.9 % was applicable (SNH, 2013). Geese and divers share various similarities in flight: size, flight action, apparent lack of manoeuvrability, and in not foraging or displaying whilst in the air – similar avoidance behaviour is therefore not unreasonable, hence the illustration of 99.8 % avoidance for red-throated divers in Table 2.9 above.

Population model outputs are not predicted outcomes in the real world. In natural bird populations there is almost always an external limiting factor that determines the overall level and trend of the population (Newton, 2013); this is frequently food supply, which may set a variable cap on population numbers from year to year irrespective of other factors. The comments from the data holders received along with the detailed Hoy red-throated diver data suggest that the low numbers and high adult mortality in 2017 may have been due to a poor food supply (Jim Williams, pers. comm.). An important implication of this is that when there is a sudden low point, such as during 2017 - 2018 on Hoy, this effectively overtakes any prior downward pressure from other minor factors (such as collisions) and tends to reset the population base irrespective of them.

Within any overarching environmental constraint, 'density-dependent' processes act in various ways to tend to stabilise a population (Newton, 2013). In general terms, non-breeders at seabird colonies are considered to act as a buffer to changes that have an adverse effect on the breeding population (Klomp and Furness, 1992). A common finding is that lower breeding density (e.g. from increased mortality) may lead to accelerated rates of recruitment from non-breeders, or to higher productivity rates, each tending to bring the breeding numbers back into balance. The apparently new birds that arrived onto the red-throated diver breeding grounds on Hoy in 2018 and 2019 may well represent such accelerated recruitment from the non-breeding pool following the high adult mortality in 2017. Red-throated divers usually lay two eggs and the proportion of double broods surviving is variable year-to-year, providing a mechanism by which density-dependent productivity rates can act to mitigate impacts.

A summary of the likelihood of various scenarios, based on the 2018 – 2019 average calculated risk and the 'average' Hoy SPA population model are given in Table 2.10. The effects on the Scapa Flow pSPA population are expected to be broadly similar to the Hoy SPA population but proportionally a bit less due to the larger pSPA population (81 pairs compared to 58 pairs).

Table 2.10 Likelihood of Red-throated diver Collision Risk Estimates for the Proposed Development at 99.5 % and 99.8 % Avoidance for the Hoy SPA 'Average' Population Model

Avoidance Rate and Likelihood	Density Dependence (Allowed for or Not Allowed for)	Modelled 25-year Decline Relative to the Baseline	Overall Likelihood of Occurrence
99.5 %: very low likelihood	Not allowed for: very low likelihood	5.66 %	Very Low
99.5 %: very low likelihood	Allowed for: high likelihood	less than 5 %	Low
99.8 %: moderate likelihood	Not allowed for: very low likelihood	2.30 %	Low
99.8 %: moderate likelihood	Allowed for: high likelihood	less than 2 %	Moderate to High

The calculated collision risk estimate for red-throated diver at 99.5 % avoidance (considered very precautionary) would result in a modelled decline of less than 5 % (relative to the baseline) in the Hoy SPA red-throated diver population over a 25-year period, when density dependence is taken into account in the model. Use of the 99.5 % avoidance rate is considered very precautionary given the findings of the carcass monitoring studies at Orkney wind farms.

At 99.8 % avoidance, (considered suitably precautionary) the modelled decline (relative to the baseline) would be less than 2 % over a 25-year period, when density dependence is taken into account in the model.

Based on the recent evidence which clearly shows the capacity of the red-throated diver population to bounce back from poor breeding years with increased numbers and increased productivity as observed in 2019, it is considered that neither of these scenarios, above, is likely to result in levels of collision risk that would undermine the Hoy SPA conservation objective *'to maintain the population of the species as a viable component of the SPA'* or the Scapa Flow pSPA draft conservation objective *'to avoid significant mortality, injury and disturbance of the qualifying features so that the distribution of the species and ability to use the site are maintained in the long-term'*. At these levels of collision mortality, no adverse effects on site integrity of Hoy SPA or Scapa Flow pSPA are anticipated.

Peregrine (Hoy SPA)

The VP flight data for this species was pooled across the year since there was no clear seasonal pattern to the occurrences at the Proposed Development and few flights at risk within the wind farm buffer. This gave a single annual calculated collision risk figure of 0.09 collisions per year at the SNH-recommended 98 % avoidance rate, equivalent to one collision every 11 - 12 years.

The birds recorded at the site are likely to be from the Hoy SPA population which was six pairs at the time of designation.

A very approximate comparison is made to the estimated population size and survival rates for the Hoy SPA population (see Table 2.11). The breeding population is assumed to be six pairs, with four single non-breeders holding territory. A

minimum productivity rate of 1.04 per pair has been calculated from the Orkney Bird Reports for 2009 – 2018 (51 known fledged young from 49 monitored pairs).

Table 2.11 Comparison of Calculated Peregrine Fatalities at the Proposed Development to the Background Mortality and Survival for the Hoy SPA Population

Parameter	Number/Percentage	Description
Hoy SPA population size	22	6 pairs (12 birds) plus juveniles at 1.04 per pair (6 birds) plus non-breeders (4 birds)
Annual survival rate	0.71	0.80 for adults, 0.67 for 1–2 year-olds and 0.54 for 0–1 year-olds (weighted 12:4:6 as above, assuming non-breeders are 1–2 year-olds) (Craig et al, 2004)
Annual mortality rate (1 – survival rate)	0.29	-
Expected no. survivors	15.62	No. x survival rate
Expected no. background deaths p.a.	6.38	No. x mortality rate
Calculated fatalities p.a. at the Proposed Development	0.09	Year-round figure for the Proposed Development at 98 % avoidance
Calculated % decrease in survival	0.58 %	Fatalities / survivors x 100
Calculated % increase in mortality	1.41 %	Fatalities / deaths x 100

The percentage changes in the survival and mortality rates are relatively high compared to the low calculated risk figure due to the small population. However, some of the year-round risk will be borne by birds that are not part of the Hoy SPA, particularly over the winter.

The likelihood of collisions being as high as estimated is low, since the 98 % avoidance rate for peregrine is the default precautionary rate recommended by SNH in the absence of detailed specific information. However, the Hesta Head Wind Farm, South Ronaldsay, Orkney application considered peregrine collision risk in detail in the Environmental Statement Addendum (ITPEnergised, 2018) due to there being a peregrine breeding site adjacent to the development. The collision risk there was calculated at 0.392 collisions per year at 98 % avoidance, but the impact assessment argued that 99 % was suitably precautionary, and 0.196 collisions per year was the key figure used when assessing the impact on the NHZ 2 population.

The evidence cited was that of the overall numbers of reported collisions, at a continental scale (Europe and the United States), compared to the estimated populations of peregrine and various species with higher accepted avoidance rates (e.g. red kite and golden eagle at 99 % and large gulls at 99.5 %). Peregrine was shown to have a lower 'vulnerability index' (i.e. the number of collisions divided by the population size) than red kite and large gulls in Europe and lower than golden eagle in the USA. The SNH response (SNH, 2018) makes no reference to avoidance rates and appears to accept the arguments presented by the applicant.

Use of a 99 % avoidance rate here would mean an annual calculated risk of 0.045, or one collision every 22 – 23 years. The impacts on survival and mortality rates for the Hoy SPA population (assuming conservatively that all of the risk impacts on SPA birds) would be similarly halved i.e. a 0.29 % reduction in survival rate and a 0.70 % increase in mortality rate.

The Hoy peregrine population is small and relatively poorly monitored, making deterministic population modelling particularly unreliable due to the effects of both stochasticity and incomplete data. If a rise in the background mortality rate of more than 1 % is taken to be significant, a broad indication of the potential significance of the calculated collision risk can be gained from the inferred changes in demographic rates shown in Table 2.11. On this basis, the likelihood of the collision mortality effect on the Hoy SPA peregrine population at different avoidance rates is given in Table 2.12.

Table 2.12 Likelihood of Hoy SPA Peregrine Collision Risk Estimates for the Proposed Development at 98 % and 99 % Avoidance

Avoidance Rate and Likelihood	Calculated Increase in the Hoy SPA Mortality Rate	Calculated Number of Collisions over 25 years	Overall Likelihood of Occurrence
98 %: very low likelihood	+ 1.41 %	2.25 (2 – 3)	Very Low
99 %: moderate likelihood	+ 0.70 %	1.12 (1 – 2)	Moderate

The calculated collision risk estimate for peregrine at the default 98 % avoidance rate (considered very precautionary), would result in a calculated rise of 1.41 % in the background mortality rate for the Hoy SPA peregrine population. The overall likelihood of this occurring is considered very low.

The calculated collision risk estimate for peregrine at 99 % avoidance (considered suitably precautionary for this site), would result in a calculated rise of 0.70 % in the background mortality rate for the Hoy SPA peregrine population. The overall likelihood of this occurring is considered moderate. This level of increase in background mortality as a result of collision mortality is unlikely to undermine the conservation objective *'to maintain the population of the species as a viable component of the SPA'*. At this level of collision mortality, no adverse effects on site integrity of Hoy SPA are anticipated.

Great skua (Hoy SPA)

The calculated great skua collision risk estimates for the Proposed Development for each year are shown in Table 2.13.

Table 2.13 Calculated Great Skua Collision Risk Estimates for the Proposed Development at 99.5 % Avoidance

Season	2018	2019	Overall Average
Breeding (April – September)	7.26	7.04	**7.15**

The risk shown for each year is very similar, so that it is reasonable to simply take the average value, which is 7.15 estimated collisions per year at 99.5 % avoidance.

SNH have advised that a modelled decline greater than 5 % (relative to the baseline) over a 25-year period could be considered significant in terms of a population trend. The population models carried out for the Hoy great skua population show a 25-year reduction of about 5 % (relative to the baseline) at 8.1 collisions per year. The total average risk for the Proposed Development is 7.15 collisions per year which is equivalent to a reduction in the Hoy great skua population of 4.45 % (relative to the baseline) over the 25-year lifetime of the wind farm.

An assessment may be made based on the average 2018 - 2019 collision risk and the population model. However, this is a very limited exercise if it takes no account of both (i.) the likelihood of the calculated collision rate and (ii.) the likelihood that the model reflects the actual effects on the population.

There is evidence from Orkney that, firstly, the accepted avoidance rate of 99.5 % for great skua is clearly precautionary and, secondly, that the simple deterministic population model bears little similarity to a real great skua population, particularly in taking no account of population processes that can counteract negative pressures.

Carcass searches at wind farms adjacent to great skua breeding populations on the Mainland of Orkney, and at the Ore Brae Turbine, have been carried out since 2007, alongside flight observations in certain years. This work was summarised up until 2014 (Upton, 2014) and since then searches have continued at the Mainland sites up until 2018, and on Hoy up until 2019.

As at 2014 an estimated 553.3 great skua collisions would have occurred at Burgar Hill, Hammars Hill and the Ore Brae Turbine before avoidance (Upton, 2014). These figures were based on the flight path observations for years when watches were carried out, together with estimates for the intervening years. For the two largest wind farms at Burgar Hill and Hammars Hill the estimates for unwatched years up to 2014 were based on the numbers of great skua territories reported by RSPB on their adjacent reserve each year – the risk was taken to be proportional to the territory numbers.

Since 2014 there are additional expected casualties as follows:

- For 2015 – 2018 at Burgar Hill, the average of the 2007 – 2014 risk is applied – this is 52 collisions per year before avoidance. For four additional years, this is 4 x 52 = 208 additional expected collisions.
- For 2015 – 2018 at Hammars Hill, flight observations were made in 2016 and 2017, and the calculations of risk for those two years averaged 40 per year before avoidance. For the four additional years, this is 4 x 40 = 160 additional expected collisions.
- For 2015 – 2019 at the Ore Brae Turbine the average risk calculated in 2011 and 2012 is applied – this is 43.5 collisions per year before avoidance. For the five additional years, this is 5 x 43.5 = 217.5 additional expected collisions.
- For 2012 – 2018 at the single turbine at Holodyke. This site was not included in the Upton (2014) review, but a risk of 15.6 collisions per year before avoidance was calculated prior to construction in 2004 – 2005. As at 2012 there was still one great skua territory at 500 m – 1,000 m from the turbine (as there had been previously) and the larger great skua population on the RSPB reserve beyond had increased markedly (the same population as used to calculate risk at Burgar Hill and Hammars Hill). Therefore, a conservative estimate of the collisions at Holodyke before avoidance is, 7 x 15.6 = 109.2 additional expected collisions.

Table 2.14 shows the expected number of great skua fatalities, before avoidance, at each of these wind farms up to the most recent search year.

Table 2.14 Total Estimated Great Skua Collisions Expected Before Avoidance at Wind Farms in Orkney where Carcass Searches have been Undertaken

Site	Estimated Collisions Before Avoidance up to 2014 (Upton, 2014)	Additional Search Years	Additional Expected Collisions Before Avoidance	Total Expected Collisions Before Avoidance to Date
Burgar Hill	416.1	2015 - 2018	208.0	624.1
Hammars Hill	78.1	2015 - 2018	160.0	238.1
Holodyke	-	2012 - 2018	109.2	109.2
Ore Brae	59.1	2015 - 2019	217.5	276.6
		Total expected collisions before avoidance		**1,248.0**

Over the course of the carcass searches at these sites, three great skua collision victims have been found: one at Hammars Hill in 2015; one at Holodyke in 2016 and one at Burgar Hill in 2017.

The observed avoidance rate for great skuas at these sites can therefore be calculated as:
1 – (3 / 1,248) = 1 – 0.0024 = 99.76 %.

Such a rate would halve the calculated collision risk at the Proposed Development to 3.6 collisions per year and the modelled population reduction would be 2.26 % after 25 years, relative to the baseline.

As discussed for red-throated diver above, population model outputs are not predicted outcomes in the real world. There may be an external limiting factor that determines the overall level and trend of the population, irrespective of collisions, and there will be various 'density-dependent' processes that tend to stabilise a real population (Newton, 2013). In general terms, non-breeders at seabird colonies are considered to act as a buffer to changes that have an adverse effect on the breeding population, as found for great skuas specifically (Klomp and Furness, 1992).

The model used here is very simplistic (it is identical in its workings to a straightforward Leslie Matrix) and incorporates simple estimates of demographic rates. Adult survival is the most important, but this rate is based on research from elsewhere. More complex stochastic models may be used but are doubtfully more accurate given the lack of sufficient in-depth knowledge to enable the use of population-specific demographic rates. Any such model outcome would be very dependent on the assumptions behind it, particularly how it allowed for density-dependent effects; its accuracy would depend on whether the assumptions were borne out in real life.

The likelihood of various scenarios based on the 2018 – 2019 average calculated risk and the population model are given in Table 2.15.

Table 2.15 Likelihood of Great Skua Risk Estimates for the Proposed Development at 99.5 % and 99.75 % Avoidance

Avoidance Rate and Likelihood	Density Dependence (Allowed for or Not Allowed for)	Modelled 25-year Decline Relative to the Baseline	Overall Likelihood of Occurrence
99.5 %: low likelihood	Not allowed: very low likelihood	4.45 %	Very low
99.5 %: low likelihood	Allowed: high likelihood	less than 4 %	Low

Avoidance Rate and Likelihood	Density Dependence (Allowed for or Not Allowed for)	Modelled 25-year Decline Relative to the Baseline	Overall Likelihood of Occurrence
99.75 %: moderate likelihood	Not allowed: very low likelihood	2.26 %	Low
99.75 %: moderate likelihood	Allowed: high likelihood	less than 2 %	Moderate to high

The calculated collision risk estimate for great skua at 99.5 % avoidance (considered very precautionary) would result in a modelled decline of less than 4 % (relative to the baseline) in the Hoy SPA great skua population over a 25-year period, when density dependence is taken into account in the model. Use of the 99.5 % avoidance rate is considered very precautionary given the findings of the carcass monitoring studies at Orkney wind farms.

At 99.75 % avoidance, (considered suitably precautionary) the modelled decline (relative to the baseline) would be less than 2 % over a 25-year period, when density dependence is taken into account in the model.

It is considered that neither of these scenarios is likely to result in levels of collision risk that would undermine the conservation objective '*to maintain the population of the species as a viable component of the SPA'*. At these levels of collision mortality, no adverse effects on site integrity of Hoy SPA are anticipated.

Great black-backed gull (Hoy SPA)

The calculated great black-backed gull collision risk estimates for the Proposed Development for each season and for each year are shown in Table 2.16.

Table 2.16 Calculated Great Black-backed Gull Collision Risk Estimates for the Proposed Development at 98 % Avoidance

Season	2018	2019	2018/19	2019/20	Overall Average
Breeding (April – August)	2.37	2.21	-	-	**2.29**
Non-breeding (September – March)	-	-	0.64	1.79	**1.79**
				Overall annual risk	**4.08**

The non-breeding season risk is about three times greater in 2019/20 than in 2018/19 (Table 2.16). This may be at least partly due to different recording methods between years, with greater confidence in the 2019/20 method and figures. Therefore, the 2019/20 figure is used to quantify non-breeding season risk, at 1.79 collisions per non-breeding season at 98 % avoidance.

Overall, the average annual collision risk for great black-backed gull is therefore 4.08 collisions per year at 98 % avoidance.

However, there is strong empirical evidence that clearly indicates much higher avoidance in this species at onshore wind farms. At present, statutory nature conservation bodies recommend use of a 99.5 % avoidance rate for large gulls (including great black-backed gull) at offshore wind farms. This 99.5 % avoidance rate is based on evidence

from terrestrial wind farms, reviewed and evaluated thoroughly (Cook et al, 2014; JNCC et al, 2014). A recent review by Furness (2019) concludes that it would be appropriate and more consistent for SNH to recommend use of avoidance rates of 99.5 % for large gulls (including great black-backed gull) at terrestrial wind farms. The equivalent risk figures at 99.5 % would simply be one quarter of those calculated at 98 %.

Application of a 99.5 % avoidance rate would reduce the 2018 breeding season collision risk to 0.59 and the 2019 breeding season risk to 0.55, averaging 0.57 collisions per breeding season at 99.5 % avoidance, or one fatality every 1.7 years (one – two years).
For the non-breeding season period, application of a 99.5 % avoidance rate would reduce the 2018/19 non-breeding season collision risk to 0.16 and the 2019/20 non-breeding season risk to 0.45. Using the 2019/20 value of 0.45 collisions per non-breeding season as representative, the risk is equivalent to one fatality every 2.2 years (two – three years).

Overall, the total collision risk for great black-backed gull calculated at 99.5 % avoidance is 1.02 collisions per year.

The bulk of the breeding season risk is not considered to involve the remnant Hoy SPA population, the scattered pairs of which now lie several kilometres away to the west of the Proposed Development. The two adjacent pairs are well separated from the SPA birds and probably have more connection with the colony on the nearby island of Fara plus any other pairs on the east coast of Hoy and the other adjacent islands in Scapa Flow (all outwith the SPA).

Since the breeding season risk at 99.5 % avoidance is less than one per year, and little of it will pertain to the Hoy SPA birds, this level of collision mortality on the Hoy SPA breeding great black-backed gulls is not anticipated to undermine the conservation objective *'to maintain the population of the species as a viable component of the SPA'*. Therefore, this level of additional mortality would not represent an adverse effect on the integrity of the SPA.

2.4 CUMULATIVE AND IN-COMBINATION EFFECTS

Cumulative effects have also been considered in relation to the Hoy SPA populations and Scapa Flow pSPA red-throated diver population.

All of the potential effects of wind farms relevant to these SPA/pSPA populations (disturbance, displacement and collision risk) have the potential to contribute to the cumulative ornithological impacts, so all have been considered in this cumulative ornithological assessment. However, the predicted effects of the Proposed Development with regard to construction disturbance and displacement are all so low it is considered that these would not make any material contribution to any potentially significant cumulative effects at the SPA level. Cumulative disturbance and displacement are not, therefore, considered any further in this cumulative assessment. The cumulative assessment has therefore focussed on collision risk. Cumulative assessments have been carried out for those species for which it was considered the Proposed Development could materially contribute to a potentially significant cumulative risk.

The only other wind farm site or proposal that will affect the Hoy SPA is the Ore Brae Turbine.

2.4.1 Red-throated diver (Hoy SPA and Scapa Flow pSPA) Cumulative Collision Risk

Any effects on the Scapa Flow pSPA population are expected to be broadly similar to the Hoy SPA population but proportionally a bit less due to the larger pSPA population (81 pairs compared to 58 pairs) therefore a separate assessment has not been undertaken.

The average calculated collision risk for red-throated diver at the Proposed Development is 0.265 collisions per year at 99.5 % avoidance; the calculated collision risk at the Ore Brae Turbine in 2008 was 0.008 per year at 99.5 % avoidance. The cumulative risk is therefore 0.273 collisions per year (see Table 2.17).

The additional risk is equivalent to a 3 % increase in risk compared to the Proposed Development. Such a small increase in collision risk is well within the uncertainty of many of the elements of the collision risk calculation. Therefore, the cumulative collision risk to the Hoy SPA red-throated diver population is essentially the same as that carried out for the Proposed Development on its own (see Section 2.3.5) and no separate cumulative assessment is required.

Table 2.17 Cumulative Collison Risk for Red-throated Divers from the Hoy SPA population

Development	Number of Turbines	Status	Annual Collision Risk Estimate (99.5 % avoidance)	Sum Total
Orkney's Community Wind Farm Project - Hoy	6	Application	0.265	0.265
Ore Brae Turbine	1	Operational	0.008	0.273
			Total	**0.273**

The Hoy SPA conservation objective '*to maintain the population of the species as a viable component of the SPA'* and the Scapa Flow pSPA draft conservation objective '*to avoid significant mortality, injury and disturbance of the qualifying features so that the distribution of the species and ability to use the site are maintained in the long-term'* would not be undermined therefore there would be no adverse effect on the site integrity of the Hoy SPA or Scapa Flow pSPA red-throated diver populations as a result of cumulative collision mortality.

2.4.2 Peregrine (Hoy SPA) Cumulative Collision Risk

The calculated collision risk for peregrine at the Proposed Development is 0.09 per year at 98 % avoidance; the calculated collision risk at the Ore Brae Turbine in 2008 was 0.006 per year at 98 % avoidance. The cumulative risk is therefore 0.096 collisions per year (see Table 2.18).

Table 2.18 Cumulative Collision Risk for Peregrines from the Hoy SPA population calculated at 98 % Avoidance

Development	Number of Turbines	Status	Annual Collision Risk Estimate (98 % Avoidance)	Sum Total
Orkney's Community Wind Farm Project - Hoy	6	Application	0.09	0.09
Ore Brae Turbine	1	Operational	0.006	0.096
			Total	**0.096**

The additional risk is equivalent to a 6.25 % increase in risk compared to the Proposed Development. Such a small increase in collision risk is well within the uncertainty of many of the elements of the collision risk calculation. Therefore, the cumulative collision risk to the Hoy SPA peregrine population is essentially the same as that carried out for the Proposed Development on its own (see Section 2.3.5) and no separate cumulative assessment is required.

The conservation objective '*to maintain the population of the species as a viable component of the SPA*' would not be undermined therefore there would be no adverse effect on the site integrity of the Hoy SPA great skua population as a result of cumulative collision mortality.

2.4.3 Great skua (Hoy SPA) Cumulative Collision Risk

The average calculated collision risk for great skua at the Proposed Development is 7.15 collisions per year at 99.5 % avoidance; the calculated collision risk at the Ore Brae Turbine in 2008 was 0.38 per year at 99.5 % avoidance. The cumulative risk is therefore 7.53 collisions per year (see Table 2.19).

Table 2.19 Cumulative Collison Risk for Great Skuas from the Hoy SPA Population at 99.5 % Avoidance

Development	Number of Turbines	Status	Annual Collision Risk Estimate (99.5 % avoidance)	Sum Total
Orkney's Community Wind Farm Project - Hoy	6	Application	7.15	7.15
Ore Brae Turbine	1	Operational	0.38	7.53
			Total	**7.53**

The additional risk is equivalent to a 5.3 % increase in risk compared to the Proposed Development. Such a small increase in collision risk is well within the uncertainty of many of the elements of the collision risk calculation, Therefore, the cumulative collision risk to the Hoy SPA great skua population is essentially the same as that carried out for the Proposed Development on its own (see Section 2.3.5) and no separate cumulative assessment is required.

The conservation objective '*to maintain the population of the species as a viable component of the SPA*' would not be undermined therefore there would be no adverse effect on the site integrity of the Hoy SPA great skua population as a result of cumulative collision mortality.

2.4.4 Great black-backed gull (Hoy SPA)

Although great black-backed gull is a Hoy SPA qualifying interest, the birds breeding close to the Proposed Development are well away from the SPA and not connected to it for foraging or roosting, nor by regular or frequent interactions with breeders that are located on the SPA.

The bulk of the calculated collision risk is therefore judged not to relate to the SPA population, and this would also be the case at the Ore Brae Turbine.

There were no collision risk calculations undertaken for this species for the Ore Brae Turbine, but as for the other Hoy SPA qualifying interests above, it may be assumed that the additional risk would be very low relative to that posed by the Proposed Development.

Since the bulk of the risk is to non-SPA birds, there is no meaningful calculation or estimation of cumulative risk that can be made for the SPA.

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4 APPENDIX A: FIGURES

Figure 4.1 Natura sites with ornithological interests identified in the Scoping Opinion as relevant to the Proposed Development