

# 8 Ornithology

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## 8 Ornithology

### 8.1 Executive Summary

- 8.1.1 A full suite of ornithological surveys was adopted for the purposes of assessing the avian baseline conditions for the Proposed Development. The surveys included: Vantage Point surveys, breeding bird surveys and breeding raptor surveys; all undertaken from September 2020 to May 2022.
- 8.1.2 Four raptor species and owl species of high conservation value and two common raptor species were registered in the site during the Vantage Point and walkover surveys, of which hen harrier and short-eared owl were also assessed as breeding within the site or within the 2 km survey area. Nine species of wildfowl and divers were recorded during the surveys, with only greylag goose confirmed as breeding. Five species of gull were recorded during flight activity surveys with none recorded as breeding within the site. Twelve species of waders were recorded, six were recorded as breeding in the site. Great skuas were frequently recorded from flight activity surveys during the breeding season while small numbers of Arctic tern and Arctic skua were also recorded but none of the three were noted as breeding within the site.
- 8.1.3 Levels of flight activity recorded at risk height were considered to be low or moderate for all target species. Collision risk modelling was undertaken for the most frequently recorded at risk height. Red-throated diver and great skua which were the only two species likely to register a collision risk.
- 8.1.4 An assessment of ornithology effects arising from the construction and operation of the Proposed Development was undertaken, based on the proposed layout and turbine dimensions. Through a standardised evaluation method, Important Ornithological Features were identified and brought forward for assessment if concluded to be vulnerable to effects. Important Ornithological Features taken forward for further consideration included an international designation, Orkney Mainland Moors Special Protection Area, which is designed for breeding and wintering hen harrier, breeding short-eared owl and breeding red-throated diver; two locally designated sites, Loch of Swannay LNCS and Loch of Hundland LNCS; as well as three species, curlew, lapwing and great skua.
- 8.1.5 In accordance with guidelines, the impact assessment assumed the application of standard mitigation measures. With these in place, predicted effects were considered to be barely perceptible or low and therefore not significant for all Important Ornithological Features. There is no requirement for further specific mitigation for construction and operation phases as they are considered to have barely perceptible or low adverse significance, i.e. not significant although proposed enhancement measures for ground nesting birds is proposed and would have a long-term beneficial effect on the breeding population.
- 8.1.6 Likely cumulative effects with nearby operational developments, as well as those currently consented or at application stage of planning, were also considered. No significant cumulative effects are anticipated as a result of the Proposed Development.

### 8.2 Introduction

#### ***Scope of Study***

- 8.2.1 This chapter considers and provides an assessment of the likely effects of the Proposed Development on the ornithological interests both within the development boundary (i.e. ‘the site’) and the surrounding area.
- 8.2.2 This chapter presents the baseline ornithological interests and considers the likely impacts of the Proposed Development on notable species, while focusing on Important Ornithological Features (IOFs).
- 8.2.3 Likely ornithological effects of the Proposed Development are outlined and an assessment is provided based on the value of the receptor and the magnitude of the impact giving the significance of the effect. Where appropriate, mitigation measures to enhance, prevent, minimise or control

identified ornithological effects are presented and residual ornithological effects following the adoption of those measures are assessed.

8.2.4 This chapter (and its associated figures and appendices) is not intended to be read as a standalone assessment. Reference should also be made to **Appendix 8.1** and **Appendix 8.2**, as well as other chapters of this EIA Report including **Chapter 3** and **Chapter 7** as referenced within the chapter.

8.2.5 Likely ornithological effects associated with the development of a wind farm can occur throughout the three main phases of a wind farm's lifespan (construction, operation and decommissioning) and may include: direct habitat loss and indirect effects on habitat quality, mortality from collision with turbines and disturbance and displacement impacts.

### ***Description of the Site***

8.2.6 The site comprises an area of approximately 120 hectares (ha). The site is predominantly grassland with gently sloping topography up to 106 m Above Ordnance Datum (AOD). The eastern boundary of the site borders the Loch of Swannay. The site is shown in **Figure 8.1**.

### ***Statement of Competence***

8.2.7 The assessment has been carried out in accordance with the Code of Professional Conduct of the Chartered Institute of Ecology and Environmental Management (CIEEM) by Allan Taylor (BA (Hons), MSc, ACIEEM) and Mikael Forup (BSc (Hons), PhD Restoration Ecology, CEnv, MCIEEM), ecologists and ornithologists with over 20 years' combined experience.

8.2.8 The field surveys were conducted by Stuart Williams, a highly experienced ornithologist and current chair of Orkney Raptor Study Group, who has been undertaking surveys for windfarm applications on Orkney for 18 years and has recently completed dedicated red-throated diver surveys on Orkney for RSPB and the Joint Nature Conservancy Council (JNCC).

## **8.3 Legislation, Policy and Guidelines**

8.3.1 Relevant legislation documents have been taken into account as part of this ornithological assessment. Of particular relevance are:

- Council Directive 2009/147/EC on the conservation of wild birds (i.e. the "Birds Directive") as transposed into Scots law by The Conservation (Natural Habitats &c.) Regulations 1994;
- The Ramsar Convention on Wetlands (1975);
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended);
- The Wildlife and Countryside Act (WCA) 1981 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011 (as amended); and
- The Nature Conservation (Scotland) Act 2004 (as amended).

### ***Planning Policy***

8.3.2 **Chapter 5** sets out the planning policy framework that is relevant to the EIA process. The policies set out include those from the Orkney Local Development Plan (LDP) 2017-2022 (2017), those relevant aspects of Scottish Planning Policy (SPP), Planning Advice Notes and other relevant guidance. In addition to policies within SPP and the LDP relevant to ornithology and nature conservation, regard has been had to the Planning Advice Note (PAN) 60: Planning for Natural Heritage (amended in 2008).

### ***Best Practice Ornithological Guidance***

8.3.3 Current best practice guidance on assessing ornithological interests in relation to onshore wind farm developments was followed. A full description of relevant guidance is presented in **Appendix 8.1**; however, of relevance to ornithology are the following:

- Guidelines for Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018);
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment (IEMA), 2005);
- Survey Methods for Use in Assessing the Impacts of Onshore Wind Farms on Bird Communities (SNH, 2017); and
- Windfarms and Birds: Calculating a Theoretical Collision Risk Assuming No Avoiding Action (SNH, 2000);
- Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model (SNH, 2018a);
- SNH (2018b). Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas (2014, updated 2018). SNH Information and Guidance Note. SNH, Battleby.
- Developing field and analytical methods to assess avian collision risk at wind farms (Band *et al.* 2007);
- Assessing the Cumulative Impact of Onshore Wind Energy Developments (SNH, 2012);
- The Scottish Biodiversity Strategy, with Scottish priority species and habitats listed on the Scottish Biodiversity List (SBL), based on the former UK Biodiversity Action Plan (UK BAP), and regional biodiversity targets defined through the Orkney Local Biodiversity Action Plan (LBAP) (Orkney Islands Council, 2013); and
- Stanbury *et al.* (2021), Birds of Conservation Concern (BoCC): the Population Status of Birds in the United Kingdom, Channel Islands and the Isle of Man.

## 8.4 Consultation

8.4.1 Details of consultees and their responses are provided in Table 8.1.

**Table 8-1 - Consultation Responses**

Consultee	Consultation Response	Applicant Action
Area Officer, Northern Isles and North Highland NatureScot 12/04/2022	Impacts on protected areas: The proposal lies adjacent to the Orkney Mainland Moorlands Special Protection Area (SPA), protected for its hen harriers, and breeding short-eared owls and red-throated divers. It also lies adjacent to the West Mainland Moorlands Site of Special Scientific Interest (SSSI), protected for its upland habitats and breeding birds.  The Applicant should assess the direct and indirect impacts on the SPA/SSSI and their qualifying interests/notified features in context of their conservation objectives/management statements. The assessment should also consider the impact of the proposal as both a single development and cumulatively with other proposals affecting these protected areas.	All points noted and all designated sites and their designated species are taken into account in the assessment.
	The scope of the EIA will also need to take account of other potential significant impacts on nature including, but not limited to, protected species	All breeding birds within the site and relevant survey

Consultee	Consultation Response	Applicant Action
	<p>(including breeding birds). We refer the Applicant to our published general scoping and pre-application advice document to help inform the work carried out for their EIA Report</p>	<p>buffers are taken into account in the assessment.</p>
	<p>The proposal lies adjacent to this SPA, and therefore within connectivity distance for all 3 SPA species. The status of the site means that the Conservation (Natural Habitats, &amp; c.) Regulations 1994 as amended (the “Habitat Regulations”) apply. Due to this connectivity, a Habitat Regulation Appraisals will be required and any direct or indirect impacts to SPA features will need to be fully considered as part of the EIA process. Avoiding impacts to this site should be a key consideration in the design and layout of the wind farm. We agree with the scoping report that an assessment of potential impacts to this SPA should include collision risk (to birds using the wind farm site and moving through it) and disturbance/displacement impacts (to birds nesting or roosting within the wind farm site and the adjacent SPA). We further advise that the potential for barrier effects to birds (e.g. divers) using normal routes to and from feeding/breeding areas is also considered within the assessment. Furthermore, depending on the activity identified during survey work, connectivity with other SPAs in this area may also need to be considered.</p>	<p>All points noted- Orkney Mainland Moorlands SPA is fully considered as part of the assessment.</p> <p>Collision risk analysis has been undertaken on target species where flight activity that is considered to be significant at-risk height.</p> <p>There were no ‘at-risk’ flights for short-eared owl and only a single flight for hen harrier, therefore no collision risk was undertaken for these species. See <b>Appendix 8.2</b>.</p> <p>A shadow HRA has been carried out to assess the impacts of the Proposed Development on all SPAs within potential ‘connectivity’ of the site including the Orkney Mainland Moorlands SPA, Marwick Head SPA, Rousay SPA and North Orkney SPA. (See <b>Appendix 8.3</b>).</p>
	<p>We agree with the scoping report that impacts to the SSSI should also be considered within the EIA. Where impacts are identified, we encourage the Applicant to address these through appropriate site design and/or mitigation measures. In relation to the bird interests of the site, the Applicant may find the SSSI’s Site Management Statement (available from SiteLink) useful in identifying which species regularly breed on the SSSI.</p>	<p>All points noted and all designated sites and their designated species are taken into account in the assessment.</p> <p>The site management statement and citations were used in reference to all protected sites details in Table 8.4.</p>
	<p>The scoping report suggests that 2 years of survey work is not required due to the proximity of the SPA and the likelihood of existing monitoring data being available. We advise that although monitoring data</p>	<p>A total of 18 months of VP surveys have been undertaken that includes one breeding season and</p>

Consultee	Consultation Response	Applicant Action
	<p>for the SPA does exist, this does not replace the need for targeted Vantage Point (VP) survey work to establish the likelihood and significance of impacts to birds using the proposal site. In addition, the Applicant will need to assess the impacts of the proposal on wider countryside species (i.e. those not connected with a protected area) as outlined in our bird survey guidance. Our guidance states that 2 years of survey work is required unless it can be demonstrated that a shorter period is appropriate. Without seeing the results of the completed survey work, we cannot comment on whether this approach is adequate in this case. We advise that, given the proximity of the SPA and SSSI, it is likely that 2 full years of survey will be required to inform a robust assessment. We would be happy to advise the Applicant further on this, if required.</p>	<p>two non-breeding seasons. The April and May data from 2022 has been collected and is referenced in the assessment but not used for collision risk calculations which should include data for entire breeding or non-breeding seasons (A comparison of April / May flight data is in <b>Appendix 8.1: Annex A Table A11</b>).</p> <p>A full four-visit survey in 2021 and a two visit breeding bird survey in 2022 were used to outline the wader breeding territories within the site.</p> <p>A full year of breeding raptor surveys was completed in 2021 of the site and 2 km survey buffer. This has been complemented with a total of 3 years of data from the Orkney Raptor Study Group covering the site and up to 5 km for SPA qualifying species.</p> <p>While a full 2-year period has not been completed, we consider that a suitably robust data set has been compiled to inform the assessment.</p>
	<p>Following survey work, and where a collision risk is identified, Collision Risk Modelling should be undertaken. For species associated with the SPA, an assessment should be made against the conservation objectives for the site. For wider countryside species, an assessment should be made against the relevant Natural Heritage Zone (NHZ) i.e. NHZ 2: Orkney and North Caithness.</p>	<p>Collision risk analysis has been undertaken on target species with significant flight activity at risk height (see <b>Appendix 8.2</b>) and assessed against the SPA designation populations and conservation objectives and NHZ2 figures as outlined.</p>
	<p>The assessment should also consider the cumulative impacts to birds from other proposals affecting this</p>	<p>All other wind farms in Orkney have been taken</p>

Consultee	Consultation Response	Applicant Action
	SPA and we refer the Applicant to our cumulative guidance for further information.	into consideration as part of the cumulative assessment.  No other proposals of relevance have been identified.
Senior Marine Conservation Planner, RSPB Scotland  12/04/2022	We are pleased to see that Ornithology has been scoped into the EIA Report. In general, the ornithological chapter of the EIA should consider all the components of the proposal including access roads (including the route on public roads to get the turbines on site), on site tracks, borrow pits, drainage, grid connection, substation and temporary construction buildings/storage compounds. Disturbance, displacement (including barrier effects), loss of suitable habitat (breeding, wintering and foraging) and collision risk should be assessed for all species.	All points noted.  All components mentioned have been taken into account in the assessment.
	The proposed development site overlaps the Hundland Hill RSPB Reserve. It lies inside and adjacent to Loch of Swannay Local Nature Conservation Site (LNCS) and is also adjacent to Orkney Mainland Moors SPA, West Mainland Moors SSI and 40 meters away from Loch of Hundland Local Nature Conservation site. There are a further six designated (either SPA, SSI or LNCS) within 5km.	These points are acknowledged.
	The Orkney Mainland Moors SPA is designated for breeding and non-breeding hen harrier, breeding red-throated diver and short eared owls, though it also provides nesting opportunities for an assemblage of other moorland breeding birds. The West Mainland Moors SSSI is recognised for blanket bog as well as its breeding bird assemblage including red-throated diver, hen harrier, and short-eared owls. Information from Orkney Island Council shows both LNCS support several nationally important habitats and bird species. This includes red-throated diver, lapwing, and curlew. Loch Swanney is also important for winter wild wildfowl, especially Greenland white-fronted geese and Hen Harriers are known to hunt over the Loch Hundland area. The RSPB reserve similarly supports breeding and wintering hen harriers, breeding red-throated diver and breeding short-eared owls. It is also an important area for waders including curlew, whimbrel and golden plover, merlin and great and arctic skua.	All points noted and all the designated sites mentioned and their designated species are taken into account in the assessment.



Consultee	Consultation Response	Applicant Action
	<p>Mindful of the importance of the surrounding area and in the absence of precise information as to what data already exists and the quality and the age of that data, we do not consider the developer has demonstrated a shorter period of data is sufficient to support the application. Use of the Orkney Mainland Moors SPA data is welcome for additional context, but it is not site specific and predominantly dates from between 2004 and 2013. It is therefore unsuitable to be relied upon as recent data. Two full years of site-specific surveys should therefore be provided in line with the published guidance from NatureScot.</p>	<p>Please see response for similar point from NatureScot above.</p> <p>In addition to the field surveys - 3 years of breeding data from ORSG were used in the assessment to provide robust information on two of the SPA qualifying species.</p>
	<p>Information within the EIA report must demonstrate that the survey data are adequate, robust, and accurate. The following should be included:</p> <ul style="list-style-type: none"> <li>• Full information on the Vantage Point (VP) Survey work undertaken, including dates, times, and weather conditions</li> <li>• Maps showing VP locations that also denote viewsheds (we note this is currently included in Figure 5.2 of the scoping report)</li> <li>• Maps showing diver and raptor foraging areas and flights</li> <li>• Worked example(s) of collision risk calculations</li> <li>• Provision of raw data in order (to allow) independent verification of collision risk calculations</li> </ul>	<p>All the requested data and figures are included in the assessment and in <b>Appendix 8.1</b> and <b>Appendix 8.2</b>.</p>
	<p>We also wish to highlight that Greenland white-fronted geese are particularly sensitive to disturbance at the roost. We would therefore recommend including wintering goose and swan roost surveys on any lochs and waterbodies within the application site and zone of influence.</p>	<p>Dedicated surveys were not considered a requirement as two full winter walkovers (seven visits each) and dusk and dawn winter VPs would have identified any wintering goose and swan roost sites within the site and its zone of influence.</p>
	<p>In regard to collision risk modelling, we wish to highlight that data analysis methodologies developed on the Scottish mainland are not always appropriate on Orkney. For example, hen harriers exhibit higher levels of polygyny on Orkney and therefore any population viability analysis as a results of disturbance impacts must be undertaken for both male and female hen harriers.</p>	<p>This point is noted. However, collision risk was not completed for hen harrier due to very low seconds at risk height recorded at the site.</p>

Consultee	Consultation Response	Applicant Action
	<p>Red-throated diver are known to demonstrate a high level of macro avoidance which could result in increased energy expenditure by birds commuting between breeding and foraging sites via a longer route. This could result in reduced condition or reduced food provisioning for any chicks and represents an important impact in addition to collision risk upon the diver population. Population viability analysis is therefore likely to be required for this species.</p>	<p>Points noted. The level of collision risk for red-throated diver was not considered sufficiently high to require population viability analysis to be completed.</p>
	<p>Cumulative impacts on the species and their populations that are sensitive to wind energy and other developments should be assessed across the Natural Heritage Zones, SPA and local populations. There are several other anticipated, consented, and operational developments close to this proposed development site, with predicted impacts on the ornithological features, including Costa Head wind farm, Burgar Hill Windfarm and Hammars Hill Windfarm. Disturbance, displacement (including barrier effects) and collision risk should be assessed cumulatively for all species.</p>	<p>All other wind farms in Orkney have been taken into consideration as part of the cumulative assessment.</p>
	<p>The EIA Report should include post-construction monitoring for collision mortality and breeding birds. We request that a detailed Habitat Management Plan (HMP) is prepared as part of the EIA and submitted with the application, including any proposals for mitigation /enhancement in relation to important habitats and species. We agree with the conclusion in paragraph 5.4.6 of the EIA Scoping Report that an appropriate assessment under the Habitats Regulations will also be required.</p>	<p>In combination with <b>Chapter 7</b> a Habitat Management Plan in terms of the management of grazing to improve habitats and breeding productivity for ground nesting birds is proposed.</p>
	<p>Designated sites: Table 6.1 of the Scoping report lists several internationally, nationally, and locally designated sites that are located within a 5km radius of the proposed development site. Peerie Water and North Mainland Evie to Finstown Coast LNCSs should also be included</p>	<p>The designations mentioned, including the two LNCSs, are considered in the assessment.</p>
<p>Case Officer, Orkney Islands Council, 12th April</p>	<p>Nationally and internationally designated sites: The proposed development borders the West Mainland Moorlands SSSI which forms part of the Orkney Mainland Moors SPA. The qualifying features of the SSSI and SPA should be taken into consideration in the assessment.</p>	<p>All points noted and all designated sites and their designated species are taken into account in the assessment.</p>

Consultee	Consultation Response	Applicant Action
	<p>Locally designated sites: Part of the proposed development site lies within the Loch of Swanney Local Nature Conservation Site (LNCS) which comprises the loch itself, fringing marshy grassland along parts of the shore, and some rough grassland. An assessment should be undertaken of the likely direct and indirect effects of the proposed development on the qualifying interests of these sites, and any other designated site with qualifying species whose foraging range includes the proposed development site. The assessment should address the effects of all parts and phases of the proposal on the bird species present in each site, including collision risk, displacement due to disturbance, and loss of foraging habitat. It should also consider the cumulative impact of the proposal with other wind turbine developments (existing and proposed).</p>	<p>All points noted and all designated sites and their designated species are taken into account in the assessment.</p>
	<p>Vantage Point surveys: These should be undertaken in line with current NatureScot guidance. The scope and frequency of these surveys, as well as potential vantage point locations should be agreed with NatureScot.</p>	<p>VP surveys were completed in line with NatureScot guidance – See <b>Appendix 8.1</b>.</p>

## 8.5 Assessment Methodology and Significance Criteria

8.5.1 This section identifies the ‘key ornithology and nature conservation issues’ which have been considered as part of the Ornithological Impact Assessment, describes the methods used to establish baseline conditions and assesses the magnitude and significance of the likely ornithological effects of the Proposed Development.

### **Study Area**

8.5.2 Appropriate study areas for each survey were derived from best practice guidance (SNH, 2017) and are provided below:

- Flight activity VP surveys: the site boundary plus 500 m;
- Breeding birds / Wintering walkover survey: the site boundary plus accessible areas within 500 m; and
- Breeding raptor survey: the site boundary plus accessible areas within 2 km.

### **Desk Study**

8.5.3 A desk study was undertaken of web-based resources to identify baseline data for the Proposed Development site and wider area. In terms of nature conservation designations, the desk study aims to identify international designations such as SPAs and Ramsar wetlands within 10 km of the site and national statutory designations such as SSSIs, National Nature Reserves (NNRs) or Marine Nature Reserves (MNRs) within 5 km of the site boundary, extending to 20 km for SPAs designated for species of geese. Any Local Nature Conservation Sites (LNCSs) or non-statutory designations, such as Local Biodiversity Sites, were identified within a 2 km distance of the site boundary.

8.5.4 Existing records that are freely available for commercial use of protected or otherwise notable species (e.g. SBL/LBAP priority species) were identified with a 5km distance of the site boundary. Records from the last 10 years were considered relevant to the study. Only those relating to birds are relevant to the assessments presented in this chapter.

8.5.5 Data for priority / notable species and designated sites were obtained from the following databases:

- National Biodiversity Network (NBN) Atlas;
- NatureScot SiteLink;
- Scotland’s Environment Interactive Map; and
- MAGIC: Nature on the Map.

8.5.6 In addition, the Orkney Raptor Study Group (ORSG) were contacted to obtain breeding records for Schedule 1/Annex 1 raptors and owls within 2 km of the site boundary, extended to 5 km for hen harrier and short-eared owl for the previous three years.

### **Field Studies**

8.5.7 The scope of the ornithology surveys, including field survey methods and vantage point (VP) locations, were developed and agreed with NatureScot (NS) (formerly Scottish Natural Heritage, SNH), taking cognisance of current best practice guidance (SNH, 2017).

8.5.8 Ornithology field surveys for the Proposed Development were commissioned directly by Nevis on behalf of the Applicant and carried out between September 2020 and May 2022.

8.5.9 Surveys were carried out at a variety of times and in different weather conditions to ensure data were collected that were fully representative of a range of behaviour patterns.

8.5.10 NS guidance (SNH, 2017) recommends that wind farm assessments should focus on ‘target species’. The guidance defines ornithological target species as:

- Those protected under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended);
- Those listed on Annex 1 of the Council Directive 79/409/EEC on the Conservation of Wild Birds;
- Regularly occurring migratory species which are either rare, vulnerable or warrant species consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed wind farm; and
- Species occurring at the site in nationally or regionally important numbers.

8.5.11 The NS guidance goes on to note that consideration should be given to species of local conservation concern (i.e. those listed in LBAPs), but that target species should be restricted to those likely to be affected by wind farms.

8.5.12 Previous experience of similar projects in Orkney identified that survey work to inform the assessment should account for the potential presence of ‘scarce’ diurnal raptors, geese and wading bird species within and adjacent to the site.

8.5.13 A summary of the ornithological methods adopted is provided in this chapter. Please refer to **Appendix 8.1** for the full details.

### **Vantage Point Surveys**

8.5.14 Flight activity surveys were undertaken over one breeding season and two non-breeding seasons. The NS guidance (SNH, 2017) advises that Vantage Point (VP) locations should be selected to achieve maximum visibility from the minimum number of survey locations. In this survey method an arc of up to 180 degrees and extending to 2 km from the observer can be surveyed from each VP, subject to topography, vegetative screening and any other constraints to effective survey. A minimum of 36 hours of survey effort is completed at each VP during each of the breeding season and winter periods, and the timing of VP watches varied to ensure that all times of day are covered.

8.5.15 Two VPs were initially selected following review of aerial imagery and Ordnance Survey maps, and the locations confirmed during a ground-truthing exercise in September 2020 when the locations were micro sited to the optimal locations. The locations of the VPs and their respective viewsheds are presented in **Figure 8.1**.

8.5.16 VP surveys were completed over 18 months, from September 2020 to March 2022. A total of 36 hours was undertaken at each VP during the breeding season and a combined total of 72 hours per VP during the two non-breeding seasons, which equates to a total of 108 hours at each VP over the 18 months. VP watches were conducted for periods of no longer than 3 hours in a single watch. A minimum 30 minute break was observed between watches to allow the surveyor an adequate rest time between VP watches.

8.5.17 Full details of the survey methodology are outlined in **Appendix 8.1** and the survey timings, dates and weather in **Appendix 8.1 Annex A: Table A1**.

#### **Winter Walkover Survey**

8.5.18 Winter walkover surveys were conducted of the site and a 500 m survey buffer within accessible areas of land ownership or public rights of way (PROW) (see **Figure 8.1**). Wintering bird walkover surveys were completed between October 2020 and March 2021 and October 2021 and March 2022 inclusive. Winter walkover surveys followed those outlined in Gilbert *et al* (2011) and full details of the survey dates and methodology are outlined in **Appendix 8.1**.

#### **Breeding Bird Survey**

8.5.19 Breeding bird surveys were conducted of the site boundary and 500 m survey buffer within accessible areas of land ownership or PROW (see **Figure 8.1**). A walkover technique based on the Brown and Shepherd (B&S) method (1993) was employed and involved approaching within 100 m of all parts of the Study Area to record the presence of breeding waders, all other non-target species were recorded during the B&S surveys. NS guidance (SNH, 2017) recommends that four survey visits should be completed over the breeding season, based on recommendations set out in Calladine *et al*. (2009). The 2021 survey included a total of four survey visits, conducted during the period April to July 2021, inclusive, with a minimum two-week gap between survey visits. At the time of writing in June 2022, the April and May visits of the 2022 survey season were complete. Full details of the survey dates and methodology are outlined in **Appendix 8.1**.

#### **Breeding Raptor Survey**

8.5.20 Breeding raptor surveys were conducted of the site boundary and a 2 km survey buffer (see **Figure 8.1**). Surveys were conducted for nesting raptors and owls from April to August 2021, inclusive. The survey methods followed Hardey *et al*. (2013) and involved four survey visits (minimum of two weeks apart) walking transect routes focusing on suitable habitat and any prominent features such as rock outcrops or fence lines within the site and a 2 km survey buffer. At the time of writing, only April and May visits were complete of the 2022 survey. Full details of the survey dates and methodology are outlined in **Appendix 8.1**.

#### **Other surveys**

8.5.21 Dedicated black grouse (*Tetrao tetrix*) surveys were not undertaken due to a lack of recent records or observations in Orkney and a lack of suitable habitat for this species, such as broad leaved-woodland.

8.5.22 Dedicated red-throated diver (*Gavia stellata*) surveys were not undertaken due to a lack breeding records for this species within the site and immediate surrounds. However, some potential commuting flights to/from breeding lochans in the wider area are considered to have been registered in the VP surveys.

8.5.23 All surveys were undertaken by suitably qualified and experienced ornithologists.

#### **Survey Limitations**

8.5.24 The desk study did not include Local Biological Records Centre data, as Orkney Wildlife Information and Records Centre was not operational.

8.5.25 All surveys were completed as per the timings and requirements of the NS guidance and limitations were noted.

### ***Assessment of Potential Effect Significance***

8.5.26 This section identifies the ‘key ornithology issues’ which have been considered as part of the Ornithological Impact Assessment, describes the methods used to establish baseline conditions and assesses the magnitude and significance of the likely ornithological effects of the Proposed Development.

#### **Design Iteration**

8.5.27 The following assessment is based on the final design of the Development, which has undergone various iterations over an extended process that has taken a variety of potential constraints into account. Ultimately, the final design (**Figure 1.2**) is one that has balanced all of these constraints to minimise the overall potential for significant effects from the Development on sensitive environmental features across all disciplines feeding into the EIA (further details on design iteration are provided in **Chapter 3**).

### ***Evaluation Methods for Ornithological Features***

#### **Assessment of Potential Significance**

8.5.28 When there is the potential for the Proposed Development to have an effect on a bird species or bird population that is considered to be part of, or linked to a designated site (whether an international designation such as an SPA or Ramsar or national designation such as a SSSI), then the effects should be judged as to whether they impact on the designation of the designated site and as such the objectives of the designation.

8.5.29 The species link to the designated area could be present throughout the year but, as stated on the designated site citation, the designated feature may specifically relate to an activity (e.g. breeding) or presence at a specific time of year (e.g. in winter). For example, a species could be designated solely as a breeding, wintering, passage or migratory species, meaning that at other times of year it has no link to the designated site. In the situation where the bird population recorded is not considered to be protected by a designation such as an SPA, Ramsar or SSSI, the birds are considered the ‘wider area population’ and in this scenario the assessment concentrates on whether there are effects on the overall population of the species in both a local (**NHZ**) and wider area (**Scotland**) context.

8.5.30 Individuals of the same species can be considered under both criteria as an SPA qualifying species and a ‘wider area population.’ For example an individual that belongs to a designated SPA breeding population will by definition be linked to that designation during the breeding season. However, it will be part of the wider area population in the non-breeding season. In another example, individuals can be present that are not part of the designated breeding population: Where immature individuals are recorded during baseline surveys, as is common in larger species such as raptors and gulls, and thus are not breeding, they are by definition not part of the designated feature but instead part of the wider area population.

#### ***Geographical Importance***

8.5.31 The importance of the ornithological features on or near to the site is assessed in line with best practice guidance, legislation, statutory designations and/or professional judgement. Determination of the level of importance of an Important Ornithological Feature (IOF) to be taken forward for assessment is based on a combination of the geographical importance and its conservation status. Table 8.2, below, lists the criteria used to determine the evaluation of the importance of ornithological features in a geographical context.

**Table 8-2 - Geographical Evaluation Criteria**

Importance	Criteria	Examples
International	<p>Nature conservation resource, i.e. designated nature conservation area or population of an individual bird species of international importance.</p> <p>Note that for a designation, such as a Special Protection Area (SPA), this may also include off-site features on which the qualifying population(s) or habitat(s) are considered, from the best available evidence, to depend.</p>	<p>International nature conservation areas:</p> <ul style="list-style-type: none"> <li>• Any SPA;</li> <li>• Any proposed SPA (pSPA); and</li> <li>• Any Ramsar wetland.</li> </ul> <p>Populations of European importance of Annex 1 species qualifying under Article 4.1 of the Bird Directive as a feature of an SPA, pSPA or Ramsar including birds outside of protected areas when there is considered to be connectivity to the site.</p> <p>A site supporting more than 1% of the EU population of a species.</p>
National (i.e. Scotland)	<p>Nature conservation resource, i.e. designated nature conservation area or population of an individual bird species of national importance.</p> <p>Note that for designations, such as an SSSI or an NNR, this may also include off-site features on which the qualifying population(s) are considered, from the best available evidence, to depend.</p>	<p>National nature conservation areas:</p> <ul style="list-style-type: none"> <li>• Any SSSI or NNR designated for ornithological feature(s); and</li> <li>• A designated site supporting more than 1% of the UK population of a bird species.</li> </ul> <p>Nationally important population / assemblage of a species listed on Schedule 1 of the Wildlife and Countryside Act (WCA).</p> <p>Populations of national importance of Annex 1 species that qualify under Article 4.2 of the Birds Directive as a feature as part of a wider breeding, migratory or wintering assemblage of an SPA, pSPA or Ramsar.</p> <p>Nationally important population / assemblage of a bird species listed on Schedule 1 of the Wildlife and Countryside Act (WCA).</p>
Council (i.e. Orkney)	<p>Nature conservation resource, i.e. designated nature conservation area or individual species of importance on a county scale.</p>	<p>Statutory and non-statutory nature conservation designations:</p> <ul style="list-style-type: none"> <li>• Any LNR designated for ornithological feature(s);</li> <li>• Any Wildlife Trust reserve designated for ornithological feature(s); and</li> <li>• Any Local Wildlife site (LWS) designated for ornithological feature(s).</li> </ul> <p>A council-scale important population / area of a bird species listed on the</p>



Importance	Criteria	Examples
		<p>Scottish Priority List (SPL) (Scottish Government, 2013) as requiring conservation action.</p> <p>A county-scale important population/area of a bird species listed on the LBAPs.</p> <p>A county-scale important population / assemblage of bird species listed on Schedule 1 of the WCA.</p>
Local (i.e. within 2 km of the Development)	Nature conservation resource, e.g. a bird species of importance in the context of the local district.	<p>A breeding population of a species or a viable area of a habitat that is listed in a LBAP because of its rarity in the locality.</p> <p>An area supporting 0.05-0.5 % of the UK population of a bird species.</p> <p>Any breeding species included on the BoCC 5 Red List (Stanbury <i>et al.</i>, 2021). A council-scale important population of an amber-listed species on the BoCC.</p> <p>A breeding population of a species on the WPL.</p> <p>All breeding populations of Schedule 1 species not captured in higher scale categories.</p>
Less than local	Unremarkable, common and widespread bird species of little/no intrinsic nature conservation value.	<p>All records of species not captured in higher scale categories, including infrequent records of species of a higher conservation value such Schedule 1, Annex 1.</p> <p>Green-listed species on the BoCC, exotic species.</p>

8.5.32 Where a feature qualifies under two or more criteria, the higher value is applied to the feature.

8.5.33 Within this chapter any feature of local or higher value is considered an IOF.

### ***Impact Assessment Methods***

8.5.34 The approach to the Ecological Impact Assessment (EclA) follows the Chartered Institute of Ecology and Environmental Management guidelines (CIEEM, 2018), which prescribe an industry-standard method to define, predict and assess potential ecological effects of a development proposal. Starting with establishing the baseline through a mix of desk study and field survey, important ornithological features (the IOFs) are first identified and then evaluated in terms of their vulnerability to the proposed development through a reasoned process considering factors such as statutory requirements, policy objectives for biodiversity, conservation status of the IOF (habitat or species), habitat connectivity and spatial separation from the Development. An impact assessment is then undertaken for scoped-in IOFs that assumes construction industry-standard mitigations will be followed to ameliorate impacts as far as practicably possible. Additional mitigation strategies can



then be determined to minimise any residual impacts that would otherwise be experienced by the IOF and any opportunities for enhancement identified.

8.5.35 In summary, the impact assessment process (CIEEM, 2018) involves:

- Identifying IOFs vulnerable to effects;
- Identifying and characterising impacts and their effects;
- Incorporating measures to avoid and mitigate negative effects;
- Assessing the significance of any residual effects after mitigation;
- Identifying the appropriate compensation methods to offset significant residual effects; and
- Identifying opportunities for ecological enhancement.

#### **Ornithological Zone of Influence**

8.5.36 The Ornithological Zone of Influence (OZOI) is defined as the area within which there may be ornithological features subject to effects from the Proposed Development. Such effects could be direct (e.g. habitat loss resulting from land-take or removal of a building occupied by breeding birds) or indirect (e.g. noise or visual disturbance causing a species to move out of the OZOI). The OZOI is determined through:

- Review of the existing baseline conditions based on desk study results, field surveys and information supplied by consultees;
- Identification of sensitivities of ornithological features, where known;
- The outline design of the Proposed Development and approach to construction; and
- Through liaison with other technical specialists involved in the assessment, e.g. hydrologists and noise specialists

8.5.37 The significance of potential effects is then determined by integrating the assessments of these factors in a reasoned way. The magnitude of likely impacts involves consideration of their spatial and temporal magnitudes. In making judgements on significance by this integration, consideration is given to the national and regional trends of the potentially affected species, and how the integrated impacts may impinge on the conservation status of the species involved at these geographical levels. Further details of the process underlying the assessment and the determination of significance follow.

#### **Temporal Scope**

8.5.38 Potential impacts on ornithological features have been assessed in the context of how the predicted baseline conditions within the OZOI might change between the surveys and the start of construction. It is anticipated that construction would take approximately 12 months to complete and would be expected to commence in in 2025, see **Chapter 3**.

#### ***Characterising Ornithological Impacts and Effects***

8.5.39 In accordance with the CIEEM guidelines, the following definitions are used for the terms ‘impact’ and ‘effect’:

- Impact – Actions resulting in changes to an ecological feature. For example, construction activities removing a hedgerow; and
- Effect – Outcome to an ornithological feature from an impact. For example, the effects on a bird population from losing a hedgerow, such as reduced nesting opportunities.

8.5.40 In accordance with the CIEEM guidelines, when determining impacts on IOFs, reference is made to the following:

- Positive or negative – i.e. whether the impact has a positive or negative effect in terms of nature conservation objectives and policy;
- Magnitude – i.e. the size of an impact, in quantitative terms where possible;
- Extent – i.e. the area over which an impact occurs;
- Duration – i.e. the time for which an impact is expected to last;
- Timing and frequency – i.e. whether impacts occur during critical life stages or seasons; and
- Reversibility – i.e. a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible.

8.5.41 Both direct and indirect impacts are considered: Direct ornithological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ornithological impacts are attributable to an action but affect ornithological resources through effects on an intermediary ecosystem, process or feature, e.g. fencing of a development site and subsequent lack of grazing may create suitable grassland for ground-nesting birds.

8.5.42 For the purposes of this assessment, the predicted impacts on an ecological feature are categorised as ‘no impact’, ‘negligible’, ‘low’, ‘medium’ or ‘high’, based on the definitions in Table 8.3, below.

**Table 8-3 - Determining Significance of Effects**

Level of impact	Definition
No impact	No detectable impacts on the ornithological resource, even in the immediate term
Negligible	Detectable impact but reversible within 12 months. Not expected to affect the conservation status of the nature conservation designation, habitat or species under consideration
Low	Detectable impacts, and may be irreversible, but either of sufficiently small scale or of short-term duration to have no material impact on the conservation status of the nature conservation designation, habitat or species population
Medium	Detectable impact on the status of the nature conservation designation, habitat or species population in the medium term but is reversible / replaceable given time, and not a threat to the long-term integrity of the feature
High	Irreversible impact on the status of the nature conservation designation, habitat or species and likely to threaten the long-term integrity of the feature. Not reversible or replaceable. Will remain detectable in the medium and long term
<p>The following definitions have been applied in respect to timescales:</p> <p>Immediate: Within approximately 12 months;</p> <p>Short term: Within approximately 1-5 years;</p> <p>Medium term: Within approximately 6-15 years; and</p> <p>Long term: More than 15 years.</p>	

**Conservation Status**

8.5.43 Where possible, the conservation status for each species population was considered within the local context. The relevant population scale for assessing potential effects on breeding species is considered to be the appropriate region or county. In the present case, the site is in NH22 ‘Orkney and North Caithness’ (ONC); however, where there is insufficient information on ONC population estimates, the national (Scottish) population estimate is used instead. For wintering or migratory species, the national (Scottish) population is considered.

8.5.44 For these purposes, conservation status was taken to mean the sum of the influences acting on a population which may affect its long term distribution and abundance. The conservation status of a species is defined by NatureScot (2018b) as “the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest” and they state that:

“A species’ conservation status is favourable when:

- population dynamics indicate that the species is maintaining itself on a long-term basis and is therefore likely to persist in the habitat it occupies; and
- the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and
- there is (and will probably continue to be) a sufficiently large habitat to maintain its populations on a long-term basis.

We recommend here that the concept of favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern.”

8.5.45 When the geographical evaluation and conservation status is considered together the species is then categorised as one of high, medium/high, medium or low sensitivity as outlined below:-

- High: All internationally important species;
- Medium/High: Nationally important species with unfavourable conservation status;
- Medium: Nationally important species with favourable conservation status, all council species;
- Medium/Low: All local species; and
- Low: All less than local species.

8.5.46 The sensitivity of a species is assigned to all IOFs that are carried forward for assessment.

#### **Determining Ecologically Significant Effects**

8.5.47 An EclA is undertaken in relation to the baseline conditions that would be expected to occur in the absence of a Proposed Development and, therefore, may include possible predictions of future changes to baseline conditions, such as environmental trends and other completed or planned development. Both adverse and beneficial impacts/effects are possible.

8.5.48 A significant effect, in ornithological terms, is defined as an effect (whether negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area, including cumulative and in-combination impacts.

8.5.49 In accordance with the CIEEM (2018) guidelines, the approach adopted in this chapter aims to determine if the effect of an impact is significant or not based on a discussion of the factors that characterise it, i.e. the ornithological significance of an effect is not dependent on the value of the feature in question. Rather, the value of a feature that will be significantly affected is used to determine the geographical scale at which the effect is significant.

8.5.50 In accordance with the current CIEEM (2018) guidelines, effects of impacts are assessed in the presence of standard mitigation measures. Additional mitigation may be identified where it is required to reduce a significant effect.

8.5.51 Any significant effect remaining post-mitigation (the residual effect), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development control in determining the application.

8.5.52 In addition to determining the significance of effects on valued ornithological features, this chapter also identifies any legal requirements in relation to wildlife.

### Limitations to Assessment

8.5.53 The surveys were undertaken at appropriate times of year, under favourable survey conditions and with full access to the study area. As such, no significant limitations were identified.

## 8.6 Baseline Conditions

### Nature Conservation Designations

8.6.1 Information gathered during the desk study exercise identified four designations of international importance and two designations of national importance within 10 km and 5 km of the site, respectively. No further designations of international importance for long-ranging species such as geese were recorded within 20 km of the site.

#### International Designations

8.6.2 Orkney Mainland Moors SPA lies directly south of the site, Rousay SPA lies 4.2 km north-east, North Orkney SPA is 4.3 km east and Marwick Head is 5.6 km west of the site. Their locations are shown on **Figure 8.2** and the designations are described below in Table 8.4.

**Table 8-4 - Qualifying Features – Special Protection Areas**

Feature	Scientific Name	Condition * (if provided)	Description
Orkney Mainland Moors			
Breeding and wintering hen harrier	<i>Circus cyaneus</i>	Breeding - Favourable, maintained (June 2006)	Average of 28 breeding females, 5.9% of GB. Average of 13 wintering birds individuals between 1994 and 1998, 2% of the Great Britain population.
Breeding red-throated diver	<i>Gavia stellata</i>	Favourable, maintained (June 2007)	Average of 18 breeding pairs, 2% of the Great Britain population.
Breeding short-eared owl	<i>Asio flammeus</i>	Not monitored	Average of 19 breeding pairs between 1993 and 1995, 2% of the Great Britain population.
Rousay			
Breeding Arctic Tern	<i>Sterna paradisaea</i>	Unfavourable, declining (June 2007)	An average of 790 pairs in the five year period between 1991 and 1995; 2% of the Great Britain population.
Seabird Assemblage (qualifying species listed below in addition to Arctic Tern)	n/a	Unfavourable, declining (June 2009)	Regularly supporting in excess of 20,000 individual seabirds.
Breeding Arctic skua	<i>Stercorarius parasiticus</i>	Unfavourable, declining (June 2007)	130 pairs; 4% of the Great Britain population.

Feature	Scientific Name	Condition * (if provided)	Description
Breeding black-legged kittiwake	<i>Rissa tridactyla</i>	Unfavourable, declining (June 2009)	4,900 pairs; 1% of the Great Britain population.
Breeding common guillemot	<i>Uria aalge</i>	Favourable, recovered (June 2009)	10,600 individuals, 1% of the Great Britain population.
Breeding northern fulmar	<i>Fulmarus glacialis</i>	Favourable, recovered (June 2009)	1,240 pairs, 0.2% the Great Britain population.
North Orkney			
Breeding red-throated diver	<i>Gavia stellata</i>	Condition not assessed as only recent given SPA status	Up to 47 pairs (3.7% of the Great Britain population) for the year of 2006.
Non-breeding great northern diver	<i>Gavia immer</i>	Condition not assessed as only recent given SPA status	A mean peak annual non-breeding population of 308 birds - 12.3% of the Great Britain population for the years 2006/07 to 2008/09.
Non-breeding Slavonian grebe	<i>Podiceps auritus</i>	Condition not assessed as only recent given SPA status	A mean peak annual non-breeding population of 120 birds - 10.9% of the Great Britain population for the years 2007/08-2008/9.
Migratory velvet scoter	<i>Melanitta fusca</i>	Condition not assessed as only recent given SPA status	A mean peak annual non-breeding population of 147 birds - 5.9% of the Great Britain population for the years of 2006/07 to 2008/09.
Marwick Head			
Breeding common guillemot	<i>Uria aalge</i>	Unfavourable Declining (Jun 2017)	Supports 37,700 individuals 1.1% of the western European biogeographic population

Feature	Scientific Name	Condition * (if provided)	Description
Seabird Assemblage (qualifying species listed below)	n/a	Unfavourable Declining (Jun 2015)	Qualifies by regularly supporting in excess of 20,000 individual seabirds, in fact regularly supports 75,000.
Breeding black-legged kittiwake	<i>Rissa tridactyla</i>	Unfavourable Declining (Jun 2015)	7,700 pairs, 2% of the Great Britain population

\*All details in the descriptions as well the condition data referred to in Table 8.4 relating to assemblage and species counts are from NatureScot, 2022.

### National Designations

8.6.3 West Mainland Moors SSSI lies directly south of the site, Loch of Isbister and the Loons SSSI lies 4.6 km south-west. Rousay SSSI makes up a section of Rousay SPA outlined above, the nearest point on the SSSI lies 8.2 km north-east is therefore not included in the tables below. The designating features of Rousay SSSI are identical to those of the SPA detailed above and as a higher classification will be covered as part of the SPA.

8.6.4 Their locations are shown on **Figure 8.1** and the designations are described below in Table 8.5.

**Table 8-5 - Qualifying Features – Sites of Special Scientific Interest**

Feature	Scientific Name	Condition (if provided)	Description
West Mainland Moors			
Assemblage upland breeding birds	n/a	Favourable, maintained (June 2010)	Wide range of breeding upland birds including three species with nationally important numbers outlined below.
Breeding and non-breeding hen harrier	<i>Circus cyaneus</i>	Favourable, maintained (June 2006)	Approximately 2% of the Great Britain population.
Breeding red-throated diver	<i>Gavia stellata</i>	Favourable, maintained (June 2007)	Approximately 2% of the Great Britain population.
Breeding short-eared owl	<i>Asio flammeus</i>	Not monitored	Approximately 2% of the Great Britain population.
Loch of Isbister and the Loons			
Breeding Pintail	<i>Anus acuta</i>	Favourable, maintained (May 2002)	Approximately 2% of the Great Britain population.

Breeding bird Assemblage	n/a	Favourable, maintained (January 2007)	Approximately 2% of the Great Britain population.
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\*All details in the descriptions as well the condition data referred to in Table 8.4 relating to assemblage and species counts are from NatureScot, 2022a.

### Non-Statutory and Local Designations

8.6.5 Four locally designated sites, all Local Nature Conservation Sites (LNCSs), designated for ornithological reasons, lie within 2km of the site boundary (OIC, 2017b). A single RSPB reserve and Important Bird Area (IBA) which is shown in Table 8.6 lie within 2km of the site. All non-statutory designations are displayed in **Figure 8.2**.

**Table 8-6 – Non-Statutory Nature Conservation Designations**

site	Designation	Description
Loch of Swannay	LNCS	Bird Assemblage including red-throated diver and waders.
Birsay Moors	RSPB	Species present include hen harrier, short-eared owl, Arctic skua and red-throated diver.
Loch of Hundland	LNCS	Bird assemblage including birds of prey, red-throated diver and waders.
Costa Hill, Evie/Birsa	LNCS	Bird assemblage including peregrine and waders.
Loch of Boardhouse	LNCS	Bird assemblage including birds of prey, wintering wildfowl and waders.

### Species Records – External Data

8.6.6 Orkney Raptor Study Group were contacted for records of Schedule 1 raptor and owl species recorded within 2 km of the site, extended to 5 km for hen harrier and short-eared owl in the previous three years (2019-2021). The results returned records for four different species (hen harrier; marsh harrier (*Circus aeruginosus*); merlin (*Falco columbarius*) and short-eared owl) and are discussed within the species accounts for each species.

### Flight Activity Summary

8.6.7 As discussed above a total of 18 months of flight activity surveys were completed at the site between September 2020 and March 2022. A summary of the results showing all target species is detailed below in Table 8.7 which shows the total number of flights recorded, the total number of flight seconds (the number of birds multiplied by the number of flight seconds), the number of flights considered at risk (with collision of the turbine rotors) and the number of flight seconds at risk. For full detail on individual flights, timings and locations see **Appendix 8.1 Annex A: Tables A4-A14 and Figure 3-6**.

**Table 8-7 - Species Recorded During Flight Activity Surveys, September 2020 to March 2022**

Species	Number of Flights Recorded	Flights 'at risk' height	Total Bird Seconds Recorded *	Total Bird Seconds Recorded in site	Number of Flight seconds recorded 'at-risk'
Arctic skua	3	2	192	148	103
Great skua	29	19	1495	1288	1175
Hen harrier	50	1	6154	4980	32
Peregrine	4	1	1023	460	416
Red-throated diver	9	9	1534	983	961
Short-eared owl	13	1	1424	1353	261
White- fronted goose	1	0	323	0	0
Whooper swan	1	1	112	52	52

\*Bird seconds are calculated for each observation as the product of flight duration and number of individuals

\*\*'At-risk' is defined as: a flight having at least part of its duration (i) at potential collision height; (ii) within the site; and (iii) recorded within the 2km viewshed of the associated VP.

8.6.8 Band *et al.* (2007) devised a method by which field data on bird flight activity can be gathered and used to quantify the likelihood of bird collisions with turbines; this is known as the 'Band' Collision Risk Model (CRM). The Band CRM involves two methods to predict estimated collision fatalities, depending on the pattern of flight of the species involved: 'predictable' and 'unpredictable' flight methods.

8.6.9 The model inputs the 'at-risk' flight seconds or number of 'at-risk' flights into the appropriate model along with a number of parameters such as the birds' biometrics, the number and types of turbine and using pre-defined 'avoidance rates' (the likelihood of a particular species flying into a turbine) predicts a collision risk value. Table 8.8 provides a summary of the results of the CRM process and full details are outlined in **Appendix 8.2**.

**Table 8-8 Collision Modelling Results**

Species	Collision risk - breeding season	Collisions per lifetime of scheme (Use 25 years)	Years per collision
Great skua	0.04	0.96	25.9
Red-throated diver	0.15	3.67	6.8

### Raptors and Owls

#### Hen Harrier

8.6.10 Hen harrier was not confirmed as a breeding species within the site but two pairs were confirmed as breeding within 2 km (See **Appendix 8.1: (Confidential Figure 3)**). Hen harrier were regularly recorded within the site during both the breeding and non-breeding season. A single winter hen harrier roost was identified outside the site but within 2km of the site during both 2020-2021 and 2021-2022 non-breeding seasons.



8.6.11 Flight activity surveys recorded 50 hen harrier flights (**Appendix 8.1 Annex A: Table A5; Confidential Figure 7**), of which one flight was considered to be ‘at-risk’ (**Table 8.7**). Due to the low flight activity ‘at-risk’ height, no collision risk was predicted for this species.

8.6.12 The desk study identified a total of nine probable or confirmed breeding records in 2019, six in 2020 and eight in 2021 for hen harrier. There are no records within the site, the nearest being over 500m from the site boundary (See **Appendix 8.1: Confidential Figure 9a**).

Marsh Harrier

8.6.13 Marsh harrier were not recorded during field surveys but two breeding records were identified during the desk study, the records were both in 2021 and over 1 km from the site (See **Appendix 8.1: Confidential Figure 9c**).

Merlin

8.6.14 Merlin were not recorded during flight activity surveys and no breeding attempts were noted during field surveys. An individual bird was noted during walkover surveys in May 2021.

8.6.15 The desk study identified two breeding records one in 2020 and one in 2021 both records were in close proximity meaning it is considered likely both records relate to the same breeding pair. The breeding records are over 2km from the site (See **Confidential Figure 11**).

Peregrine

8.6.16 Peregrine (*Falco peregrinus*) was not confirmed as breeding within the site or 2 km study area. Flight activity surveys recorded four peregrine flights (**Appendix 8.1 Annex A: Table A6; Figure 8.4**), of which one flight was considered to be ‘at-risk’ (**Table 8.7**). Due to the low flight activity ‘at-risk’ height, no collision risk was predicted for this species.

8.6.17 The desk study did not identify any breeding records within 2km of the site between 2019 and 2021.

Short-Eared Owl

8.6.18 Short-eared owl was not confirmed as breeding within the site but three breeding territories were confirmed within 2 km (See **Appendix 8.1: Confidential Figure 7**). Flight activity surveys recorded 13 short-eared owl flights (**Appendix 8.1 Annex A: Table A8; Confidential Figure 8.4**), of which one flight was considered to be ‘at-risk’ (**Table 8.7**). All the flight records were in May and June 2021. Due to the low flight activity ‘at-risk’ height, no collision risk was predicted for this species.

8.6.19 The desk study identified a single breeding territory for short-eared owl in 2020 and four in 2021, all outside the site boundary (See **Appendix 8.1: Confidential Figure 9b**). The 2021 territories which were outlined by the desk study are closely aligned with the ones recorded during field surveys at the site with one further record outside the 2 km survey buffer.

**Seabirds**

Arctic Skua

8.6.20 Arctic skua were recorded on three occasions from flight activity surveys, all in June 2021. No evidence of breeding activity was recorded for this species. Due to the low flight activity ‘at-risk’ height, no collision risk was predicted for this species.

Great skua

8.6.21 Flight activity surveys recorded 29 great skua (*Stercorarius skua*) flights totalling 33 individuals (See **Appendix 8.1 Annex A: Table AA; Figure 5**), of which 19 flights were considered to be ‘at-risk’ and predicted mean annual collision risk of 0.04, or one bird fatality every 26 years (**Table 8.8**).

8.6.22 No evidence of breeding activity was recorded for this species.

Arctic Tern

- 8.6.23 Arctic tern were recorded infrequently during the breeding season during flight activity surveys in 2021 and no breeding activity was recorded.

Fulmar

- 8.6.24 Fulmar were recorded infrequently during the breeding season in 2021 and no breeding activity was recorded.

Gulls

- 8.6.25 Gulls were commonly recorded during flight activity surveys with common gull recorded on 147 occasions and great black-backed gull (*Larus marinus*) on 149 occasions; the latter being the most frequently recorded species. Black-headed gull (*Chroicocephalus ridibundus*) were recorded on 25 occasions, herring gull (*Larus argentatus*) on 28 occasions and lesser black-backed gull (*Larus fuscus*) on eight occasions during flight activity surveys.
- 8.6.26 Common gull and great black-backed gull were recorded during the breeding bird surveys but no evidence of breeding was noted.

**Wildfowl and Divers**

Whooper Swan

- 8.6.27 Flight activity surveys recorded one whooper swan (*Cygnus cygnus*) flight (**Appendix 8.1 Annex A: Table A10; Figure 5**), which was considered to be 'at-risk' (Table 8.7). Due to the low flight activity 'at-risk' height, no collision risk was predicted for this species.

White-Fronted Goose

- 8.6.28 Flight activity surveys recorded one white-fronted goose (*Anser albifrons albifrons*) flight (**Appendix 8.1 Annex A: Table A9; Figure 5**), which was considered to be 'at-risk' (Table 8.7). Due to the low flight activity 'at-risk' height, no collision risk was predicted for this species.

Other Wildfowl

- 8.6.29 Greylag goose (*Anser anser*) were recorded frequently throughout the year from flight activity surveys and a total of eight breeding records were recorded within the site in 2021. A total of three flights totalling 123 pink-footed goose (*Anser brachyrhynchus*) were recorded from flight activity surveys.
- 8.6.30 A pair of teal (*Anas crecca*) were recorded breeding within the site. Mallard (*Anas platyrhynchos*), tufted duck (*Streptopelia turtur*) and wigeon (*Anas penelope*) were all recorded on Loch of Swannay during the breeding bird survey but no evidence of breeding was noted. Mallard, wigeon and teal were recorded occasionally from VP surveys.

Red-throated diver

- 8.6.31 No evidence of breeding activity was recorded for this species although an adult was recorded with a juvenile during breeding surveys in July 2021. It is considered a possibility there was a nest on one of the large lochans but if this was the case the nest location was presumed to be over 1 km from the site.
- 8.6.32 Flight activity surveys recorded nine red-throated diver flights totalling 10 individuals (**Appendix 8.1 Annex A: Table A7; Figure 5**), of which all nine flights were considered to be 'at-risk', with a predicted mean annual collision risk of 0.15, or one bird fatality every 6.8 years (Table 8.8).

**Waders**

Common Sandpiper

- 8.6.33 A single possible common sandpiper (*Actitis hypoleucos*) breeding attempt was recorded in 2021 within the eastern edge of the site (**Appendix 8.1: Figure 8a**) and two possible breeding attempts

were recorded in 2022, one in the site and one in the northern section of the 500m survey buffer (**Appendix 8.1: Figure 8b**). The breeding attempts were noted along the shore of Loch of Swannay. No flight activity was recorded for this species.

#### Curlew

8.6.34 Breeding bird surveys identified a total of three (one probable and two possible) breeding attempts for curlew (*Numenius arquata*) in the east of the site in 2021 (**Appendix 8.1: Figure 8a**) and a total of six breeding attempts (2 probable, 4 possible) during 2022 surveys (**Appendix 8.1: Figure 8b**). All the territories were registered within the site.

8.6.35 Curlew were recorded in small numbers from flight activity surveys throughout the survey period, and during winter walkover surveys with a peak count of 20 in February 2021.

#### Dunlin

8.6.36 No breeding activity was recorded for dunlin (*Calidris alpina schinzii*) during field surveys at the site. Small groups were infrequently recorded during flight activity surveys.

#### Golden Plover

8.6.37 Golden plover (*Pluvialis apricaria*) were not recorded as a breeding species within the 2021 or 2022 surveys. Golden plover were recorded commonly from flight activity surveys with groups of up to 55 noted over the site. Small groups were recorded using the site to roost during winter walkover surveys.

#### Lapwing

8.6.38 A total of three (one probable and two possible) breeding attempts for lapwing (*Vanellus vanellus*) were recorded in the east of the site in 2021 (**Appendix 8.1: Figure 8a**) and seven (5 probable, 2 possible) breeding attempts in 2022 (**Appendix 8.1: Figure 8b**). All (bar one territory in 2022) were recorded within the site with four recorded within 200m of the nearest infrastructure.

8.6.39 Lapwing were recorded in small numbers from flight activity surveys throughout the survey period, and during winter walkover surveys with a peak count of 35 in January 2021.

#### Oystercatcher

8.6.40 A total of four (two probable and two possible) breeding attempts for oystercatcher (*Haematopus ostralegus*) were recorded in the east of the site in 2021 (**Appendix 8.1: Figure 8a**) and 2022 (one probable and three possible). (**Appendix 8.1: Figure 8b**).

#### Redshank

8.6.41 A single possible breeding attempt for redshank (*Tringa totanus*) was recorded in 2021 and 2022 within the south-eastern edge of the site (**Appendix 8.1: Figure 8a, Appendix 8.1: Figure 8b**). Only very occasional flight activity was recorded for this species.

#### Ringed Plover

8.6.42 A single possible breeding attempt for ringed plover (*Charadrius hiaticula*) was recorded in 2021 and 2022 within the eastern edge of the site (**Appendix 8.1: Figure 8a, Appendix 8.1: Figure 8b**). Only very occasional flight activity was recorded for this species.

#### Snipe

8.6.43 No breeding activity was recorded for snipe (*Gallinago gallinago*) during field surveys at the site in 2021. The 2022 surveys identified two possible breeding attempts in the south-east area of the site and survey buffer (**Appendix 8.1: Figure 8b**). Small groups were infrequently recorded during flight activity surveys and individuals were flushed from the site during walkover surveys.

Turnstone

8.6.44 No breeding activity was recorded for turnstone (*Arenaria interpres*) during field surveys at the site. A single group of seven were recorded during flight activity surveys.

Whimbrel

8.6.45 No breeding activity was recorded for whimbrel (*Numenius phaeopus*) during field surveys at the site. Small groups were recorded on four occasions during flight activity surveys in May and June 2021.

Woodcock

8.6.46 No breeding activity was recorded for woodcock (*Scolopax rusticola*) during field surveys at the site. individuals were flushed from the site during winter walkover surveys.

**Other Species**

8.6.47 A small number of passerine species were recorded as breeding in the site, including BoCC red listed skylark (*Alauda arvensis*) and green-listed stonechat (*Saxicola rubicola*). A further BoCC Red List species not outlined in the sections above were recorded during bird surveys (starling (*Sturnus vulgaris*)) and two BoCC Amber List species, meadow pipit (*Anthus pratensis*) and rock dove (*Columba livia*), but no evidence of breeding was recorded for these three species.

8.6.48 Common raptor species buzzard (*Buteo buteo*), sparrowhawk (*Accipiter nisus*) and kestrel (*Falco tinnunculus*) were recorded occasionally during the breeding walkover surveys, none were recorded breeding within the site.

**Likely Future Baseline Without Development**

8.6.49 The future baseline at the site in the case that the Proposed Development is not built is assumed to be very similar to the conditions outlined in the section above. This assumes that there will be no change in the current land use of the site, being a livestock farm. The majority of ornithological species on the island rely on the availability of food from the grassland, moorland and wetland habitats to nest in and to forage. It is considered unlikely that there will be any significant change in the baseline conditions at the site in the coming years should the land use remain in its current state.

**Evaluation of Ornithological Features**

8.6.50 An evaluation of the baseline ornithological features is presented in Table 8.9, below. Features of local or higher value are considered Important Ornithological Features (IOFs) following CIEEM (2018) and are brought forward to the next stage of the assessment.

**Table 8-9 Summary of Evaluation of Ornithological Features**

Feature	Evaluation Reasoning	Level of Importance
Orkney Mainland Moors SPA	<p>The level of value follows the level of designation. Lies directly south-east of the site. Designated for breeding hen harrier, red-throated diver and short-eared owl wintering hen harrier. The following species recorded on site are assumed to belong to the SPA population:</p> <ul style="list-style-type: none"> <li>▪ Breeding and Wintering hen harrier;</li> <li>▪ Breeding red-throated diver;</li> <li>▪ Breeding short-eared owl.</li> </ul>	International

Feature	Evaluation Reasoning	Level of Importance
Rousay SPA	<p>The level of value follows the level of designation. Lies 4.2 km north-east of the site. Designated for breeding Arctic tern, breeding seabird assemblage including Arctic skua, black-legged kittiwake, common guillemot and northern fulmar. The following species recorded on site are assumed to belong to the SPA population:</p> <ul style="list-style-type: none"> <li>▪ Breeding Arctic tern;</li> <li>▪ Breeding Arctic skua (assemblage species);</li> <li>▪ Breeding northern fulmar;</li> </ul> <p>All other SPA features were not recorded and are not considered any further.</p>	International
North Orkney SPA	<p>The level of value follows the level of designation. Lies 4.3 km south-east of the site. Designated for breeding red-throated diver and wintering great northern diver, Slavonian grebe and velvet scoter.</p> <p>Red-throated diver were recorded on site during the breeding season but given the red-throated divers generally use the closest area of open water to their breeding sites to forage and the fact that the SPA is over 4.3 km away means it is unlikely birds recorded are from the North Orkney SPA population. In addition for this assessment they are assumed to belong to the Orkney Mainland Moors SPA population which is in direct proximity as discussed above therefore are presumed not to be part of the North Orkney SPA.</p> <p>All other SPA features were not recorded and are not considered any further.</p>	International
Marwick Head SPA	<p>The level of value follows the level of designation. Lies 5.6 km west of the site. Designated for breeding seabird assemblage including black-legged kittiwake and common guillemot.</p> <p>All SPA features were not recorded and are not considered any further.</p>	International
West Mainland Moors SSSI	<p>The level of value follows the level of designation. The site overlaps the Orkney Mainland Moors SPA and has similar designating features. The designating features will be considered a part of the SPA which is a higher classification value.</p>	National
Loch of Isbister and the Loons	<p>The level of value follows the level of designation. Lies 4.6 km south-west of the site. Designated for breeding pintail and breeding wildfowl assemblage.</p>	National

Feature	Evaluation Reasoning	Level of Importance
	All SSSI features were not recorded on site and are not considered any further.	
Loch of Swannay LNCS	The level of value follows the level of designation. Lies directly east of the site.	Council
Birsay Moors RSPB reserve	The level of value follows the level of designation. Lies directly south/slightly overlaps the site.	Council
Loch of Hundland LNCS	The level of value follows the level of designation. Lies directly west of the site.	Council
Costa Hill, Evie/Birsa LNCS	The level of value follows the level of designation. Lies 1.5 km north-east of the site.	Council
Loch of Boardhouse LNCS	The level of value follows the level of designation. Lies 1.9 km west of the site.	Council
Marsh harrier	Marsh harrier is an Annex 1 and Schedule 1 listed species, and also listed on the SBL and the BoCC Amber list. Not recorded during surveys, the desk study identified two breeding locations, both over 2 km from the site.  Despite the conservation status of this species, with such low flight activity and no breeding records with 2 km, the site is assessed as less than local for this species.	Less than local
Merlin	Merlin is an Annex 1 and Schedule 1 listed species, and also listed on the SBL, the BoCC Red List and Orkney LBAP. Not recorded during flight activity surveys and recorded once during the breeding bird survey, no evidence of breeding activity was noted within 2km of the site. The desk study identified one breeding location, over 2 km from the site.  Despite the conservation status this species, with such low flight activity and no breeding records, the site is assessed as less than local for this species.	Less than local
Peregrine	Peregrine is an Annex 1 and Schedule 1 listed species, and also listed on the SBL. Recorded on four occasions during flight activity surveys, no evidence of breeding activity was noted within 2km of the site, during surveys and also within the desk study.  Despite the conservation status this species, with such low flight activity and no breeding records, the site is assessed as less than local for this species.	Less than local
Non-breeding short-eared owl (the wider-	Short-eared owl is an Annex 1 listed species, and also listed on the SBL and Orkney LBAP.	Less than local

Feature	Evaluation Reasoning	Level of Importance
countryside population)	Short-eared owl were not recorded at the site during winter flight activity surveys or winter walkovers therefore the site is considered less than local for wintering short-eared owl.	
Non-breeding Arctic skua (the wider countryside population)	Infrequently recorded, BoCC Red and Orkney LBAP listed species. Not recorded outside the breeding season.	Less than local
Great skua	A BoCC Amber listed species. Not recorded as a breeding species but was registered regularly during flight activity surveys.	Local
Non-breeding Arctic tern (the wider-countryside population)	Annex 1, BoCC Red, Orkney LBAP listed and SBL species. Not recorded outside the breeding season.	Less than local
Non-breeding Northern fulmar (the wider-countryside population)	BoCC Amber and Orkney LBAP list species. Not recorded outside the breeding season.	Less than local
Gulls	Herring gull BoCC Red, Orkney LBAP and SPL listed species. Common gull and Lesser black-backed gull are BoCC Amber and Orkney LBAP listed species. Great black-backed gull are BoCC Amber, Orkney LBAP and SPL listed species. Black-headed gull BoCC Amber, Orkney LBAP and SPL listed species.  Commonly registered from flight activity surveys, no records of breeding activity for any species. Common and widespread species in Orkney.	Less than local
Whooper swan	A Schedule 1, Annex 1, SBL, BoCC Red listed and Orkney LBAP list species. Whooper swan were recorded once during flight activity surveys and were not recorded as a breeding species.  Despite the conservation status of this species, with such low flight activity and no breeding records, the site is assessed as less than local for this species.	Less than Local
Greenland white-fronted goose	A BoCC Red listed species. Greenland white-fronted goose were recorded once and off-site during activity surveys.	Less than Local
Other wildfowl	Pink-footed goose, greylag goose, mallard and teal, and wigeon are all BoCC Amber listed species. Tufted duck are BoCC are Green listed. Greylag goose were frequently recorded all year round and as a breeding	Less than Local

Feature	Evaluation Reasoning	Level of Importance
	species, the majority of records will belong to naturalised birds which are considered to be a pest species in Orkney. The other four species were only recorded very infrequently.	
Common sandpiper	A BoCC Amber listed species. Common sandpiper were not recorded during flight activity surveys and were noted as a possible breeding species within the site with one record within 200m of the nearest infrastructure.	Less than Local
Curlew	A BoCC Red listed and SBL species. Curlew were recorded regularly during activity surveys and confirmed as breeding within the site.	Local
Dunlin	A BoCC Red listed species. Dunlin were infrequently recorded during activity surveys and were not recorded as a breeding species.	Less than Local
Golden plover	An Annex 1 species and Orkney LBAP listed. Commonly registered in small numbers in winter months from flight activity surveys, not recorded as a breeding species.	Less than Local
Lapwing	A BoCC Red listed and SBL species. Lapwings were recorded regularly during activity surveys and confirmed as breeding within the site.	Local
Oystercatcher	A BoCC Amber listed species. Oystercatcher were recorded regularly during activity surveys and confirmed as breeding within the site.	Less than Local
Redshank	A BoCC Amber listed species. Redshank were recorded infrequently during activity surveys and were noted as a possible breeding species within the site with one record within 200m of the nearest infrastructure.	Less than Local
Ringed plover	A BoCC Red listed and SBL species. Ringed plover were recorded infrequently during activity surveys and were noted as a possible breeding species within the site with one record within 200m of the nearest infrastructure.	Less than Local
Snipe	A BoCC Red listed species. Dunlin were infrequently recorded during flight activity surveys and were not recorded as a breeding species.	Less than Local
Whimbrel	A Schedule 1 and BoCC Red listed species. Whimbrel were recorded on four occasions during flight activity surveys and were not recorded as a breeding species. Despite the conservation status of this species, with such low flight activity and no breeding records, the site is assessed as less than local for this species.	Less than Local



Feature	Evaluation Reasoning	Level of Importance
Turnstone	A BoCC Amber listed species. Turnstone were recorded once during flight activity surveys and were not recorded as a breeding species.	Less than Local
Woodcock	A BoCC Red listed species. Woodcock were not recorded during flight activity surveys or as a breeding species.	Less than Local
Passerine breeding bird assemblage	Commonly recorded species typical of the habitat, BoCC red and amber listed, Orkney LBAP and SBL species.	Less than local

**Impacts Scoped Out of the Assessment**

8.6.51 As noted in Section 8.3, under evaluation methods for IOFs, ornithological features of local and higher value are considered IOFs. Due to a range of factors, some of these IOFs can be scoped-out of further consideration if they are not vulnerable to effects from the Proposed Development.

**IOFs Scoped In or Out of the Assessment**

8.6.52 Following evaluation of the baseline data, including desk study and field survey data, and considering the embedded mitigation measures described above, some potential effects on IOFs can be scoped out of the assessment, as described in Table 8.10- below. This is based on professional judgement and experience from other relevant projects in the region.

8.6.53 The subsequent assessment of effects will be applied to IOFs considered to be of local, council, national, and international Nature Conservation Value (Table 8.8) that are known to be present within the site or surrounding area (as confirmed through survey results and consultations outlined above).

**Table 8-10 : Important Ornithological Features Scoped In or Out of the Assessment**

IOF	Rationale for Scoping In/Out	Scoped In/Out
Orkney Mainland Moors SPA	<p>The site is located directly south-west of the site and designated for breeding hen harrier, red-throated diver and short-eared owl, and wintering hen harrier.</p> <p>The Orkney Mainland moors SPA is designated for a breeding population of hen harrier (28 pairs), which represents 5.6 % of the Great Britain breeding population. The Proposed Development lies in the Natural Heritage Zone 2 (NHZ2), Orkney and North Caithness (ONC) and 28 pairs represents 27% of the ONC population (105 pairs), as well as a wintering population (13.individuals) (Wilson <i>et al</i>, 2015). Hen harrier numbers were assessed as being favourable in the 2007 site condition monitoring data.</p> <p>Hen harrier were frequently recorded during both breeding and non-breeding seasons during flight activity surveys and breeding records have been recorded within the 2 km survey buffer in the last three years and a small winter roost was recorded in the previous two years within the same survey buffer. The regular presence of hen harrier all year round and the direct proximity of the SPA meaning it is considered the birds recorded are part of the SPA population both as a</p>	<p>In:</p> <p>Breeding and Wintering hen harrier, breeding short-eared owl and breeding red-throated diver.</p>

	<p>breeding and wintering hen harrier are scoped into the assessment.</p> <p>The SPA is designated in part for supporting a breeding population of short-eared owl (19 pairs), which represents 3.3 % of the Great Britain breeding population (taking an average of the estimated 125-1,250 breeding pairs) and 6.7% of the ONC population (estimated 283 pairs) (Wilson <i>et al</i>, 2015). Short-eared owl were not assessed as part of the site condition monitoring data.</p> <p>Short-eared owl were frequently recorded during the breeding season during flight activity surveys and breeding records have been recorded within the 2 km survey buffer in the last three years. With the regular presence of short-eared owl within the site during the breeding season and the direct proximity of the SPA, it is considered the birds recorded are part of the SPA population meaning breeding short-eared owl are scoped into the assessment.</p> <p>The SPA is designated in part for supporting a breeding population of red-throated diver (18 pairs), which represents 1.4 % of the Great Britain breeding population (1250 pairs, BTO 2021) and 18.6% of the ONC population (estimated 97 pairs) (Wilson <i>et al</i>, 2015). Red-throated diver numbers were assessed as being favourable in the 2006 site condition monitoring data.</p> <p>Red-throated diver were frequently recorded during the breeding season during flight activity surveys and although not confirmed, breeding was suspected on the large Lochans east and west of the site. With the regular presence of red-throated diver within the site during the breeding season and the direct proximity of the SPA, it is considered the birds recorded are part of the SPA population meaning breeding red-throated diver are scoped into the assessment.</p>	
<p>Rousay SPA</p>	<p>The SPA is designated for breeding Arctic tern, and its breeding seabird assemblage including Arctic skua, black-legged kittiwake, common guillemot and northern fulmar.</p> <p>Arctic tern were registered twice, totalling four individuals during flight activity surveys and no evidence of breeding was recorded. Rousay SPA is designated for 790 pairs, 2% of the Great Britain population and 5.8 % of the Orkney population (estimated 13,476 pairs in 2000, Forrester <i>et al</i>, 2007). The presence of just four birds represents 0.25 % of the SPA population. With such low numbers of birds recorded during surveys and no breeding records means Rousay SPA population of Arctic tern is scoped out of the assessment.</p> <p>Arctic skua were registered on three occasions of individuals recorded from flight activity surveys in June and July 2021.</p>	<p>Out:</p> <p>Rousay SPA including Breeding Arctic tern, Breeding Arctic skua and Breeding northern fulmar.</p>

	<p>Rousay SPA is designated for 130 pairs, 4% of the Great Britain population and 5.8 % of the ONC population (estimated 399 pairs, Wilson <i>et al</i>, 2015). The presence of just three birds, represents 1.15 % of the SPA population.</p> <p>With such low numbers of birds recorded during surveys and no breeding records means Rousay SPA population of Arctic skua is scoped out of the assessment.</p> <p>Northern fulmar were only recorded infrequently during flight activity surveys. Rousay SPA is designated for 1,250 pairs, 0.2% of the Great Britain population and 1.4 % of the Orkney population (estimated 90,846pairs, Forrester <i>et al</i>, 2007). With only occasional records of this widespread and populous species on Orkney means Rousay SPA population of Northern Fulmar is scoped out of the assessment.</p> <p>All designated species are scoped out, therefore Rousay SPA is scoped out of this assessment.</p>	
North Orkney SPA	All designated species are scoped out either due to lack of registrations or (for breeding red-throated diver) the fact the birds are considered to be Orkney Mainland Moor SPA birds, and therefore North Orkney SPA is scoped out of this assessment.	Out
Marwick Head SPA	All designated species are scoped out (due to the lack of registrations and distance to the site), therefore Marwick Head SPA is scoped out of this assessment.	Out
West Mainland Moors SSSI	Assessed as part of Orkney Mainland Moors SPA.	n/a
Loch of Isbister and the Loons	All designated species are scoped out (due to lack of registrations) , therefore Loch of Isbister and the Loons SSSI is scoped out of this assessment.	Out
Loch of Swannay LNCS	The Loch of Swannay LNCS overlaps the east of the site and also covers the Loch of Swanney directly east. The LNCS is designated for a broad range of bird species including waders, passerines and waterfowl. Given the site overlaps the LNCS, Loch of Swannay LNCS is scoped into the assessment.	In
Birsay Moors RSPB reserve	The RSPB slightly overlaps the south of the site, although the footprint of the Proposed Development will not directly impact the RSPB reserve. Within 2 km of the site the RSPB reserve covers a similar area as the Orkney Mainland Moors SPA and given the higher designation afforded to the SPA and its qualifying species the impacts on Birsay Moors will be included as part of the SPA assessment.	n/a

Loch of Hundland LNCS	<p>The Loch of Hundland LNCS lies west and south-west of the site and borders the site at its north-west corner. The LNCS is designated for a broad range of bird species including waders, passerines and waterfowl. Given the site's proximity of the LNCS, Loch of Hundland LNCS is scoped into the assessment.</p>	In
Costa Hill, Evie/Birsa LNCS	<p>Costa Hill, Evie/Birsa LNCS lies over 1.5km north-east of the site and is designated for upland breeding species.</p> <p>At almost 2 km from the site boundary it is considered unlikely that the Proposed Development will have any impact on the local nature site. As such Costa Hill, Evie/Birsa LNCS is scoped out of the assessment.</p>	Out
Loch of Boardhouse LNCS	<p>Loch of Boardhouse LNCS lies over 1.5km west of the site and is designated for its broad range of bird species including waders, passerines and waterfowl.</p> <p>At almost 2 km from the site boundary it is considered unlikely that the Proposed Development will have any impact on the local nature site. As such Loch of Boardhouse LNCS is scoped out of the assessment.</p>	Out
Great skua	<p>Great skua were recorded frequently during flight activity surveys between May and September 2021. No evidence of breeding activity was noted. Great skua are a BoCC Amber List and Orkney LBAP species.</p> <p>Forrester <i>et al</i> (2007) outline that great skua numbers in Orkney initially increased from 88 Apparently Occupied Territories (AOT's) in 1969-70 to 2,000 AOT's in 1985-88 to 2,209 AOT's in 1998-2002. The ONC population is 1,868 pairs (Wilson <i>et al.</i>, 2015) suggesting a recent decline in numbers.</p> <p>In 2021 and 2022 in the northern isles a number of great skua have been casualties of bird flu and with the slight decline in numbers described above, the Orkney population of great skua is considered to be unfavourable.</p> <p>The regular presence of great skua flying across the site during the breeding season means that breeding great skua are scoped into the assessment.</p>	In
Curlew	<p>Curlew were recorded regularly in low numbers year round from flight activity surveys. Breeding bird surveys identified a total of three and six breeding territories within the site in 2021 and 2022 respectively. Six breeding territories represents 0.19 % of the estimated ONC population (estimated total of 3,223 pairs, as per Wilson <i>et al</i>, 2015). Curlew is BoCC red-listed, as well as an SBL and Orkney LBAP species and considered to be a species at risk from wind farm developments.</p>	In

	Numbers of curlew are declining across the UK and the presence of multiple breeding territories of a BoCC Red list species means that curlew are scoped into the assessment.	
Lapwing	<p>Curlew were recorded regularly in low numbers in both breeding and non-breeding season year round from flight activity surveys. Breeding bird surveys identified a total of three and seven breeding territories within the site in 2021 and 2022 respectively, which represents 0.14 % of the estimated ONC population (estimated total of 5,000 pairs, Tait (2012)).</p> <p>Numbers of lapwing are declining across the UK as a whole and the presence of multiple breeding territories of a BoCC Red list species means that curlew are scoped into the assessment.</p>	In
Oystercatcher	<p>Oystercatcher were recorded regularly in low numbers in the breeding season and infrequently in non-breeding season from flight activity surveys. Breeding bird surveys identified a total of four breeding territories 2021 and 2022, of the four territories three and two were within the site.</p> <p>Three territories represent just 0.003% of estimated Orkney population (estimated at 10,000 pairs, Tait (2012)).</p> <p>Oystercatcher are a BoCC Amber List and Orkney LBAP species. With only low numbers of a common and widespread species, oystercatcher are scoped out of the assessment.</p>	Out

## 8.7 Standard Mitigation

8.7.1 As previously noted, following CIEEM guidance (CIEEM, 2018), the assessment process assumes the application of standard mitigation measures. This section of the assessment details the mitigation measures that are recommended to ameliorate identified effects associated with the construction and operational phase of the Proposed Development. These measures are aimed to prevent, reduce or offset any likely significant effects of the Proposed Development on identified ornithological receptors. This approach is in accordance with best practice guidance and UK, Scottish and Local Government environmental, planning and sustainability policies.

8.7.2 The principles and objectives for mitigation associated with the Proposed Development have been developed through an iterative process with the Applicant’s design team and through discussion with SNH and other stakeholders.

8.7.3 Mitigation includes best practice methods and principles applied to the Proposed Development as a whole (generic measures) as well as site specific mitigation measures applied to individual locations (specific measures).

8.7.4 All ornithological mitigation will be incorporated into a Construction Environmental Management Plan (CEMP). This CEMP, to be confirmed, will outline all required mitigation and provide details on timelines for undertaking mitigation for each identified ornithological receptor. This CEMP will also outline a timetable of actions and form part of the contract documents to ensure delivery of mitigation specified in this chapter. In addition, the CEMP will incorporate the provision of an Ecological Clerk of Works (ECoW) to oversee the implementation of recommended mitigation.

### ***Generic/Embedded Mitigation***

8.7.5 In the event of consent, the generic mitigation measures that apply to all ornithological receptors across the Proposed Development, and which are considered as embedded in the site development

proposals and therefore assumed to be the case for the purposes of assessing potential impacts, are outlined below:

- Not more than 12 months prior to construction of the Proposed Development, the Applicant will engage a Suitably Qualified Ecologist (SQE) to undertake a series of pre-construction ornithological surveys to update the baseline information reported in this chapter. The aim of these surveys would be to provide up to date information in order to finalise the mitigation proposals. This would be in addition to completing a final check prior to construction for protected species (see **Chapter 7** of this EIA Report) and would be discussed and agreed with NS.
- Further to or incorporated into the update surveys above, protection of breeding bird nests from damage and/or destruction during the breeding season will need to be ensured. Wherever possible, all vegetation clearance will occur outside the breeding season (i.e. clearance to be undertaken between October and February inclusive, inclusive), to ensure that no active nests are damaged or destroyed by the proposed works. This would include any areas of shrub clearance and vegetation removal for access tracks, compounds or turbine bases due to the populations of ground nesting birds on and around the site.
- Removing vegetation from working areas outside the breeding season, wherever possible between October and February inclusive but preferably between November and January, would also reduce the attractiveness of those areas to breeding birds the following season, which means that birds are less likely to breed in those areas.
- Avoidance of unnecessary disturbance to habitats by minimising the extent of ground clearance and other construction practices as far as practicable.
- An ecological toolbox talk will be given to all construction personnel as part of site induction on the potential presence of ornithological species and any measures that need to be undertaken should such species be discovered during construction activities. The toolbox talk will also include the requirement to report and log any bird casualties at the Proposed Development during construction and operation of the site.

8.7.6 As part of the Proposed Development, it will be necessary to develop and implement a Site Restoration Plan (SRP) as part of the CEMP to ensure the regeneration of those areas of habitat that have been temporarily lost through development.

8.7.7 In order to facilitate restoration, disturbed ground will be restored as soon as practicably possible using materials removed during the construction of access tracks, excavation of cable trenches and turbine foundations. To achieve this, any excavated soil will need to be stored in such a manner that is suitable to facilitate retention of the seed bank. This will aid site restoration and help conserve the pre-construction floristic interests at the site.

8.7.8 Additional, specific mitigation measures are discussed in Section 8.9.

## 8.8 Potential Effects

### *Description of the Proposed Development*

8.8.1 As described in **Chapter 3**, the Proposed Development will consist of four wind turbines with a maximum blade tip height of up to 180 m. The specific turbine has not yet been selected although it is expected to be the SG-155 6.6MW. Confirmation of the final turbine will be subject to a pre-commencement tendering exercise and will be confirmed post-consent.

8.8.2 The proposed final locations of the turbines have been defined, in order to enable the EIA Report to fully describe the Proposed Development for which permission is being sought. The British National Grid coordinates denoting where each of the turbines are proposed to be located are listed in **Chapter 3** and shown on **Figure 8.1**.

8.8.3 The main elements of the Proposed Development which have the potential to impact on IOFs, both during construction and operation are:

- Cut track construction, including bridging/culverting of two drainage ditches and mobile plant traffic movements.
- Turbine foundation creation (including excavation, steel work and concrete pouring, pile-driving of anchors, piling if required etc.).
- Crane pad construction.
- Excavation of borrow pit.
- Cable-laying and grid connection infrastructure (including substation).
- Temporary lay-down and construction compound areas.
- Temporary materials storage (soils).
- Site water management.
- Site restoration (track batters, compounds, etc.).

**Construction Impacts**

8.8.4 The above activities have the potential to cause the following construction impacts to the IOFs identified for the site:

- Direct loss of habitat.
- Direct loss of foraging habitat and/or breeding habitat for protected species.
- Indirect loss of foraging habitats and/or breeding habitat for species, through displacement.
- Disturbance and displacement to habitats and species (including noise, vibration, pollution), due to track and turbine base construction, as well as turbine erection, heavy machinery, noise and human activity on the site. Disturbance of ground vegetation and ground-nesting birds may affect a 5 m zone around all infrastructure.

**Operational Impacts**

8.8.5 The potential operational impacts have been identified as:

- Habitat change (modification) over time (N.B. operation phase drying of peaty or marshy substrates may affect up to 5m around cut track).
- Direct and indirect loss of foraging or breeding habitat due to displacement or avoidance.
- Mortality resulting from collision with turbines.
- Cumulative impacts of the Proposed Development in the context of other nearby wind farms (operational, consented and in planning).

**Construction Effects**

**Orkney Mainland Moors SPA Qualifying Species – Hen harrier**

8.8.6 Impact: Breeding, foraging or wintering hen harrier could be displaced from the site during construction, either by disturbance or because of direct habitat loss.

8.8.7 Sensitivity of the receptor: As per Table 8.9 hen harrier are of International Importance and therefore are of **high** sensitivity.

8.8.8 Magnitude of Impact: Breeding walkover surveys identified two breeding attempts both outside the site and within the 2km survey buffer (See **Appendix 8.1: Confidential Figure 7**). The desk study



identified similar results with between two or three breeding attempts for hen harrier, the breeding attempts are all outside the site and within 2km of the site boundary. Further (up to six more in 2019) breeding attempts were recorded between 2-4 km of the site (See **Appendix 8.1: Confidential Figure 9a**). A single bird hen harrier roost was recorded in both winter season 2020-2021 and 2021-2022.

- 8.8.9 The recommended (no) disturbance buffer required for heavy construction activities is 500-750 m for breeding locations of hen harrier (Ruddock and Whitfield, 2007) and the recommended (no) disturbance buffer required for heavy construction activities is 500 m for roosting locations of hen harrier (SNH, 2014). As discussed in Section 8.7 above pre-construction surveys will be completed to check for breeding hen harrier nest and roost locations and all the recommended no-disturbance buffers will be implemented. Given all the known records for this species are over 700m from the nearest infrastructure and roost sites over 500 m from the nearest infrastructure, it is considered unlikely the construction activities will cause disturbance to hen harrier breeding or roosting attempts.
- 8.8.10 Hen harriers were registered on 50 occasions in flight activity surveys, with birds using the site to hunt and to commute to hunting grounds elsewhere in the local area. Hen harrier will generally hunt within 3.5 km of their nest locations during the breeding season with male ranges up to 7.3 km and females up to 3.6 km, although females generally stay within 500 m of the nest (Hardey *et al.*, 2013). The construction activities at the site will result in the reduction of available habitat for foraging during the time of the works, due to a combination of the actual loss of habitat and the disturbance due to visual and noise disturbance created as a result of works. The impacts will last during the construction period, expected be 12 months.
- 8.8.11 Hen harrier will hunt in moorland and grassland habitats and feed on small birds and mammals. Much of the area within the site, the immediate wider area and much of Orkney as a whole provide optimal foraging habitat for hen harrier, which is one of the reasons why Orkney is considered a stronghold for this species, with 105 breeding pairs out of an estimated 501 pairs in Scotland as a whole (Wilson *et al.*, 2015). Given the wide range of alternate hunting habitats within the ranges of this species in the local area and the distance to any breeding attempts or winter roost sites from any proposed works, the loss of habitat or disturbance caused during the construction phase is unlikely to have any significant impacts on foraging or breeding hen harrier. Given the limited impact on foraging, breeding and wintering hen harrier during the construction period, the impact on hen harrier is considered to be direct, short-term and of low magnitude.
- 8.8.12 Significance of Effect: As outlined above, the magnitude of the impact on the Orkney hen harrier population as a result of construction is deemed to be a short-term, low adverse impact and the sensitivity is considered to be high. The effect is therefore considered to be **low** and **not significant** under the EIA Regulations.

#### **Orkney Mainland Moors SPA Qualifying Species – Short-eared owl**

- 8.8.13 Impact: Breeding and foraging short-eared owl could be displaced from the site during construction, either by disturbance or because of direct habitat loss.
- 8.8.14 Sensitivity of the receptor: As per Table 8.9 short-eared owl are of International Importance and therefore are of **high** sensitivity.
- 8.8.15 Magnitude of Impact: Breeding walkover surveys identified three breeding attempts for short-eared owl in 2021 all outside the site and within the 2km survey buffer (See **Appendix 8.1: Confidential Figure 7**). The desk study identified similar results in 2021 with three breeding attempts in similar locations and a fourth between 2-4 km from the site. There were no records in 2019 and a single breeding attempt noted in 2020, which was the same location as one of the 2021 records (See **Appendix 8.1: Confidential Figure 9b**). Due to their behaviour, short-eared owl nest locations are extremely difficult to identify with any degree of accuracy without causing significant and unnecessary disturbance to the breeding pair and the locations shown in the figures reflect the best estimate for the centre of the breeding territory.
- 8.8.16 The recommended (no) disturbance buffer required for heavy construction activities is 300-500 m for breeding locations of short-eared owl (Ruddock and Whitfield, 2007). As discussed in Section 8.7



above pre-construction surveys will be completed to check for breeding short-eared owl nest locations and all the recommended no-disturbance buffers will be implemented. Given all the records for this species are over 400m from the nearest infrastructure, it is considered unlikely but possible that the construction activities will cause disturbance to short-eared breeding attempts.

- 8.8.17 The construction activities at the site will result in the reduction of available habitat for foraging during the time of the works, due to a combination of the actual loss of habitat and the disturbance due to visual and noise disturbance created as a result of works. The impacts will last during the construction period, expected to be 12 months.
- 8.8.18 Short-eared owl were registered on 13 occasions in flight activity surveys, with birds using the site to hunt and to commute to hunting grounds elsewhere in the local area. Short-eared owl will generally hunt within 2 km of their nest locations during the breeding season although this may be extended up to 6 km depending on prey availability (Hardey *et al.*, 2013).
- 8.8.19 Short-eared owl will hunt in moorland and grassland habitats and feed on small mammals. As with hen harrier much of the area within the site and wider area provide optimal foraging habitat for short-eared owl which is why they are relatively common with around 25 % of the Scottish population (283 of 1,088) found in Orkney (Wilson *et al.*, 2015). Given the wide range of hunting habitats in the local area, the loss of habitat or disturbance during the construction phase is unlikely to have a significant impact on foraging short-eared owl. Given the limited impact on foraging and breeding short-eared owl during the construction period, the impact to short-eared owl is considered to be direct, short-term and of low magnitude.
- 8.8.20 Significance of Effect: As outlined above, the magnitude of the impact on the Orkney short-eared owl population as a result of construction is deemed to be a short-term, low adverse impact and the sensitivity is considered to be high. The effect is therefore considered to be **low** and not significant under the EIA Regulations.

#### **Orkney Mainland Moors SPA Qualifying Species – Red-throated diver**

- 8.8.21 Impact: Breeding or foraging red-throated diver could be displaced from the site during construction, either by disturbance or because of direct habitat loss.
- 8.8.22 Sensitivity of the receptor: As per Table 8.9 red-throated diver are of International Importance and therefore are of **high** sensitivity.
- 8.8.23 Magnitude of Impact: No breeding records were identified within the site or within 1 km of the site boundary. The recommended (no) disturbance buffer required for heavy construction activities is 500-750 m for breeding locations of red-throated diver (Ruddock and Whitfield, 2007). As discussed in Section 8.7 above pre-construction surveys will be completed to check for breeding red-throated diver nest locations and all the recommended no-disturbance buffers will be implemented. Given the lack of known breeding records for this species within 1 km of the site it is considered unlikely the construction activities will cause disturbance to red-throated breeding attempts.
- 8.8.24 Red-throated diver were registered on 13 occasions in flight activity surveys, with birds using the site to commute between waterbodies. Red-throated diver spend almost all their time on waterbodies when not on the nest and are very unlikely to use the site for anything other than commuting between nesting and foraging areas. Given the fact that red-throated diver are only likely to use the airspace over the site, the impact on this species is likely to be limited to modifications to commuting routes.
- 8.8.25 Given the limited impact on foraging and breeding red-throated diver during the construction period, the impact on red-throated diver is considered to be direct, short-term and of negligible magnitude.
- 8.8.26 Significance of Effect: As outlined above, the magnitude of the impact on the Orkney red-throated diver population as a result of construction is deemed to be a short-term, negligible adverse impact and the sensitivity is considered to be high. The effect is therefore considered to be **negligible** and not significant under the EIA Regulations.

### Great skua

- 8.8.27 Impact: Breeding or foraging great skua could be displaced from the site during construction, either by disturbance or because of direct habitat loss.
- 8.8.28 Sensitivity of the receptor: As per Table 8.9 skua are of local Importance and therefore are of **low** sensitivity.
- 8.8.29 Magnitude of Impact: No breeding records were identified within the site or within 500 m of the site boundary. Given the lack of known breeding records for this species within the site it is considered unlikely the construction activities will cause disturbance to great skua breeding attempts.
- 8.8.30 Great skua were registered on 29 occasions in flight activity surveys, with birds using the site to commute between breeding and foraging grounds. Great skua breed on moorland and are a very adaptable species foraging on both open water and land. It is considered likely that great skua use the site to forage and roost occasionally but more likely to use the airspace over the site.
- 8.8.31 Given the limited impact on foraging and breeding great skua during the construction period, the impact on great skua is considered to be direct, short-term and of negligible magnitude.
- 8.8.32 Significance of Effect: As outlined above, the magnitude of the impact on the Orkney great skua population as a result of construction is deemed to be a short-term, negligible adverse impact and the sensitivity is considered to be low. The effect is therefore considered to be **negligible** and **not significant** under the EIA Regulations.

### Curlew

- 8.8.33 Impact: Breeding and foraging curlew could be displaced from the site during construction, either by disturbance or because of direct habitat loss.
- 8.8.34 Sensitivity of the receptor: As per Table 8.9 curlew are of local Importance and therefore are of **medium/low** sensitivity.
- 8.8.35 Magnitude of Impact: Breeding walkover surveys identified three and six curlew breeding attempts within the site (see **Figure 8.5**). Of the maximum figure six, a total of two were recorded on the site infrastructure and the remainder within 500m.
- 8.8.36 Potential impacts on curlew during construction include mortality as a result of construction activities, temporary disturbance as a result of soil stripping and increased noise and vibration and temporary habitat loss. With breeding records within the site, mortality may result from construction activities undertaken during the bird breeding season where unidentified nests and chicks may be destroyed or abandoned.
- 8.8.37 Potential disturbance during construction may result in displacement from the areas of land clearance and a slightly wider area adjacent to it. During the breeding season, in order to avoid the abandonment of nests or breeding territories as a result of disturbance, the standard mitigation outlined in Section 8.7, including the pre-construction checks and the appointed ECoW will identify active nesting locations prior to any works taking place. If nest sites are identified, then appropriate mitigation measures to protect nest sites will be implemented.
- 8.8.38 Curlew were recorded in low numbers during both breeding and non-breeding season during flight activity surveys and small numbers were registered within the site during winter walkover surveys. Construction activities may result in disturbance on roosting and foraging curlew all year round but with similar habitats in the wider area, any birds disturbed are likely to relocate in the local area.
- 8.8.39 Given the maximum number of six breeding territories recorded represents just 0.19 % of the estimated ONC population (estimated total of 3,223 pairs, as per Wilson *et al*, 2015). The impact on curlew is considered to be direct, short-term and of low magnitude.
- 8.8.40 Significance of Effect: As outlined above, the magnitude of the impact on the Orkney curlew population as a result of construction is deemed to be a short-term, low adverse impact and the sensitivity is considered to be low. The effect is therefore considered to be **low** and **not significant** under the EIA Regulations.

### Lapwing

- 8.8.41 Impact: Breeding and foraging lapwing could be displaced from the site during construction, either by disturbance or because of direct habitat loss.
- 8.8.42 Sensitivity of the receptor: As per Table 8.9 lapwing are of local Importance and therefore are of **medium/low** sensitivity.
- 8.8.43 Magnitude of Impact: Breeding walkover surveys identified three and seven lapwing breeding attempts within the site (see **Figure 8.5**). Of the maximum figure seven, none were recorded on the site infrastructure and four within 200m.
- 8.8.44 Potential impacts on lapwing during construction include mortality as a result of construction activities, temporary disturbance as a result of soil stripping and increased noise and vibration and temporary habitat loss. With breeding recorded within the site, mortality may result from construction activities undertaken during the bird breeding season where unidentified nests and chicks may be destroyed or abandoned.
- 8.8.45 Potential disturbance during construction may result in displacement from the areas of land clearance and a slightly wider area adjacent to it. During the breeding season, in order to avoid the abandonment of nests or breeding territories as a result of disturbance, the standard mitigation outlined in Section 8.7, including the pre-construction checks and the appointed ECoW will identify active nesting locations prior to any works taking place. If nest sites are identified, then appropriate mitigation measures to protect nest sites will be implemented.
- 8.8.46 Given the maximum number of seven breeding territories recorded represents just 0.14 % of the estimated Orkney population (estimated total of 10,000 pairs, Tait, 2012). The impact on lapwing is considered to be direct, short-term and of low magnitude.
- 8.8.47 Significance of Effect: As outlined above, the magnitude of the impact on the Orkney lapwing population as a result of construction is deemed to be a short-term, low adverse impact and the sensitivity is considered to be low. The effect is therefore considered to be **low** and **not significant** under the EIA Regulations.

### Loch of Swannay LNCS

- 8.8.48 Impact: breeding and foraging species could be displaced during construction, either by disturbance or because of direct habitat loss.
- 8.8.49 Sensitivity of the receptor: As per Table 8.9 Loch of Swannay LCNS is of council Importance and therefore of **medium** sensitivity.
- 8.8.50 Magnitude of Impact: breeding bird surveys identified a number of the ornithological features mentioned as part of the citation, including lapwing, curlew, redshank, skylark and common sandpiper. Potential impacts on the qualifying species during construction include mortality as a result of construction activities, temporary disturbance as a result of soil stripping and increased noise and vibration plus temporary and permanent habitat loss.
- 8.8.51 During the breeding season, in order to avoid the abandonment of nests or breeding territories as a result of disturbance, the standard mitigation outlined in Section 8.7, including the pre-construction checks and the appointed ECoW will identify active nesting locations prior to any works taking place. If nest sites are identified, then appropriate mitigation measures to protect nest sites will be implemented.
- 8.8.52 The area lost within the LNCS designation measures approximately 3.7 hectares of the LNCS area. This loss will be permanent but relatively small and the impact on the designating species is likely to be small given the amount of similar habitat available in the wider area.
- 8.8.53 Given the possibility to disturb breeding territories of qualifying species and the fact that there will be some permanent habitat loss from the designated site the impact on Loch of Swannay LCNS is considered to be direct, permanent and of **low** magnitude.
- 8.8.54 Significance of Effect: As outlined above, the magnitude of the impact on the Loch of Swannay LCNS as a result of construction is deemed to be a permanent, moderate adverse impact and the

sensitivity is considered to be medium. The effect is therefore considered to be **low** and **not significant** under the EIA Regulations.

#### **Loch of Hundland LNCS**

- 8.8.55 Impact: Breeding and foraging species could be displaced during construction, either by disturbance or because of direct habitat loss.
- 8.8.56 Sensitivity of the receptor: As per Table 8.9 Loch of Hundland LCNS is of council Importance and therefore is of **medium** sensitivity.
- 8.8.57 Magnitude of Impact: Breeding bird surveys identified a number of the ornithological features mentioned as part of the citation, including lapwing, curlew, redshank, skylark and common sandpiper. There is no overlap of the works with the LNCS so the potential impacts on the qualifying species during construction are restricted to disturbance and displacement of species due to increased noise and vibration plus temporary and permanent habitat loss.
- 8.8.58 During the breeding season, in order to avoid the abandonment of nests or breeding territories as a result of disturbance, the standard mitigation outlined in Section 8.7, including the pre-construction checks and the appointed ECoW will identify active nesting locations prior to any works taking place. If nest sites are identified, then appropriate mitigation measures to protect nest sites will be implemented.
- 8.8.59 Given the possibility to disturb breeding territories of qualifying species in the designated site the impact on Loch of Hundland LCNS is considered to be direct, short-term and of **low** magnitude.
- 8.8.60 Significance of Effect: As outlined above, the magnitude of the impact on the Loch of Hundland LCNS as a result of construction is deemed to be a short-term, moderate adverse impact and the sensitivity is considered to be medium. The effect is therefore considered to be **low** and **not significant** under the EIA Regulations.

#### **Operation**

- 8.8.61 Effects of land take on birds (i.e. decreased resource availability) are considered to be limited given the small percentage (<3 %) of the site that will be occupied by the footprint of the Proposed Development (7.2 ha). There is the potential for a component of the Proposed Development infrastructure to be sited on, or close to, a specific type and area of habitat used by one or more bird species carried through in this assessment. That potential effect is assessed, where relevant, in the species text that follows.
- 8.8.62 The two main ways in which birds can be affected by operational wind farms are:
- through displacement due to ongoing disturbance caused by wind turbine structures (i.e. barrier effect) and associated equipment (and by periodic servicing of them); and
  - potential mortality through collision with moving blades or associated infrastructure.

#### **Displacement**

- 8.8.63 A range of studies have concluded that most bird species are not significantly affected by operational wind farms (e.g. Vauk, 1990; Percival, 2005; Devereux et al., 2008; Winkelmann, 1994; Langston & Pullan, 2003; Hotker et al., 2006). This is reflected, in part, by NS guidance (SNH, 2017) on birds and wind farms which does not, for example, normally recommend surveys for breeding passerines. NS guidance, which is the UK standard, indicates that effort should focus on species and/or species groups that are thought to be susceptible to the effects of wind farms or highly protected species on which potential effects remain unclear.
- 8.8.64 Turbines may also present a barrier effect to the movement of birds across a site, restricting them from accessing wider areas. The effect this would have on a population is difficult to predict. If birds have to regularly fly over or around turbines this may result in greater energy expenditure, while birds displaced into other, suboptimal habitats may experience reduced foraging potential. Such impacts could effectively limit birds being able to build energy reserves, potentially affecting survival and/or breeding success.

8.8.65 Of those species identified as IOFs that use the site and are carried forwards in this assessment, wader species including lapwing and curlew have been assessed as breeding (including possible and probable territories) within the study area.

Curlew and Lapwing

8.8.66 Impact: Nesting or foraging curlew and lapwing may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

8.8.67 Sensitivity of the receptor: As outlined in Table 8.9, the site is considered to be of low sensitivity for both these species.

8.8.68 Magnitude of Impact: In addition to disturbance to birds during the construction phase, the operation of turbines and associated human activities for maintenance purposes also has the potential to disturb birds and displace them from the site. Existing information (e.g. de Lucas *et al.*, 2007; Douglas *et al.*, 2011; Haworth & Fielding, 2012) and reviews of effects (e.g. Madders & Whitfield, 2006; Hötter *et al.*, 2006; Gove *et al.*, 2013; Harrison *et al.*, 2017) suggest that most birds are affected only slightly, if at all, although these effects require further study. Other studies involving long-term monitoring of golden plover (Fielding & Haworth 2010, 2012, 2013, Douglas *et al.*, 2011) and curlew (Whitfield *et al.*, 2010) found no evidence of displacement due to wind farm infrastructure for either species. In addition, in their study of the effects of wind turbines on the distribution of wintering farmland birds, Devereux *et al.* (2008) did not find any effect on four species groups (seed-eaters, corvids, gamebirds and skylark), except for pheasant (*Phasianus colchicus*) an introduced species.

8.8.69 However, contradictorily in other studies, breeding birds have been found to be displaced within 300 m from a turbine (e.g. Gill *et al.*, 1996; Percival, 1998; Hötter *et al.*, 2006), with some studies suggesting some potential for partial displacement effects at greater distances (Pearce-Higgins *et al.*, 2009). Wind turbines might also displace birds from much larger areas if they act as a barrier to bird movements, or if availability of suitable habitat is restricted.

8.8.70 The evidence suggests that impacts vary between species and sites (Madders & Whitfield, 2006). There is potential for some disruption of feeding and nesting due to increased human activity for maintenance purposes, although this infrequent maintenance is unlikely to create any notable increase in disturbance as compared to current farming practices which sees activity of workers using quad bikes and other farm vehicles, which can be daily and involve workers living on the island with sheep dogs. There are limited pressures resulting from grazing livestock. Therefore, the overriding source of disturbance and displacement of birds during the operational period is considered to be the turbines operating (Pearce-Higgins *et al.*, 2009).

8.8.71 Curlew are considered to potentially be most affected by operational displacement, based on the study by Pearce-Higgins *et al.* (2012). Populations of curlew appear to decline by up to 40% during the construction phase within a 620 m area around the outermost turbines of a wind farm. The study also showed a 53% decline of snipe within wind farm sites, which is reasonably consistent with an earlier study by Pearce-Higgins (2009) that identified a 48% decline in abundance in species within 500 metres of turbines. The authors state that (non-significant) increases in numbers have been noted at reference sites which may indicate these birds also move into the wider areas to breed as opposed to being lost to the population. However, there is no clear evidence to support this assertion at present.

8.8.72 On a precautionary basis, displacement effects on lapwing are likely to be limited to c.200 m around the proposed turbine locations extended to 500 m for curlew. These distances are based on published disturbance distances for lapwing (Yalden & Yalden, 1989, 1990; Hötter *et al.*, 2005; Pearce-Higgins *et al.*, 2009) and for curlew (Pearce-Higgins *et al.* 2012).

8.8.73 Given the distances outlined above the displacement effects will impact on up to four probable lapwing territories as per the 2022 results and six curlew territories (two probable, four possible) also as per the 2022 survey results. Even in the unlikely event that all of these breeding pairs are lost it represents 0.08% of an estimated 5,000 pairs of Lapwing on Orkney (Tait, 2012) and 0.18% of 3,223 of the ONC curlew population as per Wilson *et al.*, 2015.

8.8.74 Given these low numbers (where are very much a worse case scenario and unlikely) and the availability of suitable habitat (beyond the likely extent of displacement) within the site and wider area, and the likelihood (based on research referenced above) that population-level effects will not occur, means the impact on curlew and lapwing is to result in an effect of low and medium-term magnitude on Orkney population.

8.8.75 Significance of Effect: The magnitude of the impact on the Orkney population as a result of collision risk is deemed to be a long-term, negligible adverse impact and the sensitivity is considered to be low. The effect on curlew and lapwing as a result of collisions is therefore considered to be **low** and therefore **not significant** under the EIA Regulations.

#### **Collision**

8.8.76 All Collision Risk Modelling (CRM) and analyses were completed following best practice guidelines and recommended species-specific biometrics and avoidance rates (Band *et al.*, 2007 and SNH 2000, 2010, 2013, 2017 and 2018a). Collision risk analysis was informed by the data obtained during the VP surveys and corresponding flight lines (**Appendix 8.1: Figures 3-6**); full details of the calculations are provided in **Appendix 8.2**.

#### Great Skua

8.8.77 Impact: Great skua could collide with the turbines leading to injury and potentially mortality.

8.8.78 Sensitivity of the receptor: Low.

8.8.79 Magnitude of Impact: No collisions of great skua with wind turbines in Europe have been documented by Dürr (2021). A report by Upton (2014c) outlined that the initial NS recommended avoidance rate of 98 % is a precautionary rate and that an avoidance figure of 99.5 % (as used in the CRM for great skua in this assessment) is more likely to be appropriate. This is supported through post construction carcass searching at the operational Bugar Hill wind farm, Hammars Hill wind farm and Hoy community turbine schemes (Upton, 2012b), which has resulted in no evidence of great skua collisions being found. Furthermore, Furness (2015) provides anecdotal evidence that great skua carcasses typically remain in-situ for long-periods due to an apparent reluctance of great skua to scavenge their kin (despite frequently scavenging carcasses of other species). Carcass searches are therefore likely to be a reliable monitoring method for this species, and the conclusions drawn by Upton (2014c) are considered to be robust.

8.8.80 The CRM provided an output of 0.04 collisions will occur during the breeding season, equating to 0.96 collisions over the notional 25 years of operation of the Proposed Development. The great skua breeding population on Orkney is estimated at 1,868 pairs (Wilson *et al.*, 2015). The modelled collision rate over the notional 25 years represents 0.017 % of the Orkney population. This very small increase in baseline mortality is therefore predicted to result in an impact that is considered to be long-term and of negligible magnitude.

8.8.81 Significance of Effect: The magnitude of the impact on the Orkney population as a result of collision risk is deemed to be a long-term, negligible adverse impact and the sensitivity is considered to be low. The effect on great skua as a result of collisions is therefore considered to be **negligible** and therefore **not significant** under the EIA Regulations.

#### Orkney Mainland Moors SPA Qualifying Species – Red-throated diver

8.8.82 Impact: Red-throated diver could collide with the turbines leading to injury and potential mortality.

8.8.83 Sensitivity of the receptor: High.

8.8.84 Magnitude of Impact: Dürr (2021) reports one documented collision for red-throated diver in Europe, occurring at Bremen, Germany. It is possible that the species' tendency to avoid wind farms (e.g. Halley & Hopshaug, 2007; Percival, 2014; Petersen, 2007; Topping and Petersen, 2011) precludes collision risk to some degree. Okill (1992) reports the discovery of a red-throated diver assumed to have been killed by flying into overhead wires, and Furness (2015) provides two further examples of birds reportedly flying into fences on Foula in Shetland. Furness (2015) further suggests that red-throated diver may actively avoid turbines due to their vulnerability of colliding with objects



- that they cannot detect over distance, which, given the lack of breeding records for this species within the site and surrounding 1 km, is of relevance to the Proposed Development. Post construction monitoring work by Upton (2012a; 2014a, 2014b) at Burgar Hill Wind Farm, Orkney, did not find any evidence of red-throated diver collision over eight breeding seasons of monitoring.
- 8.8.85 The diver flightlines during the breeding season all followed a north-east to south-west axis over the site therefore CRM for this species used the linear rather than random model (see **Appendix 8.2**), and provided an output of 0.054 collisions per annum, equating to 1.34 collisions over a notional 25 year operation period of the Proposed Development and one collision every 18.52 years.
- 8.8.86 Of the 13 red-throated diver flights recorded all were recorded with a south-west to north-east axis which would indicate the birds were not in fact from the Orkney Mainland Moors SPA population. Red-throated divers generally fly directly from breeding locations to foraging locations during the breeding season and this would suggest the birds would fly into the viewsheds from the SPA to the south. It seems likely be that a proportion or all of the red-throated diver flights consist of records of immature and non-breeding birds or of birds that are breeding outside the SPA, although to prove the birds are not of SPA provenance is extremely difficult.
- 8.8.87 The red-throated diver breeding population for the Orkney Mainland Moors SPA population is estimated to be 18 pairs and the Orkney population is estimated at 97 pairs (Wilson *et al.*, 2015) meaning the annual collision risk value of 0.054 collisions and presuming all the birds involved are from the SPA represents 0.15 % and 0.03 % of the SPA and ONC populations respectively. When this figure is considered over a 25 year period the total collision rate represents 3.75 % of the SPA population and 0.69 % of the Orkney population.
- 8.8.88 There are reasons to be believe the resultant figure for collision risk for red-throated diver is precautionary and the avoidance rate as used in the assessment is too low. A review of red-throated diver avoidance rates was commissioned by SNH (Furness, 2015) and including studies by Upton (2012a; 2014a, 2014b) from Burgar Hill which lies 2.7 km east of the site, as well other wind farm sites across Scotland and Europe as a whole. The study concluded that as no carcasses have been recovered in the UK which related to collision with turbines and with only one from Germany across Europe, the avoidance rate for red-throated diver is almost certainly greater than 99 % and probably greater than 99.5 %, as during the survey if a 99.5 % avoidance rate was correct the searches would of expected to recover between 1.5-3 carcasses at Burgar Hill during the search time period when in fact none were recovered.
- 8.8.89 Given this evidence from Orkney that, it is considered likely that an avoidance rate of 99.5 % is precautionary from red-throated diver. An avoidance rate of 99.8 % is currently used for geese and given their similar size and flight characteristics, being large and long-necked species which are slow to manoeuvre and with the evidence provided by the Upton studies it seems the 99.8 % would be a more realistic avoidance rate for red-throated diver and even then it still be a precautionary figure.
- 8.8.90 Given a 99.8 % avoidance rate the CRM provided an output of 0.021 collisions per annum, equating to 0.53 collisions over a notional 25 year operation period of the Proposed Development meaning the annual collision risk represents 0.06 % and 0.01 % of the SPA and ONC populations respectively. When this figure is considered over a 25 year period the total collision rate (using a 99.8 % avoidance rate) represents 1.5 % of the SPA population and 0.27 % of the Orkney (breeding) population.
- 8.8.91 Presuming the precautionary collision risk value of 99.5 % and presuming that all birds involved in the at-risk flights an annual collision risk of 0.054 is predicted which equates to 0.15 % of the SPA population. This small increase in baseline mortality is therefore predicted to result in an impact that is considered to be long-term and of low magnitude.
- 8.8.92 Significance of Effect: The magnitude of the impact on the Orkney Mainland Moors SPA population as a result of collision risk is deemed to be a long-term, negligible adverse impact and the sensitivity is considered to be high. The effect on red-throated diver as a result of collisions is therefore considered to be **low** and therefore **not significant** under the EIA Regulations.

### **Decommissioning**

- 8.8.93 The Applicant is seeking in-perpetuity consent for the Proposed Development. In the event of decommissioning, or replacement of turbines, it is anticipated that the levels of effect would be similar but of a lesser level than those during construction. Decommissioning would be undertaken in line with best practice processes and methods at that time and will be managed through an agreed Decommissioning Environmental Management Plan.

## **8.9 Additional Mitigation and Enhancement**

- 8.9.1 In the event of consent and in addition to the provision of generic mitigation measures (see Section 8.7), the following specific measures designed to avoid, reduce and offset identified ornithological effects are proposed.

### **Waders**

- 8.9.2 Specific mitigation for ground nesting birds and in particular waders will focus on habitat improvement through grazing management and avoidance of direct mortality and disturbance. A Grazing Management Plan (GMP) outlined below details the approach to improve habitats for breeding waders throughout the Proposed Development site.
- 8.9.3 The area of land shown in **Figure 8.3** will be implemented into a grazing management scheme with only specified numbers of sheep or cattle allowed to graze in specified areas at different times of the year. The GMP would have the aim to improve the breeding habitat for ground nesting birds as well improving and encouraging regeneration of sensitive moorland habitats (See **Chapter 7**)
- 8.9.4 Stocking densities will be kept low or stock will be entirely in April and May meaning that nest building and early incubation stages will be unaffected through trampling by cattle. This will mean nesting attempts will be unlikely to be damaged by cattle and the grass within the site will grow and provide good cover for incubating adults and young alike, without being so long it chokes nesting attempts. In June the cattle will be put out on pastures in low densities across several different fields to graze.
- 8.9.5 This area of the site as shown in **Figure 8.3** and includes 5 of the 6 curlew territories, 4 of the 5 lapwing territories and two oystercatcher, one ringed plover one redshank and one common sandpiper territory.
- 8.9.6 This grazing management will provide suitable grassland habitat for wader species within the site (and within Loch of Hundland LNCS) such as lapwing, oystercatcher and curlew, as well as the redshank, ringed plover and common sandpiper. It should also benefit ground nesting passerine species such as the BoCC Red listed skylark.

### **Orkney Native Wildlife Project**

- 8.9.7 The site will be included in the Orkney wide project which involves the trapping of stoat (*Mustela erminea*) for the lifetime of the Proposed Development (or the lifetime of the project should the project end sooner). Stoats are a non-native predator which were first detected on Orkney in 2010 (NatureScot, 2022). The aim of the traps is to reduce and eventually eradicate stoats from Orkney which are predators of small birds and mammals but will also eat ground nesting birds and their eggs and chicks. As outlined by NatureScot, they pose a threat to many species including:-

- the native Orkney vole,
- hen harrier,
- short-eared owl, and
- many ground-nesting birds.

(NatureScot, 2022).



- 8.9.8 It is considered likely that a reduction in stoat numbers would benefit all of the IOFs including the three SPA qualifying species hen harrier, short-eared owl and red-throated diver, all of which are ground nesting birds recorded locally.

### **General Site Mitigation**

- 8.9.9 All birds are afforded general protection under the Wildlife and Countryside Act 1981 (as amended). This prevents intentional or reckless: killing, injury or taking of any wild bird; taking, damaging, destroying or otherwise interfering with the nest of that bird while it is in use or being built; obstruction of any wild bird from using its nest; and taking or destroying an egg of any wild bird.
- 8.9.10 To avoid destruction of the nests of birds (and the killing and injury of nestlings and destruction of eggs), vegetation will be removed in the winter (between October and February inclusive but preferably between November and January). If there is a need for destruction of habitats outside the period October to February inclusive, this will be overseen by an ECoW, whose role will be to establish whether breeding birds are present or not.
- 8.9.11 It is anticipated that the internal access tracks within the Proposed Development site will be laid down in the winter. If this is not possible, and construction has to take place between March and August inclusive, any areas for tracks, material laydown, turbine bases and other infrastructure will be kept short and largely devoid of vegetation during the breeding season until such time that they are developed. This will be achieved by regular ploughing, mechanical cutting or strimming during the breeding season. It is recommended that the areas are initially ploughed in early to mid-March, and again in May if they have not been developed by that point. Between these times, the cleared areas will be visited by an ECoW, to check whether they have been colonised by nesting birds, with advice given on any restrictions these pose and whether further measures are needed to keep the vegetation under control and deter birds from nesting. These measures will be required for each breeding season during the construction phase.
- 8.9.12 The ECoW will undertake construction phase surveys of birds within the Proposed Development and will record information of breeding success as far as is possible (avoiding disturbance, and following relevant NatureScot survey guidance (SNH, 2017)). The data will be used with pre-construction baseline survey data and future data obtained during monitoring work to provide population information across each phase of the Development.

## **8.10 Residual Effects**

### **Construction**

- 8.10.1 Following the application of mitigation measures, which include land management, there are no significant adverse impacts on IOF's predicted at the site and so residual effects of the Proposed Development are unlikely, therefore no further specific mitigation is required.

### **Operation**

- 8.10.2 Taking into account the proposed mitigation measures, it is concluded that the Development will not have a significant adverse effect at greater than the Low sensitivity level for any species using the site and immediate surrounding area. Following the successful implementation of the mitigation and enhancement measures outlined in this chapter, it is anticipated that there will be a significant beneficial impact on breeding waders.
- 8.10.3 Taking into account the proposed mitigation measures, it is concluded that the Development will not have a significant adverse effect on the integrity of any of the statutory designated sites identified as having potential connectivity with the Development.
- 8.10.4 There is an inherent level of uncertainty associated with ecological assessment (as is acknowledged in CIEEM Guidance). However, post-construction monitoring (PCM) is proposed to assess the efficacy of the HMP, in terms of breeding waders, on an ongoing basis and will consist of breeding bird and habitat surveys across consecutive operational years (i.e. years 0, 1, 2, 3, 5 and 10) and also the potential impacts of the windfarm on red-throated diver with carcass checks completed monthly though the breeding season (April to September) in the same years post-construction.

8.10.5 Survey methods and timings may be adjusted across monitoring years according to each year's survey results, as well as informing other HMP factors (e.g. grazing densities).

8.10.6 This assessment has fully considered the principles of, and guidance provided by Scottish Planning Policy, the Nature Conservation (Scotland) Act 2004, the Orkney Local Development Plan 2017, and the Orkney LBAP. In particular, consideration has been given to international responsibilities and the protection of designated sites.

## 8.11 Cumulative Assessment

8.11.1 The cumulative assessment of effects on receptors takes into consideration other operational, under construction and in planning developments. The assessment does not include for developments at the scoping stage, in accordance with SPP and given the lack of detailed information on such proposed developments. The assessment takes into account all types of developments considered to be relevant in the context of the assessed impacts, not just wind farm developments.

8.11.2 The assessment of ornithological effects associated with the Proposed Development alone, predicted no significant effects for every IOF due to lack of breeding records for high sensitivity species within the site and the relatively low activity levels at collision height of IOFs recorded during baseline surveys.

8.11.3 The Proposed Development lies within NHZ2 and so a qualitative cumulative assessment of the likely effects of local wind farm projects (due to the distance involved only the Orkney area of NHZ2 is considered) as shown in Table 8.11, on local IOF populations, is considered.

8.11.4 There are seven single turbines in close proximity of the site, one within the site and a further six within 1 km of the site. There is no collision risk data for these small scale developments and the small size of the turbines mean the impacts on displacement of waders is considered to be significantly less than larger turbines and the cumulative impacts on waders is considered to be **negligible**. There are approximately 500 single domestic scale turbines on Orkney and in NHZ2 which generally have no collision risk data and given the large number of those out of immediate vicinity of the site are not considered within this assessment.

8.11.5 For the purpose of this cumulative assessment, it is considered that all other developments included in cumulative calculations remain as they were at installation and remain so for the assessment (25 year) period. As such, where appropriate the annual collision rates calculated for the Proposed Development are expanded to a 25-year equivalent in order to allow for comparisons between developments.

8.11.6 Collision risk modelling at the site identified **negligible** impacts from the results for all species, with the exception of red-throated diver where a total of 3.75 collisions were predicted over a 25-year operating period of the wind farm. This collision risk figure still predicts that impacts due to collision risk are **low** and are considered to be **not significant**.

8.11.7 The cumulative assessment therefore has been limited to disturbance-displacement of wader species and collision risk for red-throated diver.

### **Curlew and Lapwing Cumulative Disturbance / Displacement**

8.11.8 Curlew and lapwing were recorded breeding within the site and some habitat suitable for roosting or feeding may become unavailable due to displacement effects around turbines and other infrastructure. These wader species were recorded breeding within most local wind farm sites (see **Table 8.11**) and are a relatively common breeding species in Orkney where suitable open habitats are present. A small number of breeding pairs may be affected by displacement due to the construction and operation of wind farms, although in some cases, grazing management measures may help offset such losses of habitat.

8.11.9 Overall, the residual cumulative effect on the local curlew and lapwing population from operational displacement is classified as **negligible** adverse and is **not significant** in the context of the EIA Regulations. This is also likely to be the level of significance for the contribution of wind farm

projects within NHZ2 when scaled up to the relevant population (national/Scottish wintering or migrating populations).

**Red-Throated Diver – Collision Risk**

- 8.11.10 An annual collision risk of 0.05 and a total figure of 1.34 over a 25 year period was predicted at the site. Other sites which performed collision risk for red-throated diver include Hammers Hill (estimated as 0.06 per annum), Evie (0.053 per annum), Faray (0.03 per annum) and Hoy (0.265 per annum).
- 8.11.11 While low numbers of red-throated divers were recorded at other wind farm sites there were not sufficient data to undertake CRM (see Table 7.5). The combined estimated annual collision risk for all Orkney wind farms is therefore 0.458 with a cumulative total of 11.45 birds over a period of 25 years. The breeding population on Orkney is estimated at 97 pairs (Wilson *et al.*, 2015). The annual collision risk modelled represents 0.23 % (5.75 % over a 25 year period) of the Orkney population and is therefore classified as **negligible** adverse and **not significant** at the NHZ level.

**Table 8-11 – Cumulative Assessment of Likely Ornithological Effects: Wind Farm Development in Orkney (including single turbine developments within 2 km)**

Site Name	Distance from Proposed Development	Stage	Details / Description of Significant Residual Effects
Costa Head, Birsay	1.25 km north	Consented	Curlew and golden plover were recorded regularly from VP surveys. Curlew, lapwing and redshank were recorded breeding within the site in small numbers. No CRM was undertaken for red-throated diver.
Burgar Hill, Evie	2.7 km south-east	Installed	As Evie wind farm. (No detailed ornithology results were detected for later turbine applications but red-throated diver were noted breeding in the vicinity of one site)  Post construction monitoring has been undertaken for red-throated diver (See Section 8.9 above) and outlined that despite several pairs of breeding red-throated diver no collisions were reported.
Hammars Hill, Evie	19 km south-west.	Installed	At about 2 km there are up to twelve pairs of Red-throated divers.  Waders were recorded breeding within the site including (Oystercatcher: 9, Lapwing: 7, Golden Plover: 1, Snipe: 10, Curlew: 12, Redshank: 5; and Short-eared owl: 1).  Collision Risk Modelling (CRM) was undertaken for red-throated diver which was assessed as having an annual collision risk at 95 % avoidance of 0.29, at 97.5% 0.15 and at 99% of 0.06.
Hammers Hill Extension	6.9 km south-east	Consented	Hen harrier, red-throated diver, greylag goose, short-eared owl and golden plover were frequently observed from VP watches.  Breeding bird surveys identified oystercatcher (18), greylag goose (2), ringed plover (1), red grouse (1), lapwing (2), arctic skua (1–2), snipe (2), great skua (1–2), curlew (11), common gull (5), dunlin (1) and redshank (3) territories.  CRM was undertaken for greylag goose, golden plover, hen harrier as well as red-throated diver which was assessed as having an annual collision risk at 95.5% avoidance of 0.266, at 97.5 % of 0.1333 and at 99 % of 0.053.

Site Name	Distance from Proposed Development	Stage	Details / Description of Significant Residual Effects
Holodyke Wind Turbine, Birsay	4.9 km south south-east	Operational	NS request for ornithology assessment (due to potential impacts on hen harrier, short-eared owl and red-throated diver), no details of ornithology data found on Planning Portal but as the site was approved impacts on ornithology are assumed to be acceptable.
Akla	20 km south south-east	Under construction	Hen harrier, red-throated diver, great skua most frequently recorded from VP watches as well as golden plover, greylag goose and whimbrel.  Oystercatcher (14,18), lapwing (8,3), Snipe (12,18) Curlew (15,12), redshank (5,1) were recorded breeding in good numbers. CRM was not undertaken for red-throated diver as only a single flight was recorded.
Orkney's Community Wind Farm Project - Quanterness	16.1 km south-east	Consented	Potential for disturbance and displacement of wintering greylag goose, wintering pink-footed goose, curlew (no direct displacement, up to 6 territories disturbance), lapwing (potentially two displaced and up to 20 territories disturbed), golden plover (up to 2 territories), oystercatcher (four displaced and up to 30 territories disturbed), redshank (up to 4 territories), ringed plover (3 territories), snipe (up to 4 territories) and Arctic tern (1 territory)  No collision risk modelling was undertaken for red-throated diver.
Work Farm, St Ola	21.7 km south-east	Approved	No collision risk modelling was undertaken. Ornithology surveys identified both breeding and wintering greylag geese and golden plover in the vicinity of the site. A desk study outlined the presence of wintering wading birds in the vicinity, most notably golden plover and redshank. Small numbers of breeding curlew, lapwing and oystercatcher breed in the local area.
Gallowhill	22.6 km north-east	Installed	No evidence of ornithology surveys or collision risk modelling available of the Planning Portal.
Orkney's Community	23.6 km north-east	Application	Potential for disturbance and displacement of, lapwing (potentially two displaced and up to 20 territories disturbed), golden plover (up to 2 territories), oystercatcher (four displaced and up to 30 territories disturbed), redshank (up to 4 territories), ringed plover (3 territories), snipe (up to 4 territories) and Arctic tern (1 territory)

Site Name	Distance from Proposed Development	Stage	Details / Description of Significant Residual Effects
Wind Farm Project - Faray			Collision risk for red-throated diver calculated at 0.03 per annum.
Spurness Wind Farm, Sanday	30.4 km east	Installed	Surveys undertaken by RSPB at the site identified breeding gulls, Arctic tern, Arctic skua and fulmar. No collision risk modelling was undertaken.
Bu Farm Repowering, Stronsay	31.3 east south-east	Installed	It was assessed that four species were at risk from collision with turbine (red-throated diver, golden plover, dunlin and arctic skua).  No CRM details were available.
Orkney's Community Wind Farm Project - Hoy	32.6 km south	Consented	Collision risk modelling for red-throated diver predicted an average breeding season mortality of 0.265 birds.  Potential displacement of curlew (2) and snipe territories was recorded.
Barns of Ayre, Deerness	35.9 km south-east	Installed	No ornithology surveys were undertaken or collision risk modelling.
Hesta Head, South Ronaldsay	41.2 km south-east	Approved	Golden plovers were seen relatively frequently during the spring and autumn passage periods, sizeable flocks were occasional, foraging in the general area with up to 350 present on 7 <sup>th</sup> April 2011 and 16 <sup>th</sup> April 2011 and 260 on 11 <sup>th</sup> December 2015. Otherwise the records were occasional to frequent between late September and early May and appeared to relate to local movements of 1–50 birds, in various directions over and past the Proposed Development, often at risk height.  Other listed species observed at the proposed development include; Greylag goose, Oystercatcher, Lapwing, Redshank and Curlew.

Site Name	Distance from Proposed Development	Stage	Details / Description of Significant Residual Effects
			<p>The surveys for breeding birds in 2011 found two pairs of redshank and five pairs of curlew within the Survey Area, although it seemed likely that up to seven or eight pairs of curlews may have been present. No snipe were confirmed as breeding in 2011, but in 2016 up to two were seen drumming.</p> <p>No CRM was undertaken for red-throated diver, only a single flight was recorded off-shore from the development.</p>

## 8.12 Summary

- 8.12.1 Table 8-12 below summarises the predicted effects of the construction and operational impacts on ornithology and it is concluded that the Development will not have a significant adverse effect at greater than the Low sensitivity level for any species using the Site and immediate surrounding area.



**Table 8-12 – Summary of Effects**

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
Construction					
Orkney Mainland Moors SPA Qualifying Species – Hen harrier: disturbance and displacement	Negligible and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Negligible and not significant	Adverse
Orkney Mainland Moors SPA Qualifying Species – Red-throated diver: disturbance and displacement	Negligible and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Negligible and not significant	Adverse
Orkney Mainland Moors SPA Qualifying Species – Short-eared owl: disturbance and displacement	Negligible and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Negligible and not significant	Adverse
Great skua disturbance and displacement.	Negligible and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Negligible and not significant	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
Curlew disturbance and displacement.	Low and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Low and not significant	Adverse
Lapwing disturbance and displacement.	Low and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Low and not significant	Adverse
Loch of Swannay LCNS – habitat loss, disturbance and displacement of qualifying species.	Low and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Low and not significant	Adverse
Loch of Hundland LCNS - disturbance and displacement of qualifying species.	Negligible and not significant	Adverse	Timing of works or pre-construction check for nesting birds. Exclusion zones during breeding season.	Negligible and not significant	Adverse
<b>Operation</b>					
Great skua – collision risk	Negligible and not significant	Adverse	None	Negligible and not significant	Adverse
Red-throated diver – collision risk	Low and not significant	Adverse	None	Low and not significant	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
Ground nesting waders and other species displacement	Low and not significant	Adverse	Grazing management to remain in place throughout the lifetime of scheme.  Inclusion in the Orkney Native Wildlife Project.	Low and not significant	Beneficial
Decommissioning					
Scoped out of the assessment					

**Table 8-13 – Summary of Cumulative Effects**

Receptor	Effect	Cumulative Developments	Significance of Cumulative Effect	
			Significance	Beneficial/ Adverse
Red-throated diver collision risk.	Collision mortality	A combined annual collision risk of 0.558 birds is predicted which is not considered to be significant	Negligible and not significant	Adverse
Wader nest displacement	Disturbance, displacement.	Wader data is not available for a number of developments across Orkney. Some temporary displacement is likely during construction however with a HMP in place this will be offset and with grazing management schemes being put in place during operation of the schemes, waders including lapwing and curlew may benefit from improving habitats for breeding, along with the stoat trapping scheme, and as such increased productivity.	Negligible and not significant	Adverse

## 8.13 References

- Band, W, Madders, M, & Whitfield, D.P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In: Janss, G, de Lucas, M & Ferrer, M (eds.) *Birds and Wind Farms*. Quercus, Madrid. 259-275
- BirdLife International (2004) *Birds in Europe: population estimates, trends and conservation status*. BirdLife Conservation Series No. 12, Cambridge, UK.
- Calladine, J., Garner, G., Wernham, C. & Thiel, A. (2009) The influence of survey frequency on population estimates of moorland breeding birds. *Bird Study*, 56: 3, 381-388.
- CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester
- de Lucas, M.G.F., Janss, S.F.E & Ferrer, M. (2007). *Birds and wind farms: risk assessment and mitigation*. Quercus, Madrid, Spain.
- Devereux, C.L., Denny, M.J.H. & Whittingham, M.J. (2008) Minimal effects of wind turbines on the distribution of wintering farmland birds. *Journal of Applied Ecology*
- Douglas, D., Bellamy, P., & Pearce-Higgins, J. (2011) Changes in the abundance and distribution of upland breeding birds at an operational wind farm. *Bird Study* 58, Issue 1, 2011
- Dürr, T. (2021). *Vogelverluste an Windenergieanlagen / bird fatalities at wind turbines in Europe*. Available at: <http://ow.ly/wusS9>
- European Parliament (2009). Council Directive 2009/147/EC: The Conservation of Wild Birds Directive. Available at:
- Farm Advisory service (FAC). *Management and conservation for farmland Waders*. Technical note TN688.
- Fielding, A.H. & Haworth, P.F. (2010). *Farr windfarm: A review of displacement disturbance on golden plover arising from operational turbines between 2005-2009*. Haworth Conservation, Isle of Mull, Scotland.
- Fielding, A.H. & Haworth, P.F. 2012. *Farr windfarm: A review of displacement disturbance on golden plover arising from operational turbines – 2011 update*. Haworth Conservation, Isle of Mull, Scotland.
- Fielding, A.H. & Haworth, P.F. 2013. *Farr windfarm: A review of displacement disturbance on golden plover arising from operational turbines between 2005-2013*. Haworth Conservation, Isle of Mull, Scotland.
- Forester, R.W., Andrews, I.J., McInerney, C.J., Murray, R.D., McGowan, R.Y., Zonfrilla, B., Betts, M,W., Jardine, D.C. & Grundy, D.S. (EDS) 2012. *The Digital Birds of Scotland*. the Scottish Ornithologists Club, Aberlady.
- Furness, R.W. (2015). *A review of red-throated diver and great skua avoidance rates at onshore wind farms in Scotland*. Scottish Natural Heritage Commissioned Report No. 885
- Gilbert, G, Gibbons D W & Evans J, 2012. *Bird Monitoring Methods: A Manual of Techniques for Key UK Species*.
- Gill, J.P., Townsley, M. and Mudge, G.P., (1996). *Review of the impacts of wind farms and other aerial structures upon birds*. SNH Review 21: 68pp

- Gove, B., Langston, R.H.W., McCluskie, A., Pullan, J.D. & Scrase, I. (2013). Wind farms and birds: an updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment. Report prepared by BirdLife International on behalf of the Bern Convention. Strasbourg, 17 September 2013.
- Hardey, J., Crick, H., Riley, H., Etheridge, B., and Thompson, D. (2013) Raptors: A field guide to surveys and monitoring. The Stationery Office; 3rd revised edition.
- Halley, D.J. & Hopshaug, P. (2007). Breeding and overland flight of red-throated divers *Gavia stellata* at Smøla, Norway, in relation to the Smøla wind farm. NINA Report 297. 32 pp.
- Harrison, C., Llyod, H. & Field, C. (2017). Evidence review of the impact of solar farms on birds, bats and general ecology. (NEER012). Natural England. First edition.
- Hayhow, D. B., Ausden, M. A., Bradbury, R. B., Burnell, D., Copeland, A. I., Crick, H. Q. P., Eaton, M. A., Frost, T., Grice, P. V., Hall, C., Harris, S. J., Morecroft, M. D., Noble, D. G., Pearce-Higgins, J. W., Watts, O., Williams, J. M. (2017), The state of the UK's birds 2017. The RSPB, BTO, WWT, JNCC, NE and NRW, Sandy, Bedfordshire.
- Hötker, H., Thomsen, K-M & Koster, H. (2006) The impact of renewable energy generation on biodiversity with reference to birds and bats – facts, gaps in our knowledge, areas for further research and ornithological criteria for the expansion of renewables. NABU Report, Germany.
- IEMA (1995). Guidelines for Baseline Ecological Assessment. Institute of Environmental Management and Assessment.
- IEEM (2006) Guidelines for Ecological Impact Assessment. Institute of Ecology and Environmental Management.
- Langston, R.H.W. & Pullan, J.D., (2003) Wind farms and Birds: An analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues. Birdlife International.
- Madders, M. & Whitfield, D.P. (2006). Upland raptors and the assessment of wind farm impacts. *Ibis* 148, 43-56.
- Musgrove, A., Aebischer, N., Eaton, M., Hearn, R., Newson, S., Noble, D., Parsons, M., Risley, K & Stroud, D. (2013). Population estimates of birds in Great Britain and the United Kingdom. *British Birds* 106: 64-100
- NatureScot (2022a). Sitelink Available at: <https://sitelink.nature.scot/map>
- NatureScot (2022b). Available at: Orkney Native Wildlife Project <https://www.nature.scot/professional-advice/land-and-sea-management/managing-wildlife/orkney-native-wildlife-project>
- Okill, J. D. (1992) Natal dispersal and breeding site fidelity of red-throated Divers *Gavia stellata* in Shetland. *Ringing & Migration*, 13, 1, 57-58
- Orkney Islands Council (2013). Orkney Local Biodiversity Action Plan 2013-2016. Available online at: [http://www.orkney.gov.uk/Files/Planning/Development-and-Marine-Planning/DM\\_Guidance/The\\_Orkney\\_Local\\_Biodiversity\\_Action\\_Plan\\_2013-2016.pdf](http://www.orkney.gov.uk/Files/Planning/Development-and-Marine-Planning/DM_Guidance/The_Orkney_Local_Biodiversity_Action_Plan_2013-2016.pdf) .
- Pearce-Higgins, J.W., Stephen, L., Langton, R., Bainbridge, I. and Bullman, R. (2009) The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology* (46) 1323 -1331.
- Pearce-Higgins, J.W., Stephen, L., Douse, A., Langston, R. (2012) Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. *Journal of Applied Ecology*. 49, 2, April 2012, 386-394

Percival, S.M. (1998). Birds and Turbines: managing potential planning issues. Proc. of the 20th BWEA Conference 1998: pp 345-350

Percival, S.M. (2005) *Birds and wind farms: what are the real issues?* British Birds 98: 194-204.

Percival, S. M. (2014). Kentish Flats Offshore Wind Farm: Diver Surveys 2011-12 and 2012-13. Ecology Consulting, Durham, UK, on Behalf of Vattenfall Wind Power

Petersen, I. K. & Fox, A. D. (2007). Changes in bird habitat utilisation around the Horns Rev 1 offshore wind farm, with particular emphasis on Common Scoter. Report request. Commissioned by Vattenfall A/S. National Environmental Research Institute, University of Aarhus, Denmark.

Ruddock & Whitfield (2007). A review of disturbance distances in selected bird species.

Scottish Government (2013). Scottish Biodiversity List. Version 1.5. Available online at: <http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL>

Sim, I.M.W., Dillon, I.A., Eaton, M.A., Etheridge, B., Lindley, P., Riley, H., Saunders, R., Sharpe, C. and Tickner, M. (2007). Status of the Hen Harrier *Circus cyaneus* in the UK and the Isle of Man in 2004, and a comparison with the 1988/89 and 1998 surveys. Bird Study 54, 256–267.

SNH (2000) *Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note. Available at <http://www.snh.gov.uk/docs/C205425.pdf>

SNH (2010) SNH Avoidance Rate Information and Guidance Note. Use of Avoidance Rates in the SNH Windfarm Collision Risk Model.

SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments. Available at: <https://www.nature.scot/sites/default/files/2017-09/Guidance%20note%20-%20Assessing%20the%20cumulative%20impact%20of%20onshore%20wind%20energy%20developments.pdf>

SNH (2013). Avoidance rates for wintering species of geese in Scotland at onshore wind farms. Available at <http://www.snh.gov.uk/docs/A916616.pdf>

SNH (2017). Recommended Bird Survey Methods to inform Impact Assessment of Onshore Wind Farms. SNH Guidance Note Series

SNH (2018a). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. Version 2. Scottish Natural Heritage, Inverness.

SNH (2018b). Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas (2014, updated 2018). SNH Information and Guidance Note. SNH, Battleby.

SNH (2018c). Assessing the cumulative impacts of onshore wind farms on birds. SNH Information and Guidance Note. SNH, Battleby.

Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win I. 2021. The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds 114: 723-747. Tait C (2012). The Orkney Guide Book. Nature and Environment pp28-41.

The Wildlife Trust of South and West Wales (2017). The New Petrel Station on Skokholm Island has the Team all Fueled Up. Available at: <https://www.welshwildlife.org/conservation/new-petrel-station-skokholm-island-team-fueled/>

Thomas, S., Varnham, K. (2016) Seabird Island Restoration Project, RSPB - Island Biosecurity Manual. Available online at: <https://ww2.rspb.org.uk/our->

[work/conservation/shiantisles/work/downloads/hyperlinks/RSPB\\_Shiantis%20LIFE\\_Biosecurity%20Manual.pdf](http://work/conservation/shiantisles/work/downloads/hyperlinks/RSPB_Shiantis%20LIFE_Biosecurity%20Manual.pdf)

Topping C, & Petersen J,K. (2011). Report on a Red-throated diver agent-based model to assess the cumulative impact from offshore wind farms. Report commissioned by the Environmental Group. Aarhus University, DCE – Danish Centre for Environment and Energy

Upton, A. (2012a). Red-throated diver wind turbine avoidance, Burgar Hill, Orkney: 2007- 2012. Firth Ecology, Finstown.

Upton, A. (2012b). *Great skua wind turbine avoidance in Orkney*. Firth Ecology, Finstown.

Upton, A. (2014a). Wind Farm Bird Monitoring – 2013. Carcase searches and owl watches at Orkney wind farm sites. Firth Ecology, Finstown.

Upton, A. (2014b). Red-throated diver wind turbine avoidance in Orkney: 2014 update. Firth Ecology, Finstown.

Upton, A. (2014c). *Great skua wind turbine avoidance in Orkney: 2014 update*. Firth Ecology, Finstown.

Upton, A. G. (2018). Wind Farm Bird Monitoring – 2018: Carcass Searches at Orkney Wind Farm Sites. Unpublished report for Birsay Energy Ltd and Hammars Hill Energy Ltd. Vauk, G. (1990) Biological and ecological study of the effects of construction and operation of wind power land ownerships. Jahrgang/Sonderheft, Endbericht. Norddeutsche Naturschutzakademie, Germany.

Watson, H., Bolton, B. & Monaghan, P. 2014. Out of sight but not out of harm's way: Human disturbance reduces reproductive success of a cavity-nesting seabird. *Biological Conservation* 174 (2014) 127-133

Whitfield, D.P. Green, M. & Fielding, A.H. 2010. Are breeding Eurasian curlew *Numenius arquata* displaced by wind energy developments? Natural Research Projects Ltd, Banchory, Scotland.

Wilson, M.W., Austin, G.E., Gillings, S. and Wernham, C.V. (2015) *Natural Heritage Zone Bird Population Estimates*. SWBSG Commissioned Report: 1504.

Winkelmann, J.E. (1994) Bird/wind turbine investigations in Europe. Proc. of the National Avian Wind Power Planning Meeting, Denver, Colorado, pp 43-48.

Yalden, D.W. & Yalden, P.E. (1989). The sensitivity of breeding Golden Plovers *Pluvialis apricaria* to human intruders. *Bird Study* 36: 49–55.

Yalden, P.E. & Yalden, D.W. (1990). Recreational disturbance of breeding Golden Plovers *Pluvialis apricaria*. *Biol. Conserv.* 51: 243–262.