8 Ornithology

Contents

Executive Summary		8-3
8.1	Introduction	8-4
8.2	Scope of Assessment	8-4
8.3	Legislation, Policy and Guidelines	8-5
8.4	Consultation	8-7
8.5	Assessment Methods and Significance Criteria	8-9
8.6	Baseline Conditions	8-17
8.7	Potential Effects	8-25
8.8	Mitigation	8-36
8.9	Residual Effects	8-37
8.10	Cumulative Effects	8-37
8.11	Summary	8-38
8.12	References	8-40

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8. Ornithology

Executive Summary

In total, 55 bird species were recorded within the Study Area during targeted ornithological surveys between April 2017 and March 2019, using standard survey methodologies. The ornithological assessment identified twelve potentially important bird species regularly using the Study Area. These were: pink-footed goose, greylag goose, black grouse, golden eagle, white-tailed eagle, osprey, kestrel, golden plover, dunlin, curlew and greenshank.

There are no designated sites within the Site, but the Caithness and Sutherland Peatlands Special Protection Area (SPA) is adjacent to the south and south-west of the Site. The Caithness and Sutherland Peatlands SPA ornithological listed features are: black-throated diver, red-throated diver, common scoter, wigeon, dunlin, wood sandpiper, golden plover, greenshank, golden eagle, hen harrier, merlin and short-eared owl. No land-take or habitat loss would occur within the Caithness and Sutherland Peatlands SPA. No likely significant adverse effects to breeding SPA birds are predicted.

Potential impacts were considered on wider countryside bird species. No likely significant adverse ornithological residual effects are predicted, but some likely non-significant adverse effects are predicted, for example:

- The potential death of one immature, non-breeding golden eagle during the life-time of the Proposed Development.
- The potential death of one non-breeding/migrating kestrel during the life-time of the Proposed Development.

None of the predicted effects are judged likely to be significant, i.e. there would be no detectable regional population level effects and so the Peatlands of Caithness and Sutherland (PCS) Natural Heritage Zone (NHZ) 5 populations of the wider countryside species would not be adversely affected. Therefore, if the Proposed Development is built, the available information indicates, using the three NatureScot (formerly Scottish Natural Heritage (SNH)) tests (SNH, 2006), that Favourable Conservation Status would not be affected because:

- The wider countryside bird species would be likely to maintain themselves on a long-term basis as a viable component of their habitat in the PCS NHZ.
- The natural range of the wider countryside species in the PCS NHZ would not be reduced by the Proposed Development, nor would it become likely to be reduced in the foreseeable future.
- There would be (and would continue to be) a sufficiently large habitat area in the PCS NHZ to maintain the wider countryside bird populations on a long-term basis should the Proposed Development be built.

No significant residual effects on designated site species or any wider countryside bird species are predicted and so no specific mitigation is required to offset likely significant effects. Nevertheless, proposed mitigation measures, where possible, for non-significant but adverse effects and proposed measures to achieve biodiversity benefits (for example through habitat enhancements) are outlined in Appendix 7.6. Mitigation measures proposed include blanket bog/peatland restoration and native broadleaved woodland creation.

8.1 Introduction

8.1.1 This chapter considers the likely effects of the Proposed Development on the ornithological receptors at the Site and the surrounding Study Area, during both construction and operation, with decommissioning impacts having been scoped out. This assessment is based upon comprehensive baseline data, comprising specifically targeted ornithological field surveys of important and legally protected avian receptors identified during desk study, following standard survey methodologies. It draws on pre-existing information, where appropriate, from other studies and survey data sources, and is based on the Chartered Institute of Ecology and Environmental Management (CIEEM) guidance on Ecological Impact Assessment (EcIA) (2018) and NatureScot (formerly SNH) best practice guidance on surveying birds and assessment of the potential onshore wind farm impacts on birds. The scope of this ornithological chapter includes potential effects on birds only; habitats, flora and other fauna are considered separately in Chapter 7.

8.1.2 The specific objectives of this chapter are to:

- Describe the ornithological baseline.
- Describe the assessment methodology and significance criteria used in completing the ornithological impact assessment.
- Describe the likely effects, including direct, indirect and cumulative effects on birds.
- Describe the mitigation measures proposed to address any likely significant effects on birds.

8.1.3 Alba Ecology Ltd. led on all aspects of the ornithological fieldwork and assessment in association with the Proposed Development. Alba Ecology is a Scottish-based multi-disciplinary ecological consultancy that has worked in the north of Scotland for many years. Alba's staff have led on, and contributed to, all aspects of EcIA on many large-scale development projects, including the management of Ecological Clerks of Work teams, principal ornithological/ecological surveyors and advisors on planning applications, expert witness at Public Local Inquiry and production of EIA Reports and Habitat Management Plans across Highland.

8.1.4 The ornithological surveyors who undertook the surveys for the Proposed Development were Dr Dawn Anderson, Mr Donald Shields and Dr Peter Cosgrove. The surveyors have extensive ornithological field experience in Sutherland and across the north of Scotland and have attended regular training events led by experts, covering areas such as species identification, recording data concisely and accurately, navigation techniques and health and safety. Surveyors were trained to carry out surveying and mapping work in a systematic manner, following recognised standardised survey methods and best practice guidance.

8.1.5 This chapter is supported by the following figures and technical appendices:

- Technical Appendix 8.1: Birds Technical Report;
- Technical Appendix 8.2: Confidential Bird Information Report;
- Technical Appendix 8.3: Collision Risk Assessment Report;
- Technical Appendix 7.1: Natural Heritage Desk Study Report;
- Technical Appendix 7.6: Outline Habitat Management Plan (OHMP); and
- A series of 36 ornithological figures, including eleven confidential ornithological figures.

8.2 Scope of Assessment

8.2.1 The ornithological assessment involved the following key stages:

- Reference to relevant legislation, policy and guidance.
- Identification of the likely zone of influence of the Proposed Development.
- Identification of potentially important ornithological receptors likely to be affected (baseline conditions) by the Proposed Development.
- Evaluation of important ornithological receptors and features likely to be affected by the Proposed Development.
- Identification of likely impacts and the magnitude of impacts/effects of the Proposed Development on important ornithological receptors.
- Assessment of the likely significant effects of the Proposed Development on ornithological receptors, including any mitigation and enhancement measures and definition of any residual significant effects.

8.2.2 Consideration of alternative locations and design layouts are described in Chapter 3. The main elements of the Proposed Development which have the potential to impact on ornithological receptors both during construction and operation are described in Chapter 4.

8.2.3 The following potential impacts have been assessed in full in relation to the construction of the Proposed Development:

- Direct and indirect loss of foraging habitat and/or breeding habitat for birds through land-take.
- Disturbance/displacement to birds due to track and turbine base construction as well as turbine erection, access track construction/widening, buildings, heavy machinery, noise and human activity on the Site.

8.2.4 The following potential impacts have been assessed in full in relation to the operation of the Proposed Development:

- Direct and indirect loss of foraging and/or breeding habitat due to operational disturbance/displacement or avoidance.
- Impacts on commuting routes due to 'barrier effects', i.e. turbines blocking a preferred flight route/corridor.
- Death or injury of birds through collision with turbine blades ('collision risk').
- Cumulative significant impacts of the Proposed Development in the context of other nearby wind farms (operational and consented).

8.3 Legislation, Policy and Guidelines

8.3.1 Relevant national planning policy guidelines, best practice guidance, international commitments, legislation and planning policies relevant to the protection, conservation and enhancement of ornithological interests associated with the Proposed Development are outlined below. The approach used to assess the significance of potential effects of the Proposed Development upon ornithological receptors is set in the context of:

- The Wildlife and Countryside Act 1981 (as amended);
- European Commission (EC) European Biodiversity Strategy (2011 and 2020);
- EC Directive 2009/147/EC on the conservation of wild birds (codified version). Hereafter referred to as the 'Birds Directive';

- EC Directive 1992/43/EEC on the conservation of natural habitats and of wild fauna and flora. Hereafter referred to as the 'Habitats Directive';
- The Conservation (Natural Habitats) Regulations 1994. Hereafter referred to as the 'Habitats Regulations';
- The Conservation of Habitats and Species Regulations 2010;
- The Nature Conservation (Scotland) Act 2004 (as amended);
- The Scottish Biodiversity List (2013). Scottish Government;
- Scottish Planning Policy (2014). Scottish Government;
- Scottish Government Planning Circular 1 2017: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Hereafter referred to as the 'EIA Regulations';
- Scottish Government (2020). The Environment Strategy for Scotland: vision and outcomes;
- Guidelines for Ecological Impact Assessment in the UK and Ireland, 2nd Edition (2016) CIEEM;
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, 3rd Edition (2018; updated 2019). CIEEM;
- Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities (2017). SNH;
- Assessing Significance of Impacts from Onshore Windfarms on Birds Outwith Designated Areas (2006; and updates). SNH;
- Flight Speeds and Biometrics for Collision Risk Modelling (2014). SNH;
- Monitoring the Impact of Onshore Wind Farms on Birds (2009). SNH;
- Recommended bird survey methods to inform impact assessment of onshore wind farms (2017) SNH;
- Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model (2018). SNH;
- Assessing the Cumulative Impact of Onshore Wind Energy Developments (2018). SNH;
- Natural Heritage Zones Bird Population Estimates. Scottish Windfarm Bird Steering Group Commissioned Report (2015 and 2017) Wilson et al., on behalf of SWFBSG;
- Biodiversity net gain: Good practice principles for development: A practical guide (2019) CIRIA, CIEEM and IEMA;
- Biodiversity Net Gain in Scotland, CIEEM Scotland Policy Group (2019). CIEEM;
- Strategic Plan for Biodiversity 2011-2020. The Convention on Biological Diversity; and
- Highland Wide Local Development Plan. The Highland Council (THC).

8.3.2 It is recognised that the term 'Favourable Conservation Status' (FCS) as articulated within the Habitats Directive is not used in the Birds Directive, but NatureScot advises on its use and context in relation to birds. Conservation status is considered favourable where:

- Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitat.
- The natural range of the species is not being reduced, nor is it likely to be reduced in the foreseeable future.

- There is (and will continue to be) a sufficiently large habitat area to maintain its populations on a long-term basis.

8.3.3 The term '*receptor*' is used throughout the EIA process and is defined as the element in the environment affected by a development (e.g. a bird or its habitat in the case of ornithology). The term '*impact*' is also used commonly throughout the EIA process and is defined as a change experienced by a receptor (this can be beneficial, neutral or adverse). The term '*effect*' is defined as the consequences or outcomes to the receptor from an impact. The use of the word '*effect*' rather than '*impact*' at the end of species and designated site accounts is based on the wording of the EIA Regulations which require determination of '*likely significant effects*'.

8.3.4 Whilst considering a range of potential outcomes that could arise from the Proposed Development, the assessment reports the effects that are considered likely to be significant on the basis of evidence, standard guidance and professional judgement. It is these likely significant effects that the Applicant is obliged to report, and that the decision maker is obliged to consider.

8.4 Consultation

8.4.1 Table 8.1 summarises the ornithological responses received from statutory and non-statutory consultees in relation to the Proposed Development.

Table 8.1 – Consultation Responses

Consultee	Consultation Response	Applicant Response/Action
THC Pre-Application Consultation (21/07/20) – Claire Farmer, THC Case Officer.	Highlighted importance of designated sites, specifically: • Strath an Loin Site of Special Scientific Interest (SSSI); and • Caithness and Sutherland Peatlands Ramsar Site, SPA and Special Area of Conservation (SAC). THC also reported on SNH's response (which is outlined below).	Potential impacts on designated site ornithological features fully addressed within this EIA Report chapter. Potential ornithological issues raised by SNH in their Pre-Application Consultation also fully addressed within this EIA Report chapter.
SNH (03/07/17-16/08/17). Email correspondence between David Patterson (SNH) and Peter Cosgrove (Alba Ecology).	SNH identified a specific area (confidential) where a speculative golden eagle record was obtained during the national golden eagle survey in 2015 and recommended the area be checked for potential breeding activity.	Alba Ecology surveyor (under licence) thoroughly checked the area for evidence of golden eagle breeding activity on multiple occasions throughout 2017 - 2018. None was found. VP watches subsequently covered the area and no evidence of golden eagle breeding activity was recorded.
SNH Pre-Application Consultation (21/07/20).	<u>Designated sites</u> Proposal abuts the Caithness and Sutherland Peatlands SPA and Ramsar Site and so new survey work will be required to assess the potential impacts on upland birds associated with this SPA, such as; red-throated diver, golden plover, dunlin, greenshank and merlin. Impacts on SPA species should be assessed against the Conservation Objectives for the site.	Potential impacts on designated sites and their ornithological qualifying species fully addressed within this EIA Report chapter. Potential impacts on wider countryside species, including golden eagle fully addressed within this EIA Report chapter.

Consultee	Consultation Response	Applicant Response/Action
	Wider countryside birds If golden eagles are not linked to the Caithness and Sutherland Peatlands SPA, SNH advise that the effects of the proposal upon the regional population (i.e. Natural Heritage Zone 5) should be fully included within the EIA Report, indicating the likelihood and significance of any direct or indirect impact.	
SNH Pre-Application Advice Pack (25/07/20).	Repeated many comments from Pre-Application Consultation (21/07/20) and added: "*This revised proposal abuts the boundary of this SPA. Information available suggests that there may be golden eagle breeding activity closer to the development than when originally surveyed seven years ago. We are in discussion with the developer's ecologist about this new information. Two years of new vantage point bird survey work will be required to identify potential eagle nest sites and assess flight activity adjacent to this SPA. In addition, we recommend undertaking PAT modelling to help further predict the golden eagle foraging range*".	Experienced Alba Ecology surveyor (under licence) thoroughly checked the relevant area for evidence of golden eagle breeding activity on multiple occasions throughout 2017 – 2018. None was found. Two years' worth of VP watches subsequently also covered the area and no evidence of golden eagle breeding activity was recorded. The previously run independent Predicting Aquila Territories (PAT) model (Natural Research Ltd., 2011) was based on the only known golden eagle territory within vicinity of previous WKN AG 2011 EIA submission (for the previously proposed twenty-two turbine development). It showed no likely effects on territorial/breeding golden eagles. The current Proposed Development is much smaller than the previously proposed twenty-two turbine development and is further away from the only known (and same) golden eagle territory. According to David Scott of Natural Research (*pers. comm.*) "*Given your circumstances, the PAT model would not show any potential loss to eagle habitat because the area of interest would be beyond the predicted territory boundary*". Confidential Figure 1 shows the Proposed Development in relation to the golden eagle territory/nest. For the reasons outlined above, further PAT modelling has not been conducted as it is not considered necessary due to the distances involved.
Highland Raptor Study Group (HRSG) (January 2021) data request.	Provided recent (up to and including 2020) confidential information on Schedule 1 breeding raptors.	HRSG information used within EIA Report and detailed in Confidential Information Technical Appendix 8.2.

8.5 Assessment Methods and Significance Criteria

Study Area

8.5.1 The Site and Study Area comprises a Highland deer-shooting estate rising from 170 m above sea level to an elevation of up to 511 m but predominantly at about 350 m. It is characteristically open moorland dominated with heather (*Calluna vulgaris*) over peat across most of the Site.

8.5.2 The following geographic definitions are used in this EIA Report chapter and associated technical appendices (Table 8.2).

Table 8.2– Study Area Definitions

Term	Definition
The Site	This refers to all the land within the Proposed Development site boundary.
Turbine Area	This refers to the area within the turbine rotor sweep area plus a 500 m buffer.
The Development Footprint	This refers to the footprint of the Proposed Development infrastructure within the Site. It includes the turbines and associated hardstanding areas, access tracks, a temporary construction compound and a substation.
The Study Area	The Study Area equates to all the land within the Site which was considered to have potential for development, plus an appropriate survey buffer. This buffer is variable depending on the ornithological receptor, as illustrated in Figure 8.1.

8.5.3 The '*zone of influence*' for a project is the area over which ornithological receptors may be affected by biophysical changes as a result of the Proposed Development and associated activities (CIEEM, 2018). The zone of influence will vary for different ornithological receptors depending on their sensitivity to, and nature of, an environmental change. The zone of influence can extend beyond the Site and the Study Area, particularly in relation to birds with large territories. Nevertheless, the main Study Area is considered an appropriate zone of influence for the vast majority of ornithological receptors.

Issues Scoped Out

8.5.4 Ornithological impacts arising from the process of decommissioning have been scoped out of this assessment. An assessment of the ornithological impacts of decommissioning the Proposed Development has not been undertaken as part of the EIA Report because: (i) the future baseline conditions (environmental and other developments) cannot be predicted accurately at this stage; (ii) the proposals for decommissioning are not known at this stage, and (iii) the best practice decommissioning guidance methods will likely change during the lifetime of the Proposed Development and so cannot be predicted at this stage. Nevertheless, the Applicant commits to an additional consultation one year in advance of decommissioning and to implement best practice decommissioning methods at the time of decommissioning. General decommissioning plans are considered within Chapter 4.

8.5.5 The EIA Regulations require all "*likely significant effects*" (beneficial and adverse) to be considered. This is usually taken to mean site specific related effects, although this is not as straightforward as it first appears to be. For example, the benefits to ecological receptors within the Study Area stemming from the contribution made by the Proposed Development towards countering the climate emergency through renewable energy generation cannot yet be quantified at a local scale. Nevertheless, it is clear that a wind farm of the size of the Proposed Development would make a beneficial contribution to meeting national CO_2 emission targets as well as reducing actual CO_2

emissions, helping to combat climate change, a significant threat to habitats and species globally. Many Scottish bird species are threatened by climate change. Uncertainties regarding climate change predictions mean that it is not possible at present to carry out a quantitative assessment of the beneficial impacts of wind farms to habitats and birds. Therefore, these have been scoped out of further consideration within the EIA Report.

Survey Approach

8.5.6 The ornithological surveys included a desk study of historical information sources and a series of targeted field surveys of potentially important and/or legally protected ornithological receptors. All the field surveys were undertaken by experienced ornithological surveyors using recognised survey methods, during appropriate times of year and under suitable weather conditions for the habitats and species concerned. Any departures from standard guidance are explicitly stated and reasons for the departure are given. Further information on bird surveys is provided in Technical Appendix 8.1.

Desk Study

8.5.7 The natural heritage desk study was conducted using the relevant sources of data including NatureScot's SiteLink website, the local biological records group (Highland Biological Recording Group), the National Biodiversity Network (NBN) Atlas and previous ornithological surveys of the Site by WKN AG (2011). The HRSG was consulted regarding Schedule 1 breeding species; the results of which are provided in Technical Appendix 8.2. All known records of important avian receptors within a 6 km radius of the Site were identified (12 km for eagles). All designated sites with ornithological qualifying features within a 10 km radius of the Site were also identified (refer to Figure 8.2).

Field Surveys

Flight Activity Surveys

8.5.8 Care was taken to ensure that flight activity survey methods and the level and type of survey effort was consistent with best practice guidance available at the time surveys commenced (SNH, 2017; Technical Appendix 8.1). Vantage Point (VP) watches viewing to 2 km, viewsheds covering the entire Site plus a 500 m buffer and adjacent SPA areas, during the breeding and non-breeding season, for target species[1] were conducted between April 2017 and March 2019.

8.5.9 Enough VPs must be selected to enable most of the airspace above the Turbine Area to be seen, including, where possible, a 500 m survey buffer. VP watches are designed to record larger birds using the Turbine Area; they include the collection of data of the flight paths of these birds, including height from the ground, duration of sighting, and activities of the birds. Birds recorded by this method include raptors, wildfowl, grouse and waders. Methods are outlined by SNH (2017) and ultimately may result in an analysis of collision risk (Band *et al*., 2005; and subsequent updates) and mapping of flight-line distribution for target bird species. Further information is provided in Technical Appendix 8.3.

Breeding Raptor Surveys

8.5.10 Best practice guidance was used in relation to potential raptor sensitivities and survey effort (SNH, 2017; Technical Appendix 8.1). Surveys beyond the Site were undertaken to determine the location of breeding raptors listed on Annex I of the EC Birds Directive or Schedule 1 of the UK Wildlife and Countryside Act 1981 (as amended). Priority was given to detecting breeding species most likely to occur given the desk study, habitats present and within SNH recommended survey distances, with

[1] Species potentially present given their geographical range and the habitats present on site that have been identified by previous studies and SNH/NatureScot guidance as likely, through their behaviour, to potentially be affected by wind farm developments.

raptor survey methods following best practice guidance (e.g. Hardey *et al*., 2013). Breeding raptor surveys extended out to 2 km from the Site for all raptor species, except for eagles which extended to 6 km (refer to Figure 8.1).

Moorland Breeding Bird Surveys

8.5.11 The modified Brown and Shepherd (1993) Moorland Breeding Bird Survey is the standard survey technique for moorland/upland open habitat breeding birds (Gilbert *et al.,* 1998). The main habitat in the Site was defined as moorland/open habitat and so this survey methodology was used. The Brown and Shepherd methodology is based on a constant search method involving spending 25 minutes in each 500 m × 500 m quadrant, within the Site. This equates to spending 100 minutes for every square kilometre. Each quadrant was walked to ensure that all parts were approached to within 100 m. At regular intervals, the surveyor paused, scanned the area for species and listened out for calls and songs. All registrations were marked on a 1:25,000 scale map using British Trust for Ornithology (BTO) symbols with a note of the species activity recorded on a survey form. These surveys were undertaken four times each breeding season in 2017 and 2018.

Breeding Diver Surveys

8.5.12 The SNH (2017) recommended surveying all water bodies within a survey buffer of 1 km around the edge of the Site, in addition to the area contained within the Site itself. Diver nest surveys were conducted on all potentially suitable breeding waterbodies out to a distance of 1 km from the Site. All potential diver waterbodies in this area were surveyed at least twice during the nesting season.

Assessment of Potential Effects

8.5.13 This section defines the criteria that were used to evaluate the significance of predicted likely effects on potentially important ornithological receptors due to the construction and operation of the Proposed Development. A level of confidence (whether the predicted effect is certain, likely, possible or unlikely) is attached to the predicted effect.

Criteria for Evaluating Importance

8.5.14 The ornithological receptors identified in the baseline studies were evaluated following best practice guidelines (e.g. CIEEM, 2018 and SNH, various dates). Identifying the importance of potential ornithological receptors was the first step of the process, and those considered potentially important and present were then subject to detailed survey and assessment. Those considered sufficiently widespread, unthreatened and resilient to the project impacts were scoped out of further assessment as per best practice guidance (CIEEM, 2018 and SNH, 2017).

8.5.15 Ornithological receptors can be important for a variety of reasons and the rationale used to define their importance has been explained to demonstrate a robust selection and evaluation process. Importance may relate, for example, to a designated site, to species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline. Various characteristics contribute to the potential importance of ornithological receptors within a study area. Examples include:

- naturalness of a population;
- species, sub-species or varieties that are rare or uncommon, either internationally, nationally or more locally, including those that may be seasonally transient;
- ecosystems and their component parts, which provide the habitats required by important species, populations and/or assemblages;
- endemic species or locally distinct sub-populations of a species;
- size of population;

- species in decline;
- large populations of species or concentrations of species considered uncommon or threatened in a wider context; and
- species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

8.5.16 Guidance on EcIA sets out categories of ornithological or nature conservation importance that relate to a geographical framework (e.g. international through to local) together with criteria and examples of how to place a site (defined by its ornithological attributes) into these categories. It is generally straightforward to evaluate sites or species populations designated for their international or national importance (as criteria for defining these exist e.g. SPA and SSSI), but for sites or populations of regional or local importance, criteria may not be easily defined. Where possible, the potential importance of an ornithological receptor in the Site/Study Area has been determined within a defined geographical context using categories outlined in Table 8.3.

Table 8.3 – Summary of Geographical Importance

Importance term	Definition
International	For example: > 1 % of European Community (EC) population, species named as a designation feature within an international designated site e.g. SPA, Ramsar.
National	For example: > 1 % of United Kingdom (UK/Scotland) population, species named as a designation feature within a national designated site e.g. SSSI.
Regional	For example: > 1 % of Regional (e.g. Highlands or NHZ) population; potentially a species connected to a nationally important site, or forming a link with a nationally important site, that is designated for that feature.
Local	For example: common place or widespread species which despite their ubiquity may contribute towards ecological function of the local area (e.g. in the vicinity of Loch Shin). A rarer species recorded only occasionally.

8.5.17 It should be noted that there is no fundamental biological reason to take 1 % of a population as the threshold level for establishing the level of importance of a given site. Nevertheless, this percentage is widely considered to be of value in developing measures that give an appropriate level of protection to populations and has gained acceptance on this basis throughout the world. The criterion was, for example, adopted by parties involved in the Ramsar Convention 1971. Thereafter, the 1 % level of national species totals has been taken as the basis of assessment in various countries, including Britain (Stroud *et al.,* 1990).

8.5.18 The importance attached to an ornithological receptor can also be determined according to legislative status. Ornithological receptors are subject to a general level of legal protection through the Wildlife and Countryside Act 1981 (as amended) and others under the Birds Directive. The importance of other species is based on professional judgement using the characteristics outlined above. The status of potentially important receptors, such as Scottish Biodiversity List (SBL) species and species with proportionally large populations within the Study Area, is also taken into consideration.

8.5.19 For the avoidance of doubt, CIEEM EcIA guidance (2018) makes it clear that species which appear on national lists e.g. Schedule 1 of the Wildlife and Countryside Act (1981 as amended) or the SBL, are not necessarily evaluated as of national importance simply by appearing on such a list. Importance evaluation must consider the number of individuals of species within a geographical context/scale, i.e. how many of a particular species are likely to be affected by the Proposed Development and what

proportion of the local/regional/national population does this constitute. Legal listing/protection is a separate but important consideration.

8.5.20 In summary, the importance evaluation of an ornithological receptor takes into account a multitude of attributes and is carefully considered in a site/species specific manner. Once the importance of an ornithological receptor has been determined, the potential impacts on that receptor are considered in terms of magnitude, extent, duration, frequency and timing, reversibility, sensitivity and whether the impact would likely be beneficial, adverse or neutral.

Criteria for Evaluating Potential Impacts and Effects

8.5.21 An assessment of potential impacts from construction and operation of the project was conducted on each ornithological receptor that was determined important. The assessment of impacts takes into account the baseline conditions and determines if the predicted impacts are likely to result in a significant biological effect.

Positive or Negative

8.5.22 According to CIEEM EcIA guidance (2018), beneficial (positive) and adverse (negative) impacts and effects should be determined according to whether the change is in accordance with nature conservation objectives and policy. In the CIEEM guidance, the terms positive and negative are used, but in this EIA Report chapter the equivalent terms beneficial and adverse are used, as synonyms, for consistency between chapters. These terms are defined as:

- Beneficial – a change that improves the quality of the environment e.g. by increasing species diversity or extending habitat. This may also include halting or slowing an existing decline in the quality of the environment.
- Adverse – a change which reduces the quality of the environment e.g. destruction of habitat, habitat fragmentation, pollution.
- Impacts and effects can also be assessed as neutral.

Extent

8.5.23 According to CIEEM EcIA guidance (2018), extent is the spatial or geographical area over which the predicted impact/effect may occur, under a suitably representative range of conditions.

Magnitude

8.5.24 According to CIEEM EcIA guidance (2018), magnitude refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population. CIEEM guidance does not encourage the use of artificial magnitude criteria, but for consistency across other EIA Report chapters, in this assessment there are considered to be five levels of magnitude of impact (Table 8.4) and it is assumed these are adverse, unless otherwise stated. Consequently, in this chapter we provide magnitude metrics wherever possible in both absolute and/or relative terms and also refer to these magnitude criteria.

Table 8.4 – Summary of Magnitude Criteria Used

Term	Definition
Major	Total/near total loss of a population due to mortality or displacement. Total/near total loss of breeding productivity in a population due to disturbance. E.g. ≥ 50 % of population affected.

Moderate	Moderate reduction in the status or productivity of a population due to mortality or displacement or disturbance. E.g. 10 - 49 % of population affected.
Minor	Small but discernible reduction in the status or productivity of a population due to mortality or displacement or disturbance. E.g. 1 - 9 % of population affected.
Negligible	Very slight reduction in the status or productivity of a population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. E.g. < 1 % population affected.
None	No effect.

Duration

8.5.25 According to CIEEM EcIA guidance (2018), duration should be defined in relation to ornithological characteristics (such as the life-cycle of a species). The duration of an activity may differ from the duration of the resulting effect caused by the activity. Impacts and effects may be described as short, medium or long-term and permanent or temporary and should be defined. In this assessment three time-frames are used: short-term (up to two years), medium-term (two-five years) and long-term (between five years and the life-time of the Proposed Development).

Frequency and Timing

8.5.26 According to CIEEM EcIA guidance (2018), the number of times an activity occurs will influence the resulting effect. For example, a single person walking a dog will likely have very limited impact on nearby wader utilisation of a wetland, but numerous dog walkers will subject the waders to frequent disturbance and could affect feeding success, leading to displacement of the birds and knock-on effects on their ability to survive. The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. bird nesting season.

Reversibility

8.5.27 According to CIEEM EcIA guidance (2018), an irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation. In some cases, the same activity can cause both reversible and irreversible effects.

Sensitivity Criteria

8.5.28 Another factor when assessing potential impacts is the behavioural sensitivity of the ornithological receptor under consideration (e.g. high, medium or low) and the potential zone of influence. Different receptors respond differently to stimuli, making some particularly sensitive to development activities and others less so. Professional judgement is used when assigning sensitivity to an ornithological receptor and this is recorded here in a clear and transparent way. Sensitivity criteria vary across the wide range of taxonomic groups considered in an ecological impact assessment and are, therefore, provided in the receptor descriptions of this chapter.

8.5.29 By way of example, sensitivity is determined according to species' behaviour, using broad criteria set out in Table 8.5. Behavioural sensitivity can differ between species and between individuals of the same species. Therefore, sensitivity is likely to vary with both the nature and context of the disturbance activity as well as the experience and even 'personality' of the individual within a species too. Sensitivity also depends on the activity the species is undertaking and when it is doing it. For example, a species is likely to be less tolerant of disturbance during the breeding season than at other times of year. Thus, sensitivity changes with both space and time.

Table 8.5 – Summary of Sensitively Criteria Used

Term	Definition
High	Species occupying remote areas away from human activities or exhibiting strong and long-lasting reactions to disturbance events. Species that, based on direct empirical evidence, are considered susceptible to collision with turbines.
Medium	Species that appear to be warily tolerant of human activities or exhibiting short-term reactions to disturbance events. Species that, based on direct empirical evidence, occasionally collide with turbines.
Low	Species occupying areas subject to frequent human activity and exhibiting mild and brief reaction to disturbance events. Species that, based on direct empirical evidence, are considered unlikely to collide with turbines.

Likelihood

8.5.30 Finally, a level of confidence (whether the predicted impact is certain, likely, possible or unlikely) can be attached to a predicted effect.

Criteria for Evaluating Significance

8.5.31 Significance is a concept related to the weight that should be attached to predicted effects when decisions are made. For the purposes of EcIA, a '*significant effect*' is an effect that either supports or undermines biodiversity conservation objectives for important receptors (CIEEM, 2018). There could be any number of possible impacts on important ornithological features arising from a development. However, it is only necessary to describe in detail the impacts that are *likely* to be significant. Impacts that are either unlikely to occur, or if they did occur are unlikely to be significant, can be scoped out.

8.5.32 In the context of the EIA Regulations, each likely effect is evaluated and classified as either significant or not significant, using professional judgement, evidence and best practice guidance. In this assessment, a significant effect is defined as an "*impact on the structure and function of a defined site, habitat or ecosystem and the conservation status of habitats and species (including extent, abundance and distribution). Significant effects should be qualified with reference to an appropriate geographical scale*". Thus, the geographical terms of reference at which a predicted effect may be considered significant must also be defined (e.g. an effect on a species population or habitat area evaluated to be of regional importance at a given site is likely to be either significant or not at the regional level). Effects can be considered significant at a wide range of scales from international to local.

8.5.33 There is often confusion over geographical context, potentially important receptors and quantifying predicted effects and EcIA best practice guidance has often struggled to articulate this clearly. For example if a potentially important species appears on a conservation list e.g. the SBL and there is a predicted impact, the geographical context in which the receptor is found must be considered (CIEEM, 2018). Therefore, the simple presence of a species on the SBL within an area does not mean that likely effects are significant at the national (Scottish) level. For that to occur, the Proposed Development must have significant effects on its national (Scottish) population.

Requirements for Mitigation

8.5.34 Best practice guidance e.g. CIEEM (2018; 2019) identifies a hierarchy of mitigation for potential impacts that seeks to:

- avoid adverse ecological/ornithological impacts, especially those that could be significant to important receptors;

- minimise adverse impacts that could not be avoided; and
- compensate for any remaining significant residual impacts.

8.5.35 CIEEM EcIA guidance (2018) states that "*Avoiding and/or minimising negative impacts is best achieved through consideration of potential impacts of a project from the earliest stages of scheme design and throughout its development*". This approach to avoiding potential adverse impacts within a design layout is sometimes described as embedded mitigation or mitigation by design. "*Mitigation by design is particularly beneficial as there is greater certainty that it will be delivered*" (CIEEM, 2018).

8.5.36 This EIA Report chapter considers mitigation in the context of CIEEM guidance and also in relation to local planning authority guidance for protected species. The embedded mitigation is considered in the design layout and because of this, it is guaranteed through planning conditions for the Proposed Development. Where likely significant adverse effects are predicted regardless of design layout, further mitigation is required separately as per CIEEM guidance.

8.5.37 After assessing the potential impacts of the Proposed Development (incorporating embedded mitigation), all attempts were made to further avoid and mitigate predicted adverse ornithological impacts. Once measures to avoid and mitigate predicted ornithological impacts had been incorporated, assessment of the residual impacts was undertaken to determine the likely significance of their effects on important ornithological features.

Avoidance

8.5.38 According to CIEEM EcIA best practice guidance, adverse effects should be avoided or minimised through mitigation measures, either through the design of the project or subsequent measures that can be guaranteed. For example, through a planning condition. The baseline habitat surveys influenced the project design, avoiding, wherever possible areas of higher ecological sensitivities.

Minimisation

8.5.39 According to CIEEM EcIA best practice guidance, where design layout impacts on important ecological receptors cannot be avoided, they should be minimised. Minimisation takes many forms, with subsequent design iteration being tweaked and amended where possible to reduce potential ecological impacts.

Compensation

8.5.40 Where there are significant residual adverse ecological effects despite the mitigation proposed, these should, under EcIA guidelines, be offset by appropriate compensatory measures.

Enhancement

8.5.41 There is a growing body of policy and guidance that development plans should not just try to avoid causing likely significant effects. Best practice EcIA guidance recommends seeking to provide net benefits for important biodiversity over and above design requirements for avoidance, minimisation or compensation (e.g. CIEEM, 2018).

Assessment of Cumulative Effects

8.5.42 Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects are often considered particularly important in EcIA as ornithological features may be already exposed to background levels of threat or pressure and may be close to critical thresholds where further impact could cause further or irreversible decline. Cumulative effects can also make habitats and species more vulnerable or sensitive to change (CIEEM, 2018).

8.5.43 NatureScot provides specific cumulative impact assessment guidance for ornithological receptors (SNH, 2018). The key principle of this guidance on cumulative impact assessment of onshore wind farms is to focus on any significant effects and in particular those that are likely to influence the outcome of the consenting process.

Limitations to Assessment

8.5.44 Where assumptions within the assessment are made, these are explicitly identified and explained. Similarly, known limitations in methods and knowledge of species' ecology are also identified and discussed, particularly where this is likely to affect the outcome of the assessment. As with any environmental assessment there will be elements of uncertainty. Where there is uncertainty, this is identified and reported transparently, along with the measures taken to reduce it, assumptions made, and an explanation as to the likely extent that any uncertainties are likely to affect the conclusions. In circumstances where there is uncertainty; evidence, expert opinion, best practice guidance and professional judgement have been used to evaluate what is biologically likely to occur if the Proposed Development is constructed.

8.5.45 The level of certainty of impact prediction varies depending upon a range of parameters discussed already. For some elements e.g. land-take, it is relatively straightforward to assess and quantify the area of habitat that is likely to be lost to the Development Footprint and therefore quantify potential impacts of land-take on the habitats and species present. However, other impacts are less certain because there can be a range of possible scenarios. The main limitations in this assessment are common to most ornithological assessments because:

- Baseline surveys undertaken are based on sampling techniques, not absolute censuses. Results give an indication of the numbers of ornithological receptors recorded at the particular times that surveys were carried out (2017 - 2019). Species occurrence changes over time and therefore the results presented in this chapter are snapshots in time. Importantly, no information gaps were identified in the baseline survey data that would prevent assessments in line with the requirements of the EIA Regulations to be undertaken.
- Putting ornithological survey results into a wider geographical context is sometimes challenging because some species have not been systematically surveyed beyond the Study Area. Thus, defining a receptor population as locally or regionally important is potentially difficult because local or regional population estimates do not exist for most taxa. Whenever such uncertainty exists, professional judgement and published evidence is used and populations in the Study Area or Site have been assumed to be at their highest potential level of geographical/ornithological importance.

8.6 Baseline Conditions

Desk Study - Designated Sites

8.6.1 A total of four designated sites with ornithological qualifying feature within a 10 km radius of the Site were identified in the desk study (Figure 8.2; Table 8.6). The closest and most relevant to the Site was the Caithness and Sutherland Peatlands Special Protection Area (SPA). The other three designated sites (Cnoc an Alaskie, Grudie Peatlands and Strath Duchally SSSIs) were sufficiently far enough away to avoid being potentially impacted by the Proposed Development.

Table 8.6 – Designated Sites within 10 km of the Site

Name	Designation	Size (ha)	Distance (km) and direction from the Site	Feature of Interest
Caithness and Sutherland Peatlands	SPA	145,313 ha	Adjacent, 0.0 km south at its closest point. The SPA is a composite site with many isolated areas combining to form the Caithness and Peatland SPA	Aggregation of breeding birds: • Black-throated diver (*Gavia arctica*); • Common scoter (*Melanitta nigra*); • Dunlin (*Calidris alpina schinzii*); • Golden eagle (*Aquila chrysaetos*); • Golden plover (*Pluvialis apricaria*); • Greenshank (*Tringa nebularia*); • Hen harrier (*Circus cyaneus*); • Merlin (*Falco columbarius*); • Red-throated diver (*Gavia stellata*); • Short-eared owl (*Asio flammeus*); • Wigeon (*Anas penelope*); and • Wood sandpiper (*Tringa glareola*).
Cnoc an Alaskie	SSSI	3,665 ha	7.3 km north-east	Breeding bird assemblage; and Greenshank.
Grudie Peatlands	SSSI	4,785 ha	4.9 km south-east	Breeding birds: • Dunlin; • Golden plover; and • Greenshank.
Strath Duchally	SSSI	1,616 ha	4.0 km north-east	Breeding birds: • Dunlin; • Golden plover; and • Greenshank.

Desk Study – Species and Habitats

8.6.2 Full details of the desk study are provided in Technical Appendix 7.1, which makes reference to the previous Sallachy Wind Farm Environmental Statement (WKN AG, 2011) and associated technical appendices. A total of 29 bird species were recorded during targeted ornithological surveys within the Search Area in 2009 and 2010 (WKN AG, 2011) (Table 8.7).

Table 8.7 - Bird Species Recorded within the Search Area in the original Sallachy Wind Farm ES (WKN AG, 2011)

Whooper swan *Cygnus cygnus* Pink-footed goose *Anser brachyrhynchus* Greylag goose *Anser anser* Red-breasted merganser *Mergus serrator* Red grouse *Lagopus lagopus* Black grouse *Tetrao tetrix*	Golden plover Dunlin Snipe *Gallinago gallinago* Curlew *Numenius arquata* Greenshank Cuckoo *Cuculus canorus*

White -tailed eagle *Haliaeetus albicilla*	Skylark *Alauda arvensis*
Hen harrier	Meadow pipit *Anthus pratensis*
Buzzard *Buteo buteo*	Wheatear *Oenanthe oenathe*
Golden eagle	Fieldfare *Turdus pilaris*
Osprey *Pandion haliaetus*	Carrion crow *Corvus corone*
Kestrel *Falco tinnunculus*	Hooded crow *Corvus cornix*
Merlin	Raven *Corvus corax*
Peregrine *Falco peregrinus*	Snow bunting *Plectrophenax nivalis*
Dotterel *Charadrius morinellus*	

Field Surveys

8.6.3 A summary of the principal bird findings from two years of intensive ornithological surveys (April 2017 - March 2019) are provided below. Details of survey times, VP locations, VP viewshed coverage etc. are provided in Technical Appendix 8.1. A total of 55 bird species were recorded within the Study Area during 2017 - 2019 (Table 8.8).

Table 8.8 – Bird Species Recorded in the Study Area during Targeted Bird Surveys in 2017 - 2019

Whooper swan	Lesser black-backed gull, *Larus fuscus*
Pink-footed goose	Cuckoo
Greylag goose	Short eared owl
Canada goose, *Branta canadensis*	Barn owl, *Tyto alba*
Brent goose, *Branta bernicla*	Skylark
Teal, *Anas crecca*	Sand martin, *Riparia riparia*
Red grouse	Swallow, *Hirundo rustica*
Black grouse	House martin, *Delichon urbicum*
Red-throated diver	Meadow pipit
Black-throated diver	Pied wagtail, *Motacilla alba*
White-tailed eagle	Grey wagtail, *Motacilla cinerea*
Osprey	Wheatear, *Oenanthe oenanthe*
Golden eagle	Whinchat, *Saxicola rubetra*
Hen harrier	Stonechat, *Saxicola rubicola*
Buzzard, *Buteo buteo*	Redwing, *Turdus iliacus*
Kestrel	Fieldfare
Peregrine	Blackbird, *Turdus merula*
Merlin	Willow warbler, *Phylloscopus trochilus*
Ringed plover, *Charadrius hiaticula*	Goldcrest, *Regulus regulus*
Dotterel	Wren, *Troglodytes troglodytes*
Golden plover	Hooded crow
Dunlin	Carrion crow, *Corvus corone*
Curlew	Raven
Common sandpiper, *Actitis hypoleucos*	Siskin, *Carduelis spinus*
Greenshank	Twite, *Linaria flavirostris*
Woodcock, *Scolopax rustica*	Reed bunting, *Emberiza schoeniclus*
Snipe	Snow bunting
Common gull, *Larus canus*	

8.6.4 Of the bird species recorded in 2017 - 2019, evidence of regular occurrence and/or breeding of the following potentially important species occurred within the Study Area and so these species are taken forward for assessment (Table 8.9). The geographical population estimates for these potentially important Study Area bird species are also provided in Table 8.9.

Table 8.9– Geographical Population Estimates for Potentially Important Ornithology Receptors
(breeding pairs unless stated, CLs = upper and lower 95 % Confidence Levels)

Species	NHZ 5 PCS (Regional)	Scotland population	GB/UK population	Europe population (International Status)
Pink-footed goose	2,070 wintering birds	20,000 post breeding birds	510,000 wintering birds	Unknown wintering (Least Concern)
Greylag goose	N/A	110,000 wintering birds*	47,000 pairs; 230,000 wintering birds	259,000 - 427,000 breeding; 825,000 - 1,180,000 wintering (Least Concern)
Black grouse	30 displaying males[2]	3,344 displaying males	4,850 displaying males	1,220,000 - 2,040,000 males (Least Concern)
Golden eagle	18	510	510	9,300 - 12,300 (Least Concern)
White-tailed eagle	1	108	122	9,000 - 12,300 (Least Concern)
Osprey	8	197	240	8,400 - 12,300 (Least Concern)
Kestrel	153	3,850 (CLs = 2,750 -5,500)	31,000	409,000 - 603,000 (Least Concern)
Merlin	71	433 (CLs = 283 - 594)	1,150	32,000-51,600 (Least Concern)
Golden plover	3,125	37,480 (CLs = 34,472 - 40,477)	32,500-50,500	630,000-860,000 (Least Concern)
Dunlin	2,196	13,313 (CLs = 5,904 – 28,939)	8,600-10,500	426,000-562,000 (Least Concern)
Curlew	1,737	30,194	58,500	212,000-292,000 (Near Threatened)
Greenshank	421	1,297 (CLs = 851-1,792)[3]	1,100	98,700 - 202,000 (Least Concern)
Population est. reference	Wilson *et al.,* 2015	Wilson *et al.,* 2015; *The Scottish List 2011 (The SOC 2011)	Woodward *et al.,* 2020	Birdlife International, 2015 (status checked on-line January 2021)

[2] This is known to be a substantial under-estimate of actual numbers. During Alba Ecology surveys on proposed wind farms and forestry in the vicinity of Lairg/Loch Shin over the last decade, the total number of lekking black grouse males recorded exceeds Wilson *et al.,* (2015) total estimate of 30 lekking males for the whole of the PCS NHZ.
[3] This may be an under-estimate (see comments in Wilson *et al.,* 2015).

8.6.5 The behavioural sensitivity of the potentially important ornithological receptors is described using criteria set out in Table 8.5. The nature of sensitivity information described in Table 8.10 is largely from Ruddock and Whitfield (2007) and Scottish Windfarm Bird Steering Group Species Dossiers (Humphreys *et al.,* 2015 a - g, updated 2017). Five potentially occurring important species are judged to have relatively high behavioural sensitivity, five to have relatively moderate behavioural sensitivity and three to have relatively low behavioural sensitivity. When available, the assumed distance thresholds and hence sensitivity categories for disturbance in Table 8.10 has been based on expert opinion and field experience and is primarily based on disturbance to breeding birds at the nest, not general disturbance of birds undertaking other activities.

8.6.6 A potentially useful and recognised method used to describe potential disturbance to birds involves two basic measures of receptor response (Ruddock and Whitfield, 2007):

- 'Alert Distance' (AD) - the distance between the disturbance source and the bird; at the point where the bird changes its behaviour in response to the approaching disturbance event.
- 'Flight Initiation Distance' (FID) - the point at which the bird flushes or flies away from the approaching disturbance event.

8.6.7 Where known, the difference between AD and FID in potentially important ornithological receptors is described based on published and unpublished research sources. However, few studies have looked in enough detail at AD and FID to differentiate these with any degree of rigour or confidence and often simply describe a 'flushed at' distance metric instead (equivalent to FID).

Table 8.10 Behavioural Sensitivity of Potentially Important Ornithology Receptors

Species	Nature of Sensitivity	Sensitivity
Pink-footed goose	Birds potentially vulnerable to collision with turbines when making flights, although detailed studies suggest this is not a significant cause of goose mortality. Pink-footed geese migrating along a traditional flight corridor are theoretically vulnerable to collision risk. However, most migrating pink-footed geese arrive and leave the UK on a broad front and so are not concentrated within a tightly defined flight corridor. Low sensitivity to collision.	Low
Greylag goose	Birds potentially vulnerable to collision with turbines when making flights, although detailed studies suggest this is not a significant cause of goose mortality. Greylag geese migrating along a traditional flight corridor are theoretically vulnerable to collision risk. However, most migrating greylag geese move on a broad front and so are not concentrated within a tightly defined flight corridor. Low sensitivity to collision.	Low
Black grouse	Black grouse are particularly vulnerable to flying into deer fences, so are probably susceptible to unmarked low lying wires and cables. Black grouse tend to fly low and keep close to the ground, potentially underneath turbine blade height. Black grouse are sensitive to disturbance on the breeding (lekking) sites and this issue is relatively well researched and understood. Consequently, lekking sites close to areas where construction is planned are vulnerable to disturbance. Expert opinion suggests disturbance distances (FID) were 10 - 50 m for breeding females and 300 - 500 m for lekking males.	Moderate
Golden eagle	Highly sensitive. There is divergent expert opinion, but disturbance distances of breeding birds are thought to be greater than for any other UK species. Active disturbance (FID) is typically at an upper limit of 750 – 1,000 m, but perhaps out to 1,500 m. Birds are potentially vulnerable to collision with turbines when displaying, mobbing avian intruders, commuting between breeding and feeding areas and when foraging. Little or no discernible response of incubating golden eagles to forest road traffic near nests (800 - 1,400 m) (Cosgrove *et al.,* 2017).	High

Species	Nature of Sensitivity	Sensitivity
White-tailed eagle	Highly vulnerable to collision risk with turbines when displaying, mobbing avian intruders, commuting between breeding and feeding areas and foraging. Active disturbance (FID) is typically 50 - 500 m, with static disturbance at 150 - 1,000 m. However, important to note that some individuals (habituated?) appear to tolerate moderate levels of human activity in some situations. Little or no discernible response of incubating white-tailed eagles to forest road traffic near nests (50 - 270 m) with moving vehicles, but adverse reactions to stationary vehicles near nests (Cosgrove *et al.,* 2017).	High
Osprey	Birds potentially vulnerable to collision with turbines when displaying, mobbing intruders, commuting between breeding and feeding areas. Birds show a wide range in their tolerance of human disturbance. Predictable disturbance is better tolerated than unexpected disturbance. In the UK they tend to nest on natural structures, but some regularly use human structures. Static disturbance ranges from 100 - 750 m, and upper limit of active disturbance from 500 - 750 m.	Moderate
Kestrel	Species tolerant of people and not prone to human disturbance. Breeding birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and hunting. There have been at least four recorded deaths of this species as a result of collisions with wind turbines in Britain and 411 collision-related kestrel deaths have been reported on an incidental basis at 68 wind farm developments in eight European countries.	Low
Merlin	Breeding birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and hunting. Breeding merlin are particularly sensitive to human activity, visual disturbance and sudden noise events over large distances (up to 500 m). However, some individuals appear to tolerate moderate levels of disturbance in certain situations. For example, some merlins appear to be able to nest relatively close to public roads, where regular/predictable disturbance occurs.	High
Golden plover	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. Species' behaviour of flying low and having relatively small territories makes them less vulnerable to collision than high flying waders with large territories. Breeding birds are potentially sensitive to human activity, visual disturbance and sudden noise events over moderate distances (~250 m).	Moderate
Dunlin	Breeding dunlin have very small territories, are sensitive to human activity, visual disturbance and sudden noise events over moderate distances (~250 m).	Moderate
Curlew	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. Large size, big territories and species' behaviour of generally flying at low, medium and high heights makes them vulnerable to collision. Breeding birds are usually considered sensitive to human activity, visual disturbance and sudden noise events over moderate distances (~250 m). However, curlews often nest and feed close to or within in-bye fields, which are regularly used by farmers, so the species has some tolerance of human activity.	Moderate
Greenshank	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders, commuting between breeding and feeding areas. Species' behaviour of high flights and large territories makes this wader probably more vulnerable to collision than other (predominately) lower flying waders with smaller territories. There is no agreed distance at which breeding greenshanks are likely to be affected by disturbance and they were not selected for study in the review of disturbance distances commissioned by SNH (Ruddock and Whitfield, 2007). Work on 'escape' distances of non-breeding greenshanks suggests a mean disturbance distance of 94 m (38 - 250 m range).	High

Ornithological Receptors

8.6.8 A summary of the principal findings from two years of targeted ornithological surveys (2017 - 2019) are provided below. The Study Area was surveyed under a Schedule 1 licence for breeding birds by Dr Dawn Anderson, Mr Donald Shields and Dr Peter Cosgrove. All are highly experienced and competent, Highland-based ornithologists and they used the relevant standard breeding bird survey methods during suitable weather conditions.

Pink-footed goose

8.6.9 Pink-footed geese do not breed in the UK. The species is a wintering and passage migrant and migrating skeins of pink-footed geese were occasionally recorded over Loch Shin during spring migration (Figure 8.3) and in winter (Figure 8.4). Flight-lines were concentrated along Loch Shin and all but one flight-line was > 150 m height. There were no flight-lines within the Turbine Area at turbine height and this species is dropped from further consideration.

Greylag goose

8.6.10 No evidence of breeding but migrating skeins of greylag geese were occasionally recorded with a single flock flying over the Turbine Area > 150 m height (Figure 8.5). There were no flight-lines within the Turbine Area at turbine height and this species is dropped from further consideration.

Black grouse

8.6.11 Further details provided in Confidential Appendix 8.2. This species is taken forward for further consideration.

Golden eagle

8.6.12 Further details provided in Confidential Appendix 8.2. This species is taken forward for further consideration.

White-tailed eagle

8.6.13 No evidence of breeding white-tailed eagle within the Study Area, but a few flight-lines were recorded. In summer 2018 a single flight-line was recorded outside of the Turbine Area parallel to the shore of Loch Shin (Figure 8.10). In winter 2018 - 2019 a single flight-line was recorded outside and to the north of the Turbine Area (Figure 8.11). There were no flight-lines recorded within the Turbine Area. The Site is not regularly used by white-tailed eagles and so the population using the Site is evaluated as being of negligible/local importance and this species is dropped from further consideration.

Osprey

8.6.14 No evidence of breeding osprey within the Study Area, but according to the HRSG osprey does nest > 6 km away (details provided in Confidential Appendix 8.2). In summer 2017, a few flight-lines were recorded, only one of which was partly within the 'at risk' (20-150 m) height (Figure 8.12) within the Turbine Area. No ospreys were recorded during summer 2018. The Site is not regularly used by osprey and there are no suitable lochs with fish present within the Proposed Development site boundary. Therefore, the population of ospreys using the Site is evaluated as being of local importance and this species is dropped from further consideration.

Kestrel

8.6.15 No evidence of breeding kestrel within the Study Area, but a few flight-lines were recorded. Flight-lines were recorded in summer 2018 (Figure 8.13) but not in summer 2017. There were also flight-lines recorded in winter 2018 - 2019 (Figure 8.14), some of which were within the Turbine Area. The

population of non-breeding kestrels using the Site is evaluated as being of local importance and this species is taken forward for further consideration.

Merlin

8.6.16 Further details provided in Confidential Appendix 8.2. This species is taken forward for further consideration.

Golden plover

8.6.17 Evidence of breeding golden plover within the Study Area. Six pairs of golden plover nested within the Study Area in 2017 (Figure 8.17) and seven pairs of golden plover nested within the Study Area in 2018 (Figure 8.18). These relatively low numbers mean that the golden plover population using the Site is evaluated as being of local importance but noting that some Study Area territories overlap with the Caithness and Sutherland Peatlands SPA and those pairs comprise part of the internationally important designated site population. Several flight-lines were recorded of golden plovers within the Study Area, but all were outside the Turbine Area (Figures 8.19 – 8.21). This species is taken forward for further consideration.

Dunlin

8.6.18 Evidence of breeding dunlin within the Study Area. Six pairs of dunlin nested within the Study Area in 2017 (Figure 8.22) and five pairs of dunlin nested within the Study Area in 2018 (Figure 8.23). These relatively low numbers mean that the dunlin population using the Site is evaluated as being of local importance but noting that some Study Area territories overlap with the Caithness and Sutherland Peatlands SPA and those pairs comprise part of the internationally important designated site population. Only two flight-lines of single birds were recorded; one in June 2017 (Figure 8.24) and one in June 2018 (Figure 8.25). This species is taken forward for further consideration.

Curlew

8.6.19 Evidence of breeding curlew adjacent to the access track (Figure 8.26). A single curlew territory was recorded in 2017 and 2018 (successful breeding) near Corrykinloch. There were no flight-lines recorded within the Turbine Area. This low number means that the curlew population using the Site is evaluated as being of local importance. This species is taken forward for further consideration.

Greenshank

8.6.20 Further details provided in Confidential Appendix 8.2. This species is taken forward for further consideration.

Other species

8.6.21 Other species of note recorded occasionally and not taken forward for further consideration included:

- Whooper swan: winter 2017 - 2018 – two flight-lines, one of seven individuals, one of eight individuals; winter 2018 - 2019 – one flight-line, of three individuals; summer 2018 – one flight-line, of seven individuals – all along Loch Shin.
- Black-throated and red-throated divers on Loch Shin during the summer (no nesting within the Study Area or flight-lines within Turbine Area).
- Four brent geese, seen flying high over the Turbine Area in October 2018.
- Peregrine, a single flight-line, outside of the Turbine Area was recorded in May 2017.
- Hen harrier, seen twice hunting near start of access track by the bridge crossing between Loch Shin and Loch a' Ghriama.

- Barn owl, in spring 2017 pellets and some splash were found in a ruined building at NC 404 227. The ruin was monitored throughout the breeding season and no additional fresh pellets were found during the summer months, so no evidence of breeding was recorded. In early autumn 2017 some fresh pellets were recorded and then nothing until April 2018 when a freshly dead barn owl was discovered in the ruin after a period of severe cold weather. There was no evidence of barn owl use during the 2018 breeding season.
- Short-eared owl, one bird seen in June 2018 'swooping' display during flight, no evidence found of breeding.
- Dotterel, a pair seen once in May 2017.
- Ringed plover, four individuals flying along the shore of Loch Shin in February 2019.
- Snipe, a single flight-line of a bird in July 2018.
- Woodcock, a single flight-line of a bird in November 2018.

8.7 Potential Effects

8.7.1 Ornithological designated site citation interests and the following non-designated wider countryside ornithological receptors are taken forward for assessment: black grouse, golden eagle, kestrel, merlin, golden plover, dunlin, curlew and greenshank.

8.7.2 The conservation/legal importance of potentially important ornithological receptors was determined using criteria set in Table 8.11. The importance of a species from a legal perspective in this listing does not equate to the importance of the population at the Site. The importance, following CIEEM EcIA guidelines, of the bird population using a site is evaluated by considering a multitude of factors (as listed in 8.5Section 8.5) and includes the number of individuals of species present in the context of geographical populations. A site can hold a protected species of importance, but the population present may not be regionally, nationally or internationally important. Thus, the occurrence of a legally protected species listed in Table 8.11 does not mean a population using the site is necessarily important for that species.

Table 8.11. Conservation Listing of Potentially Important Ornithological Receptors

Potentially Important Species	Conservation Listing
Black grouse	Red L
Golden eagle	A1, S1
Kestrel	Red L
Merlin	A1, S1, Red L
Golden plover	A1
Dunlin	A1 (*schinz*), Amber L
Curlew	Red L
Greenshank	S1
Key: A1 = EC Birds Directive Annex I species, S1 = UK Wildlife and Countryside Act Schedule 1 species, Amber L = UK Birds of Conservation Concern Amber List Species, Red L = UK Birds of Conservation Concern Red-List species.	

Designated Sites

8.7.3 This section describes the likely effects on ornithological features of designated sites that could arise from the construction and operation of the Proposed Development. One designated site (with ornithological citation features) lies adjacent to the Site: part of the multi-site Caithness and Sutherland Peatlands SPA. Its avian features of interest are the following breeding bird species: black-throated diver, red-throated diver, common scoter, wigeon, dunlin, golden plover, greenshank, wood sandpiper, hen harrier, merlin, golden eagle and short-eared owl. Only three of these SPA breeding bird species were recorded within the Study Area, some of the pairs of which were in or had direct connectivity to the Caithness and Sutherland Peatland SPA, namely golden plover, dunlin and greenshank. Surveys specially looked for breeding divers, wood sandpiper etc. and no breeding pairs were recorded within the Study Area. All other designated sites with ornithological features lie a considerable distance away from the site (Table 8.6) and have been dropped from further consideration.

8.7.4 Of the twelve Caithness and Sutherland SPA citation species there were no flight-lines recorded at all within the Turbine Area for ten of these species: black-throated diver, red-throated diver, common scoter, wigeon, dunlin, golden plover, greenshank, wood sandpiper, hen harrier and short-eared owl. VP 4 was deliberately placed to consider/investigate potential connectivity between the Proposed Development (specifically the Turbine Area) and the SPA. No flight-lines of SPA species e.g. greenshank, golden plover and dunlin were recorded showing flights up and down slope and between the different catchments. Survey evidence collected demonstrated no connectivity with SPA breeding birds and the Development Footprint.

8.7.5 The potential exception to this were flight-lines of golden eagles which crossed over and sometimes straddled the SPA and Turbine Area. However, the SPA designated site feature is breeding golden eagles and those birds recorded were invariably juvenile, immature or sub-adult and not breeding birds. No breeding golden eagles were recorded in the Turbine Area and so consequently the potential loss of foraging habitat, disturbance/displacement and collision risk posed to golden eagles refers to wider countryside non-breeding golden eagles and is addressed elsewhere.

8.7.6 The small number of merlin flight-lines recorded did not show any connectivity between the SPA and the Turbine Area. There was evidence of possible merlin breeding (unconfirmed) within the Study Area, but it was well away from the SPA. Consequently, any potential loss of foraging habitat, disturbance/displacement and collision risk posed to merlin refers to wider countryside merlin and is addressed in Technical Appendix 8.2. The survey evidence collected demonstrated no connectivity with SPA breeding merlins.

8.7.7 NatureScot provides guidance in assessing connectivity with SPAs (SNH, 2016). "*The connectivity distances of each species are drawn from a literature review that examined ranging behaviour. In most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests*". For the three species in question, these theoretical core distances are: golden plover - 3 km, dunlin - 0.5 km and greenshank - 2 km.

8.7.8 The Caithness and Sutherland Peatlands SPA citation provides the following populations estimates (note the population data on SPA golden plover and dunlin is now very old, but much more up to date for greenshank):

- Golden plover: 1,064 pairs (at the time 5 % of the GB population) in 1993 and 1994.
- Dunlin: 1,860 pairs (at the time 20 % of the GB population) in 1993-1994.
- Greenshank: at least 653 pairs in 2009 (the SPA citation did not provide the % of GB population at the time the site was designated).

Land-take

8.7.9 The Proposed Development does not lie within the Caithness and Sutherland SPA (Figure 8.2). Therefore, no land-take or direct habitat loss would occur within the Caithness and Sutherland SPA. Chapter 4 describes how and where construction work would take place, which will all occur away from and within a different catchment to the SPA.

Golden plover

8.7.10 Exact positions of most golden plover nests were not located, although the centre of territories were. The locations marked on figures refer to notional territory centres based on recordings of territorial birds from repeat walk-over surveys. As golden plover have relatively small territories, the notional centres of territories are likely to be within the middle of actual territories, providing a level of confidence in terms of identifying where golden plover may be susceptible to land-take effects.

8.7.11 Of the seven-eight pairs of golden plovers breeding within the Study Area in 2017, three pairs were in or had direct connectivity to the Caithness and Sutherland Peatland SPA (Figure 8.17). Of the six pairs of golden plovers breeding within the Study Area in 2018, two-three pairs were in or had direct connectivity to the Caithness and Sutherland Peatland SPA (Figure 8.18). The maximum number of golden plover pairs with evidence of connectivity to the Caithness and Sutherland Peatland SPA was three annually; 0.28 % of the SPA population of 1,064 pairs. The centre of these SPA golden plover territories, which are small, lay well outside the Development Footprint, and so no land-take of possible SPA golden plover breeding habitat will take place. There were no flight-lines recorded between the SPA golden plover pairs and the Development Footprint. Consequently, no likely significant land-take effects are predicted on SPA golden plover.

Dunlin

8.7.12 Of the six pairs of dunlin breeding within the Study Area in 2017, two-three pairs were in or had direct evidence of connectivity to the Caithness and Sutherland Peatland SPA (Figure 8.22). Of the five pairs of dunlin breeding within the Study Area in 2018, one-two pairs were in or had direct evidence of connectivity to the Caithness and Sutherland Peatland SPA (Figure 8.23). The maximum number of dunlin pairs with direct evidence of connectivity to the Caithness and Sutherland Peatland SPA was three pairs annually; 0.16 % of the SPA population of 1,860 pairs. The centre of these SPA dunlin territories, which are very small, lay well outside the Development Footprint, and so no land-take of possible SPA dunlin breeding habitat will take place.

8.7.13 Exact positions of dunlin nests were not located, although the centre of territories were. The locations marked on figures refer to notional territory centres based on recordings of territorial birds from repeat walk-over surveys. As dunlin have very small territories (typically ~0.3 km^2) and are particularly sedentary during the breeding season, rarely moving more than 200-300 m from the nest (O'Connell *et al.,* 1996), this suggests that all breeding SPA pairs dunlin are likely to be far enough away from construction activity to avoid being affected by land-take. There were no flight-lines recorded between the SPA dunlin pairs and the Development Footprint. Consequently, no likely significant land-take effects are predicted on SPA dunlin.

Greenshank

8.7.14 Further details provided in Confidential Appendix 8.2

Construction and operational disturbance/displacement

Golden plover

8.7.15 Golden plovers are judged to have moderate sensitivity to disturbance during the breeding season out to ca. 250 m away from nests/territory centres (Table 8.10). Therefore, construction and

operational work within such distances could potentially displace some birds from suitable nesting areas, possibly resulting in reduced site productivity. All Caithness and Sutherland Peatland SPA golden plover nests/territory centres recorded in 2017 and 2018 were greater that ca. 250 m away from the Development Footprint. There were no flight-lines recorded between the SPA golden plover pairs and the Development Footprint, despite VP surveys specifically looking for potential connectivity. The separation distance between nests/territory centres and Development Footprint (and no line of sight) means that no likely significant construction/operational disturbance effects are predicted on SPA golden plover.

Dunlin

8.7.16 Dunlin are judged to have moderate sensitivity to disturbance during the breeding season out to ca. 250 m away from nests/territory centres (Table 8.10). Therefore, construction and operational work within such distances could potentially displace some birds from suitable nesting areas, possibly resulting in reduced site productivity. All Caithness and Sutherland Peatland SPA dunlin nests/territory centres recorded in 2017 and 2018 were greater that ca. 250 m away from the Development Footprint. There were no flight-lines recorded between the SPA Dunlin pairs and the Development Footprint, despite VP surveys specifically looking for potential connectivity. As dunlin have very small territories and are particularly sedentary during the breeding season, rarely moving more than 200-300 m from the nest (O'Connell *et al.,* 1996), the separation distance between nests/territory centres and Development Footprint (and no line of sight) that no likely significant construction/operational disturbance effects are predicted on SPA dunlin.

Greenshank

8.7.17 Further details provided in Confidential Appendix 8.2.

Collision

Golden plover

8.7.18 According to Humphreys *et al.,* (2015b, updated 2017), there have been no reported collisions of golden plover with wind turbines in Britain to date. A total of 30 collision-related deaths have been reported mostly on an incidental basis for golden plover for eight wind farm developments across five European countries. There were no flight-lines of SPA golden plover into the Turbine Area, which was within a different catchment. Consequently, significant collision mortality is considered unlikely to occur on SPA golden plover.

Dunlin

8.7.19 According to Humphreys *et al.,* (2015c, updated 2017), there have been no reported collisions of dunlin with wind turbines in Britain to date. Similarly, there have also been no such events recorded on an incidental basis within Europe. There were no flight-lines of SPA dunlin into the Turbine Area, which was within a different catchment. Consequently, significant collision mortality is considered unlikely to occur on SPA dunlin.

Greenshank

8.7.20 Further details provided in Confidential Appendix 8.2

Summary

8.7.21 Having considered the likely magnitude of impacts and effects (**none-negligible**) of the Proposed Development on the qualifying species of the Caithness and Sutherland SPA and based on evidence collected, it can be concluded that there would be no likely significant effects on any of the ornithological qualifying features or designated site integrity (Table 8.12).

Table 8.12: Summary of Potential Impacts on the Caithness and Sutherland SPA ornithological features

SPA Conservation Objective	Predicted Impact
"*To avoid deterioration of the qualifying habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained*"; and "*To ensure for the qualifying species that the following are maintained in the long term*":	
Population of the species as a viable component of the site.	**None**, no change to any qualifying species population as a viable component of the SPA.
Distribution of the species within site.	**None**, the existing distribution of qualifying species within SPA would remain unchanged.
Distribution and extent of habitats supporting species.	**None**, the distribution and extent of SPA qualifying species habitats would remain unchanged.
Structure, function and supporting processes of habitats supporting the species.	**None**, the structure, function and supporting processes of SPA qualifying species habitats would remain unchanged.
No significant disturbance of the species.	**None**, no significant disturbance of SPA qualifying species.

Wider Countryside Species

Black grouse

8.7.22 Further details provided in Confidential Appendix 8.2.

Golden eagle

8.7.23 Further details provided in Confidential Appendix 8.2.

Kestrel

8.7.24 Kestrel is a common and widely distributed resident and migrant species, with southward migration of some birds during late summer/autumn (Forrester and Andrews, 2007). Kestrel is a Red-List species (Table 8.11). The behavioural sensitivity of the species is considered low (Table 8.10). The national and international population estimates of this species are provided in Table 8.9. The PCS NHZ population estimate is 153 pairs and without evidence to the contrary the species is likely to be in FCS within Caithness and Sutherland.

8.7.25 There was no evidence of breeding kestrel within the Study Area, but a few flight-lines were recorded from non-breeding birds (Figures 8.13 - 8.14). The population of non-breeding kestrels using the Site is evaluated as being of local importance.

Land-take

8.7.26 Kestrels do not breed within the Study Area and so there will be no land-take of NHZ 5 breeding habitats. Non-breeding/migrating kestrels which use the Study Area hunt over huge areas (potentially many 100s of kms). These non-breeding individuals are recorded on an occasional basis within the Study Area.

8.7.27 Based on the small size and location of the Proposed Development and very large kestrel foraging/migrating areas, the magnitude of land-take impacts on non-breeding kestrels is considered to be **negligible**. The impact of land-take on the wider countryside, non-breeding kestrels which occasionally use the Turbine Area is long-term, irreversible, one-off and no likely significant land-take effects are predicted.

Construction and operational disturbance/displacement

8.7.28 There have been few published studies looking at disturbance/displacement effects on kestrel and according to Humphreys *et al.,* (2015e, updated 2017) the overall evidence for possible displacement effects is very limited and weak effects are shown. Kestrels do not breed within the Study Area and so there will be no construction/operational disturbance or displacement to breeding birds. Kestrels are well known for foraging along busy road verges and so are unlikely to be disturbed by construction related activity. Consequently, no likely significant construction/operational disturbance effects are predicted on wider countryside kestrel.

Collision

8.7.29 According to Humphreys *et al.,* (2015e, updated 2017), there have been at least four recorded deaths of kestrels as a result of collision with wind turbines in Britain and a total of 411 collision-related deaths have been reported on an incidental basis at 68 wind farm developments in eight European countries. The evidence for kestrel, mainly originating from studies originating from Spain, indicates that they can be highly vulnerable to collision risk – possibly a consequence of hovering when hunting (Barrios and Rodriguez, 2004). It should be noted that many of the reported mortalities came from poorly sited wind farm sites on known migration routes/bottle-necks e.g. Strait of Gibraltar. Nevertheless, there is empirical evidence that kestrels appear to be quite susceptible to collision mortality in some situations and that the peak in kestrel deaths tend to occur in July and August, coinciding with the annual peak in population abundance due to the large number of newly fledged juveniles dispersing.

8.7.30 Based on targeted VP surveys, non-breeding kestrels were sometimes recorded using the Study Area. For example, flight-lines were recorded in the Turbine Area in summer 2018 and winter 2018 - 2019 but not in summer 2017 or winter 2017 - 2018. Nevertheless, there were sufficient flight-lines recorded in the two seasons when present to undertake CRA (Appendix 8.3). Using six months of VP data per season, taking the visible areas from VPs as being maximum of 20 m above the ground, with kestrel assumed present over twelve months, and taking NatureScot's recommended 95 % avoidance factor and assuming no evasive behaviour, the predicted collision risk is as follows. The collision risk for kestrel was calculated to be between 0.08101 collisions per year (1 bird per 12.3 years) in the worst scenario, very windy conditions, flapping bird, (year 2), to 0 collisions per year best scenario, in less windy conditions, gliding bird (year 1). The mean of these two scenarios is 0.040505 collisions per year (1 bird per 24.7 years)[4].

8.7.31 Therefore, if the worse scenario conditions occur, approximately two non-breeding kestrels would be predicted killed during the 30 year lifetime of the Proposed Development. If the best-case scenario conditions occur, then zero non-breeding kestrels would be killed during the lifetime of the Proposed Development. The most likely scenario to occur is considered likely to lie somewhere between these two extremes and the mean scenario predicts one kestrel collision in the life-time of the Proposed Development. Under all three scenarios (worst-case, mean and best-case), the magnitude of collision impact is predicted to be **negligible** (one non-breeding bird during the life-time of the Proposed Development) and no likely significant collision effects are predicted on wider countryside kestrels.

Summary

8.7.32 As the kestrels recorded within the Study Area were non-breeding, migrating individuals, it is not possible to attribute them to a particular regional population and it seems likely they are best considered as part of the wider Scottish population, which is estimated to be 3,850 pairs (Wilson *et al.*, 2015). The potential magnitude of adverse impacts of land-take, construction and operational

[4] Reciprocal of the mean of the two years number of collisions per year.

disturbance and collision risk combined on wider countryside kestrel would likely be **negligible**, with no likely significant effects predicted (one predicted collision mortality during the life-time of the Proposed Development) on the Scottish population.

Merlin

8.7.33 Further details provided in Confidential Appendix 8.2.

Golden plover

8.7.34 Golden plover breeds in semi-natural moorland, dwarf shrub, peatland and arctic alpine heath (Forrester and Andrews, 2007) and are present between mid March/April and July (Humphreys *et al.,* 2015b, updated 2017). Golden plover is an Annex 1 wader species (Table 8.11), although it is still a quarry species that can legally be shot in season in the UK. The behavioural sensitivity of the species is considered moderate (Table 8.10). The national and international population estimates of this species are provided in Table 8.9. The PCS NHZ population estimate is 3,125 pairs and without evidence to the contrary the species is likely to be in FCS within Caithness and Sutherland.

8.7.35 Small numbers (six - seven pairs) of golden plover nested within the Study Area. These relatively low numbers mean that the golden plover population using the Site was evaluated as being of local importance but noting that some Study Area territories overlapped with the Caithness and Sutherland Peatlands SPA and those pairs comprise part of the internationally important designated site population (and are dealt with elsewhere).

8.7.36 Before-After-Control-Impact (BACI) studies have been used to assess the impact of operational wind turbines on golden plover (Fielding and Haworth 2013; Douglas *et al.,* 2011) and these contrast markedly with those from an initial and flawed RSPB predictive study (Pearce-Higgins *et al.,* 2009) in that they found no convincing evidence of immediate, or delayed displacement away from turbines or declines in abundance and no evidence of a systematic change in the pattern of golden plover territories (redistribution) in the operational phase of different wind farms. In a subsequent robustly designed BACI study (Pearce-Higgins *et al.,* 2012) which compared densities at different stages of wind farm development but without modelling the effects of habitat and topographical features, found in contrast with the earlier findings of the previous flawed study, population densities of golden plover were not affected by the presence of wind farms.

Land-take

8.7.37 There was evidence of seven - eight pairs of golden plover (three of which were in or had direct evidence of connectivity to the Caithness and Sutherland Peatland SPA and are dealt with in the Designated Sites section) breeding within the Study Area in 2017 and six pairs of golden plover (two - three of which were in or had direct evidence of connectivity to the Caithness and Sutherland Peatland SPA and are dealt with in the Designated Sites section) breeding within the Study Area in 2018. The centres of these wider countryside golden plover territories lay well outside the Development Footprint (> 1 km), and so no land-take of possible golden plover breeding habitat will take place. The VP flight activity data does not indicate that the Site is an important foraging area for golden plover. Consequently, no likely significant land-take effects are predicted on wider countryside golden plover.

Construction and operational disturbance/displacement

8.7.38 Golden plovers are judged to have moderate sensitivity to disturbance during the breeding season out to ca. 250 m away from nests/territory centres (Table 8.10). Therefore, construction and operational work within such distances could potentially displace some birds from suitable nesting areas, possibly resulting in reduced site productivity. All wider countryside golden plover nests/territory centres recorded in 2017 and 2018 were > 1 km away from the Development

Footprint. This separation distance means that construction/operational disturbance is considered unlikely to occur. Pre-construction breeding bird surveys, within 500 m of the Development Footprint, are guaranteed to take place. Should breeding golden plover be discovered within ca. 250 m of the Development Footprint immediately prior to or during construction, then suitable disturbance prevention measures will be deployed, e.g. no-work buffer areas will be implemented. Under such circumstances construction would be phased to avoid operating in these areas during the breeding season, meaning construction disturbance should not impact on these individuals, with no long-term consequences anticipated as a result of potential construction disturbance (which would probably only take place during one-two breeding seasons). With this embedded mitigation, the magnitude of disturbance impacts is considered likely to be **negligible**. Consequently, no likely significant construction/operational effects are predicted on wider countryside golden plover.

Collision

8.7.39 There have been no reported collisions of golden plover with wind turbines in Britain to date. A total of 30 collision-related deaths have been reported mostly on an incidental basis for golden plover for eight wind farm developments across five European countries (Humphreys *et al.,* 2015b, updated 2017). There is no evidence to suggest that golden plover regularly use the Proposed Development site boundary for flying or foraging and indeed no golden plover flight-lines were recorded within the Turbine Area at all during targeted VP surveys, meaning CRA is not possible. Consequently, no likely significant collision risks effects are predicted on wider countryside golden plover.

Summary

8.7.40 The potential magnitude of adverse impacts of land-take, construction and operational disturbance and collision risk combined on golden plover would likely be **negligible** on the regional population, with no likely significant effects predicted. The likely effects are judged to be not significant, i.e. there would be no detectable regional population level impacts and so the PCS NHZ would not be adversely affected. Therefore, if the Proposed Development was built, the available information indicates that conservation status would not likely be affected because (as articulated using three tests NatureScot use to consider FCS (SNH, 2006)):

- Golden plover is likely to maintain itself on a long-term basis as a viable component of its habitat in the PCS NHZ.
- The natural range of golden plover in the PCS NHZ would not be reduced by the Proposed Development, nor would it become likely to be reduced in the foreseeable future.
- There would be (and would continue to be) a sufficiently large habitat area in the PCS NHZ to maintain the golden plover population on a long-term basis should the Proposed Development be built.

Dunlin

8.7.41 Dunlins breed on wet upland and montane heath, especially where intact bog pool systems occur, but also on machair and rarely on salt marsh (Forrester and Andrews, 2007). Territories are occupied from April with nesting from May to July (Humphreys *et al.,* 2015c, updated 2017). Dunlin (sub-species *schinzii*) is an Annex 1 wader species and therefore of high conservation importance (Table 8.11). The behavioural sensitivity of the species is considered moderate (Table 8.10). The national and international population estimates of this species are provided in Table 8.9. The PCS NHZ population estimate is 2,196 pairs and without evidence to the contrary the species is likely to be in within FCS in Caithness and Sutherland.

8.7.42 Small numbers (five – six pairs) nested within the Study Area. These relatively low numbers mean that the dunlin population using the Site was evaluated as being of local importance but noting that some

Study Area territories overlapped with the Caithness and Sutherland Peatlands SPA and those pairs comprise part of the internationally important designated site population (and are dealt with elsewhere).

Land-take

8.7.43 There was evidence of six pairs (two - three pairs of which were in or had direct evidence of connectivity to the Caithness and Sutherland Peatland SPA and are dealt with in the Designated Sites section) breeding within the Study Area in 2017 and five pairs (one - two pairs were in or and had direct evidence of connectivity to in the Caithness and Sutherland Peatland SPA and are dealt with in the Designated Sites section) breeding within the Study Area in 2018. The centre of these wider countryside dunlin territories lay well outside the Development Footprint (> 1 km), and so no land-take of possible dunlin breeding habitat will take place. Exact positions of dunlin nests were not located. The locations marked on figures refer to notional territory centres based on recordings of territorial birds from repeat walk-over surveys. As dunlin have very small territories, the notional centres of territories are therefore likely to be within the actual territories, providing a high level of confidence in terms of identifying where dunlin may be susceptible to land-take. The VP flight activity data does not indicate that the Site is an important foraging area for dunlin. Consequently, no likely significant land-take effects are predicted on wider countryside dunlin.

Construction and operational disturbance/displacement

8.7.44 There appears to have been very little published work carried out on displacement effects for dunlin. There has, however, been a multi-site comparison of upland breeding species, partly based on the BACI approach given the constraints of the sites and data available (Pearce-Higgins *et al.,* 2012). Densities at different stages of wind farm development were compared but without modelling the effects of habitat and topographical features. Dunlin were reported to be unaffected by the presence of wind farms, providing no evidence for displacement effects on this species (Humphreys *et al.,* 2015c, updated 2017).

8.7.45 Dunlin are judged to have moderate sensitivity to disturbance during the breeding season out to ca. 250 m away from nests/territory centres (Table 8.10). Therefore, construction and operational work within such distances could potentially displace some birds from suitable nesting areas, possibly resulting in reduced site productivity. All wider countryside dunlin nests/territory centres recorded in 2017 and 2018 were > 1 km away from the Development Footprint. As dunlin have very small territories and are particularly sedentary during the breeding season, rarely moving more than 200-300 m from the nest (O'Connell *et al.,* 1996), this suggests that the separation distance means that construction/operational disturbance is considered unlikely to occur. Pre-construction breeding bird surveys, within 500 m of the Development Footprint, are guaranteed to take place. Should breeding dunlin be discovered within ca. 250 m of the Development Footprint immediately prior to or during construction, then suitable disturbance prevention measures will be deployed, e.g. no-work buffer areas will be implemented. Under such circumstances construction would be phased to avoid operating in these areas during the breeding season, meaning construction disturbance should not impact on these individuals, with no long-term consequences anticipated as a result of potential construction disturbance. With this embedded mitigation, the magnitude of disturbance impacts is considered likely to be **negligible**. Consequently, no likely significant construction/operational effects are predicted on wider countryside dunlin.

Collision

8.7.46 There have been no reported collisions of dunlin with wind turbines in Britain to date. Similarly, there have also been no such events recorded on an incidental basis within Europe (Humphreys *et al.,* 2015c, updated 2017). There is no evidence to suggest that dunlin regularly use the Proposed

Development site boundary for flying or foraging and indeed only one dunlin flight-line was recorded within the Turbine Area at all during targeted VP surveys, meaning CRA is not possible. Consequently, no likely significant collision risks effects are predicted on wider countryside dunlin.

Summary

8.7.47 The potential magnitude of adverse impacts of land-take, construction and operational disturbance and collision risk combined on dunlin would likely be **negligible** on the regional population, with no likely significant effects predicted. The likely effects are judged to be not significant, i.e. there would be no detectable regional population level impacts and so the PCS NHZ would not be adversely affected. Therefore, if the Proposed Development was built, the available information indicates that conservation status would not likely be affected because (as articulated using three tests NatureScot use to consider FCS (SNH, 2006)):

- Dunlin is likely to maintain itself on a long-term basis as a viable component of its habitat in the PCS NHZ.
- The natural range of dunlin in the PCS NHZ would not be reduced by the Proposed Development, nor would it become likely to be reduced in the foreseeable future.
- There would be (and would continue to be) a sufficiently large habitat area in the PCS NHZ to maintain the dunlin population on a long-term basis should the Proposed Development be built.

Curlew

8.7.48 Curlew is a widespread but declining Scottish breeding bird of farmland and uplands (Forrester and Andrews, 2007). Curlew is a Red-List species (Table 6.11). The behavioural sensitivity of the species is considered moderate (Table 8.10). The national and international population estimates of this species are provided in Table 8.9. The PCS NHZ population estimate is 1,737 pairs and without evidence to the contrary the species is likely to be in FCS within Caithness and Sutherland.

8.7.49 A single pair of curlews nested within the Study Area and there were no flight-lines recorded within the Turbine Area. This low number means that the curlew population using the Site was evaluated as being of local importance.

Land-take

8.7.50 There was only one breeding pair of curlew within the Development Footprint. A single curlew territory was recorded in the valley bottom near Corrykinloch (Figure 8.25). Curlews have relatively large territories, and part of this territory could potentially be susceptible to localised land-take from construction related activities associated with widening of the existing access track. The existing access track with associated ditches and cut and fill material are ca. 8-10 m wide. We have assumed the average track width, once widening is complete, would be ca. 12 m wide (including cut and fill). This means habitat loss (or change) of ca. 4 m around the existing access track. It should be noted that the exact amount will vary depending on the underlying topography. The vast majority of the access track is flat within the curlew territory at the valley bottom and therefore there will likely be minimal/no cut and fill within the part of the curlew territory closest to the existing track. The remainder of the large curlew territory will be unaffected and remain the same.

8.7.51 Detailed research into impacts of wind farms on curlew suggests adverse effects are more likely to be caused by construction and operational disturbance (displacement) and not land-take *per se* (Pearce-Higgins *et al.,* 2012). Only relatively small areas of habitat (along existing track edge) within this large curlew territory are likely to be lost to land-take so the magnitude of land-take would likely be **negligible**, with no likely significant effects predicted on wider countryside curlew.

Construction and operational disturbance/displacement

8.7.52 There have been several displacement studies on curlew carried out within Britain but these have reported conflicting results (Humphreys *et al.,* 2015g, updated 2017). Detailed research into impacts of wind farms on curlew suggests adverse effects are more likely to be caused by construction and operational disturbance (displacement) and not land-take *per se* (Pearce-Higgins *et al.,* 2012).

8.7.53 If a worst-case scenario (not likely) is assumed (a failure for the one Study Area breeding curlew pair directly related to a construction disturbance associated with the widening of the existing access track near Corrykinloch) then this would constitute an adverse impact for one year on one pair out of Caithness and Sutherland's 1,737 pairs, i.e. 0.06 % of the regional curlew population. However, based on the large size of curlew territories and opportunities to avoid disturbance and damage to any nest through the timings of road widening work etc., this worst-case scenario is considered an unlikely scenario. Assuming no such adverse response took place, then 0 % of the regional curlew population would be adversely affected.

8.7.54 Curlews on their breeding territories show disturbance responses to the presence of a moving or static person up to 250 m away (Table 8.10). Pre-construction and construction breeding season monitoring by the Ecological Clerk of Works (ECoW) would carefully search for any curlew nests within 250 m of the proposed access track widening. The planned track widening near Corrykinloch will take place outwith the breeding season (mid July - April). This in-built design feature is guaranteed to take place for the duration of construction, so the magnitude of temporary (during construction) adverse impacts of disturbance on breeding curlew would likely be **negligible** and no likely significant effects are predicted.

8.7.55 During operation, the only likely change to existing baselines would be a very small increase in the number of vehicles using the access track during the breeding season which goes through the curlew territory. Consequently, the predicted magnitude of construction/operational disturbance would likely be **negligible**, with no likely significant effects predicted on wider countryside curlew.

Collision

8.7.56 According to Humphreys *et al.,* (2015g, updated 2017) there has been at least one reported collision of curlew associated with a wind turbine in Britain, based on a series of sites where systematic recording occurs. A total of three collision-related deaths have been reported in a European wind farm data base although this is largely on an incidental basis. Based on such limited evidence curlew appear to be a low risk of collision with wind turbines. The curlew territory is centred ca. 5 km away from the nearest turbine and no curlew flights were recorded during targeted VP surveys. Consequently, no likely significant collision risk effects are predicted on wider countryside curlew.

Summary

8.7.57 The potential magnitude of adverse impacts of land-take, construction and operational disturbance and collision risk combined on curlew would likely be **negligible** on the regional population, with no likely significant effects predicted. The likely effects are judged to be not significant, i.e. there would be no detectable regional population level impacts and so the PCS NHZ would not be adversely affected. Therefore, if the Proposed Development was built, the available information indicates that conservation status would not likely be affected because (as articulated using three tests NatureScot use to consider FCS (SNH, 2006)):

- Curlew is likely to maintain itself on a long-term basis as a viable component of its habitat in the PCS NHZ.
- The natural range of curlew in the PCS NHZ would not be reduced by the Proposed Development, nor would it become likely to be reduced in the foreseeable future.

- There would be (and would continue to be) a sufficiently large habitat area in the PCS NHZ to maintain the curlew population on a long-term basis should the Proposed Development be built.

Greenshank

8.7.58 Further details provided in Confidential Appendix 8.2.

8.8 Mitigation

8.8.1 In line with best practice guidance (CIEEM, 2018), an iterative design approach has been taken and the Proposed Development was amended to avoid or minimise ornithological receptors, as far as possible within the parameters of the project. As such, where possible, mitigation has been embedded within the project design.

Avoidance

8.8.2 Avoidance of ornithological receptors has been achieved in several areas by the proposed design. For example:

- The most sensitive designated site (SSSI and SPA) and important wider countryside breeding bird habitats (along the main ridge) for species such as golden plover, dunlin and greenshank have been completely avoided by bringing proposed turbines down from the ridge line and centre of the Study Area and placing them part way down slope towards Loch Shin instead. In the 2011 submission (WKN AG, 2011) turbines were located within the ridge-line area that held potentially important ornithological receptors. An earlier iteration to the current submission proposed more turbines, and several of these were on top of the ridge-line and much closer to the SPA. The final design is far better ornithologically than all previous design iterations because it avoids the best breeding bird habitats.
- Avoiding construction in areas with potentially sensitive breeding species during the bird breeding season (approx. April - mid July). A Breeding Birds Protection Plan will be developed and implemented, with direct involvement of the ECoW.
- Creation of no stopping zones near sensitive breeding bird sites during the breeding season (approx. April - mid July) along the access track.

Minimisation

8.8.3 Minimisation of impacts on ornithological receptors has been achieved in several areas by the proposed design. For example:

- Pre-construction breeding bird surveys will be undertaken for Schedule 1 and Annex 1 species. These will inform a Breeding Birds Protection Plan. A watching brief will also be kept for all breeding bird species across the Development Footprint. Construction workers will be given toolbox talks to provide information with regard to breeding bird sensitivities and constraints.
- An independent ECoW will be present and they will lead on advice and delivery of the Breeding Birds Protection Plan, as well as update breeding bird surveys as necessary.
- Work exclusion zones to be identified wherever necessary for Schedule 1 or Annex 1 species.
- Low vehicle speed limits (15 mph) will be imposed during operation and construction to reduce the likelihood of injury or mortality of protected bird species. For example, wader chicks are precocial (i.e. they are relatively mature and able to move and feed themselves almost immediately after hatching when they leave the nest) and so are independent of their parents,

foraging and moving alone in the landscape. This makes them particularly vulnerable to both avian and ground predators and also to being runover by vehicles.

Enhancement and Biodiversity Net Gain

8.8.4 The Outline Habitat Management Plan (OHMP; Technical Appendix 7.6) identifies five main objectives, all of which will have direct benefits to the breeding bird habitats within and outwith the Study Area. These include large-scale reduced grazing pressure and peatland restoration at Sallachy and within the Grudie Peatlands SSSI which is part of the Caithness and Sutherland Peatlands SPA and native broadleaved woodland creation. Blanket bog restoration actions are likely to be directly beneficial to both designated and wider countryside breeding upland waders, in particular golden plover, dunlin and greenshank. Whist golden plover can and do utilise heavily degraded peatland environments, dunlin and greenshank prefer not to. These works are detailed within the OHMP and are also discussed in further detail with Chapter 7.

8.9 Residual Effects

8.9.1 There are no likely significant residual adverse effects predicted for any potentially important ornithological receptors and so compensation is not necessary for the Proposed Development.

8.10 Cumulative Effects

8.10.1 The above sections have considered the effects of the Proposed Development in isolation from other developments. The key principle of NatureScot guidance (SNH, 2018) on cumulative impact assessment of onshore wind farms is to focus on any significant effects and in particular those that are likely to influence the outcome of the consenting process. To summarise:

- No likely significant effects are predicted for land-take on any designated site ornithological features or wider countryside birds. No important birds' territories will be lost.
- No likely significant effects are predicted for construction/operational disturbance/displacement (or barrier effects) on any designated site ornithological features or wider countryside birds.
- No likely significant effects are predicted for collision mortality on any designated site ornithological features or wider countryside birds.

8.10.2 Consequently, there are no likely significant effects for any potentially important ornithological receptors and none of the predicted adverse effects are likely to affect the outcome of the consenting process. The only two (non-significant) adverse effects likely to result in mortality are the loss of one immature, non-breeding wider countryside golden eagle and one non-breeding/migrating kestrel during the life-time of the Proposed Development. As both receptor populations were considered to relate to the national populations; golden eagle (510 pairs, with an unknown number of immature/non-breeding birds) and kestrel (3,850 pairs, CLs = 2,750 -5,500), the loss of a single bird of each over the 30 year period cannot be monitored at the population level and is considered trivial in both population and FCS terms.

8.10.3 According to NatureScot guidance (SNH, 2018) "*Our prime aim is to maintain the conservation status of the species population at the national scale. We assess impacts on a species' population size, its population trend and its natural range within Scotland either nationally or regionally, where regional impacts have national implications (for example where a specific region holds the majority of the national population)*". It therefore follows that the predicted death (and loss to the population) of one individual golden eagle and one individual kestrel cannot be meaningfully modelled cumulatively against the Scottish non-breeding populations of these species for the life-time of the Proposed Development.

8.11 Summary

8.11.1 This chapter has:

- Established the baseline ornithological conditions of the Site using a desk-study and targeted ornithological surveys between April 2017 and March 2019, using standard bird survey methodologies.
- Identified the potentially important ornithological receptors likely to be affected by the Proposed Development namely designated site species, and the following wider countryside species: pink-footed goose, greylag goose, black grouse, golden eagle, white-tailed eagle, osprey, kestrel, peregrine, golden plover, dunlin, curlew and greenshank.
- Assessed the ecological importance and sensitivity of these ornithological receptors.
- Evaluated the likely magnitude of predicted impact on these ornithological receptors from the construction and operation of the Proposed Development.
- Identified mitigation, including avoidance and minimisation of impacts on sensitive ornithological receptors and provided enhancement opportunities.

8.11.2 This assessment does not predict any likely significant ornithological residual effects associated with the Proposed Development.

Table 8.13 – Summary Table – Ornithology

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
Land-take	**None**	Adverse	None beyond embedded mitigation.	**None**	Adverse
Construction/operational disturbance/displacement	**None**	Adverse	None beyond embedded mitigation.	**None**	Adverse
Collision risk	**None**	Adverse	None beyond embedded mitigation.	**None**	Adverse

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