Chapter 8: Ornithology

Contents

8. Ornithology

8.1 Introduction

8.1.1 This chapter assesses the likely significant effects on ornithological features associated with the construction and operation of the Proposed Development (including cumulatively). The specific objectives of the chapter are to:

- Describe the current ornithological baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Identify any potential significant effects upon ornithological features, including direct, indirect and cumulative effects;
- Describe the mitigation measures proposed to address any potential significant effects; and
- Assess the residual effects remaining following the implementation of mitigation measures.

8.1.2 Effects on habitats and non-avian fauna are addressed separately in **Chapter 7: Ecology**.

8.1.3 The assessment has been carried out by MacArthur Green in accordance with NatureScot and Chartered Institute of Ecology and Environmental Management (CIEEM 2018, updated 2022[1]) guidelines. All staff contributing to this chapter have undergraduate and/or postgraduate degrees in relevant subjects, have extensive professional ornithological impact assessment experience, hold professional membership of the and abide by the CIEEM Code of Conduct. Further details are provided in **Technical Appendix 1.1: Statement of Expertise**.

8.1.4 This chapter is supported by a number of figures which are referenced throughout the text, and which can be found in **Volume 3a: Figures**.

8.1.5 The following appendices are also referred to throughout the chapter and can be found in **Volume 4: Technical Appendices**:

- **Technical Appendix 8.1: Ornithology**; and
- **Technical Appendix 8.2: Confidential Ornithology**.

8.1.6 The following terminology will be referred to throughout this chapter:

  - ‘study area’ is defined as the spatial extent for consideration of impacts on each ornithological feature at the time of assessment and is the area used for desk-based studies (**Figure 8.1**).
  - ‘Survey area’ is defined as the area covered by each survey type at the time of survey (**Figure 8.6**)

8.2 Assessment Methodology

Legislation, Policy and Guidance

Legislation

8.2.1 This assessment is carried out in accordance with the principles contained within the following legislation:

- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[2];
- EU Environmental Impact Assessment Directive 2014/52/EU[3];
- EU Directive 2009/147/EC on the Conservation of Wild Birds (’Birds Directive’)[4];

[1] Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (version 1.2). Chartered Institute of Ecology and Environmental Management, Winchester: Chartered Institute of Ecology and Environmental Management (CIEEM): September 2018, updated April 2022.
[2] Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.
[3] Scottish Government (2014). Directive 2014/52/EU of the European Parliament and of the Council. Available at: https://www.legislation.gov.uk/eudr/2014/52 (accessed July 2024)
[4] Directive 2009/147/EC of the European Parliament and of the Council. Available at: https://www.legislation.gov.uk/eudr/2009/147/contents (accessed July 2024)

- The Habitats Regulations 1994[5] (as amended) and The Conservation of Habitats and Species Regulations 2010, as amended by The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 in Scotland[6] (hereafter the 'Habitat Regulations');
- The Wildlife and Countryside Act 1981 (as amended)[7]; and
- The Nature Conservation (Scotland) Act 2004 (as amended)[8].

Policy

8.2.2 The following policies of relevance to the assessment have been considered:

- Tackling the Nature Emergency – Scottish biodiversity strategy to 2045 (2023[9]);
- Scottish Government (2023[10]). National Planning Framework 4 ('NPF4');
- Scottish Government (2023[11]). Draft Planning Guidance: Biodiversity;
- The Scottish Biodiversity List[12]; and
- The Dumfries and Galloway Local Biodiversity Action Plan (2009[13]).

Guidance

8.2.3 This assessment is carried out in accordance with the principles contained within the following documents:

- Environmental impact assessment: NatureScot (SNH 2016a[14], 2018a[15], 2018b[16], NatureScot 2020a[17]), CIEEM (2018, updated 2022[1]), Scottish Government (2000[18], 2017[19]), Goodship & Furness (2022[20]), SERAD (2000[21]);
- Designated sites: SNH (2016b[22]);
- Collision risk modelling: SNH (2000[23], 2018c[24]), Band *et al*. (2007[25]);

[5] Scottish Government (1994) The Conservation (Natural Habitats, &c.) Regulations 1994. Available at: https://www.legislation.gov.uk/uksi/1994/2716/contents (accessed June 2024)
[6] https://digitalpublications.parliament.scot/Committees/Report/ECCLR/2019/3/7/The-Conservation--Natural-Habitats---c.---EU-Exit---Scotland---Amendment--Regulations-2019#The-Conservation--Natural-Habitats---c.---EU-Exit---Scotland---Amendment--Regulations-2019
[7] Scottish Government (1981). Wildlife and Countryside Act 1981. Available at: https://www.legislation.gov.uk/ukpga/1981/69 (accessed July 2024)
[8] Scottish Government (2004). Nature Conservation (Scotland) Act 2004. Available at: https://www.legislation.gov.uk/asp/2004/6/contents (accessed July 2024)
[9] The Scottish Government (September 2023). Tackling the Nature Emergency – Scottish biodiversity strategy to 2045. The Scottish Government, Edinburgh. https://www.gov.scot/publications/scottish-biodiversity-strategy-2045-tackling-nature-emergency-scotland-2/ (accessed July 2024)
[10] National Planning Framework 4 https://www.gov.scot/publications/national-planning-framework-4/documents/ (accessed July 2024)
[11] https://www.gov.scot/publications/scottish-government-draft-planning-guidance-biodiversity/
[12] Scottish Biodiversity List https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list (accessed July 2024)
[13] https://www.dumgal.gov.uk/media/19945/Local-Biodiversity-Action-Plan/pdf/Local_Biodiversity_Action_Plan.pdf (accessed July 2024)
[14] Scottish Natural Heritage (2016a). Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees. Version 2.
[15] Scottish Natural Heritage (2018a). Assessing significance of impacts from onshore windfarms on birds out with designated areas. Version 2.
[16] Scottish Natural Heritage (2018b). Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland.
[17] NatureScot (2020a). General pre-application and scoping advice for onshore wind farms.
[18] Natural Heritage: Policy Advice Note 60 https://www.gov.scot/publications/pan-60-natural-heritage/ (accessed June 2024)
[19] Scottish Government (2017). Planning Advice Note 1/2013 – Environmental Impact Assessment, Revision 1.0. Scottish Government, Edinburgh.
[20] Goodship, N.M. and Furness, R.W. (MacArthur Green) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283.
[21] SERAD (Scottish Executive Rural Affairs Department) (2000). Habitats and Birds Directives, Nature Conservation; Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ("the Habitats and Birds Directives"). Revised Guidance Updating Scottish Office Circular No 6/1995.
[22] Scottish Natural Heritage (2016b). Assessing connectivity with Special Protection Areas (SPAs). Version 3.
[23] Scottish Natural Heritage (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action.
[24] Scottish Natural Heritage (2018c). Avoidance Rates for the onshore SNH Wind Farm Collision Model. Version 2.
[25] Band, W., Madders, M., and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: Janss, G., de Lucas, M. & Ferrer, M (eds.) Birds and Wind Farms. Quercus, Madrid. 259-275.

- Cumulative assessment: SNH (2018d[26]);
- Bird populations/species-specific guidance: Stanbury *et al.* (2021[27]), SNH (2002[28], 2017[29]), Pearce-Higgins (2021[30]), Wilson *et al. (*2015[31]); and
- Construction and birds: SNH (2016c[32]), Goodship & Furness (2022[20]).

8.2.4 Stanbury *et. al* issued an addendum to the BoCC 5 list in September 2024. This addendum has reclassified common gull and great black-backed gull as a Red list species (previously Amber list species) which would now include them as target species. Common gull and great black-backed gull were only infrequently noted during baseline surveys and so would not have been scoped in as an IOF (due to the absence of potentially significant effects).

Consultation

8.2.5 Baseline surveys undertaken to inform the EIA for the Consented Larbrax Wind Farm were undertaken from May 2012 to August 2013. With a view of supporting a revised application for Larbrax Wind Farm, it was agreed through consultation with NatureScot in 2021 to undertake an additional breeding season of baseline ornithological surveys and these were undertaken between March and August 2021.

Study Area

8.2.6 The ornithology assessment considers the following study areas which are based on the final turbine layout and associated infrastructure (**Figure 8.1**):

- Designated sites – the Proposed Development and a 20 km study area buffer (from the proposed turbines) (based on the greatest foraging range for any species, as provided in SNH 2016b[22]) (**Figure 8.2**);
- Collision risk modelling (CRM) – the results of the flight activity surveys have been used for CRM. A 500 m buffer around the proposed turbine locations has been used to create a Collision Risk Analysis Area ('CRAA') (as per relevant guidance, SNH 2017[29]) (**Figure 8.3**);
- Scarce breeding birds[33] – the Proposed Development and a 2 km/800 m (SNH 2017[29]) study area buffer (from the proposed turbines/access track respectively) (**Figure 8.1**);
- Black grouse – the Proposed Development and a 1.5 km/750 m (SNH 2017[29]) study area buffer (from the proposed turbines/access track respectively) (**Figure 8.1**);
- Breeding upland waders and wintering waders, raptors, owls and wildfowl – the Proposed Development and a 500 m study area buffer (**Figure 8.1**); and
- Cumulative assessment – as per NatureScot guidance (SNH 2018d[26]), the Natural Heritage Zone (NHZ) level is generally considered practical and appropriate for most breeding species of wider countryside interest, although if a different geographical area is considered more applicable for a particular species, e.g. due to a restricted population distribution, then its use will be justified.

Desk Based Research and Data Sources

8.2.7 The following data sources have been consulted as part of the assessment:

- NatureScot SiteLink website[34] for designated site information; and

[26] Scottish Natural Heritage (2018d). Assessing the cumulative impacts of onshore wind farms on birds.
[27] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). Birds of Conservation Concern 5: The population status of birds in the UK, Channel Islands and Isle of Man and second ICUN Red List assessment of extinction risk for Great Britain. British Birds 114: 723-747.
[28] Scottish Natural Heritage (2002). Natural Heritage Zones: A National Assessment of Scotland's Landscapes. Scottish Natural Heritage.
[29] Scottish Natural Heritage (2017). Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms
[30] Pearce-Higgins, J.W. (2021). Climate Change and the UK's Birds. British Trust for Ornithology Report, Thetford, Norfolk.
[31] Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504. pp72. Available from: www.swbsg.org
[32] Scottish Natural Heritage (2016c). Dealing with construction and birds.
[33] Scarce breeding birds are those listed on Annex 1 of the EU Birds Directive and/or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and in the case of the Proposed Development consists of any raptor and owl species listed in Annex 1 and/or Schedule 1.
[34] https://sitelink.nature.scot/home

- Dumfries and Galloway Raptor Study Group (DGRSG) in relation to existing records of breeding/roosting Schedule 1 raptors and owls – the data provided as part of the Consented Larbrax Wind Farm desk study is summarised in the relevant baseline species sections below.

Field Surveys

8.2.8 Baseline ornithology surveys within and surrounding the Site were undertaken from May 2012 to August 2013 and March to August 2021. This covers three breeding seasons (2012, 2013 and 2021) and one non-breeding season (2012/2013). The following surveys were undertaken following NatureScot survey guidance available at the time of surveys (SNH 2005[35], 2013[36], 2017[29]) (refer to **Technical Appendix 8.1: Ornithology** for details of the survey methodologies):

- Flight activity surveys (minimum of 36 hours per Vantage Point (VP), per season as per SNH 2017[29]):
  - September 2012 to March 2013, three VP locations (**Figure 8.3**);
  - March to August 2013, three VP locations (**Figure 8.4**); and
  - March to August 2021, one VP location (**Figure 8.5**).
- Scarce breeding bird surveys:
  - April to August 2013, 2 km from the Consented Larbrax Wind Farm site boundary (**Figure 8.6**). Targeted dusk surveys for barn owl and hen harrier were also undertaken between January and July 2013; and
  - March to August 2021, 2 km from the consented turbine layout (**Figure 8.6**).
- Black grouse surveys: May 2021, 1.5 km survey area from the consented turbine layout (**Figure 8.6**);
- Breeding bird (wader) surveys:
  - May and June 2012, within the preliminary site boundary (**Figure 8.6**); and
  - April to July 2021, 500 m survey area from the consented turbine layout (**Figure 8.6**).
- Winter walkover surveys: November 2012 to March 2013, 1 km survey area buffered from the previous submission turbine layout (**Figure 8.6**).

Assessing Significance

Assessing Ornithological Features

8.2.9 The assessment of ornithological features uses the following process:

- Identifying the potential impacts associated with the Proposed Development on an ornithological feature;
- Considering the likelihood of occurrence of potential impacts on an ornithological feature;
- Defining the sensitivity of a feature to an impact from its Nature Conservation Importance ('NCI') and conservation status;
- Establishing the magnitude of the impact (extent and duration);
- Based on the above criteria, making a judgement as to whether or not the resultant effect on an ornithological feature is significant with respect to the EIA Regulations;
- If a potential effect is determined to be significant, outlining measures proposed to avoid, reduce or mitigate for the effect where required; and
- Considering residual effects after mitigation,
- Considering opportunities for enhancement where appropriate.

[35] Scottish Natural Heritage (2005). Survey methods for use in assessing the impacts of onshore windfarms on bird communities.
[36] Scottish Natural Heritage (2013). Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms.

Sensitivity

8.2.10 The sensitivity of ornithological features on or near to the Proposed Development is assessed in line with best practice guidance, legislation, statutory designations and/or professional judgement.

8.2.11 Determination of the level of sensitivity of an ornithological feature is based on a combination of the feature's NCI and conservation status. There are three levels of NCI as detailed in **Table 8.1**.

Table 8.1: Determining factors of a feature's NCI

Importance	Description
High	Populations receiving protection by an SPA, proposed SPA, Ramsar Site, SSSI or which would otherwise qualify under selection guidelines. Species present in nationally important numbers (>1 % national breeding or wintering population).
Medium	The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981. The presence of breeding species listed in Annex I of the Birds Directive (but population does not meet the designation criteria under selection guidelines). The presence of rare, Red-listed breeding species noted on the latest Birds of Conservation Concern ('BoCC') Red list (Stanbury *et al.* 2021[27]). Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the Proposed Development. Species present in regionally important numbers (>1 % regional breeding population).
Low	All other species' populations not covered by the above categories.

8.2.12 Important Ornithological Features ('IOFs', as per CIEEM 2022[1]) to be assessed for the purposes of the EIA Report, are taken to be those species of high or medium NCI.

8.2.13 As defined by NatureScot (SNH 2018a[15]), the conservation status of a species is "*the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest*". Conservation status is considered by NatureScot (SNH 2018a[15]) to be 'favourable' under the following circumstances:

- "*population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats;*
- *the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and*
- *there is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis*."

8.2.14 NatureScot (SNH 2018a[15]) recommends that "*the concept of favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern. An adverse impact on a species at a regional scale (within Scotland) may adversely affect its national conservation status*". Thus, "An *impact should therefore be judged as of concern where it would adversely affect the existing favourable conservation status of a species or prevent a species from recovering to favourable conservation status, in Scotland.*"

8.2.15 In the case of non-designated sites in Scotland, the relevant regional context for many breeding species is considered to be the appropriate NHZ (SNH 2002[28]) which the Site falls within, which in this case is NHZ 18 (Wigtown Machars and Outer Solway).

8.2.16 For wintering or migratory species, the national UK population or flyway population is considered to be the relevant scale for determining effects on its conservation status.

Magnitude

8.2.17 An impact is defined as a change of a particular magnitude to the abundance and/or distribution of a population as a result of the Proposed Development. Impacts can be adverse, neutral, or beneficial.

8.2.18 In determining the magnitude of impacts, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

8.2.19 Impact magnitude is judged in terms of extent and duration as detailed in **Table 8.2** and **Table 8.3** respectively.

Table 8.2: Extent of impact

Magnitude	Description
Very high	Total/near total loss of a bird population due to mortality or displacement. Total/near total loss of productivity in a bird population due to disturbance. Guide: >80 % of population lost or increase in additive mortality.
High	Major reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 21-80 % of population lost or increase in additive mortality.
Medium	Partial reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 6-20 % of population lost or increase in additive mortality.
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 1-5 % of population lost or increase in additive mortality.
Negligible	Very slight (or no discernible) reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the “no change” situation. Guide: <1 % of population lost or increase in additive mortality.

Table 8.3: Duration of impact

Duration	Description
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25-30 years), except where there is likely to be substantial improvement after this period. Where this is the case, long-term may be more appropriate.
Long-term	Approximately 15-25 years or longer (see above).
Medium-term	Approximately 5-15 years.
Short-term	Up to approximately 5 years.
Negligible	<12 months.

Significance

8.2.20 The potential significance of effects was determined through a standard method of assessment based on professional judgement, considering both sensitivity of feature and magnitude of impact as detailed in **Table 8.4**.

8.2.21 **Major** and **moderate** effects are considered ‘significant’ in the context of the EIA Regulations.

Table 8.4: Significance criteria

Significance of Effect	Definition
Major	The impact is likely to result in a permanent or long-term significant effect on the integrity of a feature.
Moderate	The impact is likely to result in a medium term, potentially significant effect on the integrity of a feature.
Minor	The impact is likely to affect a feature at an insignificant level by virtue of its limitations in terms of duration or extent, but there will probably be no effect on its integrity.
Negligible	No material impact.

Cumulative

8.2.22 The potential for significant cumulative effects is considered in **Section 8.9**, which presents information about predicted residual effects arising from the Proposed Development in-combination with any impacts (regardless of significance of effect) predicted for other operational, consented or proposed wind farm projects located within NHZ 18.

8.2.23 NatureScot (SNH 2018d[26]) has provided guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance.

8.2.24 Cumulative effects may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative effects, such as collision risk, may be summed quantitatively, but according to NatureScot (SNH 2018d[26]) "*In practice, however, some effects such as disturbance or barrier effects may need considerable additional research work to assess impacts quantitatively. A more qualitative process may have to be applied until quantitative information becomes available for developments in the area, e.g., from post-construction monitoring or research*".

Assessment Assumptions

8.2.25 The assessment of potential effects is based on the Proposed Development described in **Chapter 4: Development Description**. In relation to describing impacts on ornithological features, the relevant specifications used to determine the 'worst-case' Proposed Development involve:

- Up to four turbines with a maximum tip height of 149.9 m/maximum rotor diameter of 133 m. The associated infrastructure will include wind turbines and associated foundations, access tracks, crane hardstands, underground cabling, onsite substation and maintenance building, temporary construction compound, laydown area and borrow pit.
- The construction period will last for approximately 12 months, comprising a construction programme as described in **Chapter 4**. The number of bird breeding seasons potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The main breeding season of most birds at the Site extends from March to August. For the purposes of this assessment, it is assumed that, for any given species of bird, construction activities would commence during the breeding season and would therefore potentially affect up to two breeding seasons. This, therefore, represents a worst-case scenario.

8.2.26 In addition to the above , this chapter has been prepared on the basis of the embedded design mitigation and good practice measures listed below:

- Existing access tracks have been incorporated into the track layout where possible.
- All electrical cabling between the proposed turbines and the associated infrastructure will be underground in shallow trenches which would be reinstated post-construction and, in most cases, follow the proposed access tracks.

- Any disturbance areas around permanent infrastructure during construction will be temporary and land will be reinstated or restored before the construction period ends. The only excavation in these areas will be for cabling as noted above and otherwise may only be periodically used for side-casting of spoil until reinstatement.
- The borrow pit will be excavated during the construction period and will be reprofiled at the end of the construction period.
- To ensure all reasonable precautions are taken to avoid disturbance to birds and comply with environmental legislation, prior to construction the Applicant will appoint a suitably qualified Ecological Clerk of Works (ECoW) who will advise the Applicant and the Contractor on all ornithological matters (with the assistance of a suitably qualified/licenced ornithologist if required). The ECoW will be required to be present onsite during the construction period and will carry out monitoring of works and briefings with regards to any ornithological sensitivities on the Site to the relevant staff within the Contractor and subcontractors.
- A Bird Disturbance Management Plan (BDMP) will be implemented during construction of the Proposed Development and will form part of the Construction Environmental Management Plan (CEMP). The BDMP will detail measures to ensure legal compliance and safeguard breeding birds known to be in the area and will include species-specific guidance. The BDMP shall include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding bird activity in the vicinity of the construction works. The ECoW will oversee the implementation of the above measures.

Assessment Limitations

8.2.27 Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to impacts associated with onshore wind farms and associated construction activities. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

8.2.28 Baseline surveys undertaken to inform the EIA for the Consented Larbrax Wind Farm were undertaken from May 2012 to August 2013. With a view of supporting a revised application for Larbrax Wind Farm, it was agreed through consultation with NatureScot in 2021 to undertake an additional breeding season of baseline ornithological surveys and these were undertaken between March and August 2021. Whilst it has been three years since the additional baseline surveys were completed, ornithological survey data is generally accepted to remain relevant up to five years after collection. Furthermore, updated ecology surveys undertaken during summer 2023 have confirmed that the Site continues to comprise predominately of open lowland habitat primarily used for cattle, and there have been no major changes to the habitats present within the Site (since both the original 2012/2013 and 2021 baseline surveys). This combined 18-month baseline dataset is considered sufficient and representative to allow for a robust assessment on the potential impacts to ornithology (as confirmed in consultation with NatureScot in 2021).

8.3 Existing Conditions

Designated Sites

8.3.1 There are no statutory designations with ornithological features within the Site. The desk-based study has identified two SPAs, three SSSIs, and one Ramsar within 20 km of the Site (**Figure 9.2**). Note that the distances provided below are to the nearest proposed turbine.

- Loch of Inch and Torrs Warren SPA (underpinned by White Loch – Lochinch SSSI, Torrs Warren – Luce Sands SSSI and Loch of Inch and Torrs Warren Ramsar), approximately 13.3 km south-east from the Site and designated for non-breeding Greenland white-fronted goose and hen harrier. White Loch – Lochinch SSSI is also designated for non-breeding greylag goose.
- Glen App and Galloway Moors SPA (underpinned by Glen App and Galloway Moors SSSI), approximately 12.1 km north-east from the Site and designated for breeding hen harrier.

Flight Activity Summary

8.3.2 A summary of all target species recorded during flight activity surveys at the Site is presented in **Table 8.5** and **Table 8.6**. This summarises all flights observed during the baseline survey period regardless of the location of the

flights in relation to proposed wind turbine locations. For further details of the flight activity surveys, refer to **Technical Appendix 8.1: Ornithology**.

8.3.3 A summary of the collision risk model results is presented in **Table 8.7** (refer to **Technical Appendix 8.1 Annex E** for detailed results). Note that whilst short-eared owl was recorded during flight activity surveys (**Table 8.5**), no flights were identified to be 'at-risk'[37] and so the species is not included in the collision risk model (and not presented in **Table 8.7**).

Table 8.5: Target species recorded during flight activity surveys 2012-2013

Species	Total Number of Flights Recorded	Total Number of Birds Recorded	Total Bird Seconds[38] Recorded
Barn owl	2	2	17
Curlew	212	655	38,028
Golden plover	5	58	5,203
Greylag goose	18	46	1,369
Hen harrier	15	15	837
Lapwing	158	629	55,150
Merlin	5	5	117
Peregrine falcon	5	5	406
Short-eared owl	1	1	28
Whimbrel	17	75	2,912
Whooper swan	2	17	1,670

Table 8.6: Target species recorded during flight activity surveys 2021

Species	Total Number of Flights Recorded	Total Number of Birds Recorded	Total Bird Seconds[38] Recorded
Curlew	3	21	890
Golden plover	2	14	740
Herring gull	10	136	7,446
Lapwing	2	6	300

Table 8.7: Predicted collision rates

Species	2012-2013 Annual Collision Risk	2012-2013 Number of Years Per Collision	2021 Annual Collision Risk	2021 Number of Years Per Collision
Barn owl	0.0003	3,262	-	-

[37] 'At-risk' is defined as – a flight having at least part of its duration (i) at Potential Collision Height (PCH), 16.9 m to 149.9 m for the Proposed Development; (ii) within the CRAA; and (iii) recorded within the 2 km viewshed of the associated VP.
[38] Bird seconds are calculated for each observation as the product of flight duration and number of individuals. This has then been summed to provide the total bird seconds for each species recorded over the entire survey period.

Species	2012-2013 Annual Collision Risk	2012-2013 Number of Years Per Collision	2021 Annual Collision Risk	2021 Number of Years Per Collision
Curlew	2.4236	0.41	0.0244	41
Golden plover	0.3556	2.81	0.0502	19.9
Greylag goose	0.0011	941	-	-
Hen harrier	0.0111	90	-	-
Herring gull	-	-	0.2188	4.57
Lapwing	1.5089	0.66	0.0092	109
Merlin	0.0034	296	-	-
Peregrine falcon	0.0091	110	-	-
Whimbrel	0.0281	36	-	-
Whooper swan	0.0059	169	-	-

Black Grouse

8.3.4 Targeted surveys for black grouse were undertaken in May 2021, however no evidence of back grouse (lekking or otherwise) was recorded and black grouse were not recorded at any point across the baseline survey periods.

8.3.5 Considering this species' absence from the Site and lack of suitable habitat, **black grouse is scoped out of the assessment**.

Raptors and Owls

Barn Owl

8.3.6 Barn owl were identified to be breeding at one location to the north east of the Site in 2012 (**Confidential Figure 8.2.1**) and were recorded during baseline surveys on four occasions during the 2012/2013 non-breeding season and three occasions during the 2013 breeding season (**Figure 8.7**).

8.3.7 Flight activity surveys recorded two flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.8**), and collision risk modelling predicted a mean collision rate of one bird every 3,262 years (**Table 8.7**).

8.3.8 Guidance from Shawyer (2011[39]) for continuous activity disturbance distances provides a range of 20 m (pedestrian movement) to 175 m (heavy construction works) for breeding barn owl and more recently, a review of bird disturbance distances by Goodship & Furness (2022[20]) recommends a buffer of 50 m to 100 m. No turbines or infrastructure are within 500 m of any of the locations and so considering this, the limited activity within the rest of the study area and negligible risk of collision, **barn owl is scoped out of the assessment**.

Hen Harrier

8.3.9 A female hen harrier was recorded on one occasion in August 2021 (**Figure 8.7**). No evidence of breeding or roosting hen harrier was recorded across the baseline survey periods.

8.3.10 Flight activity surveys recorded 15 flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.8**), and collision risk modelling predicted an annual collision rate of one bird every 90 years (**Table 8.7**).

[39] Shawyer, C. R. 2011. Barn owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting. IEEM, Winchester.

8.3.11 Considering this species' limited presence within the study area and negligible predicted risk of collision, **hen harrier is scoped out of the assessment**.

Merlin

8.3.12 No evidence of merlin breeding was recorded across the baseline survey periods.

8.3.13 Flight activity surveys recorded five flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.8**), and collision risk modelling predicted an annual collision rate of one bird every 296 years (**Table 8.7**).

8.3.14 Considering this species' limited presence within the study area and negligible predicted risk of collision, **merlin is scoped out of the assessment**.

Peregrine Falcon

8.3.15 Peregrine falcon were identified to be breeding at one location to the north of the Site in 2012 (1.7 km, **Confidential Figure 8.2.1**) with DGRSG also providing information regarding an historic breeding territory to the south of the Site (~2.5 km, **Confidential Figure 8.2.1**). Individual peregrine falcon were recorded during April, May and June 2021 (**Figure 8.7**).

8.3.16 Flight activity surveys recorded five flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.8**), and collision risk modelling predicted an annual collision rate of one bird every 110 years (**Table 8.7**).

8.3.17 Considering this species' limited presence within the study area and negligible predicted risk of collision, **peregrine falcon is scoped out of the assessment**.

Short-Eared Owl

8.3.18 No evidence of breeding was recorded across the baseline survey periods.

8.3.19 Short-eared owl were recorded during baseline surveys on six occasions during the 2012/2013 non-breeding season (**Figure 8.7**).

8.3.20 Flight activity surveys recorded one flight during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.8**), which was not identified to be 'at-risk' and therefore no risk of collision is predicted.

8.3.21 Considering this species' limited presence within the study area and no predicted risk of collision, **short-eared owl is scoped out of the assessment**.

Waders

Curlew

8.3.22 Surveys during the 2012 and 2021 breeding seasons recorded breeding curlew with an estimated 2-3 territories within the 500 m study area (**Figure 8.9**).

8.3.23 Flight activity surveys recorded 212 flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.10**) and three flights during the 2021 flight activity surveys (**Table 8.6**, **Figure 8.10**). Collision risk modelling predicted an annual collision rate of one bird every 0.41 to 41 years for 2012-2013 and 2021 respectively (**Table 8.7**).

8.3.24 Considering this species' breeding activity within the Site, **curlew is scoped in to the assessment**.

Dunlin

8.3.25 A single dunlin was recorded in August 2021 and was likely on migration.

8.3.26 Considering this species' limited presence within the study area and no predicted risk of collision, **dunlin is scoped out of the assessment**.

Golden Plover

8.3.27 Flight activity surveys recorded five flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.11**) and two flights during the 2021 flight activity surveys (**Table 8.6**, **Figure 8.11**). Collision risk modelling predicted an annual collision rate of one bird every 2.81 to 19 years for 2012-2013 and 2021 respectively (**Table 8.7**).

8.3.28 Golden plover were recorded on one occasion during the 2012 breeding season but were noted to be non-breeding.

8.3.29 Considering this species' limited presence within the study area and low predicted risk of collision, **golden plover is scoped out of the assessment**.

Lapwing

8.3.30 Surveys during the 2012 breeding season recorded an estimated four lapwing territories within the 500 m study area, with up to two territories present in 2021 (**Figure 8.9**).

8.3.31 Flight activity surveys recorded 158 flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.12**) and two flights during the 2021 flight activity surveys (**Table 8.6**, **Figure 8.12**). Collision risk modelling predicted an annual collision rate of one bird every 0.66 to 109 years for 2012-2013 and 2021 respectively (**Table 8.7**).

8.3.32 Considering this species' breeding activity within the Site, **lapwing is scoped in to the assessment**.

Whimbrel

8.3.33 Flight activity surveys recorded 17 flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.11**), and collision risk modelling predicted an annual collision rate of one bird every 36 years (**Table 8.7**).

8.3.34 Whimbrel was recorded on one occasion during the 2012 breeding season but there was no breeding evidence. Flight activity surveys did record whimbrel across the 2013 breeding season (see above), however these were noted to be birds moving through on migration (**Technical Appendix 8.1 Annex F**).

8.3.35 Considering this species' limited presence within the study area and negligible predicted risk of collision, **whimbrel is scoped out of the assessment**.

Geese, Swans and Gulls

Greylag Goose

8.3.36 Flight activity surveys recorded 18 flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.13**), and collision risk modelling predicted an annual collision rate of one bird every 941 years (**Table 8.7**).

8.3.37 Considering this species' limited presence within the study area and negligible predicted risk of collision, **greylag goose is scoped out of the assessment**.

Herring Gull

8.3.38 Flight activity surveys recorded ten flights during the 2021 flight activity surveys (**Table 8.6**, **Figure 8.13**), and collision risk modelling predicted an annual collision rate of one bird every 4.57 years (**Table 8.6**). Herring gull were noted on occasion to be loafing/foraging on the Site and in the surrounding area but no evidence of breeding was recorded.

8.3.39 Considering this species' limited presence within the study area and low predicted risk of collision, **herring gull is scoped out of the assessment**.

Whooper Swan

8.3.40 Flight activity surveys recorded two flights during the 2012-2013 flight activity surveys (**Table 8.5**, **Figure 8.13**), and collision risk modelling predicted a mean collision rate of one bird every 169 years (**Table 8.7**).

8.3.41 Considering this species' limited presence within the study area and negligible predicted risk of collision, **whooper swan is scoped out of the assessment**.

Summary of Scoped In Important Ornithological Features

8.3.42 The assessment is applied to those scoped in IOFs of medium or high NCI (**Table 8.1**), as confirmed through survey results and consultations outlined above. **Table 8.8** presents those scoped in IOFs (limited to curlew and lapwing) and **Table 8.9** provides a summary of the conservation status of each IOF.

Table 8.8: Scoped In IOFs – Nature Conservation Importance

Feature	NCI	Reason for Inclusion
Curlew	Medium	BoCC Red listed, priority bird species for assessment in Scotland (SNH 2018a[15]).
Lapwing	Medium	BoCC Red listed, priority bird species for assessment in Scotland (SNH 2018a[15]).

Table 8.9: Scoped In IOFs – Conservation Status

IOF	Conservation Status	Information
Curlew	BoCC Red list (BDp[2], BDMp[1], WDMp[1], BI)	The most recent national (UK) breeding curlew population estimate was 58,500 pairs in 2016 (Woodward *et al.* 2020[40]) and there has been a significant long-term decline across Scotland. The continued inclusion of the species on the BoCC Red list suggests that the national and NHZ/regional populations are in unfavourable conservation status. The NHZ 18 population was estimated to be 664 (590 – 738) pairs in 2005 (Wilson *et al.* 2015[31]) and given curlew are known to be in a continued decline nationally, the lower estimate of 590 pairs is considered to be a reasonable estimation of the current population.
Lapwing	BoCC Red list (BDp[2], ERLOB, BDMp[1], WDMp[1])	The most recent national (UK) breeding lapwing population was estimated to be 97,500 pairs in 2016 (Woodward *et al.* 2020[40]) and the Scottish population was estimated to be between 71,500 and 105,600 pairs by Forrester *et al.* (2012[41]). Woodward *et al.* (2020[40]) have reported a national breeding decline of 59 % across the UK, with Scottish densities highest in Orkney, Shetland and the Outer Hebrides. The NHZ population is unknown but the NHZ and national populations are on balance likely to be in unfavourable conservation status.
BoCC Red-list criteria (Stanbury *et al.* 2021[27]) BDp[1/2] = severe breeding population decline over 25 years/longer term. **BoCC Amber-list criteria (Stanbury *et al.* 2021[27])** ERLOB = threatened in Europe. BDMp[1/2] = moderate breeding population decline over 25 years/longer term. WDMp[1] = moderate non-breeding population decline over 25 years. BI = breeding international importance.		

8.4 Implications of Climate Change for Existing Conditions

8.4.1 **Chapter 12: Climate Change** provides details of the climate change projections. In summary, the projections highlight that summer and winter temperatures are likely to be higher than the current baseline, with summer rainfall decreasing and winter rainfall increasing (heavy rain days (over 25 mm) and an increase of storms are also predicted to increase in the winter).

8.4.2 As a result of these projections, fluctuations in species abundance and distribution are likely to occur at a local level, over time which are representative of wider scale changes to populations, and so the assessment of impacts is

[40] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D.A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. British Birds 113: 69–104.
[41] Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy, D.S. (eds) 2012. The Digital Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

applicable (i.e. the impact magnitude will remain the same % - e.g. smaller numbers onsite will be part of a smaller population.

8.5 Future Baseline in the Absence of the Proposed Development

8.5.1 In the absence of the Proposed Development, assuming the continuation of the current predominately commercial land management practices within and around the Site (predominately lowland grassland and moorland habitat[42] primarily used for cattle with small areas of trees/vegetation) and allowing for changes in bird behaviour and distribution related to climate change, the bird populations are likely to continue to be present in largely similar abundances and distributions to those described in the baseline. Any changes in numbers and diversity of species are likely to be a reflection of their wider population trends and influences such as climate change (e.g., delayed breeding, reduced or increased breeding success depending on the species range, Pearce-Higgins (2021[30])), rather than site-specific factors.

8.6 Good Practice Measures

8.6.1 Standard good practice measures such as the presence of an ECoW during construction and the use of a BDMP are detailed within the **Assessment Assumptions** of **section 8.2** with further standard and embedded good practice detailed in **Chapter 4**. These good practice and embedded mitigation measures are included in the assessment of otherwise unmitigated effects on IOFs below.

8.6.2 Habitat management associated with the Outline Biodiversity Enhancement and Management Plan (OBEMP) (**Technical Appendix 7.5**) will provide biodiversity enhancement (as per NPF4[10]) that will focus on moorland enhancement, rhododendron removal and woodland enhancement.

8.7 Micrositing

8.7.1 Any micrositing of infrastructure will take into consideration the distances from historic and current nest sites of Schedule 1 breeding species. It is planned that no micrositing of infrastructure will encroach into species-specific disturbance-displacement buffers outlined in Goodship & Furness (2022[20]) (following the recommended procedures of a BDMP). Micrositing infrastructure within the sought micrositing tolerance (100 m) is unlikely to change the significance of effects identified in the assessment.

8.8 Scope of the Assessment

Effects Assessed in Full

8.8.1 Following a review of the desk-based assessment, field surveys and professional judgement, the following effects are assessed in detail:

- Direct temporary and permanent habitat loss for birds (curlew and lapwing) through construction and operation of the Proposed Development;
- Displacement of birds (curlew and lapwing) from the Proposed Development and its surrounding area due to construction disturbance, turbine operation, maintenance, and visitor disturbance. This also includes potential barriers due to the presence of the Proposed Development turbines; and
- Death or injury of birds (curlew and lapwing) through collisions with turbine blades, or fences (if any) associated with the Proposed Development.

8.8.2 The chapter also assesses the potential for additional cumulative impacts when considered in addition to other consented or proposed developments which are subject to EIA.

8.8.3 The assessment is based on the Proposed Development as described in **Chapter 4**.

[42] Refer to **Chapter 7 Ecology** Chart 7.1 for a full breakdown of habitats present on the Site.

Effects Scoped Out

8.8.4 On the basis of baseline data, experience from other relevant projects and policy guidance or standards (e.g., SNH 2018a[15]), effects on the following species are 'scoped out' since significant effects are unlikely:

- Common and/or low NCI species not recognised in statute as requiring special conservation measures (i.e., not listed as Annex 1 or Schedule 1 species);
- Common and/or low NCI conservation species not included in non-statutory lists (i.e., not listed as Amber or Red-listed Birds of Conservation Concern (BoCC) (Stanbury *et. al* 2021[27]) species), showing birds whose populations are at some risk either generally or in parts of their range; and
- Passerine species, not generally considered to be at risk from wind farm developments (SNH 2016a[14], 2017[29]), unless being particularly rare or vulnerable at a national level.

8.8.5 As detailed in the Scoping Report, there is considered to be no connectivity between the Proposed Development and the Loch of Inch and Torrs Warren SPA or Glen App and Galloway Moors SPA on the basis of the foraging ranges detailed in NatureScot guidance (SNH 2016b[22]) for hen harrier (2 km) or Greenland white-fronted goose (5-8 km). Therefore, all SPAs (and associated SSSIs/Ramsar sites) are scoped out of the assessment.

8.8.6 Following a review of the baseline activity recorded in relation to the Proposed Development, effects relating to barn owl, hen harrier, peregrine falcon, short-eared owl, dunlin, golden plover, whimbrel, greylag goose, herring gull and whooper swan are scoped out of the assessment.

8.9 Assessment of Effects

8.9.1 The assessment of effects identified above is based on the project description as outlined in **Chapter 4**. Unless otherwise stated, potential effects identified are considered to be negative.

Construction Effects – Displacement

Predicted Construction Effects

8.9.2 The main potential impacts of construction activities associated with the Proposed Development are the displacement and disturbance of breeding or foraging birds as a result of noise and general disturbance over a short-term period (either the duration of a particular construction activity within working hours, or the duration of the whole construction period).

8.9.3 Impacts on breeding birds would be confined to areas in the locality of the temporary construction compound, turbines, tracks and other infrastructure.

8.9.4 Direct habitat loss would also occur due to the Proposed Development's construction, which would be both temporary (e.g. construction compound, borrow pit) and long-term (access tracks, turbines and substation). This has the potential to affect breeding or foraging individuals.

Curlew and Lapwing

8.9.5 **Effect**: breeding curlew and lapwing may be displaced from the Site during construction, either temporarily by disturbance or temporarily or permanently via direct habitat loss.

8.9.6 **Sensitivity**: medium NCI (**Table 8.8**) with the NHZ and national populations considered to be of unfavourable conservation status. Consequently, curlew and lapwing sensitivity in the context of the Site is considered to be medium-high.

8.9.7 **Magnitude of effect**: an estimated two and 2-3 curlew territories have been recorded within 500 m of infrastructure (**Figure 8.9**). The curlew NHZ 18 breeding population is estimated to be 590 pairs (Wilson *et al.* 2015[31]), and this represents up to 0.51 % of the breeding population. The lapwing NHZ 18 population is unknown but based on the GB population of 97,500 pairs presented in Woodward *et al.* (2020[40]) and considering the suitable lowland grassland habitats present within NHZ 18, there is likely to be at least 1,000 breeding pairs within NHZ 18. Up to four lapwing territories (in 2012) were recorded within 500 m of infrastructure (**Figure 8.9**) which would represent up to 0.4 % of the estimated NHZ 18 population.

8.9.8 It is considered unlikely that all breeding curlew and lapwing within 500 m of infrastructure would be lost from the population in any year as construction activities are unlikely to take place simultaneously across the whole Site throughout the whole breeding season. Furthermore, wader activity is focussed to the east of the Site around an area that is predominately only associated with the proposed access track (**Figure 8.9**) rather than proposed turbine locations. Whilst there will be construction work to build this track (alongside the traffic use during the construction phase), the works will be less intensive and of shorter duration than those around the turbines.

8.9.9 It should be noted that the BDMP (and associated pre-construction surveys) and presence of ECoW during the construction period will ensure that no active nesting attempts are directly affected by construction activities, however some birds may still be impacted as a result of construction disturbance, either by affecting foraging ability or preventing breeding occurring at a particular location. However, even in a worst-case scenario, assuming some breeding pairs would be temporarily lost to the NHZ population during the construction phase, an effect of negligible and short-term magnitude is predicted for both curlew and lapwing.

8.9.10 **Significance of effect**: the unmitigated effect on the NHZ 18 curlew and lapwing populations as a result of construction is considered to be **minor** and therefore **not significant** in the context of the EIA regulations.

Committed Additional Mitigation

8.9.11 No significant unmitigated effects were predicted for curlew and lapwing, and therefore no specific mitigation other than the good practice measures already outlined (BDMP, ECoW and pre-construction surveys) is required.

Residual Construction Effects

8.9.12 The residual construction effects for curlew and lapwing are considered to be unchanged to those predicted above and continue to be **minor** and **not significant** in the context of the EIA regulations.

Operational Effects – Displacement

Predicted Operational Effects

8.9.13 The displacement of nesting, foraging or roosting birds from the Proposed Development has the potential to extend beyond the construction phase, as described above, and to occur during the operational phase.

8.9.14 Evidence of displacement away from operational turbines has been found to occur in a number of individual wind farm studies, although the effects vary considerably between sites and species. It is recognised that disturbance may occur due to maintenance throughout the operational phase, although since these are likely to be of shorter duration and smaller extent than construction activities, effects would be lower than those predicted for construction effects.

Curlew and Lapwing

8.9.15 **Effect**: breeding or foraging curlew and lapwing may be at risk of displacement from habitat around turbines, thereby affecting productivity or survival rates.

8.9.16 **Sensitivity**: medium-high.

8.9.17 **Magnitude of effect**: an estimated 2-3 curlew territories (recorded in both 2012 and 2021) and up to four lapwing territories (four in 2012 and two in 2021) were recorded within 500 m of turbines (**Figure 8.9**). The curlew NHZ 18 breeding population is estimated to be 590 pairs (Wilson *et al.* 2015[31]), of which one pair of curlew would represent 0.51 % of the breeding population. The lapwing NHZ 18 breeding population has been estimated to be at least 1,000 pairs (**paragraph 8.9.7**), of which up to four pairs of lapwing would represent up to 0.4 % of the breeding population.

8.9.18 A review of curlew breeding activity recorded prior to construction of the operational Fallago Rig Wind Farm and breeding activity recorded by post-construction monitoring surveys (presented in the Dunside Wind Farm EIA Report, 2023[43]) indicated that curlew were not wholly displaced with seven territories recorded prior to any development and 5-6 territories recorded in the same area when Fallago Rig Wind Farm was in operation.

8.9.19 It is therefore considered unlikely that all breeding curlew and lapwing would be lost from the population as there is suitable breeding habitat surrounding infrastructure that would still be available for breeding waders. It is therefore

[43] ECU Reference ECU00003436, Chapter 7: Ornithology.

likely that curlew and lapwing will continue to use habitats surrounding the turbines and would not be wholly displaced from all suitable habitats within 500 m of the Proposed Development.

8.9.20 Nevertheless, as a worst-case (where it is assumed that most breeding birds would be lost from the population, rather than remain or be displaced into adjacent areas), an effect of negligible and long-term magnitude is predicted for breeding curlew and lapwing.

8.9.21 **Significance of effect**: the unmitigated effect on the NHZ 18 curlew and lapwing populations as a result of operational displacement is considered to be **minor** and therefore **not significant** in the context of the EIA regulations.

Committed Additional Mitigation

8.9.22 No significant unmitigated effects were predicted for any IOF, and therefore no specific mitigation is required, however the habitat management associated with the proposed OBEMP (**Technical Appendix 7.5**) will provide some benefit for wader species via the removal of rhododendron and moorland enhancement.

Residual Operational Effects

8.9.23 The residual operational displacement effects for curlew and lapwing are considered to be unchanged to those predicted above and continue to be **minor** and therefore **not significant** in the context of the EIA regulations.

Operational Effects – Collision

Predicted Operational Effects

Curlew and Lapwing

8.9.24 **Impact**: birds that utilise the airspace within the Proposed Development at potential collision heights may be at risk of collision with wind turbines, thereby increasing the annual mortality rate of the population above background levels.

8.9.25 **Sensitivity**: medium-high.

8.9.26 **Magnitude of impact**: curlew were regularly recorded during 2012 to 2013 flight activity surveys from the three VPs, and whilst birds continued to be present during the 2021 flight activity surveys, activity was much reduced. A review of activity between the 2012 and 2021 breeding season suggests that this likely at least partially the result of a combination of double counting of curlew activity during 2012 when surveys were undertaken from VPs 2a and 3a simultaneously (which have a relatively large viewshed overlap, **Figure 8.4**) and interannual variation in where breeding curlew were situated. The predicted collision rate for 2012-2013 was estimated to be 2.4236 birds per breeding season, whereas the 2021 collision rate was estimated to be 0.0244 birds per breeding season (refer to **Technical Appendix 8.1** for the detailed collision predictions provided per season). A worst-case collision rate of 2.4236 (**Table 8.7**) is used for this assessment but it should be noted that this is likely an overestimation of the potential for curlew collisions given the reduced activity around the proposed turbines recorded during the most recent surveys in 2021 (see above regarding the comparison of curlew activity between years). The NHZ 18 breeding population is estimated to be 590 pairs (Wilson *et al.* 2015[31]) and the additional mortality due to collision would be an increase over the baseline mortality rate (0.101, BTO BirdFacts[44]) of 2.03 %. This worst-case increase in baseline mortality for curlew is considered to be of low and long-term magnitude.

8.9.27 Lapwing showed a similar spatial and temporal distribution to curlew, with reduced activity recorded during 2021 (with the same overlapping viewsheds and breeding location variation likely to be at least partially the cause with the reduction in breeding pairs from four to two pairs from 2012 to 2021 likely to also have resulted in reduced activity recorded in 2021). The predicted collision rate for 2012-2013 was estimated to be 1.5 birds per year, whereas the 2021 collision rate was estimated to be 0.0092 birds per breeding season (refer to **Technical Appendix 8.1** for the detailed collision predictions provided per season). A worst-case of 1.5089 (**Table 8.7**) is used for this assessment but it should be noted that this is likely an overestimation of the potential for lapwing collisions given the reduced activity around the proposed turbines recorded during the most recent surveys in 2021 (see above regarding the comparison of curlew/lapwing activity between years). The NHZ 18 breeding population has been estimated to be at

[44] https://www.bto.org/understanding-birds/birdfacts/curlew

least 1,000 pairs (**paragraph 8.9.7**) and the additional mortality due to collision would be an increase over the baseline mortality rate (0.101, BTO BirdFacts[45]) of up to 0.26 % (it should be noted that should only the 2021 collision rate be considered this would reduce to 0.002 %). The increase in baseline mortality for lapwing is considered to be of negligible and long-term magnitude.

8.9.28 **Significance of effect**: the unmitigated effect on the NHZ 18 curlew and lapwing populations as a result of collision risk is considered to be **negligible** (lapwing) and **minor** (curlew) and therefore **not significant** in the context of the EIA regulations.

Committed Additional Mitigation

8.9.29 No significant unmitigated effects were predicted for any IOF, and therefore no specific mitigation is required.

Residual Operational Effects

8.9.30 The residual operational collision effects for curlew and lapwing are considered to be unchanged to those predicted above and continue to be **not significant** in the context of the EIA regulations.

Cumulative Effects

8.9.31 This section presents information about the potential cumulative effects of the Proposed Development combined with other operational, consented or proposed wind farm projects that are located within NHZ 18. The assessment of cumulative effects follows the principles set out in the NatureScot (SNH 2018b) guidance.

8.9.32 Wind farm projects at scoping stage have been scoped out of the cumulative assessment because either they do not have sufficient information on potential effects to be included; because the baseline survey period is ongoing; or because results have not been published. Projects that have been refused (and no longer capable of appeal) or withdrawn have also been scoped out of the cumulative assessment.

8.9.33 Small wind farm projects with three or fewer turbines have also been scoped out from the cumulative assessment as often these projects are not subject to the same level of detail of ornithological assessment, and so there are no directly comparable data. Because of the small scale of such projects, effects are likely to be negligible on the IOFs assessed here. No other renewable or non-renewable projects within NHZ 18 were identified that could have a cumulative effect on the IOFs.

8.9.34 Based on the conclusions of the assessment presented above and the committed good practice mitigation measures, cumulative construction and operational effects for curlew and lapwing have been scoped out of further assessment.

8.10 Interrelationship Between Effects

8.10.1 The potential effects of the Proposed Development are considered above in terms of effects on ornithology as a discrete environmental topic. Indirect and secondary effects resulting from the interaction of direct effects arising both within a topic area and interrelated with other topics areas are also possible.

8.10.2 The potential interrelationship between displacement and collision risk is considered in the collision model. It is assumed via the incorporation of an ‘avoidance rate’ that a proportion of bird activity within the vicinity of proposed turbine locations will be reduced compared to the baseline survey period, as birds avoid turbines or the Proposed Development as a whole. Furthermore, the risk of collision mortality may be removed completely if birds have been displaced from the local area due to the presence of the Proposed Development. The effects of direct habitat loss during the construction and operational periods are accounted for in the assessment of more diffuse disturbance and displacement effects.

8.10.3 Of the other topics with potential to affect ornithological features, those effects identified in **Chapter 7: Ecology** and **Chapter 9: Hydrology, Hydrogeology, Geology and Peat,** are most likely to produce a measurable effect. Interrelated effects could potentially occur due to loss or reduction in quality of suitable habitats for breeding, or indirect effects on foraging due to the changes in conditions for prey items. Direct habitat loss effects have been considered above in the Construction Effects section, and although indirect effects on prey items have not been

[45] https://www.bto.org/understanding-birds/birdfacts/lapwing

considered above, these are unlikely to be significant for the IOFs, with neither having specific feeding requirements that would be materially altered.

8.11 Further Survey Requirements and Monitoring

8.11.1 With the exception of the pre-construction surveys recommended above as part of the BDMP and any ornithology monitoring proposed as part of the OBEMP (**Technical Appendix 7.5**), no further ornithological monitoring is proposed, based on a lack of predicted significant effects.

8.12 Summary of Potential Significant Effects

8.12.1 No significant construction or operational (including cumulative) effects as a result of displacement or collision mortality have been identified for the IOFs assessed (curlew and lapwing) prior to mitigation.

Glossary/Abbreviations

Table 8.10: Glossary

Term in Full	Abbreviation	Meaning
Chartered Institute of Ecology and Environmental Management	CIEEM	Organisation.
Scottish Natural Heritage	SNH	Previous name of NatureScot, still used when referencing publications made by NatureScot prior to their name change.
Collision Risk Analysis Area	CRAA	500 m buffer used to create the analysis area for collision modelling.
Natural Heritage Zone	NHZ	Defined regional areas used for bird species populations.
Dumfries and Galloway Raptor Study Group	DGRSG	Regional raptor study group.
Vantage Point	VP	Defined location used for targeted flight activity surveys.
Site of Special Scientific Interest	SSSI	Statutory designation.
Special Protection Area	SPA	Statutory designation.
Nature Conservation Importance	NCI	Term.
Birds of Conservation Concern	BoCC	Term.
Ecological Clerk of Works	ECoW	Role.
Bird Disturbance and Management Plan	BDMP	Document produced prior to construction commencing (during the discharge of conditions) to ensure the safeguarding of wild birds.
Important Ornithological Feature	IOF	Term.