6 ORNITHOLOGY

Executive Summary

The Ornithology chapter considers the potential for significant effects upon important ornithological features (IOFs) associated with the construction, operation and decommissioning of the Proposed Development (as defined in **Chapter 2 Development Description (EIAR Volume 1**).

Baseline conditions to inform the design and assessment of the Proposed Development have been established through a desk study and ornithological field surveys in accordance with industry standard guidance and in consultation with nature conservation bodies and specialist species recording groups.

The Site does not form part of any statutory designated site for nature conservation with qualifying ornithological interests or lie within potential connectivity distances to any Special Protection Area (SPA).

Baseline studies have established that the Site and adjacent habitats are used by foraging and breeding raptors (notably golden eagle, merlin, and red kite) and owls. Typical of the locale and habitats present, an assemblage of breeding ground nesting waders has also been recorded, which includes curlew. The Site and immediate surrounding area are not identified as being important for migratory waterfowl.

Collision mortality risks to Proposed Development have been estimated using the NatureScot Collision Risk Model (CRM). Collision mortality risks are predicted as being low or negligible for all species.

The potential for significant direct and/or indirect habitat loss effects from the Proposed Development is also assessed and concluded to be **not significant** for any species, with the exception of black grouse.

Standard mitigation, including the appointment of a suitably qualified Ecological Clerk of Works (ECoW) during construction works and implementation of a Bird Disturbance Management Plan (BDMP), will enable the protection of breeding birds during construction works. An operational environmental advisor will also be appointed which will enable the protection of breeding birds during operational maintenance works in accordance with measures set out within the BDMP.

Additional mitigation for inclusion within the BDMP is outlined in the additional mitigation within this chapter to avoid the potential for construction and operational disturbance to lekking black grouse. Additional mitigation for inclusion within the Proposed Developments Biodiversity Enhancement Management Plan (BEMP) is also outlined to further minimise the potential for collision risks to raptor species. An Outline BEMP is provided in **Technical Appendix 7.7 (EIAR Volume 4**).

The Proposed Development will also provide for the delivery of long-term beneficial habitat enhancement measures for bird species and wider biodiversity. This will include in areas away from operational infrastructure where specific management for breeding waders will be undertaken. This work will be in addition to habitat reinstatement following construction works.

Residual effects upon all IOFs are predicted to be **not significant** as a result of the Proposed Development alone, or in combination, with other wind farm developments.

6.1 Introduction

6.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) considers the potential for significant effects on IOFs associated with the construction, operation and decommissioning of the Proposed Development.

6.1.2 The specific objectives of the chapter are to:

- describe the ornithological baseline and identify IOFs;
- describe the assessment methodology, assumptions and significance criteria used in completing the assessment;
- describe the potential effects, including direct, indirect, and cumulative effects;
- describe additional mitigation measures proposed to address potentially significant effects;
- assess the residual effects remaining following the implementation of any additional mitigation measures; and
- outline those measures included as part of the Proposed Development that will conserve, restore, and enhance biodiversity any long-term monitoring required to monitor the implementation and efficacy of such measures.

6.1.3 The assessment has been carried out by MacArthur Green. 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 and abide by the Chartered Institute of Ecology and Environmental (CIEEM) Code of Conduct.

6.1.4 This chapter is supported by the Figures and Technical Appendices (TAs) listed in **Table 6-1,** which are referenced throughout the Chapter.

Table 6-1: Supporting Figures and Technical Appendices (TAs)

Document Location	Document Description
EIAR Volume 2	
Figure 6.1: Site and Study Areas	Figure
Figure 6.2: Ornithological Designated Sites within 20 km	Figure
Figure 6.3: Vantage Points and Viewsheds: 2021 Breeding Season	Figure
Figure 6.4: Vantage Points and Viewsheds: 2021/2022 Non-Breeding Season	Figure
Figure 6.5: Vantage Points and Viewsheds: 2022 Breeding and 2022/2023 Non-Breeding Season	Figure
Figure 6.6: Vantage Points and Viewsheds: 2023 Breeding Season	Figure
Figure 6.7: Scarce Breeding Bird Study Area and Survey Areas	Figure
Figure 6.8: Black Grouse Study Area and Survey Areas	Figure
Figure 6.9: Breeding Wader and Winter Walkover Study Area and Survey Areas	Figure
Figure 6.10: Black Grouse Lek Locations and Activity: April 2021 to August 2023	Figure
Figure 6.11: Raptor and Owl Activity: April 2021 to August 2023	Figure
Figure 6.12a-b: Flight Activity: Golden Eagle	Figure
Figure 6.13: Flight Activity: Hen Harrier	Figure
Figure 6.14: Flight Activity: Merlin	Figure
Figure 6.15: Flight Activity: Osprey, Peregrine Falcon, Short-Eared Owl and White-Tailed Eagle	Figure
Figure 6.16a-b: Flight Activity: Red Kite	Figure
Figure 6.17: Breeding Wader Activity: 2021, 2022 and 2023	Figure
Figure 6.18: Flight Activity: Curlew and Golden Plover	Figure

Document Location	Document Description
Figure 6.19: Flight Activity: Barnacle Goose, Greylag Goose, Pink-Footed Goose and Whooper Swan	Figure
EIAR Volume 4	
TA 6.1: Ornithology (including Annexes A to E)	Report
TA 6.3: Ornithology Assessment Methodology	Report
EIAR Volume 5 (Confidential)	
Confidential Figure 6.2.1: Barn Owl Nest Location: 2022	Confidential Figure
Confidential Figure 6.2.2: GET Model	Confidential Figure
Confidential Figure 6.2.3a-e: GET Model and Golden Eagle Flight Activity	Confidential Figure
Confidential Figure 6.2.4: Goshawk Nest Locations	Confidential Figure
Confidential Figure 6.2.5: Merlin Nest Locations and Activity: April 2021 to August 2023	Confidential Figure
Confidential Figure 6.2.6: Peregrine Falcon Nest Locations and Activity: April 2021 to August 2023	Confidential Figure
Confidential Figure 6.2.7: Red Kite Nest Locations and Activity: April 2021 to August 2023	Confidential Figure
Confidential Figure 6.2.8: Greenshank Activity: 2023	Confidential Figure
Confidential TA 6.2: Confidential Ornithology	Confidential Report
Confidential TA 6.4: Golden Eagle Population Viability Analysis Model	Confidential Report
Confidential TA 6.5: Red Kite Population Viability Analysis Model	Confidential Report

6.2 Assessment Methodology and Significance criteria

Scope of Assessment

6.2.1 The assessment presented within this chapter considers the following main potential impacts upon ornithological features associated with onshore renewable energy developments:

- **Direct habitat loss** – temporary and permanent habitat loss, due to land take and activities during the construction, operational maintenance and decommissioning of development infrastructure;
- **Disturbance/displacement** – the avoidance of birds from the area occupied by development infrastructure and working areas and therefore the further indirect loss of habitats during construction, operation, and decommissioning; and
- **Collision mortality** – the risk of mortality resulting from collision or interaction with turbine arrays during operation.

6.2.2 The potential for significant effects is considered as a result of the Proposed Development alone and where appropriate and sufficient information is available, cumulatively with other wind farm developments subject to a valid section 36/planning application.

6.2.3 The assessment is based on the Proposed Development as described in **Chapter 2: Development Description (EIAR Volume 1)** and has been informed by consultation responses detailed in **TA 1.2: Consultation Register (EIAR Volume 4)** and the following key pieces of legislation, planning policy and guidance:

Legislation

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017[1] (as amended);

[1] Scottish Government (2017). The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/101/contents

- Environmental Impact Assessment Directive 2014/52/EU[2];
- Directive 2009/147/EC on the Conservation of Wild Birds ('Birds Directive')[3];
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) and the Conservation of Habitats and Species Regulations 2017 (hereafter the 'Habitat Regulations');
- The Wildlife and Countryside Act 1981 (as amended)[4]; and
- The Nature Conservation (Scotland) Act 2004 (as amended)[5].

Policy

- Tackling the Nature Emergency – Scottish biodiversity strategy to 2045 (2023[6]);
- Scottish Government (2023[7]). National Planning Framework 4 ('NPF4');
- Scottish Government (2023[8]). Draft Planning Guidance: Biodiversity; and
- The Scottish Biodiversity List[9].

Guidance

- Environmental impact assessment: NatureScot (SNH 2016a[10], 2018a[11], 2018b[12], NatureScot 2023[13], 2024[14]), CIEEM (2022[15]), Scottish Government (2000[16], 2017[17]), Goodship & Furness (2022[18]), SERAD (2000[19]);
- Designated sites: SNH (2016b[20]);
- Collision risk modelling: SNH (2000[21], 2018c[22]), Band *et al.* (2007[23]);
- Cumulative assessment: SNH (2018d[24]);
- Bird populations/species-specific guidance: Stanbury *et al.* (2021[25], 2024[26]), SNH (2002[27], 2017[28]), Pearce-Higgins (2021[29]), Wilson *et al.* (2015[30]); and
- Construction and birds: SNH (2016c[31]), Goodship & Furness (2022[18]).

Consultation

6.2.4 **Table 6-2** below summarises the consultation undertaken throughout the EIAR process, including Scoping and further pre-application consultation, relevant to ornithology.

[2] 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
[3] Directive 2009/147/EC of the European Parliament and of the Council. Available at: https://www.legislation.gov.uk/eudr/2009/147/contents
[4] Scottish Government (1981). Wildlife and Countryside Act 1981. Available at: https://www.legislation.gov.uk/ukpga/1981/69
[5] Scottish Government (2004). Nature Conservation (Scotland) Act 2004. Available at: https://www.legislation.gov.uk/asp/2004/6/contents
[6] 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/
[7] National Planning Framework 4 https://www.gov.scot/publications/national-planning-framework-4/documents/
[8] https://www.gov.scot/publications/scottish-government-draft-planning-guidance-biodiversity/
[9] Scottish Biodiversity List https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list
[10] Scottish Natural Heritage (2016a). Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees. Version 2
[11] Scottish Natural Heritage (2018a). Assessing significance of impacts from onshore windfarms on birds out with designated areas. Version 2.
[12] 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.
[13] NatureScot (2023). General pre-application and scoping advice for onshore wind farms. September 2023.
[14] NatureScot (2024). General pre-application and scoping advice for onshore wind farms. February 2024.
[15] CIEEM (2022) 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 (CIEEM), Winchester
[16] Natural Heritage: Policy Advice Note 60 https://www.gov.scot/publications/pan-60-natural-heritage/
[17] Scottish Government (2017). Planning Advice Note 1/2013 – Environmental Impact Assessment, Revision 1.0. Scottish Government, Edinburgh.
[18] 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.
[19] 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.
[20] Scottish Natural Heritage (2016b). Assessing connectivity with Special Protection Areas (SPAs). Version 3.
[21] Scottish Natural Heritage (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action.
[22] Scottish Natural Heritage (2018c). Avoidance Rates for the onshore SNH Wind Farm Collision Model. Version 2.
[23] 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.
[24] Scottish Natural Heritage (2018d). Assessing the cumulative impacts of onshore wind farms on birds.
[25] 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.
[26] Stanbury, A.J., Burns, F., Aebischer, N.J., Baker, H., Balmer, D.E., Brown, A., Dunn, T., Lindley, P., Murphy, M., Noble, D.G, Owen, R. and Quinn, L. (2024) The status of the UK's breeding seabirds: an addendum to the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, **117**, pp 471-487.
[27] Scottish Natural Heritage (2002). Natural Heritage Zones: A National Assessment of Scotland's Landscapes. Scottish Natural Heritage.
[28] Scottish Natural Heritage (2017). Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms.
[29] Pearce-Higgins, J.W. (2021). Climate Change and the UK's Birds. British Trust for Ornithology Report, Thetford, Norfolk.
[30] 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
[31] Scottish Natural Heritage (2016c). Dealing with construction and birds.

Table 6-2: Consultation

Organisation and Type of Consultation	Response	How Response has been Considered
Perth and Kinross Council Scoping	PKC agrees with the overall scope and intentions of the assessment as it aligns with the overall intent of the report, that further assessment should be targeted. Advise from other consultees would be required here in consideration of the IOFs in terms of scoping in or out of further assessment.	Noted.
NatureScot Scoping	Noted that all surveys should be in accordance with the NatureScot guidance. NatureScot outline that the proposed survey methodology appears to be sufficient.	Noted.
	Concerns are raised by NatureScot regarding turbines not covered by vantage point surveys and noted that if final design includes turbines outside the vantage point viewshed, then NatureScot's confidence in collision risk modelling may be reduced and deemed unreliable. It is identified that some viewpoints are located within the turbine development and highlighted as not good practice. Justification is therefore requested on the selection of VPs within the EIAR.	Further correspondence was undertaken with NatureScot regarding the viewshed coverage (refer to **TA 1.2, EIAR Volume 4**) and an additional breeding season (2023) of flight activity surveys was also undertaken. Refer to the limitations and assumptions section below for a detailed review of viewshed coverage.
	NatureScot agree that cumulative impacts unconnected to designated sites should be assessed at the Natural Heritage Zone level.	Noted.
	It is noted that the Drummond Lochs Site of Special Scientific Interest (SSSI), a component loch of South Tayside Goose Roosts (STGR) SPA/Ramsar, is unlikely to have connectivity to the proposal due to the distance to the SPA and lack of suitable feeding habitat. Agree STGR SPA to be scoped out.	Noted.
	The scoping out of Ben Chonzie SSSI is agreed with by NatureScot due to being unlikely within the core foraging range for species designation within the breeding bird assemblage.	Noted.
	NatureScot agree a single winter of surveys would be sufficient and recommend the applicant consultants with the Scottish Raptor Study Group for information.	Noted. The Tayside and Central Raptor Study Groups were approached to request data relating to historic breeding raptors. Data was provided by the Central Raptor Study Group (CRSG) and is provided in the Baseline Conditions (Section 6.3) for the relevant species.
Stirling Council Scoping	SC are satisfied with the Scoping Report and proposed actions.	Noted.
	It is recommended that the Wildlife Information Centre are approached.	Data was requested from the Wildlife Information Centre and is included in **Chapter 7: Ecology (EIAR Volume 1)**.

6.2.5 Full details of all consultation undertaken is provided in **TA 1.2 (EIAR Volume 4**).

Ornithological Features Scoped Out

6.2.6 As stipulated within CIEEM (2022[15]) and set out in NatureScot impact assessment guidance (2017[28], 2018a[11], 2018b[12], 2023[13] and 2024[14]), it is not necessary to carry out a detailed assessment of impacts upon ornithological (or ecological) features that are sufficiently widespread, unthreatened, and resilient to potential project impacts. As such, the assessment within this chapter considers in detail the potential for significant effects on ornithological features which are considered 'important' (i.e. IOFs), identified on the basis of baseline information, relevant guidance, literature, professional judgement, opinions of statutory nature conservation bodies (provided through consultations in relation to the Proposed Development) and, where relevant, other renewable energy developments.

6.2.7 Where ornithological features are not considered so important as to warrant a detailed assessment, or where they are unlikely to be significantly affected on the basis of baseline information, these are 'scoped out' of the assessment. Mitigation measures for such features have, however, been outlined as appropriate and in line with standard industry good practice to reduce and/or avoid any potentially adverse effects or to enable compliance with national legislation and protection afforded to breeding and (where relevant) roosting birds.

6.2.8 The following ornithological features have therefore been 'scoped out' from consideration within this Chapter; on the basis of their lower conservation priority and/or generally accepted low sensitivity to renewable energy developments (e.g. as recognised in NatureScot guidance for onshore wind energy developments in Scotland (SNH, 2017[28] and 2018a[11])):

- Common and/or low Nature Conservation Interest (NCI) species not recognised in statute as requiring special conservation measures i.e., not listed as Annex 1[32] or Schedule 1[33] 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[25] and 2024[26]) 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[10] and 2017[28]), unless being particularly rare or vulnerable at a national level.

6.2.9 As detailed in the Scoping Report and agreed in consultation with NatureScot in their Scoping Response (**Table 6-2** and **TA 1.2, EIAR Volume 4**), there is considered to be no connectivity between the Proposed Development and the South Tayside Goose Roosts SPA, or underpinning Ramsar site[34] and Drummond Lochs SSSI on the basis of the lack of suitable foraging habitat on/surrounding the Site for geese (**Figure 6.2, EIAR Volume 2**). NatureScot also advised (**Table 6-2** and **TA 1.2, EIAR Volume 4**) that it considers there to be no connectivity between the Site and the Ben Chonzie SSSI. The potential for effects upon qualifying features of ornithological designated sites is therefore scoped out of the assessment.

6.2.10 Those additional ornithological features scoped-out of detailed assessment following a review of baseline information and professional judgement are set out in **Section 6.3,** which include barn owl, goshawk, hen harrier, osprey, peregrine falcon, short-eared owl, white-tailed eagle, golden plover, greenshank, lapwing, barnacle goose, greylag goose, pink-footed goose and whooper swan.

[32] Species listed on Annex 1 of Directive 2009/147/EC of the European Parliament (the 'Birds Directive').

[33] Species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

[34] A wetland site designated to be of international importance under the Convention on Wetlands (the Ramsar Convention).

Potential Effects Scoped Out

6.2.11 The potential for significant effects upon all ornithological features arising from the following are scoped out of detailed consideration within the assessment:

- Infrastructure lighting; and
- Decommissioning.

Potential Operational Impacts (Turbine/Infrastructure Lighting)

6.2.12 Once installed on-site, the Proposed Development turbines would be lit in accordance with the Aviation Obstruction Lighting Proposal set out in **TA 13.1 Glentarken Lighting Report (EIAR Volume 4**).

6.2.13 It is acknowledged that lighting can have various effects on birds e.g. they may be attracted to lights and thereby placed at higher risk of collisions, have migration patterns disrupted, show avoidance of lights with a consequent displacement impact, or be subject to increased predation threat. NatureScot has identified attraction (phototaxis) as posing the principal threat to birds, in relation to wind turbine developments (NatureScot,2020[35]).

6.2.14 In NatureScot's advice on the scope of assessment for turbine lighting (2024[14]), an assessment of the possible effects of lighting on birds may be required in the following three situations, where risk is greater:

- wind turbines on or adjacent to a seabird colony that hosts burrow nesting species;
- wind turbines that are on or adjacent to protected areas that host large concentrations of wintering waterbirds, where such sites are located within open country away from other sources of artificial light; and
- where wind farms are located on migratory corridors or bottlenecks for nocturnally migrating passerines.

6.2.15 The location of the Proposed Development does not fall into any of the above greater risk scenarios.

6.2.16 In view of NatureScot guidance (2020[35] and 2024[14]), it is therefore highly unlikely that any species would be significantly affected by the lighting requirements of the Proposed Development and such effects are therefore scoped-out of assessment.

Decommissioning

6.2.17 As noted in **Chapter 2: Development Description (EIAR Volume 1**), a decision to refurbish, remove, or replace turbines would be made at the end of the Proposed Development operational lifetime. Whilst future ornithological baseline conditions cannot be accurately known at this stage, given the nature of decommissioning works, potential effects on ornithological features associated with the decommissioning the Proposed Development can be reasonably concluded as being of equal or lesser significance to construction disturbance/displacement effects, over a reduced timeframe.

6.2.18 Decommissioning phase impacts for any ornithological feature are therefore not considered in detail within this Chapter.

[35] NatureScot (2020) The Effect of Aviation Obstruction Lighting on Birds at Wind Turbines, Communication Towers and Other Structures. NatureScot Information Note. September 2020 v1.1.

Method of Baseline Characterisation

Extent of the Study Area

6.2.19 The ornithology assessment considers the following Study Areas which are based on the final turbine layout and associated infrastructure (**Figure 6.1, EIAR Volume 2**):

- Designated sites – the Proposed Development and a 20 km Study Area (from the proposed turbines) (based on the greatest foraging range for any species, as provided in SNH 2016b[20]) (**Figure 6.2, EIAR Volume 2**).
- Collision risk modelling (CRM) – the results of the flight activity surveys have been used for CRM. A 500 m buffer around the wind farm area has been used to create a Collision Risk Analysis Area (CRAA) (as per SNH 2017[28]) (**Figure 6.3, EIAR Volume 2**).
- Scarce breeding birds[36] – the Proposed Development and a 2 km[28]/800 m Study Area buffer (from the proposed turbines/access track respectively) (**Figure 6.1, EIAR Volume 2**).
- Black grouse – the Proposed Development and a 1.5 km[28]/750 m Study Area buffer (from the proposed turbines/access track respectively) (**Figure 6.1, EIAR Volume 2**).
- Breeding upland waders and wintering waders, raptors, owls and wildfowl – the Proposed Development and a 500 m[28] Study Area buffer (**Figure 6.1, EIAR Volume 2**).
- Cumulative assessment – as per NatureScot guidance (SNH 2018d[24]), 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 Study

6.2.20 The following key sources have been consulted for existing ornithological information within proximity to the Proposed Development to inform the assessment:

- NatureScot SiteLink[37];
- Central Raptor Study Group (CRSG) and Tayside and Fife Raptor Study Group (TFRSG); and
- RSPB Data Unit.

6.2.21 Peer-reviewed literature has also been referred to and is referenced where relevant.

Field Survey

6.2.22 Baseline ornithology surveys within and surrounding the Site were undertaken between April 2021 and August 2023. This covers three consecutive breeding seasons (2021, 2022 and 2023) and two consecutive non-breeding seasons (2021/2022 and 2022/2023).

6.2.23 The following surveys were undertaken following NatureScot survey guidance available at the time of surveys (SNH 2017[28]); refer to **TA 6.1 Ornithology, Annex B** (**EIAR Volume 4**) for details of the survey methodologies followed:

- Flight activity surveys (minimum of 36 hours per Vantage Point (VP) per season, as per SNH 2017[28]):
- April to August 2021, four VP locations (**Figure 6.3, EIAR Volume 2**);
- September 2021 to March 2022, four VP locations (**Figure 6.4, EIAR Volume 2**);
- March 2022 to March 2023, three VP locations (**Figure 6.5, EIAR Volume 2**);
- May to August 2023, five VP locations (**Figure 6.6, EIAR Volume 2**).

[36] 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.

[37] Available at: https://sitelink.nature.scot/

- Scarce breeding bird (SBBS)[36] surveys – spring/summer 2021 and 2022, with survey coverage of the turbine area and appropriate buffers, and spring/summer 2023 along the access track (**Figure 6.7, EIAR Volume 2**).
- Black grouse surveys – spring/summer 2021 and 2022, with survey coverage of the turbine area and appropriate buffers and spring/summer 2023 along the access track (**Figure 6.8, EIAR Volume 2**).
- Breeding bird (wader) surveys – spring/summer 2021 and 2022, with survey coverage of the turbine area and appropriate buffers and spring/summer 2023 along the access track (**Figure 6.9, EIAR Volume 2**).
- Winter walkover surveys – autumn/winter 2021/2022, with survey coverage of the turbine area and appropriate buffers (**Figure 6.9, EIAR Volume 2**).

Method of Assessment

6.2.24 The assessment of potentially significant effects upon ornithological features has been undertaken following the principles of CIEEM guidance (2022[15]).

6.2.25 The assessment methodology, including criteria for assessing sensitivity of features, magnitude of change and cumulative effects, as well as overall significance criteria, is detailed in **TA 6.3: Ornithology Assessment Methodology (EIAR Volume 4).**

Approach to Mitigation

6.2.26 The potential for significant effects upon ornithological features has been avoided in so far as has been possible through scheme design. The Proposed Development will also be constructed, operated and decommissioned in accordance with standard industry good practice, including measures to enable the legislative protection of wild birds and safeguard sensitive bird species including those listed on Schedule A1, 1 and 1A of the Wildlife and Countryside Act 1981 (see Section 6.4).

Limitations

6.2.27 No substantial limitations to baseline studies or assessment presented within this chapter have been identified.

6.2.28 Survey effort has either met or exceeded the minimum requirements stipulated in NatureScot guidance (SNH 2017[28]) and site-specific advice received from NatureScot (**Table 6-2** and **TA 1.2, EIAR Volume 4**). In general, weather conditions were appropriate for the surveys, but where not, surveys were suspended (or additional surveys were undertaken) (refer to **TA 6.1 Ornithology, EIAR Volume 4**).

6.2.29 Limitations do 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 therefore taken in those circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

6.2.30 Following the completion of baseline ornithological surveys, Stanbury *et. al* (2021[25]) issued an addendum to the Birds of Conservation Concern (BoCC) 5 list in September 2024 (Stanbury *et al*., 2024[26]). This addendum has reclassified common gull and great black-backed gull as Red list species (previously Amber list species) and which would now include them as target species for survey and recording during onshore wind farm surveys as recommended in NatureScot guidance (2017[17]). Common gull were however 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).

6.2.31 It is acknowledged that the turbine locations T6 and T8 are just outside (approx. 60-75 m) of VP viewsheds adopted in 2021-2022 baseline flight activity surveys (**Figure 6.3**, **Figure 6.4** and **Figure 6.5, EIAR Volume 2**). These turbine locations and their surrounding area were however extensively covered during additional flight activity surveys completed in 2023 (**Figure 6.6, EIAR Volume 2**). It is therefore considered that flight activity rates, that have been collectively recorded from all VPs over the baseline survey period, provide a sufficiently representative picture of target species presence and patterns and levels of flight activity for the purpose of estimating collision mortality risks for the Proposed Development. The approach and justification was agreed in consultation with NatureScot (**Table 6-2**).

6.2.32 It is also clarified that during the selection process for flight activity survey VPs, every effort was made to identify VP locations that offered appropriate viewshed coverage from outside of the turbine area, however this was constrained in some areas by the steep terrain present on the Site. The location of VPs near to proposed turbine locations is not considered to be a limitation to the dataset and the estimation of collision mortality risks. In the NatureScot collision risk model (Band *et al*., 2007), for each target species recorded during flight activity surveys, a single mean flight activity rate per unit area is estimated for the whole turbine area, and so the exact location of a vantage point in relation to turbines is not usually an influencing factor in the model (unless the turbine area is very small). In this case, the turbine area of the Proposed Development is of sufficient size for the large majority of its extent to be unaffected by a surveyor's presence. Recorded flight activity rates are therefore considered to be sufficiently representative for their use in the NatureScot collision risk model.

6.3 Baseline Conditions

Current Baseline

Ornithological Designated Sites

6.3.1 The Site does not form part of any statutory designated site with ornithological interests. Within 20 km of the Proposed Development, there is one SPA, two SSSIs, and one Ramsar site (**Figure 6.2, EIAR Volume 2**):

- South Tayside Goose Roosts SPA (underpinned by Drummond Lochs SSSI and South Tayside Goose Roosts Ramsar site), approximately 19.3 km to the south-east and designated for non-breeding greylag goose, pink-footed goose, a non-breeding waterfowl assemblage and breeding wigeon; and
- Ben Chonzie SSSI, approximately 7 km to the east and designated for its breeding bird assemblage.

6.3.2 Distances provided above are from the nearest Proposed Development turbine location to the designation boundary at its nearest point.

6.3.3 On the basis of spatial separation, with reference to NatureScot guidance (SNH, 2016b[20]) and the absence of habitat suitability for geese on or surrounding the Site, the potential for effects upon qualifying features of these ornithological designated sites is scoped-out of assessment and not considered further within this chapter. This is in accordance with NatureScot advice (**Table 6-2** and **TA 1.2, EIAR Volume 4**).

Flight Activity Summary

6.3.4 A summary of all target species recorded during flight activity surveys at the Site is presented in **Table 6-3**. 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 **TA 6.1 Ornithology (EIAR Volume 4)**.

6.3.5 A summary of the collision risk model results is presented in **Table 6-4**, with detailed analysis presented in **TA6.1 Ornithology Annex E** (**EIAR Volume 4**).

6.3.6 Note that whilst greylag geese, osprey and whooper swan were recorded during flight activity surveys (**Table 6-3**), no flights were identified to be 'at-risk' and so the species is not included in the collision risk model (and not presented in **Table 6-4**).

Table 6-3: Target Species Recorded During Flight Activity Surveys, 2021-2023

Species	Total number of flights	Total number of birds[38]	Total bird seconds[39]
Barnacle goose	1	14	1,190
Curlew	25	31	1,763
Golden eagle	150	187	24,857
Golden plover	6	64	1,905
Greylag goose	13	946	94,361
Hen harrier	25	27	2,318
Merlin	23	24	655
Osprey	2	2	105
Peregrine falcon	14	15	1,047
Pink-footed goose	1	21	1,365
Red kite	323	430	52,505
Short-eared owl	1	1	75
White-tailed eagle	11	13	4,054
Whooper swan	1	9	360

Table 6-4: Predicted Collision Rates.

Species	Mean breeding season	Mean non-breeding season	Mean annual	No. of years per collision
Barnacle goose	0	0.0129	0.0129	77
Curlew	0.0241	0.0031	0.0272	37
Golden eagle	0.1705	0.0794	0.2499	4
Golden plover	0.0038	0.0144	0.0182	55
Hen harrier	0.0084	0.0029	0.0113	89
Merlin	0.0027	0.0002	0.0029	341
Peregrine falcon	0.0369	0.00001	0.0369	27.1
Pink-footed goose	0	0.0133	0.0133	75
Red kite	0.5031	0.2317	0.7348	1.4
Short-eared owl	0	0.0003	0.0003	3,186
White-tailed eagle	0.1012	0	0.1012	9.9

[38] This includes a summation of the number of birds recorded within each flight, and which may include the same individual bird.

[39] 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.

Black Grouse

6.3.7 Baseline surveys identified six lek locations within the 2021, 2022 and 2023 survey areas as summarised in **Table 6-5** below and shown on **Figure 6.10** (**EIAR Volume 2**).

6.3.8 Based on the species' presence, lek activity recorded within the black grouse Study Area and the species' potential sensitivity to onshore wind farm development (SNH 2018a[11]), **black grouse is scoped into the assessment**.

Table 6-5: Black Grouse Leks (Maximum Counts).

Lek	Distance to nearest turbine	Distance to nearest infrastructure	2021	2022	2023
1	2021: 1.4 km (T1) 2022: 1.3 km (T1)	2021: 116 m (new access track) 2022: 21 m (new access track)	4 males 1 female	1 male 1 female	Outwith survey area
2	2022: 1.6 km (T1)	2022: 485 m (borrow pit 3)	No activity recorded	3 males	Outwith survey area
3	2022: 2.3 km (T8)	2022: 2.3 km (hardstanding)	No activity recorded	1 male	Outwith survey area
4	2023: 2.6 km (T1)	2023: 220 m (new access track)	Outwith survey area	Outwith survey area	1 male
5	2023: 3.5 km (T1)	2023: 4 m (new access track)	Outwith survey area	Outwith survey area	6 males 2 females
6	2023: 4.8 km (T1)	2023: 69 m (new access track)	Outwith survey area	Outwith survey area	1 male

Raptors and Owls

Barn Owl

6.3.9 Barn owl was recorded on one occasion during surveys (May 2021, **Figure 6.11, EIAR Volume 2**) and a possible roost location was located during 2022 surveys, over 3 km from the nearest proposed turbine/infrastructure (refer to **Confidential Figure 6.2.1** and **Confidential TA 6.2: Confidential Ornithology, EIAR Volume 5** for further details).

6.3.10 Guidance from Shawyer (2011[40]) provides a range of disturbance distances for continuous activity for breeding barn owl, including 20 m (pedestrian movement) to 175 m (heavy construction works). A more recent review of bird disturbance distances by Goodship & Furness (2022[18]) recommends an avoidance buffer of 50 m to 100 m. No proposed turbines or infrastructure are located within 3 km of the possible roost location and so considering this, the limited level of activity recorded within the rest of the SBBS Study Area and the species generally accepted low sensitivity to wind turbines (Barn Owl Trust, [41]), **barn owl is scoped out of the assessment (Section 6.2).**

Golden Eagle

6.3.11 Golden eagles were frequently recorded across the baseline survey period with a total of 150 flights recorded during flight activity surveys (see **Table 6-3** above and **Figure 6.12, EIAR Volume 2**). Activity was

[40] 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.

[41] Barn Owl Trust (2015) Wind turbines and Barn Owls. Available at: https://www.barnowltrust.org.uk/hazards-solutions/barn-owls-wind-turbines/#:~:text=Why%20are%20Barn%20Owls%20so,clearance%20well%20above%203%20metres [Accessed 25 October 2024].

predominately recorded during the breeding seasons and comprised that of adult, sub-adult/immature and juvenile birds.

6.3.12 Scarce breeding bird surveys undertaken for the Proposed Development did not identify any nest or roost locations within the Site or wider scarce breeding bird Study Area during surveys in the 2021, 2022 or 2023 breeding seasons.

6.3.13 Data provided by the CRSG identified four known golden eagle territories in the area around the Proposed Development, however no known territories are within the scarce breeding bird Study Area and the territories provided by the CRSG are 5.3 km to 11.6 km from the nearest proposed turbines (**Confidential Figure 6.2.2, EIAR Volume 5**).

6.3.14 The NatureScot collision risk model predicts a mean collision risk of one bird every four years (see **Table 6-4** above).

6.3.15 Considering this species' activity within the Site and wider scarce breeding bird Study Area, predicted collision mortality risks and potential for habitat displacement, **golden eagle is scoped into the assessment**.

Goshawk

6.3.16 An adult goshawk was recorded on one occasion during baseline surveys in March 2022 (see **Figure 6.11, EIAR Volume 2**). No evidence of breeding/roosting was identified within the Site. Data provided by the CRSG identified goshawk breeding activity (one known territory and two other possible territories/alternative nest sites) in a forestry block over 5 km from the Proposed Development (**Confidential Figure 6.2.4, EIAR Volume 5**)**.**

6.3.17 Considering this species' limited presence within the Site and wider scarce breeding bird Study Area and the absence of predicted collision risks, **goshawk is scoped out of the assessment** (**Section 6.2**).

Hen Harrier

6.3.18 Hen harrier were infrequently recorded across the baseline survey period. This included individual birds in April and May 2022 (see **Figure 6.11**, **EIAR Volume 2**) and no evidence of breeding/roosting was identified within the Site or wider scarce breeding bird Study Area. Consultation with the CRSG indicated that they did not hold any records of breeding hen harrier within 2 km of the Proposed Development.

6.3.19 Flight activity surveys recorded 25 flights (see **Table 6-3** above and **Figure 6.13, EIAR Volume 2**), and the NatureScot collision risk model predicts a mean collision risk of one bird every 89 years (see **Table 6-4**Table 6-4).

6.3.20 Considering this species' limited presence within the scarce breeding bird Study Area and negligible predicted risk of collision, **hen harrier is scoped out of the assessment** (**Section 6.2**).

Merlin

6.3.21 During baseline surveys, merlin were confirmed to be breeding at one location within the scarce breeding bird Study Area (see ML1_1

6.3.22 **Table** 6-6 and **Confidential Figure 6.2.5, EIAR Volume 5**), a further four potential breeding areas were also recorded (ML_2-5

6.3.23 **Table** 6-6 below and **Confidential Figure 6.2.5, EIAR Volume 5**). Refer to **Confidential TA 6.2** (**EIAR Volume 5**) for further detail. Consultation with the CSRG indicated that they had most recently monitored merlin in 2018 in the area and had monitored territories that overlap with ML_1, ML_3 and ML_4 identified by baseline surveys (**Confidential Figure 6.2.5, EIAR Volume 5**). Additionally, they provided what is possibly an alternative location to ML_1 (CRSG_ML_C on **Confidential Figure 6.2.5, EIAR Volume 5**) and ML_2 (CRSG_ML_D on **Confidential Figure 6.2.5, EIAR Volume 5**).

6.3.24 Flight activity surveys recorded a total of 23 flights (see **Table 6-3** and **Figure 6.14, EIAR Volume 2**), and collision risk modelling predicted a mean collision rate of one bird every 341 years (see **Table 6-4**).

6.3.25 Considering this species' breeding activity within the scarce breeding bird Study Area, **merlin is scoped into the assessment**.

Table 6-6: Summary of Merlin Breeding Activity.

Nest	Distance to nearest turbine	Distance to nearest infrastructure	2021	2022	2023
ML_1	333 m	272 m	Confirmed breeding.	Confirmed breeding.	Confirmed breeding.
ML_2	4.6 km	4.6 km	Possible territorial behaviour in April, but no further evidence of breeding.	Outwith 2022 survey area.	Outwith 2023 survey area.
ML_3	1.7 km	1.6 km	Nest suspected in April, but no further evidence of breeding.	Outwith 2022 survey area.	Outwith 2023 survey area.
ML_4	1.2 km	502 m	Adult pair present early in season/ possible territorial behaviour recorded, but no further evidence of breeding. Note the area is within 1.5 km of a confirmed territory (ML_1) and the recorded activity could potentially be attributed to that pair.	N/A	N/A
ML_5	5.9 km	2.6 km	Outwith 2021 survey area.	Outwith 2022 survey area.	Territorial behaviour recorded.

Osprey

6.3.26 Osprey were infrequently recorded across the baseline survey period, with individual birds recorded in May and July 2022 and July 2023 (see **Figure 6.11, EIAR Volume 2**). No evidence of breeding/roosting was identified within the Site or wider scarce breeding bird Study Area. Consultation with the CRSG indicated that they did not hold any records of breeding osprey within 2 km of the Proposed Development.

6.3.27 Flight activity surveys recorded two flights (**Table 6-3**, **Figure 6.15, EIAR Volume 2**), which were not identified to be 'at-risk' and therefore no risk of collision is predicted.

6.3.28 Considering this species' limited presence within the scarce breeding bird Study Area and no predicted risk of collision, **osprey is scoped out of the assessment** (**Section 6.2**).

Peregrine Falcon

6.3.29 Peregrine falcon were recorded occasionally across the baseline survey period and were suspected to be breeding at one location, approximately 5.6 km from the Proposed Development at its nearest point (see PE_1 **Confidential Figure 6.2.6, EIAR Volume 5**). Refer to **Confidential TA 6.2** (**EIAR Volume 5**) for further detail. Consultation with the CSRG indicated that PE_1 identified by baseline surveys (**Confidential Figure 6.2.6, EIAR Volume 5**) was known to them as an historical breeding site.

6.3.30 Flight activity surveys recorded a total of 14 flights (see **Table 6-3** above and **Figure 6.15, EIAR Volume 2**). The NatureScot collision risk model predicts a mean collision risk of one bird every 27.1 years (see **Table 6-4** above).

6.3.31 Considering this species' limited presence within the scarce breeding bird Study Area, distance to nearest (potential) breeding site and negligible predicted risk of collision, **peregrine falcon is scoped out of the assessment** (**Section 6.2**).

Red Kite

6.3.32 Red kite were the most frequently recorded raptor species across the baseline survey period (**Confidential Figure 6.2.7**). Most records were of individual birds, however observations of up to six birds were also recorded.

6.3.33 Red kite were identified to be breeding at two locations (see KT_1 and KT_2, **Table 6-7** below and **Confidential Figure 6.2.7, EIAR Volume 5**). Refer to **Confidential TA 6.2** (**EIAR Volume 5**) for further detail. Consultation with the CSRG indicated that they had monitored territories that overlap with KT_1 (CSRG_KT_C, **Confidential Figure 6.2.7, EIAR Volume 5**) and KT_2 (CSRG_KT_E, **Confidential Figure 6.2.7, EIAR Volume 5**) identified by baseline surveys. Additionally, they provided four other known nest areas (CRSG_KT_B1, B2, A and D on **Confidential Figure 6.2.5, EIAR Volume 5**), however these are all over 8 km from the Proposed Development.

6.3.34 Flight activity surveys recorded 323 flights (see **Table 6-3** above and **Figure 6.16, EIAR Volume 2**), and the NatureScot collision risk model predicts a mean collision risk of one bird every 1.4 years (see **Table 6-4** above).

6.3.35 Considering this species' activity within the scarce breeding bird Study Area and the predicted collision risk, **red kite is scoped into the assessment**.

Table 6-7: Summary of Red Kite Breeding Activity.

Nest	Distance to nearest turbine	Distance to nearest infrastructure	2021	2022	2023
KT_1	4.8 km	4.8 km	Confirmed breeding.	Outwith 2022 survey area.	Outwith 2023 survey area.
KT_2	5.9 km	634 m	Outwith 2021 survey area.	Outwith 2022 survey area.	Probable breeding.

Short-Eared Owl

6.3.36 Short-eared owl were recorded on two occasions during baseline surveys in September 2022 and July 2023 (see **Figures 6.11** and **Figure 6.15, EIAR Volume 2**). No evidence of breeding/roosting was identified

within the Site or wider scarce breeding bird Study Area. Consultation with the CRSG indicated that they did not hold any records of breeding short-eared owl within 2 km of the Proposed Development.

6.3.37 The observations included a single flight during flight activity surveys (see **Table 6-3** above and **Figure 6.15, EIAR Volume 2**), and the NatureScot collision risk model predicts a mean collision rate of one bird every 3,186 years (see **Table 6-4** above).

6.3.38 Considering this species' limited presence within the scarce breeding bird Study Area and negligible predicted risk of collision, **short-eared owl is scoped out of the assessment** (**Section 6.2**).

White-Tailed Eagle

6.3.39 White-tailed eagle were occasionally recorded during the baseline survey period, with individual birds recorded in January and May 2022 (see **Figure 6.11, EIAR Volume 2**) and a total of 11 flights during flight activity surveys (see **Table 6-3** above and **Figure 6.15, EIAR Volume 2**).

6.3.40 No evidence of breeding/roosting was identified within the Site or wider scare breeding bird Study Area and the NatureScot collision risk model predicts a mean collision rate of one bird every 9.9 years (see **Table 6-4** above). Consultation with the CRSG indicated that they did not hold any records of breeding white-tailed eagle within 6 km of the Proposed Development.

6.3.41 Considering this species' limited presence within the scarce breeding bird Study Area and negligible predicted risk of collision, **white-tailed eagle is scoped out of the assessment** (**Section 6.2**).

Waders

6.3.42 **Table 6-8** below provides a summary of the estimated numbers of target breeding wader territories (i.e. Annex I, Schedule 1, BoCC Red-listed[25,26]) within the upland breeding wader Study Area and within 500 m of proposed turbine locations. Species registrations are illustrated on **Figure 6.17** (**EIAR Volume 2**), with greenshank illustrated on **Confidential Figure 6.2.8 (EIAR Volume 5)**.

Table 6-8: Breeding wader activity, 2021-2023

Species	2021 Total within 500 m Study Area	2021 Total within 500 m of proposed turbines	2022 Total within 500 m Study Area	2022 Total within 500 m of proposed turbines	2023 (access track) Total within 500 m Study Area	2023 (access track) Total within 500 m of proposed turbines
Curlew	4	0	5-6	2-3	3-5	0
Golden plover	0-1	0-1	0-3	0-3	0-1	0
Greenshank	Not recorded	Not recorded	Not recorded	Not recorded	0-1	0-1
Lapwing	0	0	Not recorded	Not recorded	1-2	0

Curlew

6.3.43 Curlew were identified to be breeding within the Site and wider upland breeding wader Study Area during baseline surveys (**Table 6-8**, **Figure 6.17**) with activity primarily to the west of the turbine area and along the proposed main western access track.

6.3.44 Flight activity surveys recorded a total 25 flights (see **Table 6-3** above and **Figure 6.18, EIAR Volume 2**), with the NatureScot collision risk model predicting a mean collision risk of one bird every 37 years (see **Table 6-4** above).

6.3.45 Considering this species' breeding activity within the Site, **curlew is scoped into the assessment**.

Golden Plover

6.3.46 Golden plover were infrequently recorded across the baseline survey period, this included activity of individual birds displaying potential breeding behaviour (see **Table 6-8** above and **Figure 6.17, EIAR Volume 2**) however, no confirmed breeding activity was recorded in any survey year.

6.3.47 Flight activity surveys recorded a total of six flights (see **Table 6-3** above and **Figure 6.18, EIAR Volume 2**), with the NatureScot collision risk model predicting a mean collision risk of one bird every 55 years (see **Table 6-4** above).

6.3.48 Considering the species' limited presence within the upland breeding wader Study Area, no confirmed breeding activity and negligible predicted risk of collision, **golden plover is scoped out of the assessment** (**Section 6.2**).

Greenshank

6.3.49 Greenshank were only recorded on two occasions during the 2023 breeding season, with one possible territory identified to be within 500 m of proposed turbine locations (see **Table 6-8** above and **Confidential Figure 6.2.8, EIAR Volume 5**).

6.3.50 Goodship & Furness (2022[18]) recommend a disturbance buffer of 300-500 m for greenshank. No turbines or infrastructure associated with the Proposed Development is located within 300 m of the potential greenshank territory recorded, however T10 is located approximately 400 m away and the proposed borrow pit adjacent to T3 is located approximately 465 m away.

6.3.51 Considering the low level of greenshank activity recorded during the baseline surveys and the limited extent of development within 500 m of the potential territory and no development within 300 m, **greenshank is scoped out of the assessment** (**Section 6.2**).

Lapwing

6.3.52 Lapwing were infrequently observed during baseline surveys, with breeding activity in the Study Area limited to along the proposed access track (see **Table 6-8** above and **Figure 6.17, EIAR Volume 2**) and where the potential for breeding activity to be displaced by the construction and operation of the Proposed Development is likely to be negligible.

6.3.53 Considering the species' low level of presence within the upland breeding wader Study Area and no predicted risk of collision, **lapwing is scoped out of the assessment** (**Section 6.2**).

Geese, Swans and Gulls

Barnacle Goose

6.3.54 Flight activity surveys recorded one barnacle goose flight (see **Table 6-3** above and **Figure 6.19, EIAR Volume 2**), with the NatureScot collision risk model predicting a mean collision risk of one bird every 77 years (see **Table 6-4** above).

6.3.55 Considering this species' limited presence within the wintering wildfowl Study Area and negligible predicted risk of collision, **barnacle goose is scoped out of the assessment** (**Section 6.2**).

Greylag Goose

6.3.56 Greylag geese were infrequently recorded during the baseline survey period with one to three birds recorded on six occasions in April 2021, May 2021, April 2022 and April 2023. Activity was predominately focussed around the Loch Lednock Reservoir (approximately 3 km to the north east of the Site).

6.3.57 Flight activity surveys recorded a total of 13 flights (see **Table 6-3** above and **Figure 6.19, EIAR Volume 2**), which were not identified to be 'at-risk' and therefore no risk of collision is predicted.

6.3.58 Considering this species' limited presence within the wintering wildfowl Study Area, no predicted risk of collision and absence of connectivity between the Site and the South Tayside Goose Roosts SPA (see **Table 6-2** and **TA 1.2, EIAR Volume 4**), **greylag goose is scoped out of the assessment** (**Section 6.2**).

Pink-Footed Goose

6.3.59 Flight activity surveys recorded one flight of pink-footed goose (see **Table 6-3** above and **Figure 6.19, EIAR Volume 2**), with the NatureScot collision risk model predicting a mean collision rate of one bird every 75 years (see **Table 6-4** above).

6.3.60 Considering this species' limited presence within the wintering wildfowl Study Area, negligible predicted risk of collision and absence of connectivity between the Site and absence of connectivity between the Site and the South Tayside Goose Roosts SPA (see **Table 6-2** and **TA 1.2, EIAR Volume 4**), **pink-footed goose is scoped out of the assessment** (**Section 6.2**).

Whooper Swan

6.3.61 Flight activity surveys recorded one flight of whooper swan goose (see **Table 6-3** above and **Figure 6.19, EIAR Volume 2**), which was not identified to be 'at-risk' and therefore no risk of collision is predicted.

6.3.62 Considering this species' limited presence within the wintering wildfowl Study Area and no predicted risk of collision, **whooper swan is scoped out of the assessment** (**Section 6.2**).

Future Baseline

6.3.63 In the absence of the Proposed Development, assuming the continuation of the current land management practices within and around the Site (predominately upland moorland habitat managed for deerstalking/sheep grazing, with small areas of woodland/plantation along the lower reaches of Glen Beich) and allowing for changes in bird behaviour and distribution related to climate change, bird populations recorded within and in proximity to the Site are likely to continue to be present in similar abundances and distributions to those described in the current baseline.

6.3.64 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[29])), rather than site-specific factors.

Sensitive Features

6.3.65 The assessment is applied to those scoped in IOFs (see **Table 6-9** below) of medium or high NCI, as established through baseline studies (**Section 6.2**) and consultations (**Table 6-2** and **TA 1.2, EIAR Volume 4**).

Table 6-9: Summary of Scoped in IOFs.

Feature	NCI	Reason for inclusion
Black grouse	Medium	BoCC Red listed, priority bird species for assessment in Scotland (SNH 2018a[11]).
Golden eagle	Medium	Annex I and Schedule 1 listed. Priority bird species for assessment in Scotland (SNH 2018a[11]).
Merlin	Medium	Annex I, Schedule 1, and BoCC Red listed. Priority bird species for assessment in Scotland (SNH 2018a[11]).
Red kite	Medium	Schedule 1 and Annex I listed. Priority bird species for assessment in Scotland (SNH 2018a[11]).
Curlew	Medium	BoCC Red listed, priority bird species for assessment in Scotland (SNH 2018a[11]).

Table 6-10: Conservation Status of Scoped in IOFs.

IOF	Conservation status	Information
Black grouse	BoCC Red list (HD, BDp[2], BDMp[1], BDMr[2])	Black grouse is Red-listed due to historical population declines in the UK between 1800 and 1995, without substantial recent recovery. It also qualifies due to a severe decline in the UK breeding population size of >50 % over 25 years. Breeding numbers in the UK declined by 80 % between 1991 and 2004. Sim *et al.* (2008[42]) estimated there to be 5,078 male black grouse in the UK in 2005, with approximately two-thirds of these occurring in Scotland. However, Forrester *et al.* (2012[43]) estimate that in Scotland there are around 3,550 to 5,750 lekking males, representing about 71 % of the British population. In Scotland the breeding range is contracting, and numbers are declining, though the rate of decline varies regionally, being higher in southwestern Scotland (-49 %) compared to north Scotland (-16 %). Evidence therefore suggests that the national and regional populations are in unfavourable conservation status. Wilson *et al.* (2015[30]) estimated the NHZ 15 population to be 844 (range 604-1,155) displaying males.
Golden eagle	Annex I, BoCC Green list	The Scottish golden eagle population has been relatively stable over the last few decades but has more recently shown signs of increasing, from a total of 442 breeding pairs estimated at the 2003 Scottish national census (Eaton *et al.* 2007[44]) to 508 territories following the 2015 Scottish national census (Hayhow *et al*. 2017[45]). The NHZ 15 golden eagle population was previously determined by Whitfield *et al*. (2008[46]) to be in unfavourable conservation status because, in 2003, only 12 ranges out of 27 known at that time were occupied (and it was noted that this low occupancy was likely linked to low survival). Formal updates to regional conservation status' following the 2015 census have not yet been published. A review of the various monitoring regions, with NHZ 15 being most comparable to the Central: Stirling and Tayside: Perth & Kinross Scottish Raptor Monitoring Scheme (SMRS) regions, identifies that in 2022 (Challis *et al.* 2023[47]) there were 29 occupied

[42] Sim, I.M.W., Eaton, M.A., Setchfield, R.P., Warren, P.K. & Lindley, P. (2008) Abundance of male black grouse *Tetrao tetrix* in Britain in 2005, and changes since 1995-96. *Bird Study*, **55**, pp. 303-313

[43] Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. and Grundy, D.S. eds. (2012). The digital birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

[44] Eaton, M.A., Dillon, I.A., Stirling-Aird, P.K. & Whitfield, D.P. 2007. Status of Golden Eagle Aquila chrysaetos in Britain in 2003. Bird Study 54: 212–220.

[45] Hayhow D. B., Benn S., Stevenson A., Stirling-Aird P.K. & Eaton M.A. (2017): Status of Golden Eagle Aquila chrysaetos in Britain in 2015, Bird Study, DOI: 10.1080/00063657.2017.1366972.

[46] Whitfield, D P, Fielding, A H, McLeod, D R A and Haworth, P F (2008). A conservation framework for golden eagles: implications for their conservation and management in Scotland. Scottish Natural Heritage Commissioned Report No.193 (ROAME No. F05AC306).

[47] Challis, A., Beckmann, B.C., Wilson, M.W., Eaton, M.A., Stevenson, A., Stirling-Aird, P., Thornton, M. & Wilkinson, N.I. (2023). Scottish Raptor Monitoring Scheme Report 2021 & 2022. BTO Scotland, Stirling.

IOF	Conservation status	Information
		territories (of 33 checked) across these two SRMS regions which result in a territory occupancy of 81.8 %. Consequently, as of 2022 it is considered that the criteria for favourable condition (>66% occupancy) has likely been met for NHZ 15.
Merlin	Schedule 1, Red list (HD, ERLOB)	The last national merlin survey, carried out in 2008, suggested a UK breeding population of around 1,162 breeding pairs with about 733 pairs in Scotland (Ewing *et al.* 2011[48]). In comparison with the previous 1993-94 survey, this suggests an overall stable population, albeit with regional differences in success. The NHZ 15 population was last estimated to be 31 (range 21-45) pairs in 2008 (Wilson *et al.* 2015[30]). A review of the various Scottish raptor monitoring regions identifies that NHZ 15 is most comparable to the Central: Stirling and Tayside: Perth & Kinross SMRS regions. The SRMS annual reports for 2022, 2021[47] and 2020 (Challis *et al.* 2023[47] and 2022a[49]; the three most recent published years) for these two regions report 6, 10 and 10 ranges respectively occupied by pairs (of the 27, 39 and 26 ranges respectively checked). The latest analysis of SRMS data (for the period 2009-2018, Challis *et al*. 2022b[50]) did not produce any national trends in the breeding number or productivity of merlin, but estimates were produced for five of the 12 SRMS regions (including Tayside and Fife) and for six of the 20 NHZ regions (not including NHZ 15). For Tayside and Fife the analysis suggested that the number of breeding merlin did not change significantly, although a downwards trend is illustrated. The conservation status of the regional/NHZ breeding merlin population is therefore unknown, but possibly declining or under-recorded outside of national census surveys.
Red kite	Annex I, Schedule 1, BoCC Green list	Woodward *et al.* (2020[51]) estimates the red kite UK breeding population to be 4,400 pairs (based on 2017 data) and red kite are included on the BoCC Green list (Stanbury *et al.* 2021[25]) indicating that the population is in favourable conservation status. The Scottish red kite breeding population was estimated by the SMRS to be at least 273 pairs in 2015 with 298 of 396 ranges checked in 2022 occupied (Challis *et al.* 2023[49]). In 2018 the RSPB have quoted a Scottish population of 'around 350 breeding pairs'[52]. Red kite were re-introduced in the central Scotland region (near Doune) between 1996 and 2001, with the NHZ 15 population most recently estimated as 27 pairs (range of 21-45 pairs) in 2013 (Wilson *et al.* 2015[30]). A review of the various monitoring regions has identified that NHZ 15 is most comparable to the Central: Stirling and Tayside: Perth & Kinross SMRS regions. The SRMS annual reports for 2022, 2021[47] and 2020 (Challis *et al.* 2023[47] and 2022a[53]; the three most recent published years) for these two regions indicated 65, 70 and 69 ranges respectively occupied by breeding pairs (of the 110, 124 and 115 ranges

[48] Ewing, S. R., Rebecca, G.W., Heavisides, A., Court, I.R., Lindley, P., Ruddock, M., Cohen, S. and Eaton, M.A. (2011). Breeding status of Merlins Falco columbarius in the UK in 2008. Bird Study 58: 379-389

[49] Challis, A., Wilson, M.W., Eaton, M.A., Stevenson, A., Stirling-Aird, P., Thornton, M. & Wilkinson, N.I. (2022). Scottish Raptor Monitoring Scheme Report 2020. BTO Scotland, Stirling.

[50] Challis, A., Wilson, M.W., Eaton, M.A., Etheridge, B., Kortland, K., Mattingley, W., Steele, L.D., Stevenson, A., Stirling-Aird, P., Thornton, M., Titherington, J., Wernham, C.V. & Wilkinson, N.I. (2022). Scottish Raptor Monitoring Scheme Trends Summary 2009-2018. BTO Scotland, Stirling

[51] 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.

[52] https://community.rspb.org.uk/ourwork/b/scotland/posts/red-kite-conservation

[53] Challis, A., Wilson, M.W., Eaton, M.A., Stevenson, A., Stirling-Aird, P., Thornton, M. & Wilkinson, N.I. (2022). Scottish Raptor Monitoring Scheme Report (2020). BTO Scotland, Stirling.

IOF	Conservation status	Information
		respectively checked), and which suggests an overall stable population (indeed, the five-year average for 2018-2022 is 68 occupied ranges). It appears that the NHZ 15 regional population is relatively stable and is likely to have a favourable conservation status.
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[51]) 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 15 population was most recently estimated to be 1,434 (1,287-1,581) pairs in 2005 (Wilson *et al.* 2015[30]) and given curlew are known to be in a continued decline nationally (10.3% decline in Scotland between 2017 and 2021), a possible NHZ 15 population estimate is 1,154 pairs, based on a decrease of the lower 2005 estimate.
BoCC Red-list criteria (Stanbury *et al.* 2021) HD = historical decline in the breeding population. BDp[2] = severe breeding population decline over 25 years/longer term. **BoCC Amber-list criteria (Stanbury *et al.* 2021)** ERLOB = threatened in Europe. BDMp[1] = moderate breeding population decline over 25 years/longer term. BDMr[2] = moderate breeding range decline over 25 years/longer term. WDMp[1] = moderate non-breeding population decline over 25 years. BI = breeding international importance.		

6.4 Assessment of Likely Effects

6.4.1 This section presents the assessment of potentially significant effects upon IOFs, in the absence of non-embedded standard (additional) mitigation as a result of the Proposed Development alone.

6.4.2 The following potential impacts are assessed, as relevant, for ornithological features scoped-in to the assessment:

- Construction and decommissioning phase impacts;
- Disturbance/displacement to birds during construction due to vehicular traffic, operating plant and the presence of construction workers;
- Operational phase impacts;
- Disturbance/displacement to birds during the operation of the turbines, vehicular traffic and the presence of people during operations; and/or
- The risk of death or injury through collision with wind turbine blades or other types of infrastructure associated with the Proposed Development. For the collision risk modelling methods used see **TA 6.1: Ornithology, Annex E (EIAR Volume 4)**. As no or very low collision risks were predicted for black grouse, curlew and merlin, it can be reasonably concluded that the magnitude of operational collision risk effects for these IOFs is of negligible significance and a detailed assessment is not required nor been undertaken.

6.4.3 The assessment is also based on the assumption of embedded standard mitigation measures and implementation and finalisation of a BEMP as set out below.

Embedded Mitigation

6.4.4 The following specific ornithological constraints buffers, identified with reference to Goodship and Furness (2022[18]), have been adopted in so far as has been possible during scheme design to avoid the potential for disturbance (and therefore displacement) of sensitive ornithological features, whilst retaining a viable scheme and meaningful contribution to renewable energy targets:

6.4.5 Avoidance of infrastructure within 500 m of Schedule 1 species' breeding sites; and

6.4.6 Avoidance of turbines within 500 m of black grouse lek locations.

6.4.7 This Chapter has also been prepared on the basis that the following standard, industry good practice, measures will form part of the Proposed Development:

- To ensure all reasonable precautions are taken to avoid disturbance to birds and comply with environmental legislation, prior to construction, decommissioning and where relevant during the operation of the Proposed Development, the Applicant (or subsequent operator of the Proposed Development) will appoint a suitably qualified Ecological Clerk of Works (ECoW) who will advise its appointed contractors on all ornithological (and ecological) matters (with the assistance of a suitably qualified/licenced ornithologist if required). The ECoW will be present on Site during the construction and decommissioning periods as required, and will carry out monitoring of works and briefings with regards to any ornithological sensitivities on the Site to the appointed contractors; and
- A Bird Disturbance Management Plan (BDMP) will be prepared and implemented for the Proposed Development, which will detail good practice and species-specific measures to be implemented during construction, decommissioning and where relevant during operational maintenance activities, to enable legislative compliance and safeguard sensitive bird species including those listed on Schedule A1, 1 and 1A of the Wildlife and Countryside Act 1981 (as amended). The BDMP shall be informed by information obtained during baseline studies, pre-commencement surveys, consultation with third-party recording groups and industry good practice.

Biodiversity Enhancement Management Plan (BEMP)

6.4.8 This chapter has also been prepared in view of the requirements of NPF4 Policy 3 and the finalisation and implementation of a Biodiversity Enhancement Management Plan (BEMP) as part of the Proposed Development, based on the OBEMP submitted as **TA 7.7** (**EIAR Volume 4**).

6.4.9 The BEMP will be finalised post consent on the basis of the OBEMP in consultation with relevant landowners, Perth and Kinross/Stirling Council, NatureScot and other stakeholders prior to the commissioning of the Proposed Development.

6.4.10 Specifically in relation to ornithological features, Aim 3 of the OBEMP will include for measures aimed at conserving and enhancing of breeding wader productivity within the Site in an area away from operational infrastructure (HMA Unit C, **Figure 7.15, EIAR Volume 2**).

6.4.11 Aims 1 and 2 of the OBEMP also set out habitat enhancement in relation to peatland restoration/enhancement (HMA Unit A, **Figure 7.15, EIAR Volume 2**) and grassland restoration (via bracken control, HMA Unit C, **Figure 7.15, EIAR Volume 2**), including in areas away from operational infrastructure which will provide benefit for local bird populations.

Black Grouse

Potential Construction Effects

6.4.12 **Impact**: lekking or foraging black grouse may be displaced during construction, either by disturbance or direct habitat loss.

6.4.13 **Sensitivity**: medium NCI and unfavourable conservation status (**Table 6-10** above). Consequently, black grouse sensitivity in the context of the Site and for the purposes of assessment is considered to be medium-high.

6.4.14 **Magnitude of impact**: according to an expert review by Goodship & Furness (2022[18]), lekking males may be actively disturbed at up to 500 m to 750 m from a disturbance source. NatureScot therefore generally advocates that a buffer of up to 750 m should be applied to avoid all disturbance to lekking black grouse during the construction phase, based on information in Zwart *et al.* (2015[54]).

6.4.15 Five of the six lek locations identified during baseline surveys are within 750 m of infrastructure associated with the Proposed Development (**Table 6-5** and **Figure 6.10, EIAR Volume 2**), however none of these lek areas are located within 750 m of the turbines associated with the Proposed Development; with black grouse lekking activity predominantly recorded along Glen Beich (**Figure 6.10, EIAR Volume 2**) where the proposed access track route is located.

6.4.16 Adopting a worst-case scenario for the purposes of assessment and assuming the temporary loss of up to eight lekking males across five lek sites along the access track route during construction works, this would represent 1.3 % of the NHZ 15 population of 604 males (lower population estimate from Wilson *et al.* 2015[30] used considering black grouse are considered to be in unfavourable conservation status, see **Table 6-10** above). This worst-case scenario of the temporary loss of up to eight lekking males is considered to be of medium spatial and short-term temporal magnitude.

6.4.17 It should however be noted that the future baseline for black grouse lek distribution along Glen Beich is likely to change as a woodland planting scheme has been installed along the lower reaches of the glen that will most likely result in the displacement of some level lek activity at leks 4, 5 and 6 (see **Figure 6.10, EIAR Volume 2**) to either leks 1 and 2 or to another location.

6.4.18 **Significance of effect**: the effect on the regional (NHZ 15) black grouse population as a result of construction disturbance is considered to be minor-moderate adverse and therefore **potentially significant** in the context of the EIA regulations. Additional mitigation measures are therefore outlined in **Section 6.5** for implementation as part of the BDMP during the construction phase of the Proposed Development.

Potential Operational Effects – Displacement

6.4.19 **Impact**: wind farm operation may cause some displacement of lekking, breeding and foraging black grouse from areas close to turbines and other infrastructure.

6.4.20 **Sensitivity**: medium-high.

6.4.21 **Magnitude of impact**: Studies in Central Europe have previously suggested that black grouse leks may be adversely affected by wind farms, although it is not clear what the exact causes may be – potentially a

[54] Zwart, M. C., P. Robson, S. Rankin, M. J. Whittingham, and P. J. K. McGowan (2015). Using environmental impact assessment and post-construction monitoring data to inform wind energy developments. Ecosphere 6(2):26. http://dx.doi.org/10.1890/ES14-00331.1

combination of turbine noise, maintenance activities or collisions (Zeiler and Grünschachner-Berger 2009[55]). In Scotland, early-stage operational monitoring (in 2014 and 2015) at the Berry Burn Wind Farm has however indicated that in some cases there were no obvious effects on black grouse behaviour with lekking areas recorded within 250 m and 420 m of turbines and black grouse activity recorded across the whole wind farm area (droppings and birds) (Nevis 2015[56] and 2016[57]). Whilst there is conflicting evidence for species displacement from wind farms within different parts of the species range, NatureScot generally advocates that a buffer of up to 500 m should be applied to avoid all potential displacement effects during turbine operation.

6.4.22 Of the six lek locations recorded during the baseline survey period, no locations are within 500 m of the proposed turbine locations (**Table 6-5** above and **Figure 6.10, EIAR Volume 2**). The access track for the Proposed Development (that runs up Glen Beich) will continue to be within 500 m of leks 1, 4, 5 and 6 (in **Figure 6.10**, **EIAR Volume 2** note that the infrastructure relating to the batching plant, borrow pits, construction compound and laydown areas is all temporary infrastructure associated with the construction phase).

6.4.23 Whilst traffic on the proposed access track will be considerably reduced in comparison to during the construction phase and that it is likely that grouse lekking along the access track will have habituated to a certain level of traffic as a result of the construction phase, as a worst-case there is a risk that birds at lek locations along the access track may be displaced by traffic accessing the Proposed Development during the operational phase.

6.4.24 The potential disturbance of up to eight lekking males along the access track at any one time represent around 1.3 % of the NHZ 15 population of 604 males (Wilson *et al.* 2015[30], lower population estimate used considering black grouse are considered to be in unfavourable conservation status **Table 6-10**).

6.4.25 **Significance of effect**: the unmitigated effect on the regional (NHZ 15) black grouse population as a result of operation is considered to be minor-moderate adverse and therefore **potentially significant** in the context of the EIA regulations. Additional mitigation measures are therefore outlined in **Section 6.5** for implementation as part of the BDMP during the operational phase of the Proposed Development.

Golden Eagle

Potential Construction Effects

6.4.26 **Impact**: breeding or foraging golden eagle may be displaced from the site during construction, either by disturbance or direct habitat loss.

6.4.27 **Sensitivity**: medium NCI (**Table 6-9** above) and favourable conservation status (**Table 6-10** above). Consequently, golden eagle sensitivity in the context of the Site and for the purposes of assessment is considered to be medium.

6.4.28 **Magnitude of impact**: Goodship and Furness (2022[18]) and NatureScot (SNH, 2014[58]) recommend a buffer of 1 km as a safe operating distance from active golden eagle nests. Given that baseline surveys did not identify any golden eagle breeding sites within the (2 km) scarce breeding bird Study Area, and that

[55] Zeiler H., V. Grünschachner-Berger (2009). Impact of wind power plants on black grouse, Lyrurus tetrix in Alpine Regions. Folia Zool. 58(2): 173–182

[56] Nevis (February 2016). 2015 Habitat Management Plan Implementation.

[57] Nevis (June 2015). 2014 Habitat Management Plan Implementation.

[58] SNH (2014) Implications of Additional Protection for Hen Harrier, Red Kite and Golden Eagle under Schedules A1 and 1A of the Wildlife and Countryside Act (1981). SNH, Guidance Note.

breeding sites provided by the CSRG are all over 5 km from the nearest proposed turbines (**Confidential Figure 6.2.2, EIAR Volume 5**), it is considered that any breeding golden eagle activity will be sufficiently distant from the Proposed Development to preclude the potential risk of direct construction disturbance.

6.4.29 **Confidential Figure 6.2.2** (**EIAR Volume 5**) presents the Golden Eagle Topographical ('GET') model (Fielding *et al*., 2019[59]) layer for the Site and surrounding area. The GET model assigns a score of between 1 and 10 at a 50 m pixel resolution; with a GET model score of 6+ being a good indicator of potential golden eagle activity and habitat with a GET score of 5 or less, assumed as being used infrequently by golden eagles (note that **Confidential Figure 6.2.2** and **Confidential Figure 6.2.3, EIAR Volume 5** only show the habitat with a GET score of 6+). Through scheme design, the majority of turbines have been located within areas which have a GET score of less than 6 and therefore predicted as being less preferred by golden eagles. Some areas of the Proposed Development are however located in topography potentially suited for foraging golden eagle (i.e. GET 6+ (**Confidential Figure 6.2.2, EIAR Volume 5**) and so some temporary loss of preferable habitat due to disturbance from construction activities may occur.

6.4.30 The GET model layer does however show a relatively high incidence of GET 6+ habitat outside of the Site within the surrounding wider area, including large areas of continuous GET 6+ within 10 km of the Site boundary, and which provide extensive foraging habitat for golden eagles at a local level (**Confidential Figure 6.2.2, EIAR Volume 5**). In the absence of any known breeding sites within the scarce breeding bird Study Area (as identified by the baseline surveys and information provided by the CRSG), it is considered unlikely that the GET 6+ habitat within the Site forms a core part of any occupied breeding golden eagle range present in the wider area, and therefore any short-term, localised loss of foraging habitat is unlikely to impact on an individual's survival probability or viability of an occupied breeding range forming part of the most recently reported regional population (see **Table 6-10**). As a worst-case, an effect of negligible and short-term magnitude is predicted.

6.4.31 **Significance of effect**: the effect on the regional golden eagle population as a result of construction is considered to be no more than minor and therefore **not significant** in the context of the EIA regulations.

Potential Operational Effects – Displacement

6.4.32 **Impact**: golden eagle may be at risk of displacement from foraging habitat, thereby impacting on productivity, fitness and survival rates.

6.4.33 Sensitivity: medium.

6.4.34 **Magnitude of impact**: behaviour evidence from satellite tagged golden eagles in Scotland, compiled by Fielding *et al.* (2019[59], 2021[60], 2022[61]), has shown that there is clear avoidance of wind farms by foraging golden eagles, and likely, out to 300 m around individual turbines, depending on habitat quality. Such avoidance may therefore result in the indirect loss of otherwise available foraging habitat to both range holding and non-range holding (young dispersing) birds.

[59] Fielding, A.H., Haworth, P.F., Anderson, D., Benn, S., Dennis, R., Weston, E and Whitfield, P. (2019) A simple topographical model to predict Golden Eagle *Aquila chrysaetos* space use during dispersal. *Ibis*, **162**(2),

[60] Fielding AH, Anderson D, Benn S, Dennis R, Geary M, Weston E, et al. (2021) Non-territorial GPS-tagged golden eagles Aquila chrysaetos at two Scottish wind farms: Avoidance influenced by preferred habitat distribution, wind speed and blade motion status. PLoS ONE 16(8): e0254159. https://doi.org/10.1371/journal.pone.0254159

[61] Fielding, A. H., Anderson, D., Benn, S., Dennis, R., Geary, M., Weston, E. and Whitfield, D. P. (2022). Responses of dispersing GPS-tagged Golden Eagles (Aquila chrysaetos) to multiple wind farms across Scotland. Ibis 164(1), 102-117.

6.4.35 The potential for significant effects upon non-range holding golden eagles (i.e. non-breeding, young dispersing birds) is unlikely in this case, given the extent of good golden eagle habitat present locally (see extent of GET 6+ within 10 km of the Site in **Confidential Figure 6.2.2, EIAR Volume 5**) and on the basis that non-breeding birds typically roam vast areas of habitats regionally and nationally. Potential effects to non-range holding birds, even at a local level, would be trivial.

6.4.36 The likelihood of actual impacts on a range holding breeding pair will also depend on a number of factors such as experience of the pair, availability of alternative nest sites, proximity to other occupied ranges, and the quality of foraging habitat within and outside of the turbine area. A review of the known territories provided by the CRSG in combination with the GET 6+ habitats (**Confidential Figure 6.2.2, EIAR Volume 5**) indicates that the Site is unlikely to be forming a core part of any of the known territories and is (at best) on the edge of the currently known/active ranges.

6.4.37 As described above, in the absence of any known breeding sites within the scarce breeding bird Study Area, the GET 6+ habitats within the Site, are not likely to form a core part of any occupied golden eagle range, although flight activity of adult birds was frequently recorded during the baseline period.

6.4.38 The loss of foraging habitat for any golden eagle pair breeding in the wider area is therefore unlikely to be of an extent, or an importance, to result in breeding range abandonment. It is possible that in some years, e.g. when prey resources are lower, that productivity may be affected by the added constraints on the territory due to the presence of operational turbines, however when considering these impacts at the NHZ 15 population level (in favourable conservation status) such effects are considered to be of no more than a low, long-term magnitude.

6.4.39 **Significance of effect**: the unmitigated effect on the regional (NHZ 15) golden eagle population as a result of operational displacement is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

Potential Operational Effects – Collision Risk

6.4.40 **Impacts:** 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.

6.4.41 Sensitivity: medium.

6.4.42 **Magnitude of impact**: the NatureScot collision risk model predicts a worst-case mean annual collision risk of 0.2499 (**Table 6-4** above).

6.4.43 **Significance of effect**: evidence from satellite tagged golden eagles in Scotland (Fielding *et al.* 2019[59], 2021[60], 2022[61]) identifies avoidance as being the species' primary response to onshore wind farm developments, with a very low risk of collision, albeit not zero.

6.4.44 For the purposes of a highly precautionary assessment, where avoidance (i.e. operational habitat displacement) and collision are not mutually exclusive, population-level impacts of additional mortality from predicted collision mortality risks, have been investigated using a population model based on the Golden Eagle Population Model (GEPM) developed by Whitfield *et al.* (2004[62]) and used by Whitfield *et*

[62] Whitfield, D.P., Fielding, A.H., McLeod, D.R.A. & Haworth, P.F. 2004. Modelling the effects of persecution on the population dynamics of golden eagles in Scotland. Biological Conservation 119: 319–333.

al. (2008[46]) in their golden eagle conservation framework report. Input data on territory numbers, occupancy and productivity were obtained from SMRS annual reports from 2017 to 2022 reports (Challis *et al*. 2018[63], 2019[64], 2020[65], 2022[53] and 2023[47]), with survival rates being those previously used by Whitfield *et al*. (2008[46]).

6.4.45 Full details are presented in **Confidential TA 6.4: Golden Eagle Population Viability Analysis Model** (**EIAR Volume 5**) and the findings from the model can be summarised as follows:

- Under the baseline situation, the model predicts an average annual growth rate of 1.024 (2.4%) for the NHZ 15 population of 31 pairs (see **Table 6-10**), assuming a regional population cap of 43 pairs, equivalent to the amount breeding ranges checked during the 2015 national golden eagle census and reported to the SRMS (see **Table 6-10**) and thought to currently exist in NHZ 15 (currently around 31 ranges are believed to be occupied).
- Considering a range of additional annual mortality due to estimated collision risks, the model predicts that at 0.3 collisions per year (slightly higher than the 0.2499 predicted for the Proposed Development), a slight reduction of 0.2% of the projected regional NHZ 15 population size would occur (counterfactual population size, CPS = 0.998079) and even at one collision per year the reduction would be 0.85% (CPS = 0.991499).

6.4.46 Overall, with added collision mortality risks from the Proposed Development, the NHZ 15 population would still be projected to grow, albeit at the end of the 25-year period to which the model predicts with sufficient accuracy, the population would be up to around 0.2% smaller than without the Proposed Development.

6.4.47 With this small level of impact, it is considered that the currently assumed favourable conservation status of the regional Central: Stirling and Tayside: Perth & Kinross (NHZ 15) population would be maintained over the operational period of the Proposed Development. The additional mortality risk on the NHZ 15 population is therefore predicted to be a low, long-term magnitude of change, but given the evidence for strong displacement of the species from operational wind turbines in Scotland is highly unlikely to be realised.

6.4.48 **Significance of effect**: the unmitigated effect on the regional golden eagle population from additional mortality risks due to collisions is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

Merlin

Potential Construction Effects

6.4.49 **Impact**: breeding or foraging merlin may be displaced from the Site during construction, either by disturbance or direct habitat loss.

6.4.50 **Sensitivity**: medium NCI and favourable conservation status (see **Table 6-10** above). Consequently, merlin sensitivity in the context of the Site and for the purposes of assessment is considered to be medium.

6.4.51 **Magnitude of impact**: baseline surveys indicated that the scarce breeding bird Study Area potentially hosts one to three merlin territories with a further two potential territories out with the Study Area (

[63] Challis, A., Wilson, M.W., Holling, M., Roos, S., Stevenson, A. & Stirling-Aird, P. (2018). Scottish Raptor Monitoring Scheme Report 2017. BTO Scotland, Stirling.
[64] Challis, A., Eaton, M., Wilson, M.W., Holling, M., Stevenson, A. & Stirling-Aird, P. (2019). Scottish Raptor Monitoring Scheme Report 2018. BTO Scotland, Stirling.
[65] Challis, A., Wilson, M.W., Schönberg, N., Eaton, M.A., Stevenson, A. & Stirling-Aird, P. (2020). Scottish Raptor Monitoring Scheme Report 2019. BTO Scotland, Stirling.

6.4.52 **Table** 6-6 above and **Confidential Figure 6.2.5, EIAR Volume 5**). Of these, ML_1 is located within 500 m Proposed Development (333 m to the nearest turbine and 272 m to the nearest infrastructure,

6.4.53 **Table** 6-6 above and **Confidential Figure 6.2.5, EIAR Volume 5**). Information provided by the CSRG did not indicate any additional territories, however an alternative breeding area for ML_1 was included in the data provided by the CRSG (CRSG_ML_C on **Confidential Figure 6.2.5, EIAR Volume 5**). Habitat loss/construction activity is not considered likely to directly affect merlin nesting at any of the other potential locations identified (

6.4.54 **Table** 6-6 above) and whilst some foraging habitat may be lost/unavailable during the construction that may affect productivity, this is considered to be negligible.

6.4.55 For ML_1, the hardstanding associated with the closest turbine location and the turbine itself are within 500 m (333 m and 272 m respectively) of the identified nest location. Whilst there is a risk that there would be a direct and indirect loss of foraging habitat at this location as a result of the construction of the Proposed Development, the unmitigated impact is predicted to result in (at worst) an effect of low and short-term magnitude on the NHZ population.

6.4.56 It should be noted that whilst there may be displacement around foraging areas as a result of construction, a BDMP for the Proposed Development (and associated pre-construction surveys) and presence of an ECoW during the construction period (refer to the 'Embedded Mitigation' detailed above) will enable the avoidance of disturbance to any active nests during the course of construction works.

6.4.57 **Significance of effect**: the effect on the regional (NHZ 15) merlin population as a result of construction is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

Potential Operational Effects – Displacement

6.4.58 **Impact**: merlin may be at risk of displacement from foraging habitat, thereby impacting on productivity, fitness and survival rates.

6.4.59 **Sensitivity**: medium.

6.4.60 **Magnitude of impact**: according to an expert review by Goodship & Furness (2022[18]), breeding merlin may be actively disturbed at 300 m to 500 m from a disturbance source. One recorded territory (ML_1) is located approximately 333 m from the nearest Proposed Development turbine location (see

6.4.61 **Table** 6-6 above and **Confidential Figure 6.2.5, EIAR Volume 5**) and so there is the possibility that this territory may be displaced by the presence of operational turbines. However, it should be noted that ML_1 is located in a steep narrow gully between the estate track and the flatter ground above (where the nearest turbine is located) and it is likely that the topography of the area in which ML_1 is situated may provide screening from the turbine location and therefore minimise the potential for displacement at the nesting site. Furthermore, information provided by the CSRG indicates what is likely an alternative nest site for ML_1 (CRSG_ML_C on **Confidential Figure 6.2.5, EIAR Volume 5**) and so there is also the possibility that this alternative nest site may be used.

6.4.62 There is little evidence as to whether merlin are affected by the presence of turbines, or a wind farm development as a whole, although some studies (e.g. Pearce-Higgins *et al.* 2012[66]) have shown that

[66] Pearce-Higgins, J.W., Stephen, L., Douse, A. and Langston, R.H.W. (2012). Greater impacts of Windfarms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology 49: 386-394.

merlin prey species such as skylark are largely unaffected, meaning that reduction in food availability is unlikely to be a relevant factor. As per NatureScot guidance (SNH 2016b[20]), merlin foraging ranges may extend out to 5 km, and so three territories may overlap with the turbine areas (ML_1, ML_3 and ML_4;

6.4.63 **Table** 6-6 above). Like other ground-nesting raptors, the majority of hunting during the breeding season is likely to take place close to nest sites, and so a buffer of at least 500 m from the nearest turbine is likely to enable much foraging to continue, should nests be in similar locations in future years. In the case of merlin nest sites ML_3 and ML_4, they are over 1 km from the nearest turbine (

6.4.64 **Table** 6-6 above and **Confidential Figure 6.2.5, EIAR Volume 5**), and so it is unlikely that there is significant overlap in territory extent with the Proposed Development. For ML_1, the closest turbine is 333 m away and so as noted above, there is an increased risk of displacement. Although this may simply lead to a relocation of nest site within the local area, unmitigated, a possible loss of this pair to the NHZ 15 population (31 pairs) cannot be ruled out.

6.4.65 A loss of 3.2 % of the NHZ 15 population would result in a low, long-term magnitude.

6.4.66 **Significance of effect**: the unmitigated operational displacement effect on the regional (NHZ 15) merlin population is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

Red Kite

Potential Construction Effects

6.4.67 **Impact**: breeding or foraging red kite may be displaced from the Site during construction, either by disturbance or direct habitat loss.

6.4.68 **Sensitivity**: medium NCI and favourable conservation status (**Table 6-10** above). Consequently, red kite sensitivity in the context of the Site is considered to be medium.

6.4.69 **Magnitude of impact**: baseline surveys identified one red kite territory (KT_2) near to the proposed access track route with a breeding territory located out with the scarce breeding bird Study Area (KT_1) (**Table 6-7** above and **Confidential Figure 6.2.7. EIAR Volume 5**). KT_2 is situated along the proposed access track but is over 500 m from any proposed works and is 5.9 km from the nearest proposed turbine (**Table 6-7** above). Data provided by the CRSG did not identify any additional red kite breeding areas within the scarce breeding bird Study Area (**Confidential Figure 6.2.7, EIAR Volume 5**).

6.4.70 Habitat loss/construction will not directly affect red kite nesting at either location identified and whilst some foraging habitat may be lost/unavailable during the construction that may affect productivity, this is considered to be negligible and the unmitigated impact is predicted to result in an effect of negligible and short-term magnitude on the regional population.

6.4.71 It should be noted that whilst there may be displacement around foraging areas as a result of construction, the BDMP (and associated pre-construction surveys) and presence of an ECoW during the construction period (refer to the embedded mitigation detailed above) will ensure that there is no disturbance to any active nests during construction.

6.4.72 **Significance of effect**: the effect on the regional (central Scotland) red kite population as a result of construction is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

Potential Operational Effects – Displacement

6.4.73 **Impact**: red kite may be at risk of displacement from foraging habitat due to the presence of operational turbines, thereby impacting on productivity, fitness and survival rates.

6.4.74 Sensitivity: medium.

6.4.75 **Magnitude of impact**: the closest nest site identified during baseline studies is 4.8 km from the nearest proposed turbine (KT_1 in **Table 6-7** above). Operational displacement is therefore not considered to be a risk to nesting birds.

6.4.76 Red kite were the most frequently recorded raptor species during baseline surveys and were recorded ranging widely across the survey area (**Confidential Figure 6.2.7** and **Figure 6.16, EIAR Volume 5**). Red kite usually forage within 3 km of a nest but can forage up to 6 km (Hardey *et al.* 2013[67]) and so whilst some of this activity may be related to the breeding activity known to be in the area, given that both KT_1 and KT_2 are over 3 km from the proposed turbines (**Table 6-7** above), Red kite activity recorded around the turbine area is likely to comprise of a combination of foraging activity relating to these nests and also of non-breeding individuals in the regional population (either juveniles or non-breeding adults). Surveys recorded up to six individual birds at any one time (although most records were of individual birds) with both adults and juvenile birds identified.

6.4.77 Whilst there may be some localised displacement directly around turbines, considering the above it is considered that it will be of negligible, long-term magnitude as there will continue to be sufficient foraging habitat out with the turbine area for both the known breeding pair(s) and non-breeding individuals.

6.4.78 **Significance of effect**: operational displacement effect on the regional (central Scotland) Red kite population is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

Potential Operational Effects – Collision Risk

6.4.79 Sensitivity: medium.

6.4.80 **Magnitude of impact**: the NatureScot collision risk model predicts a worst-case mean annual collision risk of 0.7348 (**Table 6-4** above).

6.4.81 To ascertain whether this level of additional mortality would be likely to result in a significant effect on the NHZ 15 population, a population viability analysis (PVA) model was developed, and which is presented in **Confidential TA 6.5: Red Kite Population Viability Analysis Model** (**EIAR Volume 5**). Values for population size and productivity were derived from data provided in the Scottish Raptor Monitoring scheme's annual reports (see **Table 6-10**), with adult and subadult survival rates taken from previous modelling of Scottish red kite populations by RSPB Scotland for NatureScot (Sansom *et al*. 2016[68]).

6.4.82 The model was run for the baseline situation (i.e., without additional collision mortality associated with the Proposed Development), and for a range of additional annual mortalities, which could be attributable to wind farm collision risks. Comparison of the outputs from the baseline and impact runs provides a

[67] Hardey,0 J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2013) Raptors: a field guide for surveys and monitoring (3rd edition). The Stationery Office, Edinburgh.

[68] Sansom, A., Etheridge, B., Smart, J. & Roos, S. (2016). Population modelling of North Scotland red kites in relation to the cumulative impacts of wildlife crime and wind farm mortality. Scottish Natural Heritage (SNH) Commissioned Report No. 904

calculation of the relative change in population growth rate (counterfactual of population growth, C-PGR) predicted over a 25-year timeframe when additional losses occur, for the regional estimated regional NHZ 15 population.

6.4.83 Under the baseline situation, the model (density independent PVA) predicts a large average annual population growth rate of 1.15 (c.15%) for the NHZ 15 regional population.

6.4.84 When considering an additional mortality of 0.8 birds per year due to collision risks estimated for the Proposed Development[69], the model predicts that this would result in a very small reduction in growth rate in the regional NHZ 15 population by 0.37% (C-PGR = 0.9962913). The growth rate would however remain strongly positive at 1.15 (c.15%). The total (unrestricted) NHZ 15 breeding population at year 25 would reach substantially over 5,000 individuals within both the baseline and impacted scenario.

6.4.85 Note that these predictions assume growth remains unlimited by resources which means that the difference between the impacted and unimpacted populations would continue to occur over the model's 25-year period, in contrast to a scenario where growth was constrained at some point (e.g. by food, nest sites, etc.). In the case of growth becoming constrained by competition for resources then the difference between the baseline and impacts projections would be in terms of how soon the regional population limit was attained.

6.4.86 With this level of impact, it is considered that favourable conservation status of the NHZ 15 population would be attained/maintained over the operational period of the Proposed Development, and a negligible magnitude of impact on the population is predicted.

6.4.87 **Significance of effect**: the predicted collision risk effect on the regional red kite breeding population is considered to be negligible adverse and therefore **not significant** in the context of the EIA regulations.

Curlew

Potential Construction Effects

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

6.4.89 **Sensitivity**: medium NCI and unfavourable conservation status (**Table 6-10** above). Consequently, sensitivity in the context of the Site is considered to be medium-high.

6.4.90 **Magnitude of impact**: up to six curlew territories were recorded within 500 m of infrastructure (see **Table 6-8** above and **Figure 6.17**, **EIAR Volume 5**) with activity predominately focussed to the west of the turbine area and along the proposed access track. The NHZ 15 breeding curlew population may currently be estimated as 1,154 pairs (see **Table 6-10** above), and with six pairs representing up to 0.52 % of this breeding population.

6.4.91 It is considered unlikely that all breeding curlew within 500 m of infrastructure would be lost from the population in any year because construction activities would not take place simultaneously across the whole Site during the breeding season. Furthermore, three of these territories are only within 500 m of the proposed access track, rather than proposed turbine locations and whilst there will be works associated with the construction of the access track alongside increased traffic use during the construction phase, the works are anticipated to be less intensive than turbine construction. As a worst-

[69] Slightly higher than the 0.7348 predicted (**Table 6.4**).

case, assuming some breeding pairs may be temporarily lost to the NHZ population during the construction phase, an effect of low and short-term magnitude is predicted.

6.4.92 It should be noted that whilst there may be displacement around foraging areas as a result of construction, the BDMP (and associated pre-construction surveys) and presence of an ECoW during the construction period (refer to the embedded mitigation detailed above) will enable the legislative protection of all wild birds and their active nests during construction.

6.4.93 **Significance of effect**: the unmitigated effect on the NHZ 15 curlew population as a result of construction is considered to be minor and therefore **not significant** in the context of the EIA regulations.

Potential Operational Effects – Displacement

6.4.94 **Impact**: nesting or foraging curlew may be at risk of displacement from habitat around turbines, thereby affecting productivity or survival rates.

6.4.95 Sensitivity: medium.

6.4.96 **Magnitude of impact**: an estimated range of two to three curlew territories were recorded to be within 500 m of turbines (**Table 6-8** above and **Figure 6.17, EIAR Volume 4**) and which represents 0.26 of an estimated breeding population of 1,154 pairs (see **Table 6-10** above).

6.4.97 It is however unlikely that all breeding pairs within 500 m of turbines would be lost. Evidence at the operational Fallago Rig Wind Farm included in the Dunside Wind Farm EIA Report (2023[70]) indicated that curlew are not wholly displaced from operational turbines, with surveys in 2013 and 2014 for an extension (Fallago Rig II) finding that five of the seven, and six of the 15 territories recorded in 2013 and 2014 respectively were within approximately 500 m of the Fallago Rig I turbines (which were operational at the time of surveys). This was consistent with the seven territories recorded in the same area during the baseline surveys in 2005 for Fallago Rig Wind Farm (i.e. prior to the turbines but in the same area), as reported in the Fallago Rig II assessment.

6.4.98 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.

6.4.99 **Significance of effect**: the unmitigated effect on the NHZ 15 curlew population as a result of operational displacement is considered to be minor and therefore **not significant** in the context of the EIA regulations.

Potential Decommissioning Effects

6.4.100 Decommissioning effects for the Proposed Development are difficult to predict with any confidence because of the long timeframe until their occurrence. Decommissioning effects are considered for the purpose of this chapter to be similar in nature to those of construction effects but are likely to be of shorter duration. The significance of effects predicted in the construction section are therefore considered appropriately precautionary for assessing decommissioning effects on IOFs.

[70] Refer to Chapter 7: Ornithology of the Dunside Wind Farm EIA Report, ECU reference ECU00003436.

6.5 Additional Mitigation

Mitigation During Construction

6.5.1 The only identified effect during the construction phase (and decommissioning phase) that was considered to be potentially significant for any IOF was disturbance to lekking black grouse (minor-moderate adverse). Specific construction mitigation measures for black grouse, in addition to standard procedures within a BDMP for the Proposed Development (see the 'Embedded Mitigation'), have therefore been considered and are summarised below.

6.5.2 No significant unmitigated effects were predicted for golden eagle, merlin, red kite or curlew, and therefore no specific mitigation other than the embedded mitigation measures outlined in the 'Embedded Mitigation' section above are required.

Black Grouse

6.5.3 To avoid the potential for significant disturbance effects occurring during construction works, the BDMP will be extended to include for the specific protection of black grouse leks (as well as nest sites). This will include for pre-construction surveys for lekking black grouse during the main black grouse lekking season, following methodology provided by Gilbert *et al.* (1998[71]) and NatureScot (SNH 2017[28]), in order to provide an up to date understanding of where black grouse are lekking within 750 m of the Proposed Development.

6.5.4 Should pre-construction surveys record lekking black grouse within 750 m of any proposed works (or should lekking black grouse be identified on the Site by any site personnel), all construction activities would be prohibited within a 750 m disturbance zone until a risk assessment is undertaken. The risk assessment would consider the likelihood and possible implications of the associated construction activities on the lek and set out necessary measures to ensure that no disturbance occurs.

6.5.5 Restrictions to construction activity within the 750 m disturbance zone would include (but would not be limited to) the following:

- No construction activity (including vehicle movements) before 09:00 hours in the months of April and May.

6.5.6 Furthermore, given the presence of leks along the access track, the BDMP will include the following mitigation for implementation along the section of the proposed access track identified to be within 750 m of any leks identified during pre-construction surveys:

- A maximum speed limit of 15 mph will be enforced at all times of day on the track throughout the breeding season;
- Personnel will be required to remain within vehicles and will not be permitted on foot within this zone; and,
- Gates within this zone will remain open after first arrival, therefore avoiding the need for every subsequent entry to open and close the gate and the associated potential disturbance to the lek due to pedestrian activity.

6.5.7 Any deviations to the proposed timing restrictions and/or extent of any disturbance-free zone would be agreed with NatureScot.

6.5.8 The ECoW will oversee the implementation of the above measures.

[71] Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird Monitoring Methods. RSPB, Sandy.

Mitigation During Operation

6.5.9 The only identified effect during the operational phase that was considered to be potentially significant for any IOF was disturbance to lekking black grouse (minor-moderate adverse). Specific operation mitigation measures for black grouse, in addition to standard procedures within a BDMP for the Proposed Development (see the 'Embedded Mitigation' section above), have therefore been considered and are summarised below.

6.5.10 No significant unmitigated effects were predicted for golden eagle, merlin, red kite or curlew, and therefore no specific mitigation is required. However, during the finalisation of the BEMP for the Proposed Development, as part of the discharge of conditions (should the Proposed Development be consented), an additional provision within the BEMP will be included for the regular search and removal (to an agreed location) of animal carcasses (sheep or deer/gralloch) from within 200 m of the turbines in order to reduce the risk of golden eagle or red kite collisions from scavenging.

Black Grouse

6.5.11 To avoid a significant disturbance effect occurring during the operational phase of the Proposed Development it is proposed to extend the BDMP for the Proposed Development to cover the operational phase with the provisions detailed to protect lekking black grouse during the construction phase to be extended within 500 m of the identified leks (**Figure 6.10, EIAR Volume 4**) for the operational phase as follows:

- Planned access to the Proposed Development will be restricted to between 09:00 hours and 16:00 hours in the months of April and May (it is noted that should emergency access be required, this would not be restricted);
- Appropriate signage will be installed at key locations stating no entry before 9 a.m. in April and May and no access is allowed off-track, as a minimum;
- A maximum speed limit of 15 mph will be enforced at all times of day on the track throughout the breeding season;
- Personnel will be required to remain within vehicles and will not be permitted on foot within this zone without prior arrangement;
- Gates within this zone will remain open after first arrival, therefore avoiding the need for every subsequent entry to open and close the gate and the associated potential disturbance to the lek due to pedestrian activity.

6.5.12 The wind farm operational management team will oversee the implementation of the above measures.

6.5.13 In addition, to minimise risk of black grouse collisions with fencing/met mast guy lines the following will be implemented:

- Any fencing related to the Proposed Development will be kept to a minimum and any fencing used will be 'marked' using suitable materials to reduce the likelihood of black grouse collisions with fences (Trout and Kortland 2012[72]);
- Any wires/guy-lines (e.g., those associated with met masts) will also be marked with suitable bird flight diverters/line markers to reduce collision likelihood (SNH 2016c[31]).

[72] Trout, R. and Kortland, K. (2012). Fence marking to reduce grouse collisions. Forestry Commission Technical Note.

6.6 Assessment of Residual Effects

Residual Construction Effects

6.6.1 Following the additional mitigation detailed above, the residual effect for the regional (NHZ 15) black grouse population as a result of construction disturbance is considered to be **negligible** and therefore **not significant** in the context of the EIA Regulations.

6.6.2 No significant unmitigated effects were predicted for golden eagle, merlin, red kite or curlew and so the residual effect on their regional populations remains unchanged (minor adverse and therefore not significant in the context of the EIA Regulations).

Residual Operational Effects

6.6.3 Following the additional mitigation detailed above, the residual effect for the regional (NHZ 15) black grouse population as a result of operational disturbance is considered to be **negligible** and therefore **not significant** in the context of the EIA Regulations.

6.6.4 No significant unmitigated effects were predicted for golden eagle, merlin, red kite or curlew and so the residual effect on their regional populations remains unchanged (minor adverse and therefore not significant in the context of the EIA Regulations).

6.7 Monitoring

Construction Phase Monitoring

6.7.1 Pre-construction surveys will be undertaken as part of the BDMP. These will focus on searching for nesting Schedule 1 (of the Wildlife and Countryside Act 1981, as amended) species and black grouse within 500 m of the proposed infrastructure and access routes and will be undertaken monthly between March and July during the breeding season directly prior to construction. Surveys will focus on searching for breeding evidence of the IOFs scoped into the assessment and will follow the same survey methodology as outlined for the baseline ornithology surveys in this chapter (refer to **TA 6.1, Annex B, EIAR Volume 4** for detail).

Operation Phase Monitoring

6.7.2 As part of the monitoring for the OBEMP (refer to **TA 7.7**, **EIAR Volume 4**), breeding bird surveys will be undertaken in years 1, 2, 3, 5, 7, 10 and 15. These surveys will focus on recording breeding wader activity (in relation to Aim 3) but will also record passerines and raptors. Ornithological monitoring will be used to inform amendments to the management objectives and the delineation of priority areas for management (if required).

6.7.3 In addition, it is proposed to undertake fatality monitoring for bird collisions. It is proposed that protocols for post-construction monitoring are based on the principals of Good Practice Handbook on Post-construction Bird and Fatality Monitoring (PCFM) for Onshore Wind Energy Facilities (WEFs) in Emerging Market Countries and its Decision Support Tool (DST) (September 2023[73]). All collision fatalities recorded during monitoring or incidentally will be submitted to NatureScot.

6.7.4 Any breeding attempts for target raptor or owl species located during monitoring surveys will be reported to the Local Planning Authority / NatureScot.

[73] https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099646309222331631/idu05e0083df0f09e0404d0862c028de9dcd910c

6.8 Potential Cumulative Effects

6.8.1 This section presents information about the potential for significant cumulative effects of the Proposed Development combined with other operational, consented or proposed wind farm projects that are located within the appropriate spatial context on the basis of the species considered.

6.8.2 NatureScot (SNH 2018b[12]) has provided guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance.

6.8.3 Cumulative effects may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative impacts, such as collision risk, may be summed quantitatively, but according to NatureScot "*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*" (SNH 2018b[12]).

6.8.4 The main projects likely to cause similar effects to those associated with the Proposed Development are other operational wind farm developments, or those under construction, consented, or in the planning process within NHZ 15.

6.8.5 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.

6.8.6 It should be noted that the Glen Lednock Wind Farm (proposed to the immediate east of the Proposed Development) is currently at EIA scoping stage and is therefore scoped out of the cumulative assessment presented in this chapter as whilst the scoping response is publicly available, sufficient quantitative ornithological information has not yet been published to allow a meaningful cumulative assessment to be made upon ornithological features. A cumulative assessment that considers both the Proposed Development and Glen Lednock will be undertaken, but this would be a consideration for the Glen Lednock Wind Farm (undertaken at the appropriate stage) and would include the assessment presented within this Chapter.

6.8.7 It would, however, be expected that the design and assessment of the Glen Lednock Wind Farm would be informed by site-specific baseline information, with the development designed in accordance with the Mitigation Hierarchy to firstly avoid the potential for significant effects upon ecological/ornithological features in so far as is possible. In accordance with NPF4 Policy 3c which states Development proposals for national or major development, or for development that requires an Environmental Impact Assessment will only be supported where it can be demonstrated that the proposal will conserve, restore and enhance biodiversity, it would also be assumed that the Glen Lednock Wind Farm would not proceed without such a commitment to conserve, restore and enhance biodiversity within the Site, beyond that required to offset any significant adverse effects upon ecological/ornithological features.

6.8.8 On the basis of these assumptions and considering the commitment to the enhancement of biodiversity within the Site made by the Proposed Development, the potential for significant cumulative adverse effects upon ornithological features is unlikely.

6.8.9 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.

6.8.10 Based on the conclusions of the assessment presented above, and the committed mitigation outlined in **Section 6.5**, the following have been scoped out of the cumulative assessment:

- Cumulative construction effects for black grouse – negligible effects considering proposed additional mitigation (**Section 6.6**);
- Cumulative construction effects for golden eagle, merlin, red kite and curlew considering the negligible to minor effects predicted for the Proposed Development alone and standard mitigation measures (**Section 6.6**);
- Cumulative operational displacement effects for black grouse – negligible effects considering proposed additional mitigation (**Section 6.6**);
- Cumulative operational displacement effects for merlin, red kite and curlew considering the negligible to minor effects predicted for the Proposed Development alone, together with standard mitigation measures (**Section 6.6**) and additional mitigation measures for red kite (**Section 6.6**); and
- Cumulative operational collision effects for black grouse, curlew and merlin due to no/negligible predicted collision risk.

Golden eagle

Potential Cumulative Operational Effects (Collision Risk)

6.8.11 Evidence from recent research identifies that both range holding and dispersing non-breeding golden eagles show strong avoidance of operational turbines, and therefore the main potentially significant impact of onshore wind farms in Scotland is habitat loss through operational disturbance/displacement, with the probability of collision mortality considered to be very low, although not zero (Fielding *et al*. 2019, 2022 and 2023). As such, on the basis of the species' evident avoidance of operational wind farms in Scotland, the rarity of reported collisions the potential for a significant cumulative collision risk due to operational wind farms in NHZ 15 is low and in view of livestock and/or deer carcass searching and removal proposed during operation as part of the Proposed Development's OBEMP (refer to **TA 7.7, EIAR Volume 4**), the potential for the Proposed Development to contribute to a significant cumulative collision mortality risk is also low. Such effects can reasonably be concluded as **not significant**.

Potential Cumulative Operational Effects (Displacement)

6.8.12 The Proposed Development is also not considered likely to contribute to potentially significant operational displacement effects on golden eagle. As detailed in **Section 6.4**, non-range holding (young dispersing) golden eagles typically roam across vast areas of Scotland and expanses of good golden eagle habitat. Where considering the potential for significant cumulative effects on such birds, even at a local level, areas of good golden eagle habitat (GET 6+ as shown on **Confidential Figure 6.2.2, EIAR Volume 5**) are extensive and remain open to golden eagles in the absence of other wind energy developments either operational, consented or proposed within 10 km of the Proposed Development.

6.8.13 Similarly, whilst the foraging ranges of range-holding golden eagles will be much smaller than those of non-range holding golden eagles, in the absence of other wind or non-wind energy developments within 10 km of the Proposed Development, impacting on the availability of good golden eagle habitats,

significant cumulative effects on local breeding ranges are unlikely to occur and the Proposed Development would not contribute to cumulative displacement effects at the NHZ 15 level.

Red kite

Potential Cumulative Operational Effects (Collision Risk)

6.8.14 In the assessment of potentially significant cumulative collision risks for red kite, given the species re-introduction history, there is likely to be some uncertainty as to the estimated level of annual cumulative mortality from other wind farm developments within NHZ 15 e.g. due to collision model results not being undertaken or unavailable for older wind farm projects.

6.8.15 To remove this limitation, the PVA model was run with a range of additional mortality scenarios (see **TA 6.5**). The modelled population projections show that even when adopting an added annual mortality risk of c. 4 birds (five times that predicted for the Proposed Development alone), that whilst there would be slight reduction in the population growth rate, the population growth rate would remain strongly positive at c. 13% and the population would still exceed 5,000 birds after 25 years.

6.8.16 The modelled predictions suggest that a very substantial level of additional annual wind farm mortality would need to occur to result in a population decline.

6.8.17 Even under highly precautionary scenarios investigated, it can therefore be concluded that the NHZ 15 red kite population would continue to grow and the population's favourable conservation status attained/maintained over the long-term.

6.9 Summary

Table 6-11: Summary of Potential Significant Effects

Ornithological Feature	Potential Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Construction (and Decommissioning)				
Black grouse	Temporary displacement during construction	Extension of the BDMP to include targeted pre-construction surveys for black grouse and protection of lek sites and specific construction control measures to minimise lek disturbance for any leks within 750 m of the Proposed Development.	BDMP and ECOW.	Not significant
Golden eagle, merlin, red kite and curlew	Temporary displacement during construction	None required	n/a	Not significant
Operation – Displacement				
Black grouse	Permanent displacement during operation	Extension of the BDMP to the operational phase with specific mitigation detailed to ensure black grouse using leks along the access track are protected/disturbance to this lek by operational access to the wind farm is avoided.	Operational phase BDMP.	Not significant

Ornithological Feature	Potential Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Golden eagle, merlin, red kite and curlew	Permanent displacement during operation	None required	n/a	Not significant
Operation – Collision Risk				
All IOFs	Mortality as a result of collision with turbines	Carcass removal (deer/sheep) to reduce the risk of golden eagle or red kite collisions from scavenging. Fence marking to reduce black grouse collision risk. Marking of wires/guy-lines associated with met masts etc. to reduce bird collision risk.	Through the finalisation of the Proposed Developments BEMP and discharge of suitably worded planning condition.	Not significant