

Craiginmoddie Windfarm Development

Environmental Impact Assessment Report Chapter 8: Ornithology

December 2020

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8 ORNITHOLOGY

Introduction

- 8.1 This assessment has been carried out by Gavia Environmental Ltd (GEL) in accordance with NatureScot (formerly Scottish Natural Heritage, or SNH) Guidelines (2016¹, 2017², 2018a³, 2018b⁴). The chapter evaluates the potential effects to ornithology receptors associated with the construction, operation and decommissioning of the proposed Craiginmoddie Windfarm development (hereafter referred to as the 'Proposed Development' or 'Site').
- 8.2 The assessment has been undertaken by Craig Carney MCIEEM (Senior Ornithologist) and reviewed by Christopher Baker MCIEEM CEnv (Technical Director of Ecology), who together have over 30 years' experience in the ecological consultancy sector.

Objectives

- 8.3 This chapter aims to:
- Describe the ornithological baseline and identify receptors;
 - Describe the assessment methodology and significance criteria;
 - Describe the potential effects on ornithological receptors;
 - Describe the mitigation measures proposed; and
 - Assess the residual and cumulative effects.

Legislation & Policy

Relevant Nature Legislation

- The Wildlife and Countryside Act (WCA) 1981 (as amended);
- EU Council Directive 79/409/EEC and 2009/147/EC on the Conservation of wild birds (the 'Birds Directive');
- EU Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive');
- The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2004 (as amended), which translates the Birds and Habitats Directives into Scottish Law;
- Environmental Impact Assessment Directive 85/337/EEC;
- The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012;
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011; and

¹ NatureScot (2016). Assessing Connectivity with Special Protection Areas (SPAs) – Version 3. NatureScot, Edinburgh.

² NatureScot (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms. NatureScot, Edinburgh.

³ NatureScot (2018a) Assessing Significance of Impacts from Onshore Wind Farms Out with Designated Areas. NatureScot, Edinburgh

⁴ NatureScot (2018b). Assessing the Cumulative Impact of Onshore Wind Farm Developments. NatureScot, Edinburgh.

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended).

Relevant Nature Policy

- The Scottish Biodiversity List (SBL).

Consultation Responses

- 8.4 Consultation responses are presented in Table 8.1, summarising the responses from relevant stakeholders regarding ornithology and the Proposed Development.
- 8.5 The following made comment: NatureScot, the Royal Society for the Protection of Birds (RSPB) Scotland, and South Strathclyde Raptor Study Group (SSRSG).

Table 8.1. Consultation Responses

Consultee and Date	Scoping	Topic	Response
NatureScot 13/12/2019	Pre-application	Issue of Year 1 ornithological baseline data.	Asked for further ornithology records from SSRSG and RSPB.
SSRSG 14/01/2020	Data request	Based on Year 1 data.	Provided data on breeding raptors within 2 km of the site.
RSPB 17/02/2020	Data request	Based on no black grouse (<i>Tetrao tetrix</i>) records during 2019 surveys.	No data was held on historic black grouse records within 2 km of the Site.
RSPB 30/06/2020	Pre-application	Scoping opinion.	Satisfied with stakeholders consulted, and the ornithology survey methodologies implemented. No further comments to make at this stage.
NatureScot 06/07/2020	Pre-application	Scoping opinion.	Will make specific comment on ornithology survey work once full details are submitted. Advised ground or vegetation clearance work is undertaken outside main bird nesting season.

Assessment Methodology and Significance Criteria

- 8.6 This chapter considers the effects on:

- Direct loss of habitat for birds through construction of the Proposed Development.
- Disturbance and displacement of birds during construction and operation.
- Injury or mortality of birds through collision with turbine blades.
- Cumulative effects to appropriate populations in combination with other windfarms.

Target Species

8.7 The target species for this chapter have been identified following NatureScot (2018a) guidance:

- Species listed on Annex 1 of the EU Birds Directive;
- Species listed on Schedule 1 of the WCA 1981 (as amended); and
- Red listed species on the Birds of Conservation Concern List (Eaton *et al.*, 2015⁵).

Potential Effects Scoped Out

8.8 The following species have been 'scoped out' of the assessment in line with guidance (NatureScot, 2018a), desk study information, and survey work:

- Passerine species (with exceptions) which are generally considered to not be significantly affected by onshore windfarm developments (NatureScot, 2017); and
- Designated sites (Special Protection Areas (SPA) and Ramsar sites) greater than 20km away from the Site due to an assumed lack of connectivity (NatureScot, 2016).

Survey Area

8.9 The assessment focuses on the Proposed Development and the following buffer zones that have been applied following recommendations outlined in NatureScot (2017):

- Ornithological designated sites within 20 km (Figure 8.1).
- Vantage point (VP) surveys inclusive of a 500 m buffer of the outermost turbine locations (referred to as the Collision Risk Zone (CRZ)) (Figure 8.2).
- Breeding raptors within a 2 km buffer (Figure 8.3).
- Black grouse within a 1.5 km buffer.
- Moorland breeding birds within a 500 m buffer (Figure 8.4a – 8.4c, and Figure 8.5a – 8.5c).
- Windfarm projects within Natural Heritage Zone (NHZ) 17 and 19 (Figure 8.6).

Baseline Survey Methodology

Baseline Bird Surveys

⁵ Eaton, Mark & Aebischer, Nicholas & A.F., Brown & Hearn, Richard & L., Lock & A.J., Musgrove & Noble, David & Stroud, David & Gregory, Richard. (2015). Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds. 108. 708-746.

8.10 All field surveys followed standard methodologies from NatureScot (2017), Hardey *et al.* (2013⁶), Etheridge and Baines (1995⁷), Gilbert *et al.* (1998⁸), Brown & Shepherd (1993⁹) and Calladine *et al.* (2009¹⁰). Surveys undertaken were as follows:

- VP surveys to quantify bird flight activity.
- Breeding raptors and black grouse surveys.
- Moorland breeding bird surveys.

8.11 For details of each breeding bird survey see Technical Appendix 8.1.

Vantage Point Surveys

8.12 VP surveys collected flight activity data within the Proposed Development and 500 m buffer, quantifying bird numbers that could potentially be at risk of collision with turbines, or within CRZ. Data collected comprised of flight lines of target species, including height and duration of each individual or group / flock, and activity summaries of additional avifauna (secondary species) which could potentially be vulnerable to the effects of wind turbines.

8.13 Time periods in which VP surveys were conducted are as follows:

- 2018 / 2019 non-breeding season (October 2018 – mid-March 2019);
- 2019 breeding season (mid-March – August 2019); and
- 2019 non-breeding season (September – December 2019).

8.14 Five VP locations were chosen to provide a wide and unrestricted view of the Proposed Development (Figure 8.2). VPs were identified via viewshed analysis using ArcGIS software and subsequently refined in a ground truthing reconnaissance survey to further determine the suitability of viewsheds. The final locations are detailed as follows; VP A (NX 33283 99541), VP B (NX 31361 97269), VP C (NS 31447 00527), VP D (NX 29748 97257), and VP E (NX 29933 98953).

8.15 On surveys where there was minor overlap between viewsheds, two-way radios were used between surveyors to communicate notable observations and avoid duplication of counts and flightpaths.

Species-Specific Surveys

8.16 The Proposed Development and boundary (extending up to 2 km) support suitable habitat for breeding raptors and black grouse. Species-specific surveys for these potential ornithological receptors were undertaken during the breeding season in 2019. Surveys followed Hardey *et al.* (2013) and Gilbert *et al.* (1998) methodologies. Breeding raptor

⁶ Hardey, J., Crick, H.Q.P., Wernham, C., Riley, H., Etheridge, B., Thompson, D. (2013). Raptors a field guide for surveys and monitoring (3rd Edition). The Stationery Office, Edinburgh.

⁷ Etheridge, B and Baines, D. (1995) Instructions for the Black Grouse Survey 1995/6: a joint RSPB/GCT/JNCC/SNH Project. Unpublished.

⁸ Gilbert, G., Gibbons, W. D. and Evans, J. (1998). Bird Monitoring Methods: a manual of techniques for key UK species. RSPB. p172-175.

⁹ Brown A. F. and Shepherd K. B. (1993). A method for censusing upland breeding waders, Bird Study 40, pp. 189 – 195.

¹⁰ Calladine, J., Garner, G., Wernham, C. and Thiel, A. (2009). The influence of survey frequency on population estimates of moorland breeding birds, Bird Study, 56:3, 381-388.

surveys were carried out over four visits between April and July 2019, and two black grouse surveys at pre-identified suitable lekking areas in March and May 2019. See Technical Appendix 8.1.

Moorland Breeding Birds Survey

- 8.17 The breeding bird survey (BBS) undertaken generally followed the methodology set out by the British Trust for Ornithology (BTO) and simultaneously adapted the Constant Search Method (Brown & Shepherd, 1993), modified to four visits in accordance with Calladine *et al.* (2009). Survey area included all areas of open ground, within the Site boundary plus a surrounding buffer of 500 m. The surveys avoided strong winds, heavy rain, and conditions with poor visibility.
- 8.18 All breeding bird survey records were entered into ArcGIS. These were analysed following the methods of Calladine *et al.* (2009) to identify the minimum number of probable or confirmed breeding territories for each species encountered. Territories were assumed given certain bird behaviours such as singing, calling, aggressive encounters, and displaying.

Desk Study

- 8.19 A desk study was undertaken to provide information on the ornithological interest of the study area and surroundings. This included a search for all statutory national designated sites within 5 km of the Proposed Development, increased to 20 km for SPA's and Ramsar sites.
- 8.20 Data was cited from the following sources during the desk study assessment:
- Hadyard Hill Extension Windfarm: Environmental Statement (SSE, 2015)¹¹;
 - NatureScot Sitelink (<https://sitelink.nature.scot>);
 - RSPB Scotland; and
 - SSRSR for records on breeding raptor species within a 2 km buffer of the site.
- 8.21 The Hadyard Hill Extension Windfarm is in operation and is located approximately 0.1 km west of the Proposed Development.

Methodology for Assessing Effects

- 8.22 The likely significant effects of the Proposed Development have been classified by professional judgement of the value of the ornithological receptor (Table 8.2) and the magnitude of the potential effect (Table 8.3). A precautionary approach is adopted where the response of a population to an impact is uncertain.

¹¹ <https://www.sse.com/media/301139/HadyardHillExtensionProposallInformationBoards.pdf>.

8.23

Table 8.2. Ornithological Value as Defined by Conservation Importance

Importance	Description
Very high	Populations receiving protection by a SPA, Ramsar Site, or SSSI. Species present in nationally important numbers (>1% national breeding or wintering population).
High	The presence of species listed in Annex 1 of the Birds Directive (but population does not meet the designation criteria under selection guidelines). The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).
Medium	Species present in regionally important numbers (>1% regional breeding population). Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed development. Red listed Birds of Conservation Concern. SBL species.
Low	Amber listed Birds of Conservation Concern.

Table 8.3. Magnitude of Ornithological Effects

Spatial Magnitude	Description
Very high	Total or near total loss of a bird population due to displacement or mortality. Total or near loss of productivity of a bird population due to disturbance. Guide: >80% of the population lost, or an increase in mortality.
High	A major reduction in the population status or productivity of a bird population due to disturbance, displacement, or mortality. Guide: 21-80% of the population lost, or an increase in mortality.
Medium	A partial reduction in the population status or productivity of a bird population due to disturbance, displacement, or mortality. Guide: 6-20% of the population lost, or an increase in mortality.
Low	A small (but apparent) reduction in the population status or productivity of a bird population due to disturbance, displacement, or mortality. Guide: 1-5% of the population lost, or an increase in mortality.
Nil	A very slight reduction in the population status or productivity of a bird population due to disturbance, displacement, or mortality. Any reduction would be barely noticeable, equating to a 'no change' outcome. Guide: < 1% of the population lost, or an increase in mortality.

8.24 The combined assessment of both the value of the receptor and the magnitude of an effect determined whether an effect was significant (Table 8.4). Table 8.5 describes the significance of each effect. Effects categorised as *moderate* or *major* significance are evaluated as *significant* under EIA Regulations, whilst those categorised as *minor* or *negligible* significance are evaluated as not significant.

8.25 The NatureScot (2018a) wider countryside assessment guidance notes that the key baseline population against which the assessment should be made is the NHZ population that the Proposed Development falls within. This Proposed Development falls within NHZ 17 (West Central Belt). However, NatureScot advises "Where the wind farm site is close to the boundary of an NHZ, it may be desirable to consider possible impacts on the adjacent NHZ separately, especially if the species uses habitat within that NHZ or the species population is more strongly associated with that NHZ". Therefore, due to the close proximity (1.1 km south) of the Proposed Development to NHZ 19 (Western Southern Uplands & Inner Solway); the NHZ baseline population of this zone are additionally considered in this assessment.

Table 8.4. Matrix of Magnitude and Value

Magnitude	Value				
		Very high	High	Medium	Low
	Very high	Major	Major	Major-Mod.	Moderate
	High	Major	Major	Moderate	Minor
	Medium	Major	Major-Mod.	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible
	Nil	Minor	Negligible	Negligible	Negligible

Table 8.5. Significance Criteria

Significant Criteria	Description
Major	Significant effect, as the effect is likely to result in a permanent / long term and very high / high extent significant adverse effect on the integrity of the feature.
Moderate	Significant effect, as the effect is likely to result in a medium term and high / medium extent partially significant adverse effect on the integrity of the feature.
Minor	The effect is likely to adversely affect the feature at an insignificant level by virtue of its limited duration and/or extent, but there would probably be no effect on its integrity. This is not a significant effect.
Negligible	No material effects. This is not a significant effect.

Criteria for Assessing Cumulative Effects

8.26 This chapter followed NatureScot guidance (2018b) on assessing windfarm cumulative effects, considering effects on the favourable conservation status of target species within the relevant NHZ (NHZ 17 and 19; see Wilson *et al.* 2015¹²).

¹² Wilson, M. W., Austin, G. E., Gillings, S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504pp 72.

Collision Risk Modelling

- 8.27 A full methodology of the collision risk modelling (CRM) can be found in Technical Appendix 8.2. Through application of the Band *et al.*¹³ (2007) CRM model to the vantage point survey results, the overall collision risk for target species was assessed. Flight lines were digitised in GIS software. Any flight lines within a 500m turbine buffer at collision risk height were further assessed, with total time in the CRZ calculated for each species. The observed total time was extrapolated to represent annual activity of the birds within the CRZ. The Band *et al.* (2007) model applies both turbine specification and species-specific bird biometric data to assess the flight risk of a single bird flying through a turbine, expressed as percentage collision rate.
- 8.28 The percentage collision rate is applied to the calculated number of bird transits through the CRZ to give a number of annual collisions. Avoidance rates are applied to this number to account for bird behaviour in flight whereby they identify and change course to prevent collision.

Limitations and Assumptions

- 8.29 Breeding bird survey areas did not include all of the plantation habitat within the Site boundary (apart from breeding raptor surveys). Forestry edges were included during moorland breeding bird surveys. It is therefore likely breeding passerine numbers associated with the forestry habitat within the Site are underestimated, however commercial coniferous forestry plantations do not typically support a high diversity of breeding passerines once established due to the lack of understory vegetation and non-native tree species composition.
- 8.30 The proposed maximum turbine tip height of the turbines changed during the year one surveys. This change in turbine design led to an increase in the height bands observed during the VP surveys. Collision risk height (band 2) increased from 20-180 m to 20-200 m. Therefore, any data collected before the change will have different height bandings.

8.31 **On increased turbine height through developer design iteration:**

On survey outset, flights recorded within only band 2 were considered as at collision risk height. To account for the change in turbine tip height, and establish a cautious approach to CRM, flights within band 3 (>180m above ground level) have been included within modelling and take into consideration field notes to determine this.

8.32 **On calculation of flight time in CRZ:**

Flight lines where birds were observed to fly within bands 2 and 3 were selected. The QGIS Clip function was then applied to crop the selected flight lines within the 500 m turbine buffer. New lengths of flight lines were calculated once cropped within the buffer.

¹³ Band, W., Madders, M. and Whitfield, D.P. (2007). Developing Field and Analytical Methods to Assess Avian Collision Risk at Windfarms. In De Lucas, M., Janss, G. and Ferrer, M. (eds) 'Birds and Wind Power'. www.quercus.pt

To calculate time within the buffer zone at risk height, the ratio between original flight length and clipped flight length was derived. This ratio was expressed as a percentage and applied to the total flight time recorded at bands 2 and 3.

8.33 On biometrics data applied within the Band *et al.* (2007) model:

To establish a cautious approach to development, where there are multiple appropriate values to represent particular bird biometrics, the values which would increase collision risk most are applied.

8.34 In June 2020, an extension to the original development area was added to the south-east of the Site at Doughty Hill. The extended area fell within the original VP viewsheds and it was subsequently determined that no additional viewsheds were required for VP surveys. It was decided however that an additional 500 m buffer zone for breeding birds would be added to accommodate for the extension to the development area. Four breeding bird surveys were performed in June and July 2020 within the 500 m buffer following the methodology set out in Sections 8.17 and 8.18.

Baseline Conditions

Desk Study

Designated Sites

8.35 There is one national statutory designated site for nature within 5 km of the Proposed Development, and one international statutory designated Ramsar site within 20km. Neither of these sites are designated for ornithological interest and are not considered further in this chapter.

Table 8.6. Designated Sites

Designation	Distance and Direction	Qualifying Interests	Condition
Auchalton SSSI	Approx. 3.6 km north	Lowland neutral grassland	Unfavourable no change (2008)
Silver Flowe Ramsar	Approx. 20 km south-west	Blanket bog	Unfavourable declining (2009)

Ornithology Records

8.36 There were no records of breeding raptors or black grouse within 2 km of the Site following consultation with SSRSG and RSPB Scotland.

8.37 A search of publicly available bird records¹⁴ within 5 km of the Site (available for commercial use and dated within last 10 years) returned results of the following target species or birds listed on Annex 1 of the EU Birds Directive and Schedule 1 of the WCA 1981: peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaetus*), corncrake (*Crex crex*), merlin (*Falco columbarius*), goshawk (*Accipiter gentilis*), common crossbill (*Loxia curvirostra*), barn owl (*Tyto alba*), golden plover (*Pluvialis apricaria*), dunlin (*Calidris alpina*),

¹⁴ <https://nbnatlas.org/>

short-eared owl (*Asio flammeus*), and greylag goose (*Anser anser*). None of these records are from within the Site boundary.

Survey Results

VP Target Species

- 8.38 A full copy of details from each VP survey (including date and weather conditions) can be found in Appendix 8.3.
- 8.39 Five observations of merlin were recorded during the non-breeding season. A hunting female was observed once in November 2018 across the north of the Site, and a hunting male was observed twice in February 2019. Two observations were also made of a commuting male within the east of the Site boundary in September 2019.
- 8.40 There were four observations of hen harrier (*Circus cyaneus*) in 2019. A ringtail was recorded in the buffer zone to the west in February, and another in March within the Site boundary to the north. A male was seen hunting on three occasions in April along the western Site boundary, and a male was recorded hunting again in August within the Doughty Hill area.
- 8.41 Three observations of peregrine falcon were recorded in 2019. A flight recorded in June was of an individual emerging from the existing plantation within the Site, and eventually flying east. An August observation was of an individual flying south-west and then towards plantation to the north. An individual was also recorded in October flying above plantation within the Site boundary and then westwards.
- 8.42 Four records of curlew (*Numenius arquata*) were made during the breeding season of 2019. Three records were made during March; all observations were of individuals calling in the buffer zone to the south. An individual curlew was recorded during the June survey within the same area and was likely one of the birds recorded in March.
- 8.43 Six observations of migratory pink-footed goose (*Anser brachyrhynchus*) were recorded during the March 2019 survey, two of these were within the Site boundary.
- 8.44 Two observations of snipe (*Gallinago gallinago*) were recorded during the March 2019 survey. An individual was recorded along the edge of the Proposed Development to the north, with another recorded outside the buffer zone to the south.
- 8.45 Woodcock (*Scolopax rusticola*) was recorded on two occasions, once within the Proposed Development and a second time to the east.
- 8.46 Flightpaths of all target species are shown in Figures 8.7a – 8.7g.
- 8.47 The results from the 2018 and 2019 non-breeding season VP surveys are outlined in Table 8.7 below. The 2019 breeding season VP survey results are outlined in Table 8.8. Rotor height is defined as 20-200 m, though band 3 flightpaths are assumed to be at rotor height as a precautionary measure.

Table 8.7. Target Species Recorded in Non-Breeding Season

Species	Date	Fight Duration (secs) per Observation	No. of Birds	Flight at Rotor Height (Y/N)	Flightpaths within CRZ (Y/N)
Merlin	15/11/2018	167	1	Yes	Yes
	04/02/2019	30	1	Yes	Yes
	04/02/2019	124	1	Yes	Yes
	23/09/2019	121	1	Yes	Yes
	24/09/2019	60	1	Yes	Yes
Woodcock	15/11/2018	15	1	No	No
	15/11/2018	10	1	No	No
	23/01/2019	30	1	No	Yes
Hen harrier	04/02/2019	210	1	Yes	Yes
Peregrine falcon	22/10/2019	60	1	No	Yes

Species	Date	Fight Duration (secs) per Observation	No. of Birds	Flight at Rotor Height (Y/N)	Flightpath within CRZ (Y/N)
Hen harrier	21/03/2019	15	1	No	Yes
	29/04/2019	20	1	Yes	Yes
	29/04/2019*	12	1	No	Yes
	29/04/2019*	18	1	Yes	Yes
	26/08/2019	210	1	Yes	Yes
Peregrine falcon	10/06/2019	17	1	Yes	Yes
	26/08/2019	5	1	Yes	Yes
Pink-footed goose	21/03/2019	20	>10*	Yes	No
	21/03/2019	83	20	Yes	No
	21/03/2019	73	50	Yes	No
	21/03/2019	65	35	Yes	Yes
	21/03/2019	60	15	Yes	No
	21/03/2019	30	>3*	Yes	Yes
Snipe	21/03/2019	15	1	No	No
	21/03/2019	60	1	Yes	No
Curlew	21/03/2019	120	1	Yes	No
	21/03/2019	180	1	Yes	No
	21/03/2019	60	1	Yes	No
	11/06/2019	45	1	No	No

Table 8.8. Target Species Recorded in Breeding Season

*** Poor light conditions, unable to accurately determine number**

VP Secondary Species

- 8.48 Widespread raptors were recorded frequently, including buzzard (*Buteo buteo*), sparrowhawk (*Accipiter nisus*) and kestrel (*Falco tinnunculus*), as well as raven (*Corvus corax*).
- 8.49 Buzzard and raven activity was most commonly recorded, with 217 buzzard observations and 227 raven observations. 51% of buzzard flights and 61% of raven flights were recorded all, or in part, at rotor height. No raven roosts were identified within the Site, with a peak count of four birds recorded. Observations of kestrel and sparrowhawk were less frequent with 8 observations of kestrel and 10 observations of sparrowhawk respectively. Four of all kestrel flights and two of all sparrowhawk flights were recorded all, or in part, at rotor height.
- 8.50 A lesser black-backed gull (*Larus fuscus*) was recorded during the May 2019 survey commuting south across the Site and at rotor height.

Breeding Raptors

- 8.51 The following species were recorded during the dedicated breeding raptor surveys:
- Buzzard; and
 - Sparrowhawk.
- 8.52 No Schedule 1 raptors of the WCA 1981 (as amended) were recorded.
- 8.53 Buzzard were most frequently observed during the breeding raptor survey, including three pairs recorded during May 2019 (Figure 8.3). A nesting location was also observed to the north of the Site within plantation. However, this area has since been felled as of November 2019. A buzzard territory was additionally recorded in plantation during the breeding bird surveys in 2020 (see Table 8.9).
- 8.54 Sparrowhawk alarm calls were heard in the western area of plantation within the Site boundary, and this is likely to be a nesting site.
- 8.55 No other raptors or target species were observed during these surveys.

Black Grouse

- 8.56 No lekking sites, observations or field signs of black grouse were found during the dedicated black grouse surveys. Small areas of suitable lek habitat were recorded to the east of Doughty Hill, however the east aspect does not provide sufficient cover for females.

Upland Breeding Birds

- 8.57 Table 8.9 below presents a summary of estimated breeding territories recorded within the Site and buffer zone from breeding bird surveys in 2019 and 2020. The table does not include potential territories recorded during the other baseline surveys.

- 8.58 Territory mapping can be found in Figure 8.4a – 8.4c (2019) and Figure 8.5a – 8.5c (2020).
- 8.59 A single merlin was recorded during the first 2020 breeding bird survey at the bottom of Doughty Hill. A single short-eared owl (*Asio flammeus*) was additionally recorded during the third 2020 breeding bird survey and flew south from the top of Doughty Hill. These birds were not seen on subsequent or prior breeding bird surveys.

Table 8.9. Breeding Bird Survey Territories

Species	Abundance
Blackbird (<i>Turdus merula</i>)	Two territories in Site.
Buzzard	One territory in plantation above Doughty Hill. Two adults and two juvenile birds were noted.
Chaffinch (<i>Fringilla coelebs</i>)	Eight territories.
Coal tit (<i>Periparus ater</i>)	One territory.
Cuckoo (<i>Cuculus canorus</i>)	Cuckoos are brood parasites and are not territorial. Meadow pipit and willow warbler are common host species, and both of these species were recorded as breeding within the Site and buffer. Male cuckoo was heard calling on two occasions during surveys, one in the south-west buffer and another east of the Site.
Curlew	Two territories at Doughty Hill.
Goldcrest (<i>Regulus regulus</i>)	One territory within Site boundary.
Goldfinch (<i>Carduelis carduelis</i>)	One territory within buffer zone to the west.
Great tit (<i>Parus major</i>)	One territory along plantation on Site.
Grey wagtail (<i>Motacilla cinerea</i>)	One territory along Site boundary at Doughty Hill.
Robin (<i>Erithacus rubecula</i>)	One territory within Site boundary.
Stonechat (<i>Saxicola rubicola</i>)	15 territories within Site boundary and buffer.
Siskin (<i>Spinus spinus</i>)	One territory within the Site boundary.
Skylark (<i>Alauda arvensis</i>)	Up to 30 territories within the Site boundary, most concentrated in the Doughty Hill area.
Snipe	Four territories within Site boundary at Doughty Hill.
Meadow pipit (<i>Anthus pratensis</i>)	Up to 53 territories within the Site boundary, most concentrated in the Doughty Hill area.
Wren (<i>Troglodytes troglodytes</i>)	Four territories within Site boundary and buffer.
Willow warbler (<i>Phylloscopus trochilus</i>)	Ten territories within Site boundary and buffer.
Whinchat (<i>Saxicola rubetra</i>)	Two territories within buffer.

Conservation Value

Non-Breeding Season

- 8.60 The conservation value of target and secondary species recorded during VP surveys in the non-breeding season was determined using the criteria specified in Table 8.2. The results are summarised in Table 8.10.

Table 8.10. Non-Breeding Bird Population Conservation Value

Species	Peak Count	EU Birds Dir. Annex 1	W&C Act 1981 Sch. 1	Red / Amber List (BoCC)	SBL	Value
Buzzard	4					Nil
Hen harrier	1	✓	✓	Red	✓	High
Kestrel	3			Amber	✓	Medium
Merlin	2	✓	✓	Red	✓	High
Peregrine falcon	1	✓	✓		✓	High
Pink-footed goose	50			Amber		Medium
Raven	4					Nil
Sparrowhawk	1					Nil
Woodcock	2			Red		Medium

- 8.61 Although pink-footed goose was recorded during the breeding bird surveys; this species is included within the non-breeding section. These wildfowl do not breed in Scotland and were recorded during migratory movements between overwintering and breeding grounds.

Breeding Season

- 8.62 The conservation value of breeding birds was determined using the criteria specified in Table 8.2. For non-target or secondary species, only records where evidence or behaviour of breeding was observed are included. The results are summarised in Table 8.11.

Table 8.11. Breeding Bird Conservation Value

Species	Peak Territory No.	EU Birds Dir. Annex 1	W&C Act 1981 Sch. 1	Red / Amber List (BoCC)	SBL	Value
Blackbird	2					Nil
Buzzard	4					Nil
Chaffinch	9					Nil
Coal tit	1					Nil
Cuckoo	N/A			Red	✓	Medium
Curlew	5			Red	✓	Medium
Goldcrest	1					Nil
Goldfinch	1					Nil
Grey wagtail	1			Red		Medium
Meadow pipit	c. 53			Amber		Low
Robin	1				✓*	Nil
Siskin	1				✓	Medium
Skylark	c. 30			Red	✓	Medium
Snipe	4			Amber		Low
Sparrowhawk	1					Nil
Stonechat	15					Nil
Whinchat	2			Red		Medium
Willow warbler	10			Amber		Low
Wren	4					Nil

*** Social criteria only**

- 8.63 No hen harrier display flights or interactions between individuals were observed during the breeding season. The observation of a male in April 2019 would suggest breeding was potentially attempted outwith the Site and buffer.
- 8.64 Although no peregrine falcon nesting sites were located, it is likely a nesting site is located outwith the Site and buffer based on dates of observations and flightpaths.
- 8.65 It is possible both merlin and short-eared owl additionally have nesting sites outwith the Site and buffer. Neither of these species were recorded on any of the other baseline surveys during the breeding season.
- 8.66 Grey heron and lesser black-backed gull were recorded flying over the Site during breeding season VP surveys, though these were individual birds and showed no evidence of breeding within the Site boundary or buffer.

Future Baseline

- 8.67 Commercial forestry operations within the extent of the Proposed Development would continue. This would prompt localised fluctuations to breeding and foraging bird populations, although it is unlikely any target species recorded would be significantly affected by this.
- 8.68 Timber harvesting and subsequent restocking may provide suitable breeding habitats for species such as black grouse, and raptors during the early afforestation stages. This is considered to be a temporary and short-term effect that would diminish as plantation matured.
- 8.69 Grazing from deer and livestock in the surrounding areas outside the forestry zones would likely continue. The abundance and distribution of breeding passerines is unlikely to be affected by this, and therefore the presence and diversity of recorded raptors foraging would likely continue. Grazing pressures would likely limit future breeding opportunities for ground nesting raptors due to insufficient sward height.
- 8.70 Overall, it is considered unlikely that the future upland bird community associated with the Proposed Development would change significantly compared to the current baseline. This does not however include indirect factors associated with climate change.

Identification and Evaluation of Effects

- 8.71 The assessment of effects applies to 'scoped in' species listed within NatureScot's (2018a) birds that require assessment when assessing significance of impacts from onshore windfarms.
- 8.72 There are no known records of black grouse within 2 km of the Site following consultation with RSPB Scotland. No lekking sites, observations, or field signs were found during the dedicated black grouse surveys.

Identification of Effects

Construction

- 8.73 The primary effects from construction will likely be the disturbance and displacement of breeding and foraging birds. Baseline surveys do not indicate the Site is a key winter roost site for any target or secondary species.
- 8.74 Disturbance to the bird community would likely be highest during construction as a result of increased activity from Site personnel, lighting, vibrations, and heavy plant movement. Studies have suggested that the construction phase of windfarm developments can have greater adverse effects to birds when compared to the operational phase, although it is recognised positive effects to ground nesting passerine birds is a likely outcome due to an opening-up of habitats and upland sward (Pearce-Higgins et al. 2012).

- 8.75 Construction will also elicit habitat loss from the installation of access tracks, compounds, borrow pits, laydown areas, and turbine bases. This will directly impact breeding and foraging birds in both woodland and upland flora habitats.
- 8.76 The most dominant habitat that will be affected from construction is commercial coniferous plantation, with approximately 53.10-hectares set to be removed. This would be a permanent effect in habitat loss. However, approximately 643.74-hectares of this commercial crop will remain unaffected from the Proposed Development and therefore displacement effects are expected to be negligible.
- 8.77 Approximately 0.04-hectares of plantation broadleaved plantation is set to be removed. This would additionally be a permanent effect in habitat loss. 6.38-hectares of plantation broadleaved woodland within the Site boundary will remain unimpacted and therefore displacement effects are expected to be negligible.
- 8.78 Due to the proposed locations of turbines within the forestry boundary, felling operations will primarily be undertaken in a 'keyhole' fashion. This will provide a degree of screening to ornithology receptors and will likely reduce disturbance effects, particularly to birds outwith the forestry zone.
- 8.79 There will be permanent habitat loss to upland flora habitats outside forestry zones for the construction of turbines on the periphery of forestry above the Doughty Hill area, and from the utilisation of a borrow pit in the same area, and access tracks - particularly the haul route into the Proposed Development via the B734 to the east. Ground flora habitat loss will total approximately 2.56-hectares, including acidic grassland, marshy grassland, wet heath, and bog type habitats. These habitats are widespread in the local area and the wider region.
- 8.80 Breeding raptors are more sensitive to disturbance when nesting compared to passerine birds. Repeated disturbance can cause adults to abandon egg and chick incubation, resulting in clutch failure. The only breeding raptors recorded during baseline surveys were buzzard and sparrowhawk; confined to woodland. Due to the intensive grazing of the upland flora vegetation surrounding the forestry, conditions are considered to be sub-optimal for ground nesting raptors as the sward structure lacks height. The plantation edge effect would also limit breeding success due to the exposure to predators.

Operational

- 8.81 Effects that occur during the operational phase of a windfarm can include disturbance caused by site access, as well as flightpath obstruction from the turbines in the form of the barrier effect. Access would likely be intermittent for maintenance purposes and is unlikely to provoke regular disturbance to the upland bird community. The barrier effect could disrupt and divert birds on route to important feeding sites and ancestral migratory routes, potentially resulting in an increased level of energy consumption that could jeopardize future breeding attempts. It is however considered that any displacement required to navigate around the Site once operational would be relatively small. Baseline surveys also indicate that the Site is not situated within an important and regularly used flightpath for target species.

- 8.82 An increase in forestry edge at proposed turbine locations and access tracks will additionally provide positive effects to ornithology receptors, creating favourable breeding conditions, and hunting and commuting pathways across the Site.

Collision Risk Modelling

- 8.83 The collision risk for target species was modelled using the non-direct flight model. The only exception to this is migratory pink-footed goose, which have been modelled using directional flight to determine their collision risk.
- 8.84 The magnitude of the mortality per annum arising from collision has been assessed against the baseline survey data and a 98% default collision avoidance rate, increased to 99% for hen harrier and 99.8% for pink-footed goose, as recommended by NatureScot (2017¹⁵). In accordance with NatureScot guidelines, the magnitude has been assessed against the NHZ population estimate (Wilston *et al.* 2015) using the criteria outlined in Table 8.3.
- 8.85 Curlew, snipe, and woodcock were all reported outwith the CRZ or below rotor height.

Table 8.12. Target Species Collision Risk Rate

Species	Collisions per Annum	Collisions per Annum with Avoidance Rate	Total Collisions over 25 Years with Avoidance Rate
Hen harrier	0.058	0.0006	0.0145
Merlin	0.292	0.0058	0.146
Peregrine falcon	0.056	0.0011	0.0279
Pink-footed goose	22.19	0.04	1.10

Assessment of Effects

Target Species

Curlew

- 8.86 Up to five curlew territories were recorded within the buffer zone of the Proposed Development; two within the Doughty Hill area (recorded during the 2019 breeding bird survey) and up to three within the south buffer (recorded during VP surveys). Curlew was not recorded again in the Doughty Hill area during the 2020 breeding bird surveys. The 2019 observations were more than 200 m away from the nearest turbine (including turbine oversail) and associated construction infrastructure. Furthermore, the territories in the southern buffer are more than 1 km away from the nearest turbine and associated construction infrastructure. Suitable breeding habitat in the context of the Proposed Development is limited to buffer zones and the surrounding area.
- 8.87 Wilson *et al.* (2015) estimates 2,303 and 4,284 breeding curlew pairs within NHZ 17 and 19 respectively, though in Scotland this species is estimated to have declined by 59% since

¹⁵ NatureScot. (2017b). Avoidance Rates for the Onshore SNH Wind Farm Collision Risk Model. NatureScot, Edinburgh.

1998 and these numbers may now be lower (Harris *et al.* 2019¹⁶). Some minor displacement effects to curlew may occur as a result of construction related activity within the Doughty Hill area, though it is unlikely this will result in the loss of any breeding pairs. The likely outcome would be temporary displacement at a local scale from the Site periphery, though this area is likely unfavourable due to exposure to predators associated with the forestry edge. Any effects to this species are likely to be **negligible** in magnitude and therefore **not significant**.

Hen Harrier

- 8.88 No confirmed hen harrier breeding sites were recorded during baseline surveys. No records of breeding hen harrier within 2 km of the Site following consultation with SSRSG. Nesting habitat is considered to be unsuitable. There was additionally no evidence of breeding hen harrier recorded for the neighbouring Hadyard Hill Extension Windfarm proposal, which additionally covered all of the land within the Site. Display flights ('sky-dancing') during the breeding season could increase the risk of collision with turbines, along with fledgling practice flights, however this would be an unlikely scenario considering the absence of breeding activity.
- 8.89 A male was observed in April 2019, though not again for the remainder of the breeding season. This could indicate a breeding attempt nearby; however male hen harrier maintains breeding territories at an average of 7.3km² in Scotland and can hunt up to 10 km away from a nest (Arroyo *et al.* 2009¹⁷). Some foraging habitats outside the plantation will be lost to four turbines, access tracks, and the temporary utilisation of borrow pits. However, upland habitat is widespread in the surrounding area and construction is likely to elicit temporary displacement to hunting rather than the loss of a NHZ pair. The magnitude of effect from displacement would be **negligible** in both NHZ's and **not significant**.
- 8.90 Following tree felling, it is likely there would be an increase in suitable foraging habitat for hen harrier within the Site throughout the operational phase, which could prompt a subsequent positive yet temporary effect if prey species abundance increases. The low-flying hunting behaviour of hen harrier does not place them at particular risk of collision with turbines and this species are estimated to have a 99% avoidance rate as well as a low mortality rate (Whitfield and Madders, 2006¹⁸). It is additionally unlikely restocking of forestry during the operational phase would provide suitable breeding conditions for this raptor. These areas will be enclosed and exposed to predators, and likely subject to intermittent disturbance from site personnel.
- 8.91 Wilson *et al.* (2015) estimates eight and 19 breeding hen harrier pairs within NHZ 17 and 19 respectively. The collision risk value per annum (0.0006) would be **negligible** in the context of each NHZ baseline mortality (an increase of 0.02% for NHZ 17, 0.009% for NHZ 19) and therefore **not significant**.

¹⁶ Harris, S.J., Massimino, D., Balmer, D.E., Eaton, M.A., Noble, D.G., Pearce-Higgins, J.W., Woodcock, P. & Gillings, S. (2020). The Breeding Bird Survey 2019. BTO Research Report 726. British Trust for Ornithology, Thetford.

¹⁷ Arroyo, B., Amar, A., Leckie, F., Buchanan, G., Wilson, J. and Redpath, S., (2009). Hunting habitat selection by hen harriers on moorland: Implications for conservation management. *Biological Conservation*, 142(3), pp.586-596.

¹⁸ Whitfield, D.P. & Madders, M. (2006). Flight height in the hen harrier *Circus cyaneus* and its incorporation in wind turbine collision risk modelling. Natural Research Information Note 2. Natural Research Ltd, Banchory, UK.

Merlin

- 8.92 Merlin share similar habitat preferences to hen harrier, and it is likely construction will elicit similar temporary foraging displacement effects during construction. Merlin are considered to be at greater potential risk of collision during aerial display flights by adults and practice flights by fledgelings. However, both behaviours would be expected to be concentrated within approximately 500m from a nest site. There are no records of breeding merlin sites within 2 km of the Proposed Development following consultation with SSRSG and no birds were recorded during the breeding raptor survey or during the breeding season throughout VP surveys. No breeding evidence for merlin was recorded as part of the Hadyard Hill Extension Windfarm proposal. A lone merlin was recorded flying through the buffer zone near Doughty Hill during the June 2020 breeding bird survey. However, suitable ground conditions within the Site boundary are considered to be sub-optimal for breeding. The foraging range for merlin during the breeding season can range up to 5km from a nest (NatureScot, 2016). It is likely the individual recorded in June 2020 was a bird commuting between a foraging and breeding ground. The remaining observations (one bird in November, two in February, and two in September) were likely individuals moving between wintering and breeding grounds. The collision risk value per annum (0.0058) would be **negligible** in the context of the national population baseline mortality (an increase of 0.0018%) and **not significant**.

Peregrine Falcon

- 8.93 No peregrine falcon nest sites or breeding activity were recorded on the Site. This raptor was recorded on only three occasions during baseline surveys. Peregrine falcon was not recorded breeding within 2 km of the Hadyard Hill Extension Windfarm proposal. The scoping report for Carrick Windfarm (Scottish Power Renewables, 2020) reported an active peregrine falcon territory in Carrick Forest directly to the east of the Proposed Development, though successful breeding was not recorded in 2019. It is unlikely the Site is located within a key foraging or commuting zone for this breeding pair, possibly due to a lack of prey species recorded on Site (i.e., wading birds and game birds). Disturbance effects to hunting peregrine associated with construction is likely to be **negligible** and **not significant** and are considered unlikely to have a material effect on breeding success for this species.
- 8.94 There are no known breeding sites within 2 km following consultation with SSRSG. Studies suggest peregrines are not adversely impacted by windfarms (Schmidt *et al.* 2003¹⁹; Percival 2014²⁰; Green 1995²¹). Wilson *et al.* (2015) estimates 41 and 34 breeding peregrine pairs within NHZ 17 and 19 respectively. The collision risk value per annum (0.0011) would be **negligible** in the context of each NHZ baseline mortality (an increase of 0.0069% for NHZ 17, 0.0085% for NHZ 19) and therefore **not significant**.

¹⁹ Schmidt, E. Piaggio, A.J. Bock, C.E. and Armstrong, D.M. (2003). National Wind Technology Center Site Environmental Assessment: Bird and Bat Use and Fatalities - Final Report; Period of Performance: April 23, 2001 -- December 31, 2002. Work performed by University of Colorado, Boulder, Colorado. NREL/SR-500-3298

²⁰ Percival, S.M. (2014). Kirkby Moor wind farm re-power Environmental Statement: Ornithology. Ecology Consulting report to RWE Innogy Ltd.

²¹ Green, M. (1995). Effects of Windfarm operation on the winter bird community of the Bryn Tytli Uplands: 1994/95. A report to National Windpower.

Pink-Footed Goose

- 8.95 The only records of pink-footed goose were of migratory flocks moving between overwintering and breeding grounds. Two flightpaths were recorded across the Proposed Development, with one during poor-visibility. As a precautionary measure, the average (mean) number of flock size from the four recordings in good visibility were used to inform the CRM for this particular observation. The wintering abundance of pink-footed goose is estimated to be 16,237 and 34,621 in NHZ 17 and 19 respectively (Wilson *et al.* 2015). The collision risk value per annum (0.04) would be of no threat to national or regional populations and is **negligible** in magnitude, therefore **not significant**.

Short-Eared Owl

- 8.96 One short-eared owl was recorded commuting south at the top of Doughty Hill during the third breeding bird survey in 2020. No hunting behaviour was noted. This was the only observation of this species throughout baseline surveys. The forestry within the Site boundary is of established status and outwith the early afforestation stage that short-eared owls have been known to breed within (Shaw, 1995). It is likely this bird was an individual commuting between foraging and breeding grounds. No evidence of breeding short-eared owl was recorded in the Hadyard Hill Extension Windfarm proposal, and only one individual was recorded. Similar to hen harrier, it is unlikely restocking of forestry would provide suitable breeding conditions due to the enclosed environment and exposure to predators, and intermittent disturbance from site personnel. Any effect on this species would likely be of **negligible** magnitude and **not significant**.

Snipe

- 8.97 There are potentially four pairs of breeding snipe within the Site boundary, confined to the open and marshy swards of Doughty Hill. Displacement effects could occur from the construction of access tracks, turbine bases, and the temporary utilisation of borrow pits. Pearce *et al.* (2012) suggests snipe densities are unlikely to recover post-construction and therefore displacement would likely be a permanent effect until completion of the decommissioning stage (though this would depend on future habitat management plans). In the context of the Proposed Development, the majority of habitat is commercial plantation and suitable breeding habitat is limited to marshy grassland within the wider Site boundary and buffer. Therefore, displacement effects would likely be minimal and is not expected to result in the loss of any NHZ breeding pairs. Wilson *et al.* (2015) estimates the number of breeding snipe to be at 568 and 1,252 for NHZ 17 and 19 respectively. Suitable breeding habitat is abundant in the wider area. Any effect on this species would likely be of **negligible** magnitude and **not significant**.

Woodcock

- 8.98 Wintering woodcock was recorded on two occasions outwith the CRZ and below rotor height. These birds forage and roost in dense vegetation, including coniferous thickets. Considering the low numbers of recorded birds and the abundance of coniferous plantation in the wider area, any effect on this species would likely be of **negligible** magnitude and **not significant**.

Secondary Species

Buzzard

- 8.99 One nest was recorded within plantation on the Site, though this area was subsequently felled. An additional three pairs were recorded across the Site, and adults with young were recorded in plantation north of Doughty Hill. This habitat is widespread within the local area and the likely outcome would be local displacement from Site, or relocation to undisturbed areas of forestry. Buzzard are a Green listed species on the Birds of Conservation Concern list. A peak count of four birds were recorded during VP surveys. Any effect to regional population is highly likely to be of **negligible** magnitude and **not significant**.

Kestrel

- 8.100 Any effect to this species would likely be of **negligible** magnitude and **not significant** considering the lack of breeding activity recorded on Site. This could potentially be a reflection of low vole numbers associated with the habitats within the Site boundary.

Raven

- 8.101 No breeding raven or roosting sites recorded on the Site. A peak count of four commuting birds were recorded during VP surveys. Raven are a Green listed species on the Birds of Conservation Concern list. Any effect to regional population would likely be of **negligible** magnitude and **not significant**.

Sparrowhawk

- 8.102 An individual sparrowhawk was recorded alarming during the 2019 breeding raptor survey, north of Craiginmoddie. This suggests a likely breeding site within this area. Plantation habitat is widespread within the local area and the likely outcome would be local displacement from Site or relocation to forestry within the Site boundary, rather than loss of any breeding pairs. Sparrowhawk are a Green listed species on the Birds of Conservation Concern list. A peak count of one bird was recorded during VP surveys. Any effect to regional population would likely be of **negligible** magnitude and **not significant**.

Medium Sensitivity Species

Cuckoo

- 8.103 Two calling males were recorded during baseline surveys, one within the Site buffer and another away from Site to the east. Any adverse effect to the breeding success of cuckoo as a result of the Proposed Development is expected to be **negligible** in magnitude and **not significant** considering the majority of upland host species (particularly meadow pipit) breed outwith commercial forestry habitat.

Siskin

- 8.104 One territory recorded within the Site boundary. This is likely an underestimate considering breeding bird surveys focused on forestry edges. There is a risk of loss of this breeding site from the felling of plantation. Forestry is widespread within the local area and the likely outcome would be local displacement from Site or relocation to forestry within the Site boundary. Felling would additionally occur outwith the breeding season. Siskin also have

a relatively large and widespread Scottish population size. Any effect would likely be of **negligible** magnitude and **not significant**.

Skylark and Whinchat

- 8.105 There is limited breeding habitat within the Site for both these species, confined to the Site boundary and buffer zones. Higher concentrations of territories were recorded in the open swards at Doughty Hill, though the proposed turbines in this area are located on the periphery of forestry. These birds are widespread and have relatively large Scottish population sizes, and ground nesting attempts are typically away from areas where predators can perch, such as forestry edges. Any adverse effects are unlikely and are considered to be of **negligible** magnitude and **not significant**.

Decommissioning Effects

- 8.106 The effects to ornithology receptors during the decommissioning phase are expected to be similar to that during the construction phase. Considering the presence of turbines and associated infrastructure, and limited tree felling required within the Site, it is likely any effects would be lower in magnitude.

Cumulative Effects

- 8.107 The cumulative effects to ornithology receptors have been assessed following NatureScot (2018b) guidance outwith designated sites. This considers the effects on the conservation status of relevant target species within the respective NHZ.
- 8.108 As the Proposed Development has been assessed against two NHZ's, and the collision risk values for target species are considered to be negligible in magnitude, a radii of 20 km for windfarm projects surrounding the Proposed Development was considered to be an appropriate precautionary spatial scale for the cumulative assessment (Table 8.13). The cumulative collision risk for pink-footed goose was not assessed at a cumulative level as data for this species was not available from windfarm projects within 20 km.
- 8.109 The cumulative assessment takes into consideration windfarms at an 'application', 'approved', and 'installed' stage. Windfarms at the 'scoping' stage have been scoped out of the cumulative assessment as they typically lack sufficient information on the potential effects to ornithological receptors. Projects that have been 'refused' or 'withdrawn' are also not included.
- 8.110 The only exception to the above is Carrick Windfarm, a proposed development of up to 17 turbines approximately 50 m east of the Site. Carrick Windfarm is currently in the 'scoping' stage. The scoping report (Scottish Power Renewables, 2020) identified one breeding osprey pair and a peregrine falcon territory (thought to be an unsuccessful breeding attempt in 2019), breeding crossbill, and non-breeding goshawk, merlin, hen harrier, and pink-footed goose throughout Year 1 surveys (September 2018 – August 2019). Osprey were not recorded during baseline surveys for the Proposed Development, and only one flightpath was recorded in previous surveys from 2011 – 2013 as part of the Hadyard Hill Extension Windfarm proposal. The location where osprey have been recorded breeding with respect to the Carrick Windfarm scoping report is over 3.5 km to the east of

the Site, and there are additionally no lochs within the Site or a 2 km radius. The absence of osprey flightpaths recorded suggest the Proposed Development is not located within a key foraging route. Goshawk and crossbill were additionally not recorded within the Site.

- 8.111 It is not expected that any effects from habitat loss or disturbance to any target species would be greater than negligible in magnitude. Therefore, these effects at a cumulative scale are not considered further.

Peregrine Falcon

- 8.112 The collision risk value for peregrine falcon at Kirk Hill, Tralorg, South Kyle, and Breaker Hill windfarms are higher than that at the Proposed Development. It is likely the habitats at these windfarms provide higher prey abundance compared to the Proposed Development or are located within regularly used flightpaths. A peregrine falcon eyrie was additionally recorded to the east of the Site at the proposed Carrick Windfarm. However, the low count of flights recorded within the Site suggests the Proposed Development is not located within a key foraging or commuting zone for this pair.
- 8.113 Peregrine falcon total cumulative collision risk for NHZ 17 is 0.0641, and 0.0311 for NHZ 19. The contribution to this cumulative risk is an increase of 0.427% and 0.239% respectively against each NHZ baseline mortality rate and is therefore **negligible** and **not significant**.

Hen Harrier

- 8.114 The hen harrier collision risk value for the Hadyard Hill Extension Windfarm proposal was higher than that calculated for the Proposed Development. This could be a representation of more optimal foraging and winter roosting conditions at the former. Hen harrier were recorded hunting during surveys for the proposed Carrick Windfarm, though not in the breeding season and there was no evidence of winter roosting.
- 8.115 Hen harrier total cumulative collision risk for NHZ 17 is 0.0306, and 0.0046 for NHZ 19. The contribution to this cumulative risk is an increase of 1.02% and 0.0657% respectively against each NHZ baseline mortality rate and is therefore **negligible** and **not significant**.

Merlin

- 8.116 The collision risk value for merlin at for Hadyard Hill Extension Windfarm proposal was higher than the Proposed Development, and as with hen harrier this is likely a representation of more suitable habitats and prey abundance. Small numbers (less than five flightpaths) of merlin were recorded in the non-breeding season at the proposed Carrick Windfarm. The total cumulative collision risk for NHZ 17 is 0.0158. Collision risk data was not available from other windfarm projects for merlin within NHZ 19. The contribution to the cumulative risk is an increase of 0.0048% against the baseline mortality rate of the Scottish population and is therefore **negligible** and **not significant**.
- 8.117 The overall significance of cumulative effects to both NHZ 17 and 19 populations, and the national merlin population, is considered to be **negligible** and therefore **not significant** in the context of the EIA Regulations.

Table 8.13. Windfarms within 20km (Source: Scottish Gov. Windfarm Proposals July 2020)

Project	Status	No. of Turbines	Distance (km) and direction	NHZ	Annual Collision Risk			
					Hen Harrier	Merlin	Peregrine	Pink-Footed Goose
Hadyard Hill	Installed	52	0.2 west	17	0.03	0.01	*	*
Carrick Windfarm	Scoping	Up to 17	0.05 east	17	-	-	-	-
Linfairn	Application	17	1.36 north	17	-	-	-	-
Kirk Hill	Application	7	5.71 north	17	*	*	0.03	*
Tralorg	Approved	8	7.03 west	17	*	*	0.01	*
Dersalloch	Approved	23	7.85 north-east	19	0	0	0	0
Assel Valley	Application	17	7.91 west	17	-	-	-	-
Scienteuch/Keirs	Application	33	8.14 north-east	17	-	-	-	-
Scienteuch/Keirs	Application	33	8.14 north-east	19	-	-	-	-
Leffinwyne Farm	Application	5	8.17 north	17	-	-	-	-
Mark Hill	Installed	28	10.82 south	19	-	-	-	-
Knowside	Application	15	11.61 north	17	-	-	-	-
Millenderdale	Application	8	11.94 west	17	-	-	-	-
Breaker Hill (2)	Application	9	13.40 west	17	*	*	0.023	*
Chalmerston (Burnhead)	Application	2	15.08 north east	19	-	-	-	-
Burnhead	Application	19	15.09 north east	19	-	-	-	-
Balunton	Application	9	15.24 south	19	0	0	0	0
Corwar Windfarm Barrhill	Application	8	15.84 south	19	0.004	*	*	*
Arecleoch	Installed	60	16.05 south -west	19	*	*	*	*
Altercannoch	Application	8	16.84 south -west	19	-	-	-	-
Benbrack	Application	18	17.78 east	19	*	*	0	*
South Kyle	Application	50	19.02 north-east	19	*	*	0.030	*

*** Collision risk not assessed**

- Data not available

Mitigation Measures

Construction

- 8.118 The following mitigation measures should be implemented during the construction phase and can be secured by planning condition:
- The felling of plantation and shrubs within the Site boundary should be programmed and undertaken outside the breeding bird season. In the unlikely event that felling is required between March and August, vegetation should be checked by an experienced ornithologist prior to works to identify the presence of any nesting birds. Felling should only commence once a check has been undertaken and approved for clearance by an ornithologist;
 - Borrow pits, laydown areas, access routes, and any other construction activities / mobilisation that require ground-breaking or land-take of habitat outside plantation should additionally be programmed and undertaken outwith the breeding bird season. If these works are required to take place between March and August, then they should be subject to a ground nesting bird survey by an ornithologist;
 - An experienced Ecological Clerk of Works (ECoW) should be appointed to the Proposed Development, with experience with ornithology. A role of the ECoW should include monitoring bird activity across the Site on a weekly basis. If breeding activity is recorded, particularly target species, the ornithologist should be contacted to advise on requirements. Suitable protection / buffer zones for nesting birds within the Site should be outlined by the ornithologist and agreed with the ECoW and works contractor; and
 - A Breeding Bird Protection Plan (BBPP) should be produced to ensure that the nests, eggs and young of any bird species within the Site are protected under the WCA 1981 (as amended) legislation.

Operational

- 8.119 Mitigation for ornithological receptors is not required for the operational phase of the Proposed Development as collision risks for target species were assessed to be negligible in magnitude and not significant.

Decommissioning

- 8.120 Mitigation measures used during the construction phase should be applied in the decommissioning phase to ensure effects to ornithological receptors are not significant.

Residual Effects

- 8.121 The residual effects to ornithological receptors as a result of the Proposed Development are expected to be non-significant with the mitigation measures outlined above in place.
- 8.122 Commercial forestry plantation will be felled, and small amounts of habitat will be permanently lost for turbine bases, access tracks, and one substation. These habitats are

widespread in the wider and local area, and existing ground vegetation within the Site buffer zone is considered to be sub-optimal for breeding Schedule 1 birds of the WCA 1981 (as amended) due to intensive grazing.

- 8.123 Should disturbance to the upland bird community occur, it is likely that alternative nesting or foraging sites can be found locally rather than losses to regional breeding populations.

Table 8.14. Residual Effects

Stage	Description	Mitigation Measure	Residual Effect
Construction	Habitat loss	Tree felling outwith breeding season	Not significant
	Disturbance to breeding Schedule 1 and Annex 1 birds	Tree felling outwith breeding season BBPP in place Avoid decommissioning during breeding season ECoW appointed to monitor activity	Not significant
	Disturbance to other breeding birds	Tree felling outwith breeding season BBPP in place Avoid decommissioning during breeding season ECoW appointed to monitor activity	Not significant
	Bird displacement	None required	Not significant
	Displacement to foraging birds	None required	Not significant
	Displacement to wintering or passage birds	None required	Not significant
Operational	Bird collision with turbine	None required	Not significant
	Bird displacement	None required	Not significant
Decommissioning	Disturbance to breeding Schedule 1 and Annex 1 birds	Survey bird community prior to decommissioning Avoid decommissioning during breeding season Implement BBPP ECoW appointed to monitor activity	Not significant
	Disturbance to other breeding birds	Survey bird community prior to decommissioning Avoid decommissioning during breeding season Implement BBPP Tree felling outwith breeding season ECoW appointed to monitor activity	Not significant
	Bird displacement	None required	Not significant
	Displacement to foraging birds	None required	Not significant
	Displacement to wintering or passage birds	None required	Not significant

Summary

- 8.124 The EIA presented assesses the potential effects to ornithology receptors associated with the Proposed Development.
- 8.125 In line with NatureScot guidance, target species (or those of notable conservation value) that may be adversely affected by windfarms were identified during baseline surveys.
- 8.126 Surveys consisted of VP surveys and breeding bird surveys (including targeted breeding raptor surveys) across 2019 and 2020. Effects to peregrine falcon, hen harrier, pink-footed goose, and merlin were all assessed through collision risk modelling. No significant effects to either target species or the rest of the upland bird community associated with the Site are expected during the construction, operational, and decommissioning stage of the windfarm. The same outcome is expected at a cumulative scale following assessment.
- 8.127 The Proposed Development is located within commercial forestry plantation and buffered by bog, marsh, and heath habitats that are heavily grazed, therefore no significant effects as a result of habitat loss are expected. A Breeding Bird Protection Plan (BBPP) will be produced and adhered to during the construction stage of the Proposed Development to reduce the effects of disturbance and displacement.

Acronyms

Table 8.15. List of Acronyms

Acronym	Expanded Term
BTO	British Trust for Ornithology
CRM	Collision Risk Modelling
CRZ	Collision Risk Zone
EIA	Environmental Impact Assessment
NBN	National Biodiversity Network
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SPA	Special Protection Area
SSRSG	South Strathclyde Raptor Study Group
SSSI	Site of Special Scientific Interest
VP	Vantage Point
WCA	Wildlife & Countryside Act 1981 (as amended)

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