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# Glentarken Wind Farm

## Ornithology

### Appendix 6.1

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## 1 INTRODUCTION

MacArthur Green was commissioned by SSE to complete ornithological surveys at the proposed Glentarken Wind Farm, east of Lochearnhead in Perth and Kinross (hereafter referred to as ‘the Proposed Development’). The surveys were conducted between April 2021 and August 2023 to inform an assessment of the potential ornithological effects of the Proposed Development on the species assemblage present.

This technical report summarises the methods employed and the results of the field surveys and is supported by the following Annexes.

- **Annex A:** Ornithological Legal Protection;
- **Annex B:** Ornithological Survey Methodologies;
- **Annex C:** Ornithological Survey Effort and General Information;
- **Annex D:** Ornithological Survey Results; and
- **Annex E:** Collision Risk Assessments.

Confidential information relating to species listed on Annex 1 of the EU Birds Directive or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) is detailed in **Confidential Appendix 6.2 (EIAR Volume 5)**.

A range of surveys were employed to accurately record baseline conditions within the Proposed Development and appropriate survey areas (detailed in **Annex B**). In this Technical Appendix, associated **Annexes A – E**, **Confidential Technical Appendix 6.2 (EIAR Volume 5)** and **Chapter 6 (Ornithology)** of the Environmental Impact Assessment Report. Terms referred to are as follows:

- ‘the Site’ refers to the area within the red line boundary, e.g. **Figure 6.1 (EIAR Volume 2)**;
- ‘Survey Area is defined as the area covered by each survey type for the Proposed Development; and
- ‘Study Area is defined as the area of consideration of effects on each species at the time of assessment (**Figure 6.1, EIAR Volume 2**).

## 2 LEGAL PROTECTION

With limited exceptions, all wild birds and their eggs are protected by law. Specific levels of protection are determined by a species’ inclusion on certain lists. **Annex A** to this report details the various levels of legal protection afforded to UK bird species.

## 3 FIELD SURVEY METHODS

The following surveys were undertaken at the Site between April 2021 and August 2023:

- Flight activity surveys (three breeding seasons and two non-breeding seasons), from between three and five Vantage Points (VPs) depending on the season: 2021 breeding season and 2021/2022 non-breeding season, four VPs (**Figure 6.3** and **Figure 6.4, EIAR Volume 2**); 2022 breeding season and 2022/2023 non-breeding season, three VPs (**Figure 6.5**); and 2023 breeding season, five VPs (**Figure 6.6**);
- Breeding bird surveys (main Site: two breeding seasons, access track: one breeding season), 500 m survey buffer, **Figure 6.9**;
- Winter walkover surveys (one non-breeding season), 500 m survey buffer, **Figure 6.9**;
- Scarce breeding bird surveys (main Site: two breeding seasons, access track: one breeding season), 2 km/800 m survey buffer (main Site/access track), **Figure 6.7**; and
- Black grouse surveys (main Site: two breeding seasons, access track: one breeding season) 1.5 km/800 m survey buffer (main Site/access track), **Figure 6.8**.

Survey methods followed the recommended NatureScot (SNH 2017<sup>i</sup>) guidelines available at the time and methods are described in detail within **Annex B**. Where possible, each survey was carried out beyond the Site within a buffer distance specific to that method (e.g. 2 km buffer for the scarce breeding bird surveys) and these are detailed within **Annex B**.

A target species list for surveying/recording was defined from the following lists and refined on the basis of the species perceived sensitivity to onshore wind farm developments (e.g., as set out in Annex 1 of SNH 2018<sup>ii</sup>).

- Annex I of the EU Birds Directive<sup>iii</sup>;
- Schedule 1 the Wildlife and Countryside Act 1981 (as amended)<sup>iv</sup>; and
- Species included on the Birds of Conservation Concern (BoCC) red list (Stanbury *et al.* 2022<sup>v</sup>).

Secondary species for survey/recording were defined as the non-red list raptor and owl species (i.e. buzzard, kestrel, sparrowhawk, tawny owl and long-eared owl), gulls (excluding herring gull), amber or green listed waders, feral species (e.g. Canada goose), mallard, raven and any large concentrations of regionally common Schedule 1 or red listed passerine species as noted to be present during surveys.

## 4 FIELD SURVEY RESULTS

All valid surveys were undertaken during suitable weather conditions (as described within **Annex B**). Where weather conditions deteriorated below acceptable conditions (see definitions in **Annex B**), surveys were either suspended or additional surveys were undertaken. In the case of flight activity surveys, any time where the visibility was <1 km was excluded from total survey effort and subsequent analysis (further detail in **section 4.1**). Schedule 1/Annex 1 surveys were carried out by appropriately licensed surveyors. All survey data were reviewed, inputted, and analysed by MacArthur Green.

A total 93 bird species were recorded within, or adjacent to, the Site during the various ornithological surveys conducted. Survey effort and results of the field surveys are detailed within **Annexe C** and **Annex D**. The following sections summarise the results from each survey undertaken.

### 4.1 Flight Activity

The flight activity surveys recorded all target species' flight activity within the Site and beyond. These data have been used in the collision risk modelling. The flights used included those within the 'Collision Risk Analysis Area' (CRAA) (i.e. the area to be occupied by operational turbines, together with a 500 m buffer).

Flight activity surveys across the 2021, 2022 and 2023 breeding seasons and 2021/2022 and 2022/2023 non-breeding seasons were undertaken between three and five VPs. Valid survey effort<sup>1</sup> is detailed in **Table 6-1-1** and full details of flight activity surveys are contained in **Annex C** with methodology in **Annex B**.

**Table 6-1-1 Summary of total hours of valid survey per VP in each season**

Season	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11
2021 breeding season	39.75	36.5	36.16	36	-	-	-	-	-	-	-
2021/2022 non-breeding season	-	-	36	31	38	36	-	-	-	-	-
2022 breeding season	-	-	-	36.5	33	36	-	-	-	-	-
2022/2023 non-breeding season	-	-	-	36	36	36	-	-	-	-	-
2023 breeding season	-	-	-	-	-	-	36	36	36	36	36.34

A total of 14 target species were recorded during the flight activity surveys (further details are provided in **Annex D**). For each species across the whole flight activity survey period, **Table 6-1-2** shows the total number of flights recorded and the total number of birds recorded<sup>2</sup>. The bird seconds are calculated for each observation as the product of flight duration and number of individuals. This is then summed per species to give the total bird seconds recorded across the entire surveyed period.

<sup>1</sup> Hours where visibility was >1 km are not considered valid for use in collision risk modelling as less than half the 2 km viewshed can be seen.

<sup>2</sup> This includes flights that would not technically be 'at-risk' of collision (e.g. recorded outwith the CRAA and/or not at rotor height).

<sup>3</sup> This includes a summation of the number of birds recorded within each flight, and which may include the same individual bird.

**Table 6-1-2 Target species recorded and total number of flights recorded during flight activity surveys, 2021-2023**

Species	Total number of flightlines recorded	Total number of birds recorded <sup>3</sup>	Total bird seconds recorded
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

#### 4.1.1 Flightlines Used in Collision Risk Modelling

Only flightlines identified to be within the CRAA and recorded within the 2 km viewshed of the associated VP were considered in the collision risk modelling and **Annex E** provides details of the bird seconds from flights identified to be 'at-risk'.

- 'At-risk' is defined as – a flight having at least part of its duration (i) at Potential Collision Height (PCH)<sup>4</sup>; (ii) within the CRAA; and (iii) recorded within the 2 km viewshed of the associated VP.
- PCH is defined as – the altitude between the minimum and maximum blade height<sup>5</sup> (taken to be from 18 m to 180 m for the Proposed Development).

Greylag goose, osprey and whooper swan were recorded during flight activity surveys, but no flights were considered to be 'at-risk'<sup>6</sup>. Full survey results detailing the findings from each survey visit (including target species' flightlines considered not 'at-risk' and secondary species information) can be found within **Annex D**. Only bird seconds for observations identified as within the CRAA and associated viewshed are considered in the following discussions. Full target species results are detailed within **Annex D** and the collision risk calculations are detailed in **Annex E**.

<sup>4</sup> In some cases, only part of a total flight duration was recorded at PCH, and it is assumed that this proportion is applicable for that part of the flight within the CRAA and 2 km viewshed area.

<sup>5</sup> Where the actual rotor blade altitude differs from the pre-defined survey height bands, the collision risk model accounts for this difference on the assumption of an even flight distribution within each particular survey height band, and an adjustment can be made to estimate total flight duration at actual rotor blade altitude.

<sup>6</sup> i.e. the flights were either not within the CRAA and associated viewshed or were only recorded flying above 150m.

#### 4.1.2 Collision Risk Model Outputs

The bird seconds for target species flights within the CRAA at PCH were then input into a Collision Risk Model (CRM) to calculate the predicted collision rates per season. The CRM calculations for each species can be found in **Annex E. Table 6-1-3** and **Table 6-1-4** provide the estimated collision rates and number of seasons per collision for each species.

**Table 6-1-3 Estimated collision rates**

Species	2021 breeding season	2021/2022 non-breeding season	2022 breeding season	2022/2023 non-breeding season	2023 breeding season	Mean breeding	Mean non-breeding	Mean annual
Barnacle goose	-	0.0259	-	-	-	n/a	0.0129	0.0129
Curlew	-	0.0062	0.0265	-	0.0458	0.0241	0.0031	0.0272
Golden eagle	0.2306	0.0918	0.1892	0.0670	0.0917	0.1705	0.0794	0.2499
Golden plover	-	0.0012	0.0115	0.0276	-	0.0038	0.0144	0.0182
Hen harrier	0.0005	0.0054	-	0.0004	0.0246	0.0084	0.0029	0.0113
Merlin	0.0006	0.0002	-	0.0002	0.0076	0.0027	0.0002	0.0029
Peregrine falcon	0.1018	0.00002	0.0090	-	-	0.0369	0.00001	0.0369
Pink-footed goose	-	0.0267	-	-	-	n/a	0.0133	0.0133
Red kite	0.6422	0.1866	0.4547	0.2768	0.4125	0.5031	0.2317	0.7348
Short-eared owl	-	-	-	0.0006	-	n/a	0.0003	0.0003
White-tailed eagle	-	-	-	-	0.3035	0.1012	n/a	0.1012

**Table 6-1-4 Estimated number of seasons per collision**

Species	2021 breeding season	2021/2022 non-breeding season	2022 breeding season	2022/2023 non-breeding season	2023 breeding season	Mean breeding	Mean non-breeding	Mean annual
Barnacle goose	-	38.7	-	-	-	-	77.3	77.3
Curlew	-	162	37.7	-	21.9	41.5	323	36.8
Golden eagle	4.3	10.9	5.3	14.9	10.9	5.9	12.6	4
Golden plover	-	802	87.2	36.3	-	262	69.4	54.8
Hen harrier	1,842	185	-	2,730	40.6	119	347	88.7
Merlin	1,697	5,695	-	4,207	132	366	4,839	341
Peregrine falcon	9.8	59,919	111	-	-	27.1	119,837	27.1
Pink-footed goose	-	37.5	-	-	-	-	75	75
Red kite	1.6	5.4	2.2	3.6	2.4	2	4.3	1.4
Short-eared owl	-	-	-	1,593	-	-	3,186	3,186
White-tailed eagle	-	-	-	-	3.3	9.9	-	9.9

#### 4.2 Breeding Birds

Moorland breeding bird surveys (comprising of four visits each; April to July) were undertaken during the 2021, 2022 and 2023 breeding seasons (note that surveys during the 2023 breeding season were focussed along the proposed access track). Surveys recorded seven wader species which were considered to be breeding (**Table 6-1-5**). Full details of the breeding bird surveys are provided within **Annex C** and **Annex D** and survey methodology is provided within **Annex B**.

**Table 6-1-5 Breeding wader territories, 2021 to 2023<sup>7</sup>**

Species	Number of territories 2021	Number of territories 2022	Number of territories 2023
Common sandpiper	2-4 (0)	0-2 (0)	1 (0)
Curlew	8 (4)	7-10 (5-6)	3-5 (3-5)
Golden plover	0-1 (0-1)	0-4 (0-3)	0-1 (0-1)
Greenshank	-	-	1-2 (1)
Lapwing	0-1 (0)	-	1-2 (1-2)
Oystercatcher	1-2 (0)	-	0-1 (0-1)
Snipe	10-16 (3)	11-20 (2-4)	12-15 (9-12)

#### 4.3 Winter Walkover

Winter walkover surveys were conducted during the 2021/2022 non-breeding seasons. Surveys recorded 18 species of which seven are considered to be target species (**Table 6-1-6**). Full details of the winter walkover surveys are provided within **Annex C** and **Annex D** and survey methodology is provided within **Annex B**.

**Table 6-1-6 Winter walkover: target species records (number of birds recorded per visit), 2021/2022**

Species	2021/2022 non-breeding season	
	Number of records	Total number of birds
Black grouse	1	1
Golden eagle	3	4
Golden plover	1	1
Merlin	1	1
Peregrine falcon	1	1
Red kite	9	15
White-tailed eagle	1	1

#### 4.4 Scarce Breeding Birds

Scarce breeding bird surveys were conducted during the 2021 (April to August), 2022 (March to August) and 2023 (April to July) breeding seasons. Surveys during the 2024 breeding season were focussed along the proposed access track.

Merlin and red kite were confirmed to be breeding during baseline surveys. A potential peregrine falcon territory and one possible barn owl roosting location were also identified during baseline surveys. Breeding activity is summarised in **Table 6-1-7**. **Confidential Technical Appendix 6.2** contains the full details of all breeding activity. Golden eagle, goshawk, hen harrier, osprey, short-eared owl and white-tailed eagle were also recorded during surveys but were not considered to be breeding/no breeding attempts were located.

**Table 6-1-7 Scarce breeding bird summary**

Species	2021	2022	2023
Barn owl	Not identified in 2021.	One possible roost location recorded.	-
Merlin	One confirmed nest (minimum one fledged). One probable and two potential territories also recorded.	One confirmed nest (minimum one fledged).	One confirmed nest (fledging success unknown). One potential territory also recorded.
Peregrine falcon	One potential territory.	-	-

<sup>7</sup> Number of territories within the 500 m study area shown in (brackets).

Species	2021	2022	2023
Red kite	One confirmed nest (juveniles heard).	-	One probable territory; breeding not confirmed.

Buzzard, kestrel, sparrowhawk and tawny owl (secondary raptor and owl species) were also recorded across the survey area and are likely to have bred within the wider area.

Full details of the scarce breeding bird surveys are provided within **Annex C** and **Annex D** and **Confidential Technical Appendix 6.2** and survey methodology is provided within **Annex B**.

#### 4.5 Black Grouse

Surveys to identify areas of black grouse activity, locate lek locations and establish lek size were conducted in the 2021 and 2022 breeding seasons (main Site) and 2023 breeding season (proposed access track) during April and May. Surveys identified six lek locations with lek 5 recording the largest numbers in 2023 (**Table 6-1-8**). Full details of the black grouse surveys are provided within **Annex C** and **Annex D** and survey methodology is provided within **Annex B**.

**Table 6-1-8 Black grouse lek activity: 2021 to 2023**

Lek	Location	2021		2022		2023	
		Maximum number of males recorded	Maximum number of females recorded	Maximum number of males recorded	Maximum number of females recorded	Maximum number of males recorded	Maximum number of females recorded
1	Tom Cadalach	4	1	1	1	-	-
2	Creag Dhubh	-	-	3	-	-	-
3	Easter Glentarken	-	-	1	-	-	-
4	Upper Glen Beich	-	-	-	-	1	-
5	Mid Glen Beich	-	-	-	-	6	2
6	Lower Glen Beich	-	-	-	-	1	-

<sup>i</sup> Scottish Natural Heritage (2014; updated 2017) Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms.

<sup>ii</sup> Scottish Natural Heritage (2018) Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas.

<sup>iii</sup> Directive 2009/147/EC of the European Parliament and of the Council. Available at: <https://www.legislation.gov.uk/eudr/2009/147/contents>

<sup>iv</sup> Scottish Government (1981). Wildlife and Countryside Act 1981. Available at: <https://www.legislation.gov.uk/ukpga/1981/69>

<sup>v</sup> Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win I. (2021). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, 114, pp. 723-747