
Millennium East Wind Farm
Environmental Impact Assessment (EIA) Report
Technical Appendix 7.1: Ornithology



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1 INTRODUCTION

1.1 Overview

- 1.1.1 This Technical Appendix has been prepared to accompany **Chapter 7: Ornithology** of the Environmental Impact Assessment (EIA) Report for Millenium East Wind Farm (the Proposed Development), an extension to the operational Millennium Wind Farm.
- 1.1.2 The Technical Appendix presents details of data gathering methodologies and results, gathered from ornithological desk studies and field surveys, in order to inform the design and assessment of the Proposed Development.
- 1.1.3 This Technical Appendix should be read with reference to the following figures, available in **Volume 2a** of the EIA Report:
- **Figure 7.1** – Statutory Designated Sites with Ornithological Interest.
 - **Figure 7.2a** – Vantage Point Locations and Viewsheds (Year 1).
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- 1.1.4 Information regarding the locations of sensitive breeding bird species, including discussion of the Golden Eagle Topography (GET) Model undertaken for the Proposed Development, is provided separately:
- **Confidential Technical Appendix 7.3:** Confidential Ornithology.
 - **Confidential Technical Appendix 7.4:** GET Model.
- 1.1.5 These Confidential Technical Appendices are provided in **Volume 4**. Such information will not be made publicly available, but will be provided to the Scottish Government, The Highland Council (THC) NatureScot and the Royal Society for the Protection of Birds (RSPB). This sensitive information is presented on:
- **Confidential Figure 7.9a** – Desk Study Records (RSPB - Sensitive).

- **Confidential Figure 7.9b** – Desk Study Records (HRSG - Sensitive).
- **Confidential Figure 7.10** – Breeding Raptor Survey Results.
- **Confidential Figure 7.11** – Breeding Black Grouse Survey Results (Year 2).
- **Confidential Figure 7.12** – Breeding Black Grouse Survey Results (from SBBS in Year 3).
- **Confidential Figure 7.13** – Breeding Black Grouse Survey Results (Combined).

1.1.6 Collision mortality risk analysis is provided separately in **Technical Appendix 7.2: Collision Risk Model Analysis**.

1.1.7 Only common bird species names are referred to within the main body of this Technical Appendix. Annex 1 provides a summary of all bird species referred to herein and within **Chapter 7: Ornithology** of the EIA Report and all other associated appendices and figures. Both common and species names together with a summary of their conservation status, as relevant, are presented.

1.2 Terminology

1.2.1 To aid clarity, within this Technical Appendix and **Chapter 7: Ornithology**, the following terms are used to describe components of the Site:

- Development Area: defined as that part of the Site where the wind turbines and associated infrastructure, including new track, substation, Battery Energy Storage System (BESS) compound etc. are proposed; and
- Access Route: defined as that part of the Site encompassing the existing Millennium Wind Farm access track from the A887 to the Development Area.

1.2.2 The Site, the boundary of which is shown in red as the Application Boundary on **Figures 7.1 - 7.8** accompanying **Chapter 7: Ornithology**, therefore comprises the Development Area, the Access Route, and also small areas to the north and north-west of the Access Route proposed for habitat creation, enhancement and management under the outline Habitat Management Plan (oHMP; see **Technical Appendix 6.7**).

1.2.3 Due to the iterative approach to design that has been ongoing throughout the baseline survey period, the Site boundary and survey scope has evolved over the course of baseline studies. Therefore, the surveys have been undertaken with reference to 'Study Areas' which are defined below and shown on **Figures 7.3 to 7.5**, and which do not in all cases precisely correspond with the Application Boundary of the Site.

- Study Area 1: An early iteration of the Site boundary, comprising an early proposed developable area only, and excluding Site access. Surveyed from September 2021 to August 2022.
- Study Area 2: Following Year 1 surveys the preliminary Site boundary was extended to the north towards Druim á Chàthair. The extended developable area was surveyed from September 2022 to August 2023.
- Study Area 3: In late 2023 the Scoping boundary was developed, with the boundary extended to the forestry to the north, and inclusion of the Access Route from the Development Area to the A887. The Access Route was surveyed from March to July 2024.

1.2.4 The areas surveyed (the Survey Areas) are appropriate buffers of the Study Area for a given survey and have been defined with reference to appropriate industry standard guidance. How Survey Areas

relate to the Application Boundary is shown on **Figures 7.3 to 7.5** and discussed in the survey method sections where relevant.

- 1.2.5 As the Development Area and Access Route have been surveyed at different stages throughout the baseline data gathering period, and due to the notable difference in habitat character and impact pathways in these different areas of the Site, different survey methods have been used for the different areas of the Site in order to ensure appropriate and proportionate data has been collected. Therefore, where appropriate, methods and results for different areas of the Site are described separately.

1.3 Site Overview

- 1.3.1 The Site is located within Natural Heritage Zone (NHZ) 7 'Northern Highlands' on land west of Fort Augustus, in the Scottish Highlands, with the Site location shown on **Figure 7.1**.
- 1.3.2 The habitat within the Development Area is primarily blanket bog, with a number of bog pools and lochans, and grading into heath, grassland and plantation woodland, particularly in the Access Route at the west of the Site and at lower elevations. There is commercial forestry adjacent to the Site, to the north and east, and the operational Millennium Wind Farm immediately adjacent to the south-west.

1.4 Key Guidance

- 1.4.1 Ornithology survey methodologies and subsequent interpretation of results has made reference to the following key industry standard guidance, including that produced by NatureScot (formerly Scottish Natural Heritage (SNH)):
- Band, W., Madders, M. & Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: de Lucas, M., Janss, G.F.E. & Ferrer, M. (Eds.) *Birds and Wind Farms: Risk Assessment and Mitigation*, pp 259-275. Quercus, Madrid.
 - SNH (2000) *Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note.
 - SNH (2018). *Assessing significance of impacts from onshore wind farm outwith designated areas*. Guidance. Version 2 – February 2018.
 - SNH (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*. Version 2. March 2017.
 - SNH (2016). *Assessing connectivity with Special Protection Areas (SPAs)*. Guidance. Version 3 – June 2016.
 - Goodship, N.M. and Furness, R.W. (MacArthur Green) (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.
 - 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: 723-747.
 - Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: a field guide to survey and monitoring*. Third Edition. The Stationary Office, Edinburgh.

- Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird monitoring methods*. A manual of techniques for key UK species. RSPB, Sandy, Bedfordshire.
- Brown, A.F. & Shepherd, K.B. (1993). A method for censusing upland breeding waders. *Bird Study* 40, 189-195.

1.5 Target Species

1.5.1 In accordance with NatureScot guidance (SNH, 2017), the surveys focussed on ‘target’ species. These were identified as being those species which are afforded a higher level of legislative protection and are potentially most sensitive to wind farm developments, and were based on the following lists:

- Annex I of the EC Birds Directive;
- Schedule 1 of the Wildlife & Countryside Act 1981;
- Red-listed Birds of Conservation Concern (Stanbury, *et al.* (2021)); and
- Annex 1 ‘Priority bird species for assessment when considering the development of onshore wind farms in Scotland’ (SNH, 2018).

1.5.2 Appropriate target species for the Proposed Development were further identified through desk study and an initial reconnaissance visit, on the basis of known species distributions or likely presence within the vicinity of the Site, and the likely sensitivity of such species to the Proposed Development. The species for survey were agreed with NatureScot through informal consultation (see **Table 7.1** in **Chapter 7: Ornithology**).

1.5.3 Based on the above, target species during vantage point (VP) flight activity surveys comprised all Schedule 1 and Annex I listed raptors and owls, all wader species, all waterfowl (swans, geese and ducks but excluding feral species and mallard), divers, grebes, herons and black grouse, as observed during survey.

1.5.4 During the VP flight activity surveys, ‘secondary’ species were also recorded. Secondary species were defined as commoner raptors (common buzzard, kestrel and sparrowhawk), all gulls, mallard, red grouse and raven, along with any large concentrations of Schedule 1 or red-listed passerines (Stanbury *et al.*, 2021), as recorded during survey.

2 DESK STUDY

2.1 Overview

2.1.1 In accordance with guidance (SNH, 2017), a desk study was undertaken with the aim of obtaining relevant supplementary information, to provide context to the field survey data and to inform the EIA Report.

2.2 Methodology

2.2.1 The desk study comprised a review of sources summarised in **Table 2.1**. The RSPB and Highland Biological Recording Group (HBRG) requests were made in June 2023 and May 2023 respectively. Requests to Highland Raptor Study Group (HRSBG) were made in June 2023.

Table 2.1: Desk study key sources and information sought.

Key Source	Information Sought	Search Area
NatureScot Sitelink ¹	Statutory designated sites for nature conservation with qualifying ornithological interests.	Within 10 km of the Study Area 2, extended to 20 km for internationally designated sites with migratory geese as a qualifying interest.
RSPB	Existing ornithological records of all species for period 2012-2023.	Within 10 km of Study Area 2.
HBRG	Existing ecological records (including ornithological) of protected and notable species for period 2013-2023.	Within 2 km of Study Area 2.
HRSG	Existing records of scarce breeding and roosting raptors and owls; 2013-2023.	Within 10 km of Study Area 2.

2.3 Results

Statutory Designated Sites for Nature Conservation

- 2.3.1 **Table 2.2** summarises the statutory designated sites with ornithological features of interest located within the search area: 10 km of the Site for all species, extended to 20 km for statutory sites with migratory geese as a qualifying feature (due to the larger foraging distance of some wintering goose species).
- 2.3.2 The Site does not form part of any internationally or nationally designated area for ornithological interests.
- 2.3.3 The only designated area with ornithological interests within 10 km of the Site, is West Inverness-shire Lochs SPA and SSSI which is approximately 2.2 km from the Site.
- 2.3.4 The Site is not located within 20 km of any SPA, or Ramsar site, with cited migratory waterfowl interests and is not located within or close to any known migratory goose feeding areas.
- 2.3.5 The location of the identified statutory designated areas in relation to the Site are illustrated on **Figure 7.1**.

Table 2.2: Designated sites for nature conservation with ornithological interests.

Designated Site	Distance from Site at closest point / Orientation	Qualifying Ornithological Interest
European Sites		
West Inverness-shire Lochs SPA	2.22 km, south	<i>Breeding</i> • Black-throated diver; and • Common scoter.
Nationally Designated Sites		

¹ Available from: <https://sitelink.nature.scot/map> [Last accessed March 2025]

Designated Site	Distance from Site at closest point / Orientation	Qualifying Ornithological Interest
West Inverness-shire Lochs SSSI	2.22 km, south	<i>Breeding</i> • Black-throated diver; and • Common scoter.
Glen Affric SSSI	8.58 km, north-west	Breeding bird assemblage including crested tit, Scottish crossbill, capercaillie and black grouse

Existing Ornithological Records

- 2.3.6 This section provides a summary of existing ornithological records identified through desk study sources. Only records of ‘priority species for assessment when considering the development of onshore windfarms in Scotland’ and ‘species with restricted ranges’ as listed in Annex 1 of NatureScot guidance (SNH, 2018) are considered in detail.
- 2.3.7 The consideration of existing records is also limited to those reported since 2013, to ensure that only the most recent and relevant records are considered.

RSPB

- 2.3.8 One indicative record of breeding white-tailed eagle (juvenile), a record of an adult white-tailed eagle in May 2022, two records of golden eagle (four individuals in May 2012) and another unspecified golden eagle record from 2022, were returned from the RSPB. Twenty-six records of black grouse have been provided. Some of these records relate to annual counts of the same locations across a number of years and thus are indicative of established lek sites. Full details are provided in **Volume 4: Confidential Appendices** and shown on **Confidential Figure 7.9a – Desk Study Records (RSPB - Sensitive)**.

HBRG

- 2.3.9 No relevant records were returned from the HBRG.

HRSB

- 2.3.10 Ten golden eagle and two white-tailed eagle nest site locations were returned by the HRSB. Full details are provided in **Volume 4: Confidential Appendices** and shown on **Confidential Figure 7.9b – Desk Study Records (HRSB - Sensitive)**.

3 FIELD SURVEYS

3.1 Overview

- 3.1.1 In order to assess the potential effects of the Proposed Development upon ornithological features, detailed knowledge of bird populations, distributions and flight activity within the vicinity of the Site, has been derived from a programme of field surveys undertaken between 2021 and 2024.
- 3.1.2 The suite of baseline ornithology surveys undertaken was informed by expert knowledge and experience of bird habitat associations at comparable sites and locations in Scotland. NatureScot were also consulted informally in respect to field survey effort and methodologies.

- 3.1.3 All field surveys have been completed by professional ornithologists, all of whom are highly experienced in bird identification and are fully conversant in bird survey methodologies for proposed wind farm developments.
- 3.1.4 All survey visits were undertaken in weather conditions conducive to survey. Details of weather conditions were regularly recorded during field surveys and this information is summarised in **Annex 2**.

3.2 Methodologies

3.2.1 The following baseline ornithological surveys have been undertaken:

- Vantage Point Flight Activity Surveys;
- Moorland Breeding Bird Surveys (MBBS);
- Annex I and Schedule 1 Breeding Raptor and Owl Surveys;
- Breeding Black Grouse Surveys;
- Breeding Diver Searches and Common Scoter Suitability Appraisal; and
- Scarce Breeding Bird Surveys (SBBS).

Vantage Point Flight Activity Surveys

- 3.2.2 Vantage Point (VP) flight activity surveys were undertaken between September 2021 and August 2023, in accordance with NatureScot guidance (SNH, 2017). For exceptions see **Section 3.3: Limitations**. The surveys covered two non-breeding seasons (taken to be the period September to February, in 2021/22 and 2022/2023) and two breeding seasons (taken to be the period March to August, in 2022 and 2023).
- 3.2.3 Appropriate VP locations were set up to provide the best possible visual coverage of the indicative turbine layout (at the time of survey commencement) and 500 m surrounding buffer; whilst adopting the minimum number of VPs in order to obtain this coverage (in accordance with NatureScot guidance (SNH, 2017)).
- 3.2.4 During the course of the baseline survey programme the VPs used to undertake the flight activity surveys changed several times to better cover the Proposed Development, as the turbine layout evolved. When surveys commenced in September 2021, they were undertaken from three VP locations (VP1a, VP2a and VP3a) (**Figure 7.2a**). In September 2022, the three VPs were relocated (VPs 1b, 2b and 3b) (**Figure 7.2b**) to improve coverage of the extended developable area.
- 3.2.5 The locations of these VPs and the survey period during which each was used, is summarised in **Table 3.1**.

Table 3.1: Vantage point locations used during baseline surveys September 2021 to August 2023.

VP	Grid Reference	Orientation	Months Surveyed
1a	NH 29283 06091	North north-east	September 2021 to August 2022
2a	NH 31554 08545	North-west	September 2021 to August 2022
3a	NH 29085 09664	South south-west	September 2021 to August 2022

VP	Grid Reference	Orientation	Months Surveyed
1b	NH 29917 06387	North-north-east	September 2022 to August 2023
2b	NH 30329 09986	East	September 2022 to August 2023
3b	NH 27449 08042	South	September 2022 to August 2023

- 3.2.6 It is acknowledged that changing VPs during the course of the baseline survey programme is best avoided, however the overall coverage of the turbine area was largely comparable throughout, despite the minor changes made. The subsequent Collision Risk Mortality Modelling (CRM) accounts for these changes by filtering flights to appropriate VP locations and by using VP-specific survey effort.
- 3.2.7 Visible areas for each VP viewshed were determined using a Digital Elevation Model (DEM), based on an observer height of 1 m and a 20 m above ground offset, and were subsequently ground-truthed prior to use.
- 3.2.8 VP locations were positioned at the edge of the turbine development area to minimise any potential disturbance caused by surveyors. The VPs were also offset from summits to reduce visibility of surveyors.
- 3.2.9 NatureScot guidance (SNH, 2017) recommends 36 hours of survey effort per VP per season (breeding and non-breeding); deviations from guidance are discussed in **Section 3.3: Limitations** as appropriate. The total survey effort (hours) completed during the two years of baseline surveys is presented in **Table 3.2**.

Table 3.2: VP flight activity survey effort (hours) – September 2021 to August 2024.

V P	Year 1													
	Non-breeding Season							Breeding Season						
	Sep	Oct	Nov	Dec	Jan	Feb	Total	Mar	Apr	May	Jun	Jul	Aug	Total
1a	6	6	9	6	6	0	33	12	6	6	6	6	6	42
2a	6	6	6	6	6	6	36	6	6	6	0	12	6	36
3a	6	6	9	6	6	0	33	12	6	6	6	6	6	42
V P	Year 2													
	Non-breeding Season							Breeding Season						
	Sep	Oct	Nov	Dec	Jan	Feb	Total	Mar	Apr	May	Jun	Jul	Aug	Total
1b	3	9	6	6	6	6	36	6	6	6	6	6	6	36
2b	6	6	6	6	6	6	36	6	6	6	6	6	6	36
3b	3	3	6	9	6	6	33	3	6	6	6	6	6	33

- 3.2.10 Flight lines were mapped for all target species passing through the surveyed viewsheds. Details of species, number of birds, flight height (in bands), duration and direction were noted on standardised recording forms and field plans.
- 3.2.11 The use of height bands allows for determining flight activity as being at, below, or above collision risk height, whilst acknowledging that final turbine specifications had not been decided at the time of survey completion.

3.2.12 The following height bands (HT) were used in the field:

- HT 1 = 0 - 20 m;
- HT 2 = 20 – 50 m;
- HT 3 = 50 – 160 m;
- HT 4 = 160 – 180 m;
- HT 5 = 180 – 230 m; and
- HT 6 = >230 m.

3.2.13 Secondary species were noted in five-minute summary intervals, with the number of birds present and general behaviour recorded, in order to build an overall picture of relative activity. Secondary species were not mapped, in line with NatureScot guidance (SNH, 2017).

Moorland Breeding Bird Surveys

3.2.14 A moorland breeding bird survey (MBBS), following an adapted Brown and Shepherd (1993) methodology but updated to include four survey visits as recommended by Calladine *et al.* (2009), was undertaken in the breeding seasons of 2022 (Study Area 1) and 2023 (Study Area 2). The Survey Areas are shown in **Figure 7.3** and **Figure 7.4**, respectively for 2022 and 2023, in accordance with NatureScot guidance (SNH, 2017).

3.2.15 The survey was carried out across open ground habitats within the Study Areas, and out to 500 m as shown on **Figures 7.3 and 7.4**. Forested areas were not included, as guidance does not require inclusion of these habitats (SNH, 2017).

3.2.16 Target species for the MBBS included breeding moorland and open country non-passerine species, typically waders, waterfowl, grouse and gulls, in accordance with NatureScot guidance (SNH, 2017). Any other species of note encountered during the course of the survey were also recorded. During surveys all observations of target species (seen or heard) were recorded onto a base map, with any evidence of breeding activity also noted (e.g. displaying, alarming, juvenile birds).

3.2.17 Four visits were undertaken between April and July in each survey year, with one survey visit being completed each month. Survey effort is summarised in **Table 3.3**. Each survey visit was completed by two surveyors covering different parts of the Site on the same day. All survey visits were undertaken in fine weather conditions conducive to survey.

Table 3.3: Moorland Breeding Bird Survey effort summary.

Survey Visit	2022			2023		
	Date	Time (Start)	Time (Finish)	Date	Time (Start)	Time (Finish)
1	22/04/2022	08:45	14:45	25/04/2023	08:50	16:30
2	26/05/2022	08:30	14:35	26/05/2023	08:30	14:30
3	23/06/2022	08:30	14:30	20/06/2023	08:30	14:30
4	26/07/2022	08:45	14:45	11/07/2023	08:30	14:30

- 3.2.18 Following completion of all survey visits, territory analysis was undertaken to estimate the number and location of apparent territories within the Study Area. Details of the methodology for undertaking the territory analysis can be provided upon request.

Annex I and Schedule 1 Breeding Raptor and Owl Surveys

- 3.2.19 Dedicated searches for breeding Annex I and Schedule 1 listed raptors and owls were conducted in 2022 (Study Area 1) and 2023 (Study Area 2 adopting species-specific survey advice from Hardey *et al.* (2013), in accordance with NatureScot guidance (SNH, 2017).
- 3.2.20 The survey area comprised the Study Areas, and out to 2 km, extended to 6 km for eagle species (where access permissions allowed), in accordance with NatureScot guidance (SNH, 2017). Presence, and particularly any breeding evidence, was recorded for all Schedule 1 and Annex I listed raptor and owl species, where observed. The raptor and owl Survey Areas are respectively shown on **Figure 7.3** and **Figure 7.4** for 2022 and 2023.
- 3.2.21 Surveys consisted of a combination of walkovers and short vantage point watches over suitable habitat features, to determine occupancy and any evidence of breeding behaviour. The surrounding buffer was surveyed by scanning from within the Site and by using public highways. This included drive around surveys using public roads to cover the 6 km buffer, where available.
- 3.2.22 Survey effort is summarised in **Table 3.4**. All survey visits were undertaken in weather conditions conducive to survey.

Table 3.4: Breeding raptor and owl survey effort.

2022			2023		
Date	Start time	Finish time	Date	Start time	Finish time
29/04/2022	12:10	18:10	24/04/2023	12:50	18:50
30/04/2022	07:00	13:00	26/04/2023	12:45	15:45
25/05/2022	12:05	18:10	27/04/2023	05:45	08:45
26/05/2022	14:30	17:45	02/05/2023	11:20	17:20
27/06/2022	11:00	17:00	05/05/2023	07:35	13:35
01/07/2022	08:00	14:00	31/05/2023	07:00	13:00
25/07/2022	12:50	18:50	22/06/2023	08:10	14:10
26/07/2022	14:45	17:45	28/06/2023	16:00	22:00
			25/07/2023	15:50	19:00

Breeding Black Grouse Surveys

- 3.2.23 Targeted searches for lekking black grouse were scoped out of surveys in 2022, in consultation with NatureScot, due to the elevation of the Site and predominant habitats being largely unsuitable for the species (absence of tree cover).
- 3.2.24 Observations of black grouse were however made during survey effort in 2022, and existing records of this species were returned by RSPB, including known lek locations within proximity to the Site.
- 3.2.25 Searches for black grouse leks were therefore undertaken in 2023, based on species-specific survey techniques detailed within Gilbert *et al.* (1998), as per NatureScot guidance (2017), with a visit in early

May to record the distribution of lek sites and peak numbers of lekking males within Study Area 2 and out to 1.5km, as access permissions allowed.

3.2.26 As the habitats within the Study Area were known ahead of survey, an earlier March visit to identify suitable black grouse habitats (as is recommended in guidance) was not required. The Survey Area is shown in **Figure 7.4**.

3.2.27 Survey effort for the black grouse surveys is summarised in **Table 3.5**. Surveys were undertaken at dawn in fine weather conditions conducive to survey.

Table 3.5: Breeding black grouse survey effort (2023).

Date	Start time	Finish time	Sunrise
05/05/2023	04:25	07:25	05:25

Breeding Diver Searches and Common Scoter Suitability Appraisal

3.2.28 In 2022, suitable waterbodies were searched for the presence of breeding red-throated and black-throated during the breeding Schedule 1/Annex I breeding raptors and owl surveys (with the Study Area shown in **Figure 7.3**).

3.2.29 In 2023, specific searches for breeding divers were carried out, with survey visits undertaken in late May and late June in accordance with Gilbert *et al.* (1998). The survey area comprised all waterbodies in Study Area 2 and out to 1 km, as shown in **Figure 7.4**.

Table 3.6: Breeding diver search effort (2023).

Date	Start time	Finish time
31/05/2023	07:00	13:00
28/06/2023	10:00	13:00

3.2.30 During the breeding diver searches in 2022 and 2023, an appraisal was made of the waterbodies as to suitability for supporting breeding common scoter.

Scarce Breeding Bird Surveys

3.2.31 The proposed Access Route to Site was defined and added to the scoping layout in early 2024 and principally follows the route of the existing Millennium Wind Farm site access. As such, the extent of construction works required will be minimal for the majority of the Access Route. Scarce Breeding Bird Survey (SBBS) walkovers were undertaken, along, and out to 750 m, of the Proposed Access Route (Study Area 3) during March to July 2024 to identify the presence or potential presence of breeding bird species, given this area had not been surveyed during 2021 to 2023 baseline surveys. These surveys targeted black grouse (including dawn visits earlier in the survey period; March and April), raptors and owls (also with one 'evening' survey) and other breeding open ground species of conservation concern, such as waders.

3.2.32 The Study Area is shown on **Figure 7.5**.

3.2.33 Survey effort is summarised in **Table 3.7**. On each date, surveys were undertaken by multiple surveyors covering different parts of the Study Area at the same time.

Table 3.7: Scarce breeding bird survey effort (2024).

Date	Start time	Finish time	Sunrise
29/03/2024	04:55	09:25	05:52
12/04/2024	05:15	09:00	06:14
11/05/2024	04:10	05:40	05:03
12/05/2024	05:30	07:40	05:01
16/06/2024	17:45	19:45	22:17
26/07/2024	08:00	11:00	05:02

3.3 Limitations

- 3.3.1 The Site has evolved and been revised throughout the baseline survey period. The scoping boundary extended the Development Area further to the north than Study Area 2 and so some small areas at the north of the Development Area have not been subject to ornithological walkover. However, these are of limited extent, distant from the Proposed Development and comprise habitats directly comparable with those surveyed during all the other surveys undertaken in 2022 and 2023, and so it is considered that survey effort undertaken will have been sufficient to characterise the baseline at the Site and adequately inform impact assessment.
- 3.3.2 Due to changes in the turbine layout as the Proposed Development evolved, there were some minor gaps in VP viewshed coverage in each survey year, when assessed against the turbine locations plus 500m buffers of the Proposed Development. However, all turbine locations were fully covered by at least one year of VP survey effort. Some level of gaps in viewshed coverage are expected, and while in some cases down to a height of 20 m AGL may not have been visible much of the airspace above this will have been, and so flights at greatest risk of collision are likely to have been detected even for locations where visibility down to 20 m AGL was not achieved. As such, this is not considered to be a substantive limitation to assessment.
- 3.3.3 Due to adverse weather conditions particularly in some of the winter months, and access restrictions due to stalking activities, survey hours at some VPs were reduced (e.g. in February 2022, with no hours carried out at VPs 1a and 3a, September 2022 with reduced hours at VPs 2b and 3b, and October 2022 and March 2023 with reduced hours at VP3b). In these instances, where possible, additional hours were undertaken in the subsequent months to address the deficit
- 3.3.4 For the Year 1 non-breeding season for VPs 1a and 3a, the minimum 36 hours was not achieved due to February's missed hours being caught up in March, which is considered to be the start of the breeding season. However, the number of non-breeding season hours achieved at these VPs was 33 hours so only marginally less, and with only eight flights recorded across the entire Year 1 non-breeding season it is considered unlikely that notable numbers of flights will have been missed. As stated above, additional hours were undertaken to address the deficit, so the minimum of 72 hours across the year were achieved, with 75 hours total effort achieved at VPs 1a and 3a. Furthermore, the breeding season is considered the most sensitive time for ornithological interest at that locality, and the minimum of 36 hours was achieved or exceeded for all VPs during the breeding season.
- 3.3.5 In Year 2, missed September hours at VPs 1b and 3b were caught up in early October, and three hours of missed October hours at VP3b were caught up in December. However, due to its elevation at c. 640m AOD and adverse weather limiting access, only 33 hours was achieved at VP3b in both the non-breeding and breeding seasons of Year 2. Very low levels of flight activity were recorded from VP3b in Year 2, and it is considered that the weather experienced is typical for the locale and elevation, and so the reduction in hours is not considered to represent a substantive constraint to the validity of the

data. Differences in survey effort achieved will be accounted for in the CRM carried out to inform assessment.

- 3.3.6 During the Annex I and Schedule 1 breeding raptor and owl surveys, access to private land within the full 6 km buffer outside the land ownership for the surveys was largely restricted. Suitable habitat features were however scanned from appropriate vantage points within the land ownership and public roads to detect activity and likely breeding locations of target species. Given the large study area and large amount of inaccessible terrain, there is potential that some raptors may have not have been recorded, but that in conjunction with the raptor study group data, it is considered unlikely that many breeding raptors would have been missed and that the data on which the assessment is based is adequate.

3.4 Results

Vantage Point Flight Activity Surveys

- 3.4.1 A summary of the target species recorded during the VP flight activity surveys is presented in **Table 3.8**. Note that for completeness all records are presented in this table, including flights which are not considered to be at risk of collision (i.e. flights above and below rotor swept height or that lie outside the rotor swept area of the proposed turbines). For a summary of 'at-risk' (from collision) flights see **Table 3.9**. Note also that the number of birds presented is simply the sum of the number of individuals recorded for each flight, but in some cases, this may refer to the same bird seen more than once.
- 3.4.2 Full details of these records are presented in **Annex 3**.
- 3.4.3 Flight-lines are illustrated on **Figures 7.6a** and **7.6c** (for raptors respectively in Years 1 and 2) and **Figures 7.6b** and **7.6d** (for other species respectively in Years 1 and 2).

Table 3.8: Vantage point flight activity results

Species	No. of flights	No. of individuals
Non-breeding season year 1 (September 2021 to Feb 2022)		
Peregrine	1	1
Golden eagle	4	4
Red kite	1	1
Pink-footed goose	1	13
Black grouse	1	1
Breeding season year 1 (March to August 2022)		
Golden eagle	15	18
White-tailed eagle	1	1
Goshawk	2	2
Merlin	1	1
Pink-footed goose	2	304
Greenshank	2	3
Golden plover	2	2
Lapwing	1	1
Dunlin	2	2

Species	No. of flights	No. of individuals
Whimbrel	1	2
Non-breeding season year 2 (September 2022 to February 2023)		
Peregrine	1	1
Golden eagle	1	1
Greylag goose	1	2
Breeding season year 2 (March to August 2023)		
Golden eagle	7	7
Pink-footed goose	1	100
Teal	1	1
Goosander	1	1
Wood sandpiper	4	5
Greenshank	2	2
Golden plover	1	1
Dunlin	2	2

- 3.4.4 The purpose of the flight activity surveys is to determine potential collision risk of target species. Target species flights recorded outside the collision risk zone (CRZ) or not recorded at potential collision height (PCH) can be considered as not being at-risk from collision and are excluded from the assessment. The identification of collision risk flights, including how CRZ and PCH have been defined in the assessment, is detailed in **Technical Appendix 7.2: Collision Risk Model Analysis**.
- 3.4.5 Those target flights regarded as being at-risk are summarised in **Table 3.9**. Those target species recorded with sufficient flight activity to meet the threshold for undertaking CRM analysis (as defined in **Technical Appendix 7.2: Collision Risk Model Analysis**) are highlighted in bold in the table.

Table 3.9: At- risk target species flights.

Species	Number of flights	Number of individuals	Total flight time (secs)
Golden eagle	7	7	1,640
Pink-footed goose	2	244	442
Greenshank	2	2	359
Grey heron	1	1	149
Merlin	1	1	105
Black grouse	1	1	52

Moorland Breeding Bird Surveys

- 3.4.6 The MBBS and subsequent territory analysis produced estimates for the number of territories present within the survey area (Study Area plus 500 m). These estimates are summarised in **Table 3.10**.
- 3.4.7 The locations of these territories, based on estimated central point, are illustrated on **Figure 7.7a** (2022) and **Figure 7.7b** (2023).

Table 3.10: Moorland breeding bird results.

Species	No. of territories	
	Year 1 (2022)	Year 2 (2023)
Golden plover	12	10
Dunlin	7	4
Greenshank	4	6
Wood sandpiper	2	3
Snipe	0	2
Teal	2	1

Annex I and Schedule 1 Breeding Raptor Surveys

- 3.4.8 The results presented are based on the Annex I Schedule 1 breeding raptor and owl surveys in conjunction with other survey results where relevant.

Osprey

- 3.4.9 In 2022 an osprey nest was recorded approximately 6 km from the Site. In 2023 osprey were recorded on multiple occasions during the dedicated searches, however no breeding evidence was observed. The details of the osprey nest site are given in **Volume 4: Confidential Appendices** and shown on **Confidential Figure 7.10** – Breeding Raptor Survey Results.

Golden eagle

- 3.4.10 Golden eagles were frequently recorded during the dedicated raptor surveys, including an active pair. Breeding evidence was recorded In May 2023 when an adult male was seen displaying (within the 6 km survey buffer) and landing in a potentially suitable eyrie location. This golden eagle record is provided in **Volume 4: Confidential Appendices**, shown on **Confidential Figure 7.10** – Breeding Raptor Survey Results.

Other Species

- 3.4.11 Although activity of hen harrier, red kite, golden eagle and white-tailed eagle was recorded during surveys (in 2022) there was no definitive evidence that these species were holding breeding territories within the Survey Area.

Breeding Black Grouse Surveys

- 3.4.12 In 2022, a black grouse lek was recorded incidentally during the walk to a VP location and comprised a maximum count of four lekking males.
- 3.4.13 The dedicated black grouse lek searches undertaken in 2023 recorded three lek sites as shown in **Table 3.11**. The locations of black grouse leks recorded are detailed in **Volume 4: Confidential Appendices**, and **Confidential Figure 7.11** – Breeding Black Grouse Survey Results (Year 2). Note, leks recorded during the SBBS (see below), are provided on **Confidential Figure 7.12** – Breeding Black Grouse Survey Results (from SBBS in Year 3). The results showing black grouse leks recorded during the targeted breeding black grouse surveys in 2023 and the SBBS in 2024 combined are provided on **Confidential Figure 7.13** – Breeding Black Grouse Survey Results (Combined).

Table 3.11: Black grouse lek searches results.

Lek number	Males in attendance (max. count)	Females in attendance (max. count)
1	4	1
2	3	0
3	1	0

- 3.4.14 There were a small number of other black grouse sightings including single males, and single females, but none of these records were indicative of confirmed lek sites/lekking behaviour.

Breeding Diver Searchers and Common Scoter Suitability

- 3.4.15 No black-throated divers were recorded. The waterbodies within the Study Area were considered too small to support breeding black-throated diver. One red-throated diver flight was recorded approximately 2 km south of the Site, with a circling flight over Loch a Bhainne, before gaining height and flying north-east. No evidence of breeding red-throated divers was recorded, and no further sightings of divers were made.
- 3.4.16 Lochs within the Site and out to 1 km were also appraised for their potential to support common scoter. No evidence of common scoter was recorded, and all waterbodies were considered unlikely to support common scoter, due to factors including lack of suitably vegetated nesting sites (such as islands) and the presence of the operational Millennium Wind Farm (which is likely to deter scoters from settling to breed). For those on-site waterbodies, such as the bog pools and small lochans around Loch nam Faoileag, although the habitat was considered potentially suitable, the disturbance from adjacent operational wind farms makes it unlikely that any breeding scoter would be present.

Scarce Breeding Bird Surveys

- 3.4.17 Black grouse lek counts were carried out in Study Area 3 as part of the SBBS in 2024. Black grouse leks were recorded in four different locations and are summarised in **Table 3.12**. The locations of these leks are presented in **Volume 4: Confidential Appendices**, and on **Confidential Figure 7.12** – Breeding Black Grouse Survey Results (from SBBS in Year 3). Given the overlap in the breeding black grouse surveys in 2023 and the SBBS in 2024, it is considered that some of the identified lek sites in 2024 (during the SBBS) are the same lek sites as those identified in 2023. The combined results are provided on **Confidential Figure 7.13** – Breeding Black Grouse Survey Results (Combined).

Table 3.12: SBBS black grouse search results

Date	Lek number	Males in attendance	Females in attendance
29/03/2024	1	7	1
	2	1	0
12/04/2024	1	3	0
	2	2	0
	3	1	0
11/05/2024	2	1	1
	4	2	0

- 3.4.18 During the SBBS, low numbers of waders were recorded, comprising golden plover (four pairs), dunlin (two pairs), and snipe (two pairs) that were considered as likely to be breeding. One breeding red

grouse pair was also recorded. Indicative locations of breeding target species territories are illustrated on **Figure 7.8**.

3.4.19 No breeding Annex I or Schedule 1 raptors or owls were recorded during the SBBS.

4 REFERENCES

Band, W., Madders, M. & Whitfield, D.P. (2007). *Developing field and analytical methods to assess avian collision risk at wind farms*. In: de Lucas, M., Janss, G.F.E. & Ferrer, M. (Eds.) *Birds and Wind Farms: Risk Assessment and Mitigation*, pp 259-275. Quercus, Madrid.

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

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, 381-388

Gilbert, G., Gibbons, D.W. and Evans, J. (1998). *Bird monitoring methods*. A manual of techniques for key UK species. RSPB, Sandy, Bedfordshire.

Goodship, N.M. and Furness, R.W. (MacArthur Green) (2022). *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2013). *Raptors: a field guide to survey and monitoring*. Third Edition. The Stationary Office, Edinburgh.

SNH (2000) Windfarms and Birds - *Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note.

SNH (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*. Version 2. March 2017.

SNH (2016). *Assessing connectivity with Special Protection Areas (SPAs)*. Guidance. Version 3 – June 2016.

SNH (2018). *Assessing significance of impacts from onshore wind farm outwith designated areas*. Guidance. Version 2 – February 2018.

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, 723-747.

ANNEX 1: SCIENTIFIC NAMES & CONSERVATION STATUS

Common name	Scientific Name	Conservation Status*
Greylag goose	<i>Anser anser</i>	Amber; Sch1.2 (Outer Hebrides, Caithness, Sutherland and Wester Ross only)
Pink-footed goose	<i>Anser brachyrhynchus</i>	Amber; RBBP
Mallard	<i>Anas platyrhynchos</i>	Amber
Teal	<i>Anas crecca</i>	Amber
Common scoter	<i>Melanitta nigra</i>	Red; Sch1.1; SBL; RBBP
Goosander	<i>Mergus merganser</i>	Green
Red grouse	<i>Lagopus scotica</i>	Amber; SBL
Capercaillie	<i>Tetrao urogallus</i>	Red; Sch1.1; SBL; Ann1; RBBP
Black grouse	<i>Lyrurus tetrix</i>	Red; SBL
Slavonian grebe	<i>Podiceps auritus</i>	Red; Sch1.1; SBL; Ann1; RBBP
Lapwing	<i>Vanellus vanellus</i>	Red; SBL
Golden plover	<i>Pluvialis apricaria</i>	Green; SBL; Ann1
Whimbrel	<i>Numenius phaeopus</i>	Red; Sch1.1; RBBP
Dunlin	<i>Calidris alpina</i>	Red; SBL
Common snipe	<i>Gallinago gallinago</i>	Amber
Wood sandpiper	<i>Tringa glareola</i>	Amber; Sch1.1; SBL; Ann1; RBBP
Greenshank	<i>Tringa nebularia</i>	Amber; Sch1.1; RBBP
Red-throated diver	<i>Gavia stellata</i>	Green; Sch1.1; SBL; Ann1; RBBP
Black-throated diver	<i>Gavia arctica</i>	Amber; Sch1.1; SBL; Ann1; RBBP
Grey heron	<i>Ardea cinerea</i>	Green
Osprey	<i>Pandion haliaetus</i>	Amber; Sch1.1; SBL; Ann1; RBBP
Golden eagle	<i>Aquila chrysaetos</i>	Green; Sch1.1/1A/A1; SBL; Ann1; RBBP
Sparrowhawk	<i>Accipiter nisus</i>	Amber

Common name	Scientific Name	Conservation Status*
Goshawk	<i>Astur gentilis</i>	Green; Sch1.1; RBBP
Hen harrier	<i>Circus cyaneus</i>	Red; Sch1.1 & 1A; SBL; Ann1; RBBP
Red Kite	<i>Milvus milvus</i>	Green; Sch1.1 & 1A; SBL; Ann1
White-tailed eagle	<i>Haliaeetus albicilla</i>	Amber; Sch1.1, 1A & A1; SBL; Ann1; RBBP
Buzzard	<i>Buteo buteo</i>	Green
Kestrel	<i>Falco tinnunculus</i>	Amber; SBL
Merlin	<i>Falco columbarius</i>	Red; Sch1.1; SBL; Ann1; RBBP
Peregrine	<i>Falco peregrinus</i>	Green; Sch1.1; SBL; Ann1; RBBP
Raven	<i>Corvus corax</i>	Green
Crested tit	<i>Lophophanes cristatus</i>	Green; Sch1.1; RBBP
Scottish crossbill	<i>Loxia scotica</i>	Amber; Sch1.1; SBL; Ann1

* **Key**

Ann1: Listed on Annex I of The Birds Directive.

Sch1.1/1.1A/A1/1.2: Schedule 1 part 1, part 1A, part A1 or part 2 of the Wildlife and Countryside Act 1981 (as amended).

Red/Amber/Green: Red, Amber or Green listed on the Birds of Conservation Concern 5 List.

SBL: Scottish Biodiversity List species.

RBBP: Listed as one of the species that the UK Rare Breeding Bird Panel reports on; breeding records of these species should be shared with the relevant county recorder.

ANNEX 2 – ORNITHOLOGY FIELD SURVEY EFFORT

The following codes were used to record weather conditions during surveys and are used in **Tables A2.1 to A2.4**:

Wind Speed		Rain		Cloud Cover	
Calm	0	None	0	Out of 8 (oktas)	
Light air	1	Drizzle/mist	1		
Light breeze	2	Light showers	2	Frost	
Gentle breeze	3	Heavy showers	3	None	0
Moderate breeze	4	Heavy rain	4	Ground	1
Fresh breeze	5			All day	2
Strong breeze	6	Visibility			
Moderate gale	7	Poor	0	Snow	
Fresh gale	8	<1km	1	None	0
Strong gale	9	>1km	2	On site	1
Whole gale	10			High ground	2
Storm	11	Cloud Height			
		<150m	0		
Wind Direction		150-500m	1		
16-point compass		>500m	2		

Field surveys were undertaken by the following named surveyors:

M. Wood (MW), P. Carroll (PC), C. Griffin (CG), A. MacNab (AJM), A. Little (AL), K. Little (KL), G. Dunbar (GD), J. Sykes (JS), S. MacDonald (SM), G. Haskins (GH), M. Lawson (ML), D. Burt (DB), P. Higginson-Bell (PH), J. Morton (JM), J. Pass (JP) and G. Haskins (GH).

Table A2.1: VP flight activity survey effort.

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
24/09/2021	2a	PC	09:30	12:30	3	4/5/5	WSW/WSW/WSW	0/0/0	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
24/09/2021	2a	PC	13:00	16:00	3	4/5/4	WSW/WSW/WSW	1/0/1	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2021	1a	SM	11:25	14:25	3	5/4/4	SSW/SSW/SSW	2/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2021	1a	SM	14:55	17:55	3	4/3/4	SSW/SSW/SSW	0/0/0	6/5/5	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2021	3a	PC	12:05	15:05	3	4/4/4	SSW/SSW/SSW	2/2/2	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2021	3a	PC	15:35	18:35	3	4/3/3	SSW/SSW/SSW	2/2/0	5/4/3	2/2/2	2/2/2	0/0/0	0/0/0
20/10/2021	2a	PC	09:40	12:40	3	4/5/5	W/WSW/WSW	2/2/2	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/10/2021	2a	PC	13:10	16:10	3	5/5/5	W/WSW/WSW	2/2/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
29/10/2021	1a	MW	08:15	11:15	3	0/0/1	-/-/WSW	1/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
29/10/2021	1a	MW	11:45	14:45	3	1/1/1	WSW/WSW/WSW	2/2/2	8/8/8	1/2/2	2/2/2	0/0/0	0/0/0
29/10/2021	3a	PH	08:20	11:20	3	1/1/1	W/WSW/WSW	0/2/1	8/8/8	1/2/2	1/2/2	0/0/0	0/0/0
29/10/2021	3a	PH	11:50	14:50	3	2/1/2	W/WSW/WSW	1/1/3	8/8/8	2/2/1	2/1/1	0/0/0	0/0/0
11/11/2021	1a	PC	10:15	13:15	3	1/2/2	SW/SW/SW	1/1/1	8/8/8	1/0/0	0/0/1	0/0/0	0/0/0
11/11/2021	3a	GD	10:00	13:00	3	0/2/2	SE/SE/SE	0/0/0	8/8/8	1/0/0	1/0/0	0/0/0	0/0/0
24/11/2021	1a	MW	09:40	12:40	3	3/3/3	WNW/WNW/WNW	1/2/0	7/6/4	2/2/2	2/2/2	0/0/0	0/0/0
24/11/2021	1a	MW	13:10	16:10	3	4/4/4	WNW/WNW/WNW	0/1/0	5/6/4	2/2/2	2/2/2	0/0/0	0/0/0
24/11/2021	3a	GD	09:30	12:30	3	3/3/4	WNW/WNW/WNW	0/2/0	8/8/4	2/2/2	2/2/2	0/0/0	0/0/0
24/11/2021	3a	GD	13:00	16:00	3	4/4/4	WNW/NW/NW	0/0/2	8/8/4	2/2/2	2/2/2	0/0/0	0/0/0
29/11/2021	2a	MW	09:35	12:35	3	2/2/2	W/W/W	1/1/1	8/7/8	1/2/1	2/2/2	0/0/0	0/0/0
29/11/2021	2a	MW	13:05	16:05	3	3/4/4	W/W/W	1/0/0	8/7/7	1/2/2	2/2/2	2/2/2	1/1/1
20/12/2021	3a	SM	08:50	11:50	3	1/1/2	SSE/SSE/SSE	0/0/0	6/2/0	2/2/-	1/2/2	2/2/2	0/0/0
20/12/2021	3a	SM	12:20	15:20	3	2/2/2	S/SSW/SSW	0/0/0	0/0/0	n/a	2/2/2	2/2/2	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
21/12/2021	2a	SM	08:55	11:55	3	1/2/1	SSE/SSE/SSE	0/0/0	1/3/2	2/2/2	2/1/2	2/2/2	0/0/0
21/12/2021	2a	SM	12:25	15:25	3	3/2/1	SSW/SSE/SSE	0/0/0	4/3/2	2/2/2	2/1/2	2/2/2	0/0/0
22/12/2021	1a	SM	08:30	11:30	3	1/1/1	NNE/NE/ENE	0/0/0	8/8/8	2/2/2	2/2/2	2/2/2	1/1/1
22/12/2021	1a	SM	12:00	15:00	3	1/1/1	ESE/SSE/SSW	0/0/0	8/8/8	2/2/2	2/2/2	2/2/2	1/1/1
18/01/2022	1a	PC	09:30	12:30	3	3/4/4	SW/SW/SW	0/0/1	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
18/01/2022	1a	PC	13:00	16:00	3	4/4/4	SW/SW/SW	1/2/2	8/7/7	1/2/2	2/2/2	0/0/0	2/2/2
18/01/2022	3a	GD	09:10	12:10	3	2/3/3	SW/SW/SW	0/0/0	7/8/8	2/2/2	2/2/2	1/1/0	2/2/2
18/01/2022	3a	GD	12:40	15:40	3	4/4/5	SW/SW/SW	1/0/3	8/8/8	2/2/2	2/1/1	0/0/0	2/2/2
31/01/2022	2a	SM	09:55	12:55	3	4/4/4	NW/NW/WNW	2/0/0	7/8/8	2/2/2	2/2/2	1/1/0	1/1/1
31/01/2022	2a	SM	13:25	16:25	3	3/5/4	WNW/WNW/W	0/0/1	8/7/8	2/2/2	2/2/2	0/0/0	1/1/1
01/02/2022	2a	SM	09:20	12:20	3	6/6/6	W/W/W	0/1/0	7/8/7	2/2/2	2/2/2	0/0/0	0/0/0
01/02/2022	2a	SM	12:50	15:50	3	6/6/6	WNW/WNW/WNW	2/0/1	6/8/8	2/2/2	2/2/2	0/0/0	0/0/0
01/03/2022	1a	PC	09:40	12:40	3	2/2/2	WSW/SW/SW	0/0/0	2/6/6	2/2/2	2/2/2	0/0/0	1/1/1
01/03/2022	1a	PC	13:10	16:10	3	2/2/2	SW/WSW/WSW	0/0/0	5/5/5	2/2/2	2/2/2	0/0/0	1/1/1
01/03/2022	3a	JS	09:15	12:15	3	2/2/1	WSW/WSW/WSW	0/0/0	2/4/4	2/2/2	2/2/2	0/0/0	1/1/1
01/03/2022	3a	JS	12:45	15:45	3	2/2/1	WSW/SW/SW	0/0/0	2/2/2	2/2/2	2/2/2	0/0/0	1/1/1
14/03/2022	1a	SM	11:40	14:40	3	3/3/3	S/SSW/SSW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
14/03/2022	1a	SM	15:10	18:10	3	3/2/3	SSW/SW/WSW	2/0/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
18/03/2022	2a	SM	07:00	10:00	3	5/4/4	SW/SW/SW	0/0/0	4/1/3	2/2/2	2/2/2	1/1/0	1/1/1
18/03/2022	2a	SM	10:30	13:30	3	5/5/3	SSW/WSW/WSW	0/0/0	6/2/6	2/2/2	2/2/2	0/0/0	1/1/1
14/03/2022	3a	GD	11:15	13:15	3	3/3/3	S/SSW/SSW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
14/03/2022	3a	GD	14:45	17:45	3	3/2/3	SSW/SW/WSW	2/0/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
27/04/2022	1a	GD	10:20	13:20	3	3/3/2	SE/SE/SE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
27/04/2022	1a	GD	13:50	16:50	3	2/2/2	E/E/E	0/0/0	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2022	2a	DB	07:00	10:00	3	3/3/4	S/S/S	1/1/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2022	2a	DB	10:30	13:30	3	4/4/4	S/S/S	2.2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
27/04/2022	3a	DB	10:05	13:05	3	1/2/1	W/SE/S	0/0/0	5/6/7	2/2/2	2/2/2	0/0/0	0/0/0
27/04/2022	3a	DB	13:35	16:35	3	1/1/3	W/W/NW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
27/05/2022	1a	SM	06:15	09:15	3	6/5/6	W/W/WSW	2/3/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
27/05/2022	1a	SM	09:45	12:45	3	6/5/6	WSW/WSW/W	2/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2022	2a	SM	12:35	15:35	3	5/6/6	WSW/W/W	0/0/0	7/5/7	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2022	2a	SM	16:05	19:05	3	6/6/5	W/WSW/WSW	0/0/0	7/7/5	2/2/2	2/2/2	0/0/0	0/0/0
27/05/2022	3a	AJM	05:15	08:15	3	4/4/4	WNW/WNW/W	2/3/2	6/6/7	2/2/2	2/2/2	0/0/0	0/0/0
27/05/2022	3a	AJM	08:45	11:45	3	4/4/4	W/W/W	2/2/2	6/7/6	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2022	1a	MW	06:35	09:35	3	0/1/1	-/S/S	0/2/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2022	1a	MW	10:05	13:05	3	1/1/1	S/S/S	0/0/0	7/6/5	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2022	2a	KL	08:30	11:30	3	2/2/2	SSW/S/S	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2022	2a	KL	12:00	15:00	3	3/2/3	SSE/SSW/SSW	0/0/0	7/5/6	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2022	3a	CG	06:15	09:15	3	1/1/1	SW/SW/SW	0/2/1	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2022	3a	CG	12:45	15:45	3	2/2/2	SW/SW/SW	0/0/0	4/4/3	2/2/2	2/2/2	0/0/0	0/0/0
20/07/2022	1a	GD	13:30	16:30	3	3/3/3	W/W/W	0/0/0	4/4/4	2/2/2	2/2/2	0/0/0	0/0/0
20/07/2022	1a	GD	17:00	20:00	3	3/3/3	W/W/W	0/0/0	2/2/5	2/2/2	2/2/2	0/0/0	0/0/0
25/07/2022	2a	DB	12:30	15:30	3	3/3/3	N/N/N	0/0/0	8/7/7	2/2/2	2/2/2	0/0/0	0/0/0
25/07/2022	2a	DB	16:00	19:00	3	3/3/3	N/N/N	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/07/2022	3a	DB	13:30	16:30	3	3/3/3	WSW/W/W	0/0/0	4/4/2	2/2/2	2/2/2	0/0/0	0/0/0
20/07/2022	3a	DB	17:00	20:00	3	3/3/3	W/W/W	0/0/0	2/2/5	2/2/2	2/2/2	0/0/0	0/0/0
29/08/2022	1a	GD	13:50	16:50	3	2/2/2	SW/SW/SW	0/0/0	6/6/7	2/2/2	2/2/2	0/0/0	0/0/0
29/08/2022	1a	GD	17:20	20:20	3	2/1/1	SW/SW/SW	0/0/0	7/5/5	2/2/2	2/2/2	0/0/0	0/0/0
25/08/2022	2a	MW	05:50	08:50	3	2/2/2	SW/SW/SW	0/0/0	5/5/6	2/2/2	2/2/2	0/0/0	0/0/0
25/08/2022	2a	MW	09:20	12:20	3	2/3/3	SW/SW/SW	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
29/08/2022	3a	DB	13:50	16:50	3	2/2/2	SW/SW/SW	0/0/0	6/5/6	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
29/08/2022	3a	DB	17:20	20:20	3	2/1/1	SW/SW/SW	0/0/0	7/5/5	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2022	1b	GD	13:00	16:00	3	3/3/3	NE/NE/NE	0/0/1	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2022	2b	DB	13:00	16:00	3	3/3/3	NE/NE/NE	0/0/1	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2022	2b	DB	16:30	19:30	3	3/3/3	NE/N/N	0/1/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
28/09/2022	3b	GD	16:30	19:30	3	3/3/3	NE/N/N	0/1/0	8/7/8	2/2/2	2/2/2	0/0/0	0/0/0
05/10/2022	1b	DB	13:45	16:45	3	4/4/4	SW/SW/SW	0/0/0	6/7/8	2/2/2	2/2/2	0/0/0	0/0/0
06/10/2022	1b	GD	11:15	14:15	3	4/4/4	SW/SW/SW	0/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/10/2022	1b	GD	14:45	17:45	3	5/4/4	SW/SW/SW	1/3/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/10/2022	2b	DB	11:00	14:00	3	4/5/4	SW/SW/SW	0/0/2	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
06/10/2022	2b	DB	14:30	17:30	3	4/4/4	SW/SW/SW	0/2/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
05/10/2022	3b	GD	13:40	16:40	3	4/4/4	SW/SW/SW	0/2/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
23/11/2022	1b	AJM	08:30	11:30	3	4/4/4	SE/SE/SE	0/0/1	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
23/11/2022	1b	AJM	12:00	15:00	3	4/4/4	S/SSW/SW	1/0/0	8/7/6	2/2/1	2/2/2	0/0/0	2/2/2
22/11/2022	2b	AJM	09:25	12:25	3	2/2/2	SSW/SSW/S	0/0/0	7/6/6	2/2/2	2/2/2	1/1/0	2/2/2
22/11/2022	2b	AJM	12:55	15:55	3	2/2/2	S/SSW/SSW	0/0/0	3/3/5	2/2/2	2/2/2	0/0/0	2/2/2
24/11/2022	3b	AJM	08:00	11:00	3	4/4/4	S/S/SSE	0/0/0	7/6/5	2/2/2	2/2/2	0/0/0	2/2/2
24/11/2022	3b	AJM	11:30	14:30	3	4/3/4	SSE/SSE/SSE	0/0/2	7/8/8	2/2/1	2/2/2	0/0/0	2/2/2
15/12/2022	1b	AJM	09:00	12:00	3	1/1/1	NNW/NNW/NW	0/0/0	1/1/1	2/2/2	2/2/2	2/2/2	1/1/1
15/12/2022	1b	AJM	12:30	15:30	3	1/2/2	NW/NW/WNW	0/0/0	4/5/6	2/2/2	2/2/2	2/2/2	1/1/1
16/12/2022	2b	AJM	08:20	11:20	3	2/2/2	SW/SW/SW	0/0/0	8/8/8	1/2/1	2/2/1	2/2/2	1/1/1
16/12/2022	2b	AJM	11:50	14:50	3	2/2/2	SW/SW/SW	0/0/0	8/8/7	1/2/1	2/2/1	2/2/2	1/1/1
14/12/2022	3b	AJM	09:05	12:05	3	2/2/2	NW/NW/NW	0/0/0	1/1/1	2/2/2	2/2/2	2/2/2	1/1/1
14/12/2022	3b	AJM	12:35	15:35	3	2/2/2	NNW/N/N	0/0/0	4/3/2	2/2/2	2/2/2	2/2/2	1/1/1
22/12/2022	3b	SM	11:50	14:50	3	3/3/3	NNE/NE/NNE	0/0/0	5/7/7	2/2/2	2/2/2	0/0/0	1/1/1
26/01/2023	1b	AJM	08:05	11:05	3	2/3/2	NW/NNW/NW	0/0/0	5/6/3	2/2/2	2/2/2	0/0/0	0/0/0
26/01/2023	1b	AJM	11:35	14:35	3	2/2/1	N/N/N	0/0/0	3/3/7	2/2/2	2/2/2	0/0/0	0/0/0
25/11/2023	2b	AJM	08:10	11:10	3	4/4/4	WNW/NW/NW	0/2/0	7/5/7	1/1/2	2/2/2	0/0/0	0/0/0
25/11/2023	2b	AJM	11:40	14:40	3	4/4/3	WNW/WNW/WNW	0/2/0	7/6/8	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
24/01/2023	3b	AJM	10:00	13:00	3	3/3/3	SW/SW/SW	0/1/1	8/8/8	2/1/2	2/2/2	0/0/0	2/2/2
24/01/2023	3b	AJM	13:30	16:30	3	3/3/3	SW/SW/SW	1/1/1	8/8/8	1/1/2	1/2/2	0/0/0	2/2/2
14/02/2023	1b	AJM	10:30	13:30	3	2/2/2	SW/SW/SW	0/0/0	7/7/5	2/2/2	2/2/2	0/0/0	0/0/0
14/02/2023	1b	AJM	14:00	17:00	3	2/3/3	SW/SW/SW	0/0/0	5/6/7	2/1/1	2/2/2	0/0/0	0/0/0
15/02/2023	2b	AJM	10:20	13:20	3	3/4/4	SW/SW/SW	2/2/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
15/02/2023	2b	AJM	13:50	16:50	3	5/5/6	SW/WSW/WSW	0/3/3	7/8/8	2/1/1	2/2/1	0/0/0	0/0/0
16/02/2023	3b	AJM	07:45	10:45	3	3/3/3	SW/SW/WSW	1/1/1	8/8/8	1/1/1	1/1/1	0/0/0	0/0/0
16/02/2023	3b	AJM	11:15	14:15	3	3/3/3	SW/SW/SW	1/1/1	8/8/8	1/1/1	1/1/1	0/0/0	0/0/0
21/03/2023	1b	AJM	10:55	13:55	3	2/2/2	WSW/WSW/WSW	0/0/0	7/7/7	1/1/1	2/2/2	0/0/0	0/0/0
21/03/2023	1b	AJM	14:25	17:25	3	2/2/3	WSW/SW/SW	0/0/0	7/6/6	1/1/1	2/2/2	0/0/0	0/0/0
23/03/2023	2b	AJM	06:05	09:05	3	4/4/4	SW/SW/SW	2/0/2	7/6/6	1/1/2	2/2/2	0/0/0	2/2/2
23/03/2023	2b	AJM	09:35	12:35	3	4/4/3	SW/SW/SW	0/0/0	5/5/4	2/2/2	2/2/2	0/0/0	2/2/2
23/03/2023	3b	AJM	13:15	16:15	3	4/4/4	SW/SW/SW	0/0/0	6/5/5	2/2/2	2/2/2	0/0/0	2/2/2
26/04/2023	1b	PC	06:15	09:15	3	1/2/2	NE/NE/NE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
26/04/2023	1b	PC	09:45	12:45	3	2/1/2	NE/NE/NE	0/0/0	5/5/6	2/2/2	2/2/2	0/0/0	0/0/0
27/04/2023	2b	PC	13:00	16:00	3	2/2/2	SSE/SSE/SSE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
27/04/2023	2b	PC	16:30	19:30	3	2/2/2	SSE/SSE/SSE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
24/04/2023	3b	JM	14:25	17:25	3	4/4/4	NNW/NW/NNW	0/2/2	5/6/5	2/2/2	2/2/2	0/0/0	2/2/2
24/04/2023	3b	JM	17:55	20:55	3	3/4/3	NW/NW/NW	0/0/0	4/3/2	2/2/2	2/2/2	0/0/0	2/2/2
02/05/2023	1b	JM	11:30	14:30	3	1/2/2	SSW/SW/SSW	0/0/0	5/6/5	2/2/2	2/2/2	0/0/0	0/0/0
02/05/2023	1b	JM	15:00	18:00	3	2/1/2	SSW/SSW/SW	0/0/0	6/4/4	2/2/2	2/2/2	0/0/0	0/0/0
05/05/2023	2b	JM	07:40	10:40	3	3/3/2	NE/NE/ESE	0/0/0	5/6/7	2/2/2	2/2/2	0/0/0	0/0/0
05/05/2023	2b	JM	11:10	14:10	3	4/4/2	ESE/ESE/SSE	0/0/0	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
05/05/2023	3b	ML	07:05	10:05	3	3/3/2	E/ENE/ESE	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
05/05/2023	3b	ML	10:35	13:35	3	2/3/4	ESE/ESE/SE	0/0/2	8/8/8	1/2/2	2/2/2	0/0/0	0/0/0
19/06/2023	1b	SM	14:40	17:40	3	5/4/4	SW/SW/SW	3/2/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
19/06/2023	1b	SM	18:10	21:10	3	4/3/3	SW/SSW/SSW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
19/06/2023	2b	ML	14:15	17:15	3	5/4/4	SSW/SSW/SSW	3/2/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
19/06/2023	2b	ML	17:45	20:45	3	3/4/3	SSW/SSW/SSW	0/0/0	8/7/6	2/2/2	2/2/2	0/0/0	0/0/0
22/06/2023	3b	SM	08:10	11:10	3	3/3/3	SW/WSW/W	0/0/0	3/6/7	2/2/2	2/2/2	0/0/0	0/0/0
22/06/2023	3b	SM	11:40	14:40	3	3/3/3	W/W/W	0/0/0	7/6/5	2/2/2	2/2/2	0/0/0	0/0/0
25/07/2023	1b	ML	09:15	12:15	3	3/3/4	W/W/WSW	2/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
25/07/2023	1b	ML	12:45	15:45	3	3/4/4	WNW/WNW/WNW	0/0/0	7/8/7	2/2/2	2/2/2	0/0/0	0/0/0
28/07/2023	2b	JM	04:40	07:40	3	0/1/2	NA/SW/SW	0/0/0	2/3/5	1/1/2	2/2/2	0/0/0	0/0/0
28/07/2023	2b	JM	08:10	11:10	3	1/1/2	S/S/SW	0/1/0	6/7/6	2/2/2	2/2/2	0/0/0	0/0/0
26/07/2023	3b	ML	09:50	12:50	3	3/2/3	SSW/SW/SW	0/0/0	0/3/6	2/2/2	2/2/2	0/0/0	0/0/0
26/07/2023	3b	ML	13:20	16:20	3	3/3/3	SSW/SW/SSE	0/0/0	4/4/6	2/2/2	2/2/2	0/0/0	0/0/0
22/08/2023	1b	ML	10:25	13:25	3	3/3/3	SW/SW/SW	1/0/2	8/8/8	1/2/2	2/2/2	0/0/0	0/0/0
22/08/2023	1b	ML	13:55	16:55	3	3/3/3	WSW/WSW/W	0/2/0	8/8/6	2/2/2	2/1/2	0/0/0	0/0/0
22/08/2023	2b	SM	10:15	13:15	3	3/3/3	SW/SW/SW	0/0/2	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
22/08/2023	2b	SM	13:45	16:45	3	4/4/4	SW/SW/SW	2/2/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
24/08/2023	3b	ML	07:45	10:45	3	3/3/3	SW/SW/SW	1/0/0	8/8/8	1/1/2	1/2/2	0/0/0	0/0/0
24/08/2023	3b	ML	11:15	14:15	3	3/3/3	SSW/S/S	2/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0

Table A2.2: Moorland breeding bird survey effort.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Visibility
22/04/2022	GD	08:45	14:45	3/3/3/3/3/3	0/0/0/0/0/0	1/2/2/2/2/2
22/04/2022	DB	08:45	14:45	3/3/3/3/3/3	0/0/0/0/0/0	1/2/2/2/2/2
26/05/2022	SM	08:35	14:35	4/4/4/4/4/4	2/0/0/0/0/0	2/2/2/2/2/2
26/05/2022	AJM	08:35	14:30	4/4/4/4/4/4	0/2/2/3/2/0	2/2/2/2/2/2
23/06/2022	MW	08:30	14:30	3/3/2/2/3/3	0/0/0/0/0/0	2/2/2/2/2/2
23/06/2022	CG	08:30	14:30	2/3/3/2/3/3	0/1/0/0/0/0	2/2/2/2/2/2
26/07/2022	GD	08:45	14:45	3/3/4/3/4/3	0/0/0/0/1/1	2/2/2/2/2/2
26/07/2022	DB	08:45	14:45	3/3/3/3/4/3	0/0/0/0/1/1	2/2/2/2/2/2

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Visibility
25/04/2023	JM	08:50	16:50	2/1/2/2/2/2/2/2	2/2/0/1/0/0	2/2/2/2/2/2
25/04/2023	PC	09:30	16:30	1/2/2/2/2/2/2	0/2/2/2/0/0	2/2/2/2/2/2
26/05/2023	MW	08:30	14:30	2/2/2/2/2/2	0/0/0/0/0/0	2/2/2/2/2/2
26/05/2023	JM	08:35	14:35	2/3/2/3/3/3	0/0/0/0/0/0	2/2/2/2/2/2
20/06/2023	JM	08:30	14:30	3/3/2/3/2/2	1/0/0/0/0/0	2/2/2/2/2/2
20/06/2023	MW	08:30	14:30	2/2/3/3/3/3	0/0/0/0/0/0	2/2/2/2/2/2
11/07/2023	JM	08:30	14:30	2/2/2/3/2/2	0/0/1/0/1/1	2/2/2/2/2/2
11/07/2023	MW	08:30	14:30	1/2/2/3/3/3	0/0/0/0/1/0	2/2/2/2/2/2

Table A2.3: Breeding Annex I and Schedule 1 raptor and owl survey effort.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Visibility
29/04/2022	GD	12:10	18:10	2/3/3/3/3/3	0/0/0/1/0/0	2/2/2/2/2/2
29/04/2022	DB	12:10	18:10	2/3/3/3/3/3	0/0/0/1/0/0	2/2/2/2/2/2
30/04/2022	GD	07:00	13:00	4/4/4/4/4/4	1/0/0/2/0/1	2/2/2/2/2/2
25/05/2022	AJM	12:05	18:10	4/5/6/5/5/5	2/0/2/2/0/0	2/2/2/2/2/2
26/05/2022	AJM	14:30	17:45	4/5/5	2/2/3	2/2/2
26/05/2022	SM	14:45	17:45	4/5/5	2/2/0	2/2/2
27/06/2022	KL	11:00	17:00	2/3/3/2/1/1	0/2/0/0/2/0	2/2/2/2/2/2
01/07/2022	AL	08:00	14:00	2/2/2/1/2/3	0/0/0/0/0/0	2/2/2/2/2/2
25/07/2022	GD	12:50	18:50	2/2/3/2/2/2	0/0/0/0/0/0	2/2/2/2/2/2
26/07/2022	GD	14:45	17:45	3/3/3	0/1/0	2/2/2
26/07/2022	DB	14:45	17:45	3/3/3	0/1/0	2/2/2
24/04/2023	PC	12:50	18:50	3/3/3/3/3/3	2/2/2/0/2/0	2/2/2/2/2/2
26/04/2023	PC	12:45	15:45	2/2/2	0/0/0	2/2/2

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Visibility
27/04/2023	PC	05:45	08:45	1/1/1	2/2/2	2/2/2
02/05/2023	ML	11:20	17:20	1/2/1/2/1/2	0/0/0/0/0/0	2/2/2/2/2/2
05/05/2023	SM	07:35	13:35	3/4/3/3/3/3	0/0/0/0/0/0	2/2/2/2/2/2
31/05/2023	JM	07:00	13:00	0/0/2/2/2/2	0/0/0/0/0/0	1/2/2/2/2/2
22/06/2023	ML	08:10	14:10	3/3/3/3/4/4	0/0/0/0/0/0	2/2/2/2/2/2
28/06/2023	JM	16:00	22:00	3/3/3/2/2/2	0/0/0/0/0/0	2/2/2/2/2/2
25/07/2023	ML	16:00	19:00	3/3/3	0/0/0	2/2/2
25/07/2023	SM	15:50	18:50	3/3/3	0/0/0	2/2/2

Table A2.4: Breeding black grouse survey effort.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility
05/05/2023	JM	04:25	07:25	3/2/2	SE/SE/ESE	0/0/0	7/6/6	2/2/2	2/2/2

Table A2.5: Breeding diver survey effort.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Visibility
31/05/2023	JM	07:00	13:00	0/0/2/2/2/2	0/0/0/0/0/0	1/2/2/2/2/2
28/06/2023	JM	10:00	13:00	3/3/2	0/0/1	2/2/2

Table A2.6: Scarce breeding bird survey effort.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
29/03/24	PC & JP	04:55	06:25	1/2	0/0/0	2/2/2	2/2/2	1/0/0	0/0/0
29/03/24	PC & JM	06:25	09:25	2/0/1	0/0	2/2	2/2	1/1	2/2
12/04/24	GH	05:15	07:15	2/2	1/0	7/2	2/2	0/0	0/0
12/04/24	CG	05:30	07:00	3/4	1/0	7/6	2/2	0/0	0/0

Date	Surveyor	Start Time	Finish Time	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
12/04/24	GH	07:30	09:00	3/3	0/0	6/6	2/2	0/0	0/0
12/04/24	CG	07:30	09:00	6/6	0/0	6/4	2/2	0/0	0/0
11/05/24	CG	04:10	05:40	2/1	0/0	1/2	2/2	0/0	0/0
11/05/24	GH	04:10	05:40	0/1	0/0	2/2	2/2	0/0	0/0
12/05/24	GH	05:30	07:40	1/1	0/0	6/4	2/2	0/0	0/0
12/05/24	CG	05:40	07:40	2/2	0/0	6/4	2/2	0/0	0/0
16/06/24	GH	17:45	19:45	1/1	1/1	8/8	2/2	0/0	0/0
16/06/24	CG	17:45	19:45	1/1	1/1	8/8	2/2	0/0	0/0
26/07/24	JP	08:00	11:00	3/3/3	1/0/0	8/6/5	2/2/2	0/0/0	0/0/0
26/07/24	JP	08:00	11:00	3/3/3	0/2/0	7/7/7	2/2/2	0/0/0	0/0/0

ANNEX 3 – VP FLIGHT ACTIVITY SURVEYS: TARGET SPECIES FLIGHTS

Table A3.1 presents details of target species flight lines recorded during VP surveys undertaken between September 2021 and August 2023.

The species, number of birds, total flight duration (in seconds) and duration spent at each height band (HT), recorded during timed VP flight activity surveys, is presented. Note that the flights presented refer to all target species flights recorded, and not just those flights which are identified as being ‘at-risk’ from the Proposed Development.

Table A3.1: Target species flights.

Date	VP	Species	Min. no	Start Time	Duration (s)	HT1	HT2	HT3	HT4	HT5	HT6
28/09/2021	1a	Peregrine	1	15:44	332	2	60	150	75	45	0
28/09/2021	1a	Golden eagle	1	16:24	761	56	390	315	0	0	0
24/09/2021	2a	Pink-footed goose	13	15:34	40	30	10	0	0	0	0
11/11/2021	1a	Red kite	1	12:40	55	10	45	0	0	0	0
24/11/2021	1a	Golden eagle	1	12:03	348	0	33	315	0	0	0
24/11/2021	3a	Black grouse	1	09:51	52	22	30	0	0	0	0
31/01/2022	2a	Golden eagle	1	11:07	109	0	0	109	0	0	0
31/01/2022	2a	Golden eagle	1	12:02	171	120	51	0	0	0	0
01/03/2022	3a	Merlin	1	11:56	105	0	105	0	0	0	0
14/03/2022	1a	Golden eagle	1	12:46	209	0	30	179	0	0	0
14/03/2022	1a	Golden eagle	1	14:59	131	0	131	0	0	0	0
14/03/2022	1a	Golden eagle	1	16:29	17	0	17	0	0	0	0
14/03/2022	1a	Lapwing	1	17:02	77	0	2	75	0	0	0
18/03/2022	2a	Goshawk	1	08:59	118	0	28	90	0	0	0
14/03/2022	3a	Golden plover	1	13:41	25	25	0	0	0	0	0
27/04/2022	1a	Pink-footed goose	160	10:37	230	0	0	0	0	110	120
27/04/2022	1a	Golden eagle	1	11:41	200	0	75	125	0	0	0
27/04/2022	1a	Golden eagle	1	11:41	470	0	0	120	90	260	0
27/04/2022	1a	Goshawk	1	12:34	50	0	0	0	0	50	0
27/04/2022	1a	Golden eagle	2	13:51	370	0	0	105	45	75	145
27/04/2022	1a	White-tailed eagle	1	15:54	60	0	30	30	0	0	0

Date	VP	Species	Min. no	Start Time	Duration (s)	HT1	HT2	HT3	HT4	HT5	HT6
27/04/2022	1a	Golden eagle	1	15:55	80	0	80	0	0	0	0
27/04/2022	1a	Golden eagle	2	15:56	590	0	0	0	60	135	395
27/04/2022	1a	Golden eagle	1	16:06	220	0	0	0	0	130	90
27/04/2022	1a	Golden eagle	1	16:36	350	0	0	0	0	0	350
30/04/2022	2a	Greenshank	1	07:05	30	30	0	0	0	0	0
30/04/2022	2a	Golden plover	1	07:13	18	18	0	0	0	0	0
30/04/2022	2a	Greenshank	2	08:40	71	0	15	56	0	0	0
27/04/2022	3a	Pink-footed goose	144	11:13	247	0	0	0	0	247	0
27/04/2022	3a	Golden eagle	1	16:06	82	7	15	30	15	15	0
27/04/2022	3a	Golden eagle	2	16:25	131	11	15	30	30	45	0
27/05/2022	1a	Golden eagle	1	12:27	738	0	30	558	150	0	0
24/06/2022	1a	Golden eagle	1	11:58	314	0	164	150	0	0	0
01/07/2022	2a	Golden eagle	1	12:17	15	15	0	0	0	0	0
24/06/2022	3a	Dunlin	1	7:02	7	7	0	0	0	0	0
24/06/2022	3a	Dunlin	1	7:16	14	14	0	0	0	0	0
25/08/2022	2a	Whimbrel	2	09:54	42	0	42	0	0	0	0
28/09/2022	2b	Greylag goose	2	19:07	81	0	0	30	51	0	0
23/11/2022	1b	Golden eagle	1	09:39	305	30	90	30	155	0	0
16/02/2023	3b	Peregrine	1	08:00	45	45	0	0	0	0	0
26/04/2023	1b	Pink-footed goose	100	07:00	195	0	0	0	30	165	0
24/04/2023	3b	Golden eagle	1	18:15	230	200	30	0	0	0	0
24/04/2023	3b	Golden eagle	1	20:50	26	26	0	0	0	0	0
02/05/2023	1b	Golden eagle	1	12:53	431	0	135	296	0	0	0
05/05/2023	2b	Wood sandpiper	1	07:41	49	49	0	0	0	0	0
05/05/2023	2b	Golden eagle	1	07:47	93	45	48	0	0	0	0
05/05/2023	2b	Grey heron	1	07:55	149	74	75	0	0	0	0
05/05/2023	2b	Golden plover	1	08:13	55	0	55	0	0	0	0
05/05/2023	2b	Wood sandpiper	2	08:17	31	16	15	0	0	0	0
05/05/2023	2b	Greenshank	1	08:24	156	36	90	30	0	0	0

Date	VP	Species	Min. no	Start Time	Duration (s)	HT1	HT2	HT3	HT4	HT5	HT6
05/05/2023	2b	Greenshank	1	09:50	203	23	75	105	0	0	0
05/05/2023	2b	Wood sandpiper	1	11:18	50	50	0	0	0	0	0
05/05/2023	2b	Wood sandpiper	1	11:53	18	18	0	0	0	0	0
05/05/2023	2b	Golden eagle	1	12:10	192	162	30	0	0	0	0
19/06/2023	2b	Golden plover	1	16:59	16	16	0	0	0	0	0
19/06/2023	2b	Goosander	1	19:21	21	21	0	0	0	0	0
22/06/2023	3b	Golden eagle	1	12:19	453	0	0	108	105	90	150
22/06/2023	3b	Golden eagle	1	12:24	419	0	0	0	30	135	254
28/07/2023	2b	Teal	1	08:15	22	22	0	0	0	0	0
28/07/2023	2b	Dunlin	1	09:14	39	0	0	0	0	0	0