APPENDIX 9.1: ORNITHOLOGY

TANGY IV WIND FARM

ORNITHOLOGY

Environmental Impact Assessment Report

Volume 4: Appendices

Appendix 9.1

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CONTENTS

FIGURES

1 INTRODUCTION

MacArthur Green was commissioned by the applicant to complete ornithological surveys at the proposed Tangy IV Wind Farm, Campbeltown in Argyll and Bute (hereafter referred to as 'the proposed development). The surveys were conducted between April 2011 and November 2017 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 Methodology;

Annex C: Ornithological Survey Effort and General Information;

Annex D: Ornithological Survey Results;

Annex E: Collision Risk Assessments;

Annex F: Review of the Effects of Artificial Light on Birds in Relation to Deployment of Obstruction Lighting on Wind Turbines; and

Annex G: Tangy I and Tangy II Wind Farms Historical Information and Data.

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 Figure 9.23**.

A range of surveys were employed to accurately record baseline conditions within the proposed development and appropriate survey buffers (detailed in Annex B). In this Appendix, associated Annexes (A – E) and Chapter 9 (Ornithology) of the Environmental Statement. Terms referred to are as follows:

- 'the proposed development' refers to the area within the red line boundary (**Figure 9.2**);
- 'survey area' is defined as the area covered by each survey type at the time of survey (**Figure 9.2**, refer to Annex B for details of various survey buffers); and
- 'study area' is defined as the area of consideration of effects on each species at the time of assessment (**Figure 9.2**).

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 METHODS

3.1 Consultations and Desk-Based Study

The following organisations and resources were consulted regarding the ornithological interests on and adjacent to the proposed development:

- The Argyll Raptor Study Group;
- SNH SiteLink (www.snh.gov.uk/sitelink); and
- Tangy I Wind Farm and Tangy II Wind Farm Environmental Statements, associated ES data, and subsequent ornithological monitoring reports.

3.2 Field Surveys

The following surveys were undertaken at the proposed development between April 2012 and November 2017:

- Flight activity surveys (three breeding seasons and four non-breeding seasons), three vantage points;
- Breeding bird surveys (two breeding seasons), 500 m survey buffer;
- Winter walkover surveys (two non-breeding seasons), 500 m survey buffer;
- Goose roost surveys (two non-breeding seasons), Tangy Loch and surroundings;
- Woodland point count surveys (one breeding and one non-breeding season), within site boundary;
- Scarce breeding bird surveys (three breeding seasons), 2 km survey buffer; and
- Black grouse surveys (three breeding seasons), 1.5 km survey buffer.

Survey methods followed the recommended SNH (2014[i]) guidelines available at the time and methods are described in detail within Annex B. Where possible, each survey was carried out beyond the proposed development 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.

The relative importance of the data collected was determined by the specific level of protection assigned to those species recorded, coupled with their perceived susceptibility to potential impacts resulting from the proposed development. The resulting 'target species' and 'secondary species' lists are a standard assessment tool for wind farm ornithological studies (see Annex B).

4 FIELD SURVEY RESULTS

All valid surveys were undertaken during suitable weather conditions (as described within Annex B – Survey Methodologies). Where weather conditions deteriorated below acceptable conditions (Annex B), surveys were either suspended or additional surveys were undertaken. In the case of flight activity surveys, any time where the visibility was <1km 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 73 bird species were recorded within, or adjacent to, the proposed development during the various ornithological surveys conducted. Survey effort and results of the field surveys are detailed within Annexes C & D and survey results are also illustrated within **Figure 9.5** to **Figure 9.26**. 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 proposed development 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 2012, 2013 and 2017 breeding seasons and 2012/2013, 2013/2014, 2016/2017 and 2017/2018 non-breeding seasons were undertaken across three Vantage Points (VPs) (**Figure 9.3**). Valid survey effort[1] is detailed in Table 9-1 and full details of flight activity surveys are contained in Annex C with methodology in Annex B.

Table 9-1 Summary of total hours of valid survey per VP in each season

Period	VP1	VP2	VP3
2012 breeding season	36	36	36
2012/2013 non-breeding season	44	44.5	45.5
2013 breeding season	35	36	38
2013/2014 non-breeding season	45	45	48
2016/2017 non-breeding season	42	38	42
2017 breeding season	36	36	36
2017/2018 non-breeding season	24	24	24

A total of 15 target species were recorded during the flight activity surveys (**Figure 9.5** to **Figure 9.19** present observed flightlines and further details are provided in Annex D). For each species across the whole flight activity survey period, Table 9-2 details the number of flights recorded and the number of birds recorded[2]. 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.

[1] 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.

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

Table 9-2 Target species recorded and total number of flights recorded during flight activity surveys, 2012 – 2017

Species	Total number of flightlines recorded	Total number of birds recorded	Total bird seconds recorded
Barnacle goose	1	6	900
Common sandpiper	9	10	70
Curlew	22	25	1,080
Golden eagle	1	1	420
Greenland white-fronted goose	132	16,473	1,258,114
Greylag goose	100	9,319	693,595
Hen harrier	24	24	2,998
Herring gull	42	349	35,953
Merlin	8	8	322
Oystercatcher	2	4	150
Peregrine falcon	5	5	610
Red-throated diver	1	1	75
Snipe	3	4	500
Whooper swan	1	1	120
Woodcock	1	1	5

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)[3]; (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[4] (19.9 m to 149.9 m).

Common sandpiper, golden eagle, red-throated diver, whooper swan and woodcock were recorded during flight activity surveys but are not considered to be 'at-risk'[5]. 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.

[3] 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.

[4] 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.

[5] 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 9-3 to Table 9-8 provide the estimated collision rates and number of seasons per collision for each species. A dashed line indicates that no “at-risk” flights were recorded during that season, and estimated collision risk is consequently zero. The highest estimated collision rates for each species are indicated in Table 9-3 to Table 9-5 in **bold**.

Seasonal survey effort (in terms of total survey hours) was used to calculate weighted average collision estimates for the breeding and non-breeding seasons. This permitted all survey data to be included in the assessment, whilst also ensuring that variation in survey time between years was accounted for (i.e. seasons with more comprehensive coverage have a greater influence on the average than those with lower levels). It was necessary to calculate the season weighting separately for each species in order to reflect the different dates used to define breeding and non-breeding seasons for collision modelling (SNH 2014). For example, the curlew breeding season is considered as 1st May to 31st July, while that for hen harrier is defined as 16th March to 31st August. Thus, curlew activity recorded in April is assigned to the non-breeding season, while hen harrier flights recorded during the same surveys are assigned to the breeding season. Thus, the season effort values reflected the different seasonal divisions.

Table 9-3 Estimated mean breeding season weighted collision rate per turbine option

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Barnacle goose	-	-	-	-	-
Curlew	0.0530	**0.0672**	0.0487	0.0656	0.0638
Greenland white-fronted goose	-	-	-	-	-
Greylag goose	-	-	-	-	-
Hen harrier	6.8413E-05	0.00015	8.1664E-05	**0.00017**	0.00015
Herring gull	0.1659	**0.1869**	0.1466	0.1760	0.1757
Merlin	-	-	-	-	-
Oystercatcher	0.0025	**0.0027**	0.0022	0.0026	0.0026
Peregrine falcon	**0.0154**	0.0153	0.0130	0.0137	0.0143
Snipe	-	-	-	-	-

Table 9-4 Estimated mean non-breeding season weighted collision rate per turbine option

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Barnacle goose	0.0008	0.0018	0.0010	**0.0021**	0.0019
Curlew	0.0001	0.0002	0.0001	**0.0003**	0.0002
Greenland white-fronted goose	0.0362	**0.0382**	0.0322	0.0362	0.0373
Greylag goose	0.4303	**0.4642**	0.3848	0.4413	0.4487

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Hen harrier	0.0003	0.0006	0.0003	**0.0007**	0.0006
Herring gull	-	-	-	**2.3436E-06**	-
Merlin	-	-	-	**1.3310E-05**	-
Oystercatcher	-	-	-	-	-
Peregrine falcon	-	-	-	**7.0242E-06**	-
Snipe	0.0044	0.0099	0.0055	**0.0118**	0.0109

Table 9-5 Estimated mean annual weighted collision rate per turbine option

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Barnacle goose	0.0008	0.0018	0.0010	**0.0021**	0.0019
Curlew	0.0531	**0.0674**	0.0488	0.0659	0.0641
Greenland white-fronted goose	0.0362	**0.0382**	0.0322	0.0362	0.0373
Greylag goose	0.4303	**0.4642**	0.3848	0.4413	0.4487
Hen harrier	0.0004	0.0007	0.0004	**0.0008**	0.0007
Herring gull	0.1659	**0.1869**	0.1466	0.1760	0.1757
Merlin	-	-	-	**1.3310E-05**	-
Oystercatcher	0.0025	**0.0027**	0.0022	0.0026	0.0026
Peregrine falcon	**0.0154**	0.0153	0.0130	0.0137	0.0143
Snipe	0.0044	0.0099	0.0055	**0.0118**	0.0109

Table 9-6 Estimated number of breeding seasons per collision per turbine option

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Barnacle goose	-	-	-	-	-
Curlew	18.9	14.9	20.5	15.2	15.7
Greenland white-fronted goose	-	-	-	-	-
Greylag goose	-	-	-	-	-
Hen harrier	14617.2	6512.6	12245.4	5830.2	6559.9
Herring gull	6.0	5.4	6.8	5.7	5.7
Merlin	-	-	-	-	-
Oystercatcher	395.8	364.0	453.8	384.5	379.9
Peregrine falcon	64.8	65.5	77.2	73.1	69.9
Snipe	-	-	-	-	-

Table 9-7 Estimated number of non-breeding seasons per collision per turbine option

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Barnacle goose	1228.6	545.9	990.2	475.4	529.5
Curlew	9562.3	4260.1	8002.8	3793.1	4322.6
Greenland white-fronted goose	27.6	26.2	31.0	27.6	26.8
Greylag goose	2.3	2.2	2.6	2.3	2.2
Hen harrier	3076.0	1753.1	2914.9	1525.9	1788.9
Herring gull	-	-	-	426692.3	-
Merlin	-	-	-	75129.2	-
Oystercatcher	-	-	-	-	-

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Peregrine falcon	-	-	-	142364.9	-
Snipe	227.9	101.1	181.5	85.0	92.0

Table 9-8 Estimated number of years per collision per turbine option

Species	Vestas 4.2	Vestas 3.6	Senvion 4.3	Senvion 4.2	Enercon 4.2
Barnacle goose	1228.6	545.9	990.2	475.4	529.5
Curlew	18.8	14.8	20.5	15.2	15.6
Greenland white-fronted goose	27.6	26.2	31.0	27.6	26.8
Greylag goose	2.3	2.2	2.6	2.3	2.2
Hen harrier	2541.3	1381.3	2354.5	1209.4	1405.6
Herring gull	6.0	5.4	6.8	5.7	5.7
Merlin	-	-	-	75129.2	-
Oystercatcher	395.8	364.0	453.8	384.5	379.9
Peregrine falcon	64.8	65.5	77.2	73.1	69.9
Snipe	227.9	101.1	181.5	85.0	92.0

4.2 Breeding Birds

Two complete breeding bird surveys (comprising of four visits each) were conducted in the 2012 and 2017 breeding seasons (April to July 2012 and 2017). Surveys recorded four wader species which were considered to be breeding (Table 9-9) and wader activity is detailed on **Figure 9.20**. Full details of the breeding bird surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

Table 9-9 Breeding wader territories, 2012 and 2017 – (number of territories within 500m study area)

Species	Number of territories 2012	Number of territories 2017
Common sandpiper	1 (0)	2 (0)
Curlew	3 (2)	2 (2)
Oystercatcher	1 (1)	0
Snipe	-	1 (0)

4.3 Winter Walkover

Winter walkover surveys were conducted during the 2012/2013 and 2016/2017 non-breeding seasons. Surveys recorded 46 species of which six are considered to be target species (Table 9-10, **Figure 9.21**). Full details of the winter walkover surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

Table 9-10 Winter walkover: target species records (number of birds recorded per visit), 2012/2013 and 2016/2017

Species	2012/2013 non-breeding season			2016/2017 non-breeding season		
	November 2012	January 2013	February 2013	November 2016	January 2017	February 2017
Golden plover	-	-	-	4	-	-
Goldeneye	-	1	5	5	9	5
Greylag goose	-	-	24	-	-	-
Hen harrier	-	-	1	-	-	-
Herring gull	-	41	-	21	82	22
Snipe	-	-	-	3	-	-

4.4 Scarce Breeding Birds

Scarce breeding bird surveys were conducted during the 2012 (April to August), 2013 (April to August) and 2017 (April to August) breeding seasons. Winter checks for roosting barn owl were also conducted in February 2013, November 2016 and January 2017.

An osprey nest was located on the edge of the 2km survey buffer during 2017 surveys (**Confidential Figure 9.23**), however no osprey were recorded during and surveys during the 2012 and 2013 breeding seasons. Breeding and roosting checks for barn owl found no evidence of breeding or roosting. Confidential Appendix 9.2 contains the full details of all breeding activity.

Hen harrier, merlin, peregrine falcon, red-throated diver and short-eared owl (target raptor/diver species) were also recorded during surveys (**Figure 9.22**) but were not considered to be breeding/no breeding attempts were located.

Buzzard, kestrel and sparrowhawk (secondary raptor 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 Annexes C and D 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 2012, 2013 and 2017 breeding seasons during April and May. Surveys identified two lek locations during 2017 surveys (Table 9-11, **Figure 9.24**), however no black grouse (or signs of black grouse) were recorded within the same survey area during the 2012 and 2013 surveys. Full details of the black grouse surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

Table 9-11 Black grouse lek activity: 2017

Lek	Location	2017	
		Maximum number of males recorded	Maximum number of females recorded
1	North of Gobagrennan	2	1
2	North of Clachfin Glen	3	0

4.6 Goose Roost Surveys

Goose roost surveys (comprising of vantage point style surveys and perimeter searches of Tangy Loch for signs of geese) were undertaken during the 2012/2013 and 2013/2014 non-breeding seasons. Surveys generally focused on the periods around dawn and dusk and were undertaken in a range of weather conditions and included a survey in mist and low cloud. Full details of the goose roost surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

Surveys during the 2012/2013 non-breeding season recorded 12 goose flights consisting mostly of Greenland white-fronted goose and flocks regularly numbered several hundred birds. Most flights were to and from Lussa Loch, however geese also landed on Tangy Loch on a number of occasions (**Figure 9.25**). Although goose signs were present around Tangy Loch in October 2012 (i.e. droppings and feathers) it was November 2012 before these surveys recorded the first flights of Greenland white-fronted and greylag goose. Flights continued through the non-breeding season and were recorded on most survey days. Further notable species recorded during these surveys were three whooper swan (November 2012) and a male teal (February 2013) that were recorded resting on Tangy Loch.

Surveys during the 2013/2014 non-breeding season recorded 22 goose flights were recorded (21 flightlines and one audible only record) with the first flight observed in October 2013. Goose flights continued throughout the non-breeding season and were observed during every goose roost survey. The majority of the flocks recorded were mixed flocks of Greenland white-fronted and greylag goose and flocks ranged from 8 to 230 individuals with an average of 40 birds. The majority of the flights were to and from Lussa Loch (17 of the 21 recorded flightlines), however geese were also recorded flying to and from Tangy Loch (4 of the 21 recorded flightlines) (**Figure 9.25**). Further notable species recorded during these surveys were two whooper swan flightlines heading from Tangy Loch (24th October 2013).

4.7 Woodland Point Counts

Surveys during the 2012 breeding season and 2012/2013 non-breeding season recorded among other species, common crossbill, cuckoo, fieldfare, lesser redpoll and song thrush. Woodland Point Count sample locations are shown in **Figure 9.4**, and full details of the woodland point count surveys are provided within Annexes C and D and survey methodology is provided within Annex B.

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[i] Scottish Natural Heritage (2014) Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms.

ANNEX A ORNITHOLOGICAL LEGAL PROTECTION

In Scotland, all wild birds are protected under the Wildlife and Countryside Act 1981 (the 'Act'), as amended by the Nature Conservation (Scotland) Act 2004. This protection also extends to their eggs and nests, with it being an offence to intentionally or recklessly[1]:

- Kill, injure or take any wild bird[2];
- Take, damage, destroy or otherwise interfere with the nest of any wild bird while it is being built or is in use[3];
- At any other time take, damage, destroy or otherwise interfere with any nest habitually used by any wild bird included in Schedule A1 (Protected Nests and Nest Sites for Birds: white-tailed eagle and golden eagle)[4];
- Obstruct or prevent any wild bird from using its nest[5]; or
- Take or destroy an egg of any wild bird[6].

It is also an offence to have in possession or control any live or dead wild bird or any part thereof; or any egg or part of an egg of any wild bird[7].

Further special protection under this legislation is afforded to those species listed on Schedule 1 of the Act. For these species, it is an offence to:

- Intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or is in, on or near a nest containing eggs or young, or disturb the dependent young of such a bird[8];
- Intentionally or recklessly disturb any wild birds included on Schedule 1 which leks, while it is doing so[9] (capercaillie is the only bird this offence applies to in Scotland);
- Intentionally or recklessly harass any wild bird included in Schedule 1A[10]. Section 1, subsection 5B states, '*Subject to the provisions of this Part, any person who intentionally or recklessly harasses any wild bird included in Schedule 1A shall be guilty of an offence*'. At this time, Schedule 1A includes golden eagle, hen harrier, red kite and white-tailed eagle. This updated legislation was introduced on 16 March 2013; or

[1] Exceptions to these offences exist under various circumstances (e.g. controlling pest species; taking birds during specific season; and killing sick or injured birds etc.).
[2] Wildlife and Countryside Act 1981, Section 1(1)(a)
[3] Wildlife and Countryside Act 1981, Section 1(1)(b)
[4] Wildlife and Countryside Act 1981, Section 1(1)(ba)
[5] Wildlife and Countryside Act 1981, Section 1(1)(bb)
[6] Wildlife and Countryside Act 1981, Section 1(1)(c)
[7] Wildlife and Countryside Act 1981, Section 1(2)
[8] Wildlife and Countryside Act 1981, Section 1(5)
[9] Wildlife and Countryside Act 1981, Section 1(5A)
[10] Wildlife and Countryside Act 1981, Section 1(5B)

- Intentionally or recklessly take, damage, destroy or otherwise interfere with any nest and/or nest site habitually used by any bird on Schedule A1 at any time. At this time, Schedule 1A includes golden eagle and white-tailed eagle[11];

It is also an offence to knowingly cause or permit to be done an act which is made unlawful by any of the above provisions.

Further protection is described under the EU Birds Directive which requires member states to maintain wild bird species in favourable conservation status[12] and promote the conservation of bird species listed within Annex 1 of the Birds Directive through the protection of their habitat. This is achieved via the designation of Special Protection Areas (SPAs).

Red List bird species are those deemed to be globally threatened and to be suffering population declines within the UK. Although not legally enforceable, the conservation of Red List bird species represents a material consideration, in planning terms.

[11] This reflects the changes introduced by the Wildlife and Countryside Act 1981 (as amended by: Variation of Schedules A1 and 1A (Scotland) Order 2013

[12] While the term 'favourable conservation status' is not used in the Birds Directive, EU court cases over recent years have progressively interpreted the concept as meaningful in a Birds Directive context (SNH, 2006).

ANNEX B ORNITHOLOGICAL SURVEY METHODOLOGY

In addition to the baseline data already gathered for Tangy III Wind Farm, further ornithological surveys were undertaken prior to the submission of proposed Tangy IV Wind Farm[1] (hereafter referred to as 'the proposed development'). The methodologies used across all surveys are summarised in the sections below; more detailed descriptions are provided in the Scottish Natural Heritage (SNH) guidance (2014[i] and 2010[ii]) on which these surveys are based.

SNH Survey Guidance Updates

When baseline surveys for Tangy III Wind Farm commenced in April 2012, survey methodology was based on the available SNH 2010[ii] guidance. A new version of the SNH 2010 guidance was released in August 2013 (midway through the Tangy III baseline surveys) however SNH advised in an email (2nd September 2013) that *'This document updates guidance first published by SNH in 2005 which had minor amendments in 2010. It replaces the 2005 document. It should be used for projects where survey work is about to commence or has only very recently started. For ongoing proposals, consultants should continue to follow any previous specific advice we have given at either formal EIA Scoping or pre-application stage'*. This 2013 guidance was therefore not considered relevant to the Tangy III surveys undertaken between August 2013 and March 2014. Surveys undertaken between October 2016 and November 2017 followed the most recent version of the SNH guidance – released in May 2014[i]. Where relevant, multiple guidance versions are referenced in the sections below.

Study Area

Surveys were undertaken during the 2012, 2013 and 2016 breeding and 2012/2013, 2013/2014, 2016/2017 and 2017/2018 non-breeding seasons. Flight activity, black grouse, winter walkover, woodland point count, breeding and scarce breeding bird survey study areas were buffered from a Site boundary (**Figure 9.2 and Figure 9.3**) provided by the applicant.

Delaunay Triangulation from the turbine points was used to create a wind farm area[2] and from this the Collision Risk Analysis Area (CRAA) was defined using a 500 m buffer (**Figure 9.3**). Using the larger 500 m area around the turbines accounts for possible inaccuracies in the recording of flightlines and ensures the assessment is precautionary. Target species flight activity within this area were used to inform the Collision Risk Analysis.

B.1 Flight Activity Survey

The aims of the flight activity (vantage point) surveys are: (1) to record flight activity within the vicinity of the site in order to identify areas of importance to birds; and (2) to quantify flight activity within 500 m of the proposed turbines in order to estimate the likelihood of collision (SNH, 2010[ii] P13; SNH, 2014[i] P14-15).

[1] It should be noted that Tangy IV would replace the consented Tangy III Wind Farm rather than extend it. As such, all baseline ornithology surveys have covered the same core area.

[2] This was adjusted where appropriate depending on the spatial location of the turbines in relation to other turbines.

Timing

- A survey period of 36 hours is recommended as the minimum level of sampling intensity at each VP for each season (breeding, non-breeding, migratory) (SNH 2010[ii], P15; SNH, 2014[i] P17);
- Watches were spread as evenly throughout the year as possible to ensure that temporally representative data are collected (see Annex C). Specific consideration was given to the period around dawn and twilight for breeding waders/migratory geese and to changing raptor behaviour across seasons (SNH, 2010[i] P16,19; SNH, 2014[i] P16);
- Watches were suspended and resumed to take account of changes in visibility (e.g. fluctuations in cloud base). Watches were undertaken in conditions of good ground visibility when the cloud base was higher than the most elevated ground being observed; and
- Watches were conducted in a range of weather conditions and were spread throughout the day (see Annexes C and D).

Field Methods

- Viewshed analysis was conducted using Arc GIS to confirm suitable Vantage Point (VP) locations and their associated visible areas[3];
- Reconnaissance surveys were undertaken to refine VP locations;
- The VP locations and associated viewsheds are detailed in **Figure 9.3**;
- Care was taken to maximize the area visible whilst minimising disturbance to birds;
- The final three VP locations were selected with the aim of achieving coverage of the whole study area such that no point was greater than 2 kilometres from a VP. This objective was achieved for the majority of the CRAA, although areas on the western and northern edges of the CRAA (7 %) remained 'invisible'[4] ;
- A maximum 180˚ view arc was scanned. This rule did not however apply when tracking migratory geese and waterfowl, raptors or divers across the CRAA;
- Each watch lasted a maximum of three hours but was suspended and then resumed to take account of changes in visibility (e.g. fluctuations in the cloud base).

For species of high nature conservation importance (target species) the following data were recorded (SNH, 2010[ii] P44; SNH, 2014[i] P17-18):

- The flightlines by individuals or flocks of birds;
- The time the target bird was detected and the duration (seconds) spent flying over a defined study area (the viewshed);

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[3] The viewsheds are based on a 5m DTM to provide a representation of visibility from the observer locations; this is confirmed and refined through field site visits.

[4] The habitat here is of sufficient similarity such that the survey data collected and subsequently assessed are considered to be representative of the whole CRAA. In addition, there were no records made during any of the BBS, breeding raptor and walkover surveys which would suggest that this area was of any importance to target species.

- The birds' flight heights (defined into prescribed height bands[5]) were recorded at the point of detection and at 15 second intervals thereafter. From this the proportion of time spent flying below, within (referred to as Potential Collision Height (PCH)) and above approximate rotor height could be estimated;
- The actual rotor height will be between 149.9 and 19.9 m[6]. This difference is accounted for within the collision risk models on the assumption of even flight distribution;
- The flight path followed was plotted in the field onto 1:25,000 scale maps;
- For secondary species, activity summaries were sub-divided into 5 minute periods at the end of which the number and activity of all secondary species were recorded;
- If a target species was being tracked during a 5 minute period, then the activity summary for that period was abandoned and a new one started once observations of the target species had ended;
- Observation of target species took priority over recording secondary species;
- The number of birds recorded were the minimum number of individuals that could account for the activity observed; and
- Observers only recorded perched birds and birds on water-bodies once only on arrival at the VP. Thereafter only flying birds and newly noticed perched/swimming birds were included in the activity summaries.

B.2 Moorland Breeding Bird Survey

Upland breeding bird survey methodology was employed as detailed within SNH Guidance (SNH, 2010[ii] P15-16; SNH, 2014[i] P11-13). Study areas are detailed in **Figure 9.2**. In summary, surveys involved the following:

- Open upland (including hedgerows, scrub, isolated trees and copses) was surveyed using an intensive version of the Brown and Shepherd (1993[iii]) method for upland bird survey;
- The objectives were to map the distribution of breeding bird territories and estimate the approximate size of breeding bird populations;
- After each survey visit one overview map was then produced showing all target species. The maps from all four survey visits from that year were then compared, enabling the production of composite breeding territory maps. This was done by grouping the observations into territories using the methodology described by Bibby *et al*. (2000[iv]). Due to the cryptic nature of many breeding birds and the necessary assumptions made when plotting territories, a minimum and maximum number of territories was identified for each target species;

[5] In April 2014 (1st), MacArthur Green increased their standard height bands from 3 bands (0-20 m, 21-125 m, >126 m) to 5 bands (0-20 m, 21-40 m, 41-100 m, 101-150 m, >151 m) to account for industry changes in maximum turbine heights. Consequently, baseline surveys for Tangy III (2012 to 2014) were undertaken using 3 height bands whilst the additional baseline surveys in 2016-2017 were undertaken using 5 height bands. Annex E details how the collision modelling accounts for these different height bands.

[6] Five turbine options are being considered for the project, all of which have been considered in the collision modelling (Annex E).

- The survey covered all areas within 500 m of the site; and
- All upland wader species were recorded during the breeding bird survey.

Timing

- As recommended in Calladine *et al.* (2009[v]), four survey visits were undertaken between April and July;
- Fieldwork was undertaken between sunrise and sunrise and 1800hrs; and
- Fieldwork was not undertaken in conditions considered likely to affect bird detection rates, for example in winds greater than Beaufort Scale Force 4, persistent precipitation, poor visibility (less than 300 m), or in unusually hot weather.

Field Methods

- Walk-routes which optimised ground visibility were used;
- Surveyors paused at appropriate vantage and listening points;
- Isolated trees, copses and patches of scrub were approached and examined;
- Streams, ditches and hedgerows were walked;
- All other areas were approached to within 100 m; and
- Registrations were mapped at the first location that behaviour indicative of breeding was observed; and
- Standard BTO activity codes were used.

B.3 Winter Walkover

Winter walkovers were undertaken during non-breeding seasons to map wintering populations of birds within the site. Study areas are detailed in **Figure 9.2**.

- The area was surveyed three times during each non-breeding season;
- These surveys involved following a route that optimised ground coverage, such that observers walked within 250 m of every point; and
- Observers periodically stopped at appropriate viewing and listening points along the route and longer vantage point watches were included within the walkover to allow potentially important areas to be monitored in greater detail.

B.4 Scarce Breeding Bird Survey

The aim of the scarce breeding bird surveys was to determine the distribution of occupied nests/territories for target raptor, owl and diver species within 2 km of the site and record breeding success. Secondary species such as buzzard, sparrowhawk and kestrel were also noted but location of their nests was not the key focus of the surveys. Survey areas are detailed in **Figure 9.2**.

Surveys were undertaken by experienced and licensed[7] field ornithologists. Extreme care was taken to avoid unnecessary disturbance to breeding birds.

Guidance from SNH (SNH, 2010[ii] P16-18; SNH, 2014[i] P11-13), 'Bird Monitoring Methods' (Gilbert *et al.* 1998[vi]) and 'Raptors: a field guide to survey and monitoring' (Hardey *et al.* 2009[vii] and 2013[viii]) were all consulted to inform survey methodology and are referenced where appropriate in the species methodologies below.

Barn Owl

- The surveys followed methodology outlined in Gilbert *et al.* (1998[vi]), as mentioned in SNH Guidance (SNH, 2010[ii] P26-27; SNH, 2014[i] P12-13);
- Surveys were undertaken within 1 km of the site; and
- Surveyors checked for signs of occupation (moulted feathers, pellets) in all suitable buildings within this 1 km buffer.

Black-Throated Diver

Methodology outlined in Gilbert *et al.* (1998[vi]), as mentioned in SNH Guidance (SNH, 2010[ii] P22-24; SNH, 2014[i] P12), was used as guidance. Extreme care was taken not to disturb potential nests especially around the time of year when females were likely to be laying or incubating.

- All suitable habitats within 1 km of the site boundary were searched, including areas of water, lochs and/or any shorelines where present;
- Searches carried out between April and July were focussed on locating summer territories and sitting, brooding or prospecting/nest-building birds as well as numbers of non-breeding adults;
- By observing from a distance, disturbance to nesting or incubating birds was kept to a minimum;
- Where pairs without eggs or young were present, a subsequent visit was made to confirm nest occupancy;
- Where breeding was confirmed, no subsequent visits were made (Gilbert *et al.* (1998[vi])); and
- Where present, numbers of non-breeding divers were also assessed (SNH, 2010[ii] P22-24; SNH, 2014[i] P34).

Golden Eagle

Methodology outlined in Hardey *et al.* (2009[vii], 2013[viii]) was used as guidance. Extreme care was taken not to disturb potential nests, especially where nesting was confirmed or during periods of extremely wet, hot or cold conditions (Hardey *et al.* 2009[vii], 2013[viii]).

- All habitats within 2 km of the site boundary with the potential to accommodate golden eagle were searched including; Caledonian pine woodland, montane areas, heather moorland, open and unimproved habitat, and where present, seacliffs;

[7] All surveyors hold SNH Schedule 1 Licences.

- Searches carried out between January and March focussed on watching for territorial displays and nest building activities. Occupancy of the home range was confirmed by seeing two adult birds together, or by seeing one bird incubating in the later months (Hardey *et al.* 2009[vii], 2013[viii]);
- When searches of a nesting site were carried out, they were done so from a distance, so as to not cause disturbance to any displaying, nesting or incubating birds; and
- Where breeding was confirmed, scans of the nests were carried out in June, to check for the presence of young. Further scans were carried out in late July to search for fledged young.

Goshawk

Methodology outlined in Hardey *et al.* (2009[vii], 2013[viii]) was used as guidance for the surveying of areas for potential goshawk breeding. Extreme care was taken not to disturb potential nests especially around the time of year when females were likely to be laying or incubating.

- Areas of suitable woodland were observed for the presence of nests. Searches for goshawk nests were focused on mature forestry blocks, although their presence was not ruled out of other wooded areas;
- Searches carried out between March and April focussed on observing territorial and nest building behaviours;
- Where nests were known to be present, scans were carried out between mid-March and May to confirm breeding. Scans were kept brief – carried out for between 5-10 minutes and from a distance; and
- When breeding was confirmed, searches for further nests were deferred until such a time as the young had hatched. Searches were then undertaken between late May and late June for evidence of provisioning young and then between late July and early August to watch for fledgling activity, this included listening for the begging calls of newly fledged young.

Hen Harrier

Methodology outlined in Hardey *et al*. (2009[vii], 2013[viii]) was used as guidance for the surveying of areas for potential hen harrier breeding. Extreme care was taken not to disturb potential nests especially around the time of year when females were likely to be laying or in cold/wet weather when females were likely to be incubating or brooding. Areas of suitable habitat[8] were visited during four time periods across the breeding season to:

- Check for territory occupancy (between March and mid-April) – this consisted of watching over suitable habitat from a good vantage point for displaying males (and females) and checking all areas of suitable habitat to within 250m (watching out for signs of kills);
- Locate incubating females (between mid-April and late May) by listening for female begging calls and watching for food passes between the male and female – surveyors watched for at least four hours as Hardey *et al.* (2009[vii], 2013[viii]) notes that when the female is incubating it

[8] Unsuitable habitat areas include: land above 600m; improved pasture and arable land; extensive areas of degraded land with no heather cover and low vegetation; the vicinity of cliffs, rocky outcrops, boulder fields and scree; areas within 100m of hill farms and occupied dwellings.

can be up to six hours between feeding visits from the male, but on average it is less than every four hours. Surveys were undertaken between 06:00 to 12:00 or 16:00 to 20:00;

- Check for young or breeding evidence (between late May and late June) again by listening for female begging calls and watching for food passes between male and female when the female is brooding and watching for the male and female provisioning the nest with food once brooding has ended– surveyors watched for at least two hours as Hardey *et al.* (2009[vii], 2013[viii]) notes that an adult bird will visit the nest every 1-2 hours. Surveyors also watched for display behaviour which could indicate a failed breeding attempt; and
- Check for fledged young (between late June and late August).

Merlin

Methodology outlined in Hardey *et al.* (2009[vii], 2013[viii]) was used as guidance for the surveying of areas for potential merlin breeding.

- Areas of suitable nesting habitat (including forest edge where trees are >5 m high) were closely observed between 20th March and 30th April;
- Boulders, fence lines, isolated posts, stone dykes, grouse butts, hummocks, stream banks, crags, trees and recently burnt areas of heather were checked for signs of occupation (e.g. plucked prey, moulted feathers, pellets and faeces);
- If merlin were observed, or signs found, areas were visited at least twice to verify occupation of the site; and
- Potential nest areas were watched for 4-6 hours if necessary.

Osprey

Methodology outlined in Hardey *et al.* (2009[vii], 2013[viii]) and Gilbert *et al.* (1998[vi]) was used as guidance for the surveying of areas for potential osprey breeding. Care was taken when carrying out the searches so as not to disturb any displaying or nesting birds, with nests checked from a distance.

- All wooded areas within the study area were searched for the possible presence of nests, especially those located close to freshwater lochs and rivers that could provide feeding sites. Artificial platforms were also checked;
- If breeding was suspected within the study area, the location was visited between April and May until nesting was confirmed;
- In line with the methods suggested by Gilbert *et al.* (1998[vi]) and Hardey *et al*. (2009[vii], 2013[viii]), proof of occupancy was determined by:
    - Two ospreys seen on the same eyrie on more than one occasion (with a week separating observations);
    - Incubation; or
    - Feeding of chicks.

- Further scans were undertaken between late May and early July to try and observe any young in the nests.

Peregrine Falcon

- Potential nest sites were visited and checked for evidence of occupation between March and April;
- Sites checked included crags and steep banks identified from OS maps and searches of the study area;
- Surveyors checked for signs of occupation (e.g. faecal splash, fresh plucked prey);
- If occupied sites were found they were re-visited to verify incubation; and
- Searches were made for eyries. Where this was not possible sites were watched from a suitable vantage point for 3-4 hours or until a nest was located.

Red-Throated Diver

Methodology outlined in Gilbert *et al.* (1998[vi]), as mentioned in SNH Guidance (SNH, 2010[ii] P22-24; SNH, 2014[i] P12), was used as guidance for the surveying of areas for potential red-throated diver breeding. Extreme care was taken not to disturb potential nests especially around the time of year when females were likely to be laying or incubating and by observing from a distance, disturbance to nesting or incubating birds was kept to a minimum.

- All suitable habitats within 1 km of the site boundary were searched, including all areas of standing water (small pools and lochans in open moorland and forested areas) and shorelines where present;
- Searches carried out between late May and July focussed on locating breeding pairs, incubating adult birds and non-breeding adults; and
- Surveyors recorded the number of breeding pairs (including incubating birds seen or young, eggshell fragments or dead chicks) and the maximum number of non-breeding adults.

Short-Eared Owl

- At least two visits between early April and the end of May were carried out;
- Suitable habitat was visited and checked for evidence of hunting males, territorial activity and other signs of presence; and
- If breeding was confirmed, a further visit was be made in June to watch birds, locate nest-sites and confirm breeding behaviour wherever possible.

White-Tailed Eagle

Methodology outlined in Hardey *et al.* (2009[vii], 2013[viii]), as mentioned in SNH Guidance (SNH, 2010[ii] P16-18; SNH, 2014[i] P11-12) was used as guidance for the surveying of areas for potential white-tailed eagle breeding. Active nests were observed from a distance so as to minimise disturbance.

- All suitable habitats (including open coastal or fresh water, large and small crags and suitable trees) within a 6 km radius were checked for signs of nest sites, breeding territories or communal roosts;
- Surveys within nesting ranges were carried out between November and mid-February, focussing on locating refurbished nest sites;
- Surveys between mid-March and August focussed on locating active nests and young; and
- All suitable crags and trees within nesting ranges were checked for signs of roosts. These include droppings, down, feathers and pellets.

B.5 Black Grouse Survey

The survey methodology used is detailed in SNH Guidance (SNH, 2007[ix]; SNH, 2010[ii] P24 and SNH, 2014[i] P12) and a summary is provided below. Survey areas are detailed in **Figure 9.2**. Surveys were conducted in April and May in 2012, 2013 and 2017.

- Breeding Black Grouse were surveyed within 1.5 km of the proposed development Area by counting total numbers of males and females at leks, most lekking activity taking place at or soon after dawn in spring.
- Known lek sites and other areas of suitable habitat which can host leks were identified and visited during April within 2 hours of dawn on calm dry days with good visibility;
- Visits involved listening and scanning for lekking black grouse from strategic locations (avoiding disturbance of leks) and during walks between these locations ensuring that all potential habitat was covered;
- The maximum count of males in the 2 hours around dawn gives the standard count estimate but the maximum number of females seen was also presented; and
- Leks that were at least 200 m apart within the same year were treated as separate leks.

B.6 Goose Roost Surveys

Goose Roost Surveys were undertaken during the 2012/2013 and 2013/2014 non-breeding season at Tangy Loch (part of the Kintyre Goose Roosts SPA). Surveys were conducted monthly from September 2012 to February 2013 and October 2013 to February 2014.

Timing

- Surveys focussed on the periods around dawn and dusk in the vicinity of Tangy Loch, however daytime surveys were also carried out.

Field Methods

- The perimeter of Tangy Loch was inspected for goose roosting evidence; i.e. feathers and droppings; and

- Vantage Point style watches lasting between one and three hours were then undertaken from a suitable point nearby to detail any goose roosting flights in or out of Tangy Loch or the nearby Lussa Loch.

B.7 Woodland Point Counts

The objective of woodland point counts is to describe the species composition of the woodland bird community. The survey methodology used is detailed in SNH Guidance[9] (SNH, 2010[ii] P25) and a summary is provided below. Survey areas are detailed in **Figure 9.4**

Timing

- Each sample point was visited three times in summer 2012 (April, May and June) and two times in winter 2012/2013 (November and January);
- The first and second survey visits are designed to capture resident species and potentially some migrants. The third and fourth visit should record later migrants possibly missed in the first visits; and
- Surveys were not undertaken in conditions considered likely to affect bird detection rates, for example strong winds (greater than Beaufort Scale Force 4), persistent precipitation, poor visibility (less than 300m), or in unusually hot weather.

Field methods

- Hedgerows, patches of scrub, isolated trees and copses were surveyed as part of the breeding bird survey of open habitats (see below);
- Woodland/forest breeding birds were surveyed at a sample of woodland count points stratified spatially across the relevant area;
- Counts were delayed for a few minutes after the observer arrived at a point to minimise any disturbance effects; and
- All birds seen and heard during a 5-minute recording period were noted, together with details of any breeding behaviour.

[i] Scottish Natural Heritage (2014) Recommended bird survey methods to inform impact assessment of onshore windfarms.
[ii] Scottish Natural Heritage (2005, revised December 2010) Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities.
[iii] Brown, A. F. and Shepherd, K. B. (1993) A method for censusing upland breeding waders. Bird Study, 40: 189-195.
[iv] Bibby, C. J., Neil D. Burgess, David A. Hill and Simon H. Mustoe (2000) Bird Census Techniques, 2nd Edition, London, Academic Press.
[v] Calladine. J., Garner, G., Wernham, C., & Thiel, A. (2009) The influence of survey frequency on population estimates of moorland breeding birds. Bird Study, 56: 3, 381-388.

[9] Please note: woodland point counts were not included in the revised 2014 SNH survey guidance and were therefore not undertaken in surveys after the release of the revised guidance.

[vi] Gilbert, G., Gibbons, D. W. and Evans, J. (1998) Bird Monitoring Methods. RSPB, Sandy.
[vii] Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2009) Raptors: a field guide for surveys and monitoring (2nd edition). The Stationery Office, Edinburgh.
[viii] Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (November 2013) Raptors: a field guide for surveys and monitoring (3rd edition). The Stationery Office, Edinburgh.
[ix] Scottish Natural Heritage (2007) Black grouse survey methodology.

ANNEX C ORNITHOLOGICAL SURVEY EFFORT & GENERAL INFORMATION

Table C-1 shows the system used for recording weather conditions on all the surveys detailed in sections C.1 to C.7 below.

Table C-1 Key to meteorological conditions recorded during all surveys

Wind speed		Rain		Cloud cover		Cloud height	
Calm	0	None	0	In eighths		<150m	0
Light air	1	Drizzle/Mist	1	*e.g.*	3/8	150-500m	1
Light breeze	2	Light showers	2			>500m	2
Gentle breeze	3	Heavy showers	3				
Moderate breeze	4	Heavy rain	4				
Fresh breeze	5						
Strong breeze	6	**Snow**		**Frost**		**Visibility**	
Moderate gale	7	None	0	None	0	Poor (<1km)	0
Fresh gale	8	On site	1	Ground	1	Moderate (1-2km)	1
Strong gale	9	High ground	2	All day	2	Good (>2km)	2
Whole gale	10						
Storm	11						
Hurricane	12						

C.1 Flight Activity Surveys

Flight activity surveys were undertaken during the 2012, 2013 and 2017 breeding seasons and 2012/2013, 2013/2014, 2016/2017 and 2017/2018 non-breeding seasons. Details of the flight activity surveys undertaken across each Vantage Point (VP) location are supplied in Table C-2 (survey hours per VP per season are summarised in Appendix 9.1, Table 9-1) and the associated weather data recorded is detailed in Table C-3. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-2 Summary of flight activity surveys undertaken at Tangy IV (sorted chronologically)

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
30/04/2012	BR 2012	1	MT	0945	1245	3
30/04/2012	BR 2012	1	MT	1255	1555	3
30/04/2012	BR 2012	2	HM	1345	1645	3
30/04/2012	BR 2012	3	HM	1030	1330	3
02/05/2012	BR 2012	2	HM	1430	1730	3
02/05/2012	BR 2012	3	HM	1100	1400	3
24/05/2012	BR 2012	2	HM	1400	1700	3
24/05/2012	BR 2012	3	HM	1030	1330	3
29/05/2012	BR 2012	1	MT	0830	1130	3
29/05/2012	BR 2012	1	MT	1145	1445	3
29/05/2012	BR 2012	2	HM	1200	1500	3
29/05/2012	BR 2012	3	HM	0830	1130	3

[1] Note: only valid hours (i.e. where visibility was at least 1km) are presented in this column.

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
26/06/2012	BR 2012	2	HM	1015	1315	3
26/06/2012	BR 2012	3	HM	0615	0915	3
28/06/2012	BR 2012	1	HM	1500	1800	3
28/06/2012	BR 2012	2	HM	1900	2200	3
05/07/2012	BR 2012	1	HM	0510	0810	3
05/07/2012	BR 2012	3	HM	0930	1230	3
11/07/2012	BR 2012	1	MT	1520	1820	3
11/07/2012	BR 2012	1	MT	1850	2150	3
11/07/2012	BR 2012	2	HM	1930	2230	3
11/07/2012	BR 2012	3	HM	1600	1900	3
18/07/2012	BR 2012	2	HM	1015	1315	3
18/07/2012	BR 2012	3	HM	0640	0940	3
16/08/2012	BR 2012	1	CS	0835	1135	3
16/08/2012	BR 2012	1	CS	1205	1505	3
16/08/2012	BR 2012	2	HM	0830	1130	3
16/08/2012	BR 2012	2	HM	1200	1500	3
21/08/2012	BR 2012	1	CS	1335	1635	3
21/08/2012	BR 2012	1	CS	1705	2005	3
21/08/2012	BR 2012	3	HM	1345	1645	3
21/08/2012	BR 2012	3	HM	1715	2015	3
22/08/2012	BR 2012	3	HM	1030	1330	3
22/08/2012	BR 2012	3	HM	1400	1700	3
23/08/2012	BR 2012	2	HM	0730	1030	3
23/08/2012	BR 2012	2	HM	1100	1400	3
17/09/2012	NBR 2012/2013	1	HM	1400	1700	3
17/09/2012	NBR 2012/2013	1	HM	1730	2030	3
18/09/2012	NBR 2012/2013	2	HM	1400	1700	3
18/09/2012	NBR 2012/2013	2	HM	1800	2100	3
24/09/2012	NBR 2012/2013	3	HM	1730	2030	3
25/09/2012	NBR 2012/2013	1	HM	1100	1400	3
25/09/2012	NBR 2012/2013	2	HM	0700	1000	3
26/09/2012	NBR 2012/2013	3	HM	0630	0930	3
26/09/2012	NBR 2012/2013	3	HM	1030	1330	3
09/10/2012	NBR 2012/2013	2	HM	0700	1000	3
09/10/2012	NBR 2012/2013	2	HM	1030	1330	3
12/10/2012	NBR 2012/2013	3	HM	1300	1600	3
12/10/2012	NBR 2012/2013	3	HM	1630	1930	3
16/10/2012	NBR 2012/2013	1	HM	0700	1000	3
16/10/2012	NBR 2012/2013	1	HM	1030	1330	3
17/10/2012	NBR 2012/2013	2	HM	1300	1600	3
18/10/2012	NBR 2012/2013	1	HM	1130	1430	3
18/10/2012	NBR 2012/2013	3	HM	0730	1030	3
08/11/2012	NBR 2012/2013	2	HM	0800	1030	2.5
08/11/2012	NBR 2012/2013	2	HM	1040	1310	2.5
15/11/2012	NBR 2012/2013	1	HM	1130	1400	2.5
15/11/2012	NBR 2012/2013	1	HM	1410	1640	2.5
26/11/2012	NBR 2012/2013	3	HM	1200	1430	2.5
26/11/2012	NBR 2012/2013	3	HM	1440	1710	2.5
10/12/2012	NBR 2012/2013	1	HM	1000	1200	2

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
10/12/2012	NBR 2012/2013	1	HM	1210	1410	2
11/12/2012	NBR 2012/2013	3	HM	0700	0930	2.5
11/12/2012	NBR 2012/2013	3	HM	1000	1200	2
13/12/2012	NBR 2012/2013	2	HM	1200	1400	2
13/12/2012	NBR 2012/2013	2	HM	1410	1610	2
07/01/2013	NBR 2012/2013	2	HM	1100	1300	2
07/01/2013	NBR 2012/2013	2	HM	1310	1510	2
09/01/2013	NBR 2012/2013	3	HM	0745	0945	2
09/01/2013	NBR 2012/2013	3	HM	0955	1155	2
10/01/2013	NBR 2012/2013	1	HM	1030	1230	2
10/01/2013	NBR 2012/2013	1	HM	1240	1440	2
06/02/2013	NBR 2012/2013	2	HM	1300	1500	2
06/02/2013	NBR 2012/2013	2	HM	1520	1750	2.5
07/02/2013	NBR 2012/2013	1	HM	0930	1130	2
07/02/2013	NBR 2012/2013	1	HM	1200	1400	2
08/02/2013	NBR 2012/2013	3	HM	0700	0900	2
08/02/2013	NBR 2012/2013	3	HM	0930	1130	2
12/03/2013	NBR 2012/2013	2	HM	0630	0930	3
12/03/2013	NBR 2012/2013	2	HM	1000	1300	3
18/03/2013	NBR 2012/2013	3	HM	1300	1600	3
18/03/2013	NBR 2012/2013	3	HM	1630	1930	3
21/03/2013	NBR 2012/2013	1	HM	1200	1500	3
21/03/2013	NBR 2012/2013	2	HM	1530	1830	3
02/04/2013	NBR 2012/2013	1	HM	0900	1200	3
02/04/2013	NBR 2012/2013	1	HM	1230	1530	3
04/04/2013	NBR 2012/2013	3	HM	0930	1230	3
04/04/2013	NBR 2012/2013	3	HM	1300	1400	1
22/04/2013	BR 2013	1	CB	1525	1825	3
22/04/2013	BR 2013	1	CB	1835	2035	2
23/04/2013	BR 2013	3	CB	1005	1305	3
23/04/2013	BR 2013	3	CB	1315	1615	3
10/05/2013	BR 2013	3	CB	1150	1350	2
13/05/2013	BR 2013	2	HM	0800	1100	3
13/05/2013	BR 2013	2	HM	1130	1430	3
17/05/2013	BR 2013	1	HM	1000	1300	3
17/05/2013	BR 2013	1	HM	1330	1630	3
20/05/2013	BR 2013	2	HM	1430	1730	3
20/05/2013	BR 2013	2	HM	1800	2100	3
21/05/2013	BR 2013	1	HM	1200	1500	3
21/05/2013	BR 2013	1	HM	1530	1830	3
28/05/2013	BR 2013	3	HM	0500	0800	3
28/05/2013	BR 2013	3	HM	0830	1130	3
10/06/2013	BR 2013	1	HM	0700	1000	3
10/06/2013	BR 2013	1	HM	1030	1330	3
11/06/2013	BR 2013	2	HM	0600	0900	3
11/06/2013	BR 2013	2	HM	0930	1230	3
17/06/2013	BR 2013	3	HM	1000	1300	3
17/06/2013	BR 2013	3	HM	1330	1630	3
18/06/2013	BR 2013	2	HM	0900	1200	3

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
18/06/2013	BR 2013	2	HM	1230	1530	3
19/06/2013	BR 2013	3	HM	1500	1800	3
19/06/2013	BR 2013	3	HM	1830	2130	3
01/07/2013	BR 2013	1	HM	1300	1600	3
01/07/2013	BR 2013	1	HM	1630	1930	3
08/07/2013	BR 2013	2	HM	0600	0900	3
08/07/2013	BR 2013	2	HM	0930	1230	3
10/07/2013	BR 2013	3	HM	0600	0900	3
10/07/2013	BR 2013	3	HM	0930	1230	3
07/08/2013	BR 2013	1	HM	1000	1300	3
07/08/2013	BR 2013	1	HM	1330	1630	3
08/08/2013	BR 2013	2	HM	0930	1230	3
08/08/2013	BR 2013	2	HM	1300	1600	3
12/08/2013	BR 2013	3	HM	1000	1300	3
12/08/2013	BR 2013	3	HM	1330	1630	3
25/09/2013	NBR 2013/2014	1	HM	1400	1700	3
25/09/2013	NBR 2013/2014	1	HM	1730	2030	3
24/09/2013	NBR 2013/2014	3	HM	0600	0900	3
24/09/2013	NBR 2013/2014	3	HM	0930	1230	3
23/09/2013	NBR 2013/2014	2	HM	1030	1330	3
23/09/2013	NBR 2013/2014	2	HM	1400	1700	3
20/09/2013	NBR 2013/2014	1	HM	1430	1730	3
20/09/2013	NBR 2013/2014	1	HM	1800	2100	3
14/10/2013	NBR 2013/2014	1	HM	0600	0900	3
14/10/2013	NBR 2013/2014	1	HM	0930	1230	3
16/10/2013	NBR 2013/2014	2	HM	0600	0900	3
16/10/2013	NBR 2013/2014	2	HM	0930	1230	3
18/10/2013	NBR 2013/2014	2	HM	1300	1600	3
18/10/2013	NBR 2013/2014	2	HM	1630	1930	3
21/10/2013	NBR 2013/2014	3	HM	1300	1600	3
21/10/2013	NBR 2013/2014	3	HM	1630	1930	3
24/10/2013	NBR 2013/2014	3	HM	0900	1200	3
29/10/2013	NBR 2013/2014	1	HM	1300	1600	3
04/11/2013	NBR 2013/2014	3	HM	1300	1530	2.5
04/11/2013	NBR 2013/2014	3	HM	1600	1830	2.5
25/11/2013	NBR 2013/2014	1	HM	0700	0930	2.5
25/11/2013	NBR 2013/2014	1	HM	1000	1230	2.5
27/11/2013	NBR 2013/2014	2	HM	1030	1300	2.5
27/11/2013	NBR 2013/2014	2	HM	1330	1600	2.5
02/12/2013	NBR 2013/2014	1	HM	0700	0900	2
02/12/2013	NBR 2013/2014	1	HM	0930	1130	2
09/12/2013	NBR 2013/2014	2	HM	1130	1330	2
09/12/2013	NBR 2013/2014	2	HM	1400	1600	2
10/12/2013	NBR 2013/2014	3	HM	0800	1000	2
10/12/2013	NBR 2013/2014	3	HM	1030	1230	2
11/12/2013	NBR 2013/2014	3	HM	1230	1430	2
11/12/2013	NBR 2013/2014	3	HM	1500	1700	2
08/01/2014	NBR 2013/2014	1	HM	1030	1230	2
08/01/2014	NBR 2013/2014	1	HM	1300	1500	2

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
10/01/2014	NBR 2013/2014	3	HM	1200	1400	2
10/01/2014	NBR 2013/2014	3	HM	1430	1630	2
14/01/2014	NBR 2013/2014	2	HM	0900	1100	2
14/01/2014	NBR 2013/2014	2	HM	1130	1330	2
04/02/2014	NBR 2013/2014	1	HM	0915	1145	2.5
04/02/2014	NBR 2013/2014	1	HM	1215	1445	2.5
06/02/2014	NBR 2013/2014	2	HM	1300	1530	2.5
06/02/2014	NBR 2013/2014	2	HM	1600	1830	2.5
19/02/2014	NBR 2013/2014	2	HM	1330	1630	3
20/02/2014	NBR 2013/2014	3	HM	0700	0930	2.5
20/02/2014	NBR 2013/2014	3	HM	1000	1230	2.5
04/03/2014	NBR 2013/2014	1	HM	0700	1000	3
04/03/2014	NBR 2013/2014	1	HM	1030	1330	3
11/03/2014	NBR 2013/2014	2	HM	0630	0930	3
11/03/2014	NBR 2013/2014	2	HM	1000	1300	3
12/03/2014	NBR 2013/2014	3	HM	1350	1600	2
12/03/2014	NBR 2013/2014	3	HM	1630	1930	3
20/03/2014	NBR 2013/2014	3	HM	1330	1630	3
20/03/2014	NBR 2013/2014	3	HM	1700	2000	3
24/10/2016	NBR 2016/2017	2	CS	0945	1245	3
24/10/2016	NBR 2016/2017	2	CS	1315	1615	3
25/10/2016	NBR 2016/2017	3	CS	0910	1210	3
25/10/2016	NBR 2016/2017	3	CS	1240	1540	3
26/10/2016	NBR 2016/2017	3	CS	0835	1135	3
26/10/2016	NBR 2016/2017	3	CS	1205	1505	3
27/10/2016	NBR 2016/2017	1	CS	1040	1340	3
27/10/2016	NBR 2016/2017	1	CS	1410	1710	3
28/10/2016	NBR 2016/2017	2	CS	0725	1025	3
28/10/2016	NBR 2016/2017	2	CS	1055	1355	3
29/10/2016	NBR 2016/2017	1	CS	0935	1235	3
29/10/2016	NBR 2016/2017	1	CS	1305	1605	3
10/11/2016	NBR 2016/2017	3	CS	1035	1335	3
10/11/2016	NBR 2016/2017	3	CS	1405	1705	3
11/11/2016	NBR 2016/2017	2	CS	0915	1215	3
11/11/2016	NBR 2016/2017	2	CS	1245	1545	3
12/11/2016	NBR 2016/2017	1	CS	0955	1255	3
12/11/2016	NBR 2016/2017	1	CS	1325	1625	3
14/11/2016	NBR 2016/2017	2	WS	1100	1400	0
14/11/2016	NBR 2016/2017	2	WS	1430	1730	3
23/11/2016	NBR 2016/2017	1	WS	1035	1335	3
23/11/2016	NBR 2016/2017	1	WS	1405	1705	3
29/11/2016	NBR 2016/2017	3	WS	1030	1330	3
29/11/2016	NBR 2016/2017	3	WS	1400	1700	3
02/12/2016	NBR 2016/2017	3	WS	0725	1025	3
02/12/2016	NBR 2016/2017	3	WS	1055	1355	3
12/12/2016	NBR 2016/2017	1	WS	0825	1125	3
12/12/2016	NBR 2016/2017	1	WS	1155	1455	3
18/12/2016	NBR 2016/2017	2	WS	0730	1030	3
18/12/2016	NBR 2016/2017	2	WS	1100	1400	3

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
01/01/2017	NBR 2016/2017	3	CS	1030	1330	3
01/01/2017	NBR 2016/2017	3	CS	1400	1700	3
04/01/2017	NBR 2016/2017	2	CS	0715	1015	3
04/01/2017	NBR 2016/2017	2	CS	1045	1345	3
25/01/2017	NBR 2016/2017	1	CS	0940	1240	3
25/01/2017	NBR 2016/2017	1	CS	1310	1610	3
01/02/2017	NBR 2016/2017	2	CS	0705	1005	2
01/02/2017	NBR 2016/2017	2	CS	1035	1335	3
13/02/2017	NBR 2016/2017	3	CS	1200	1500	3
13/02/2017	NBR 2016/2017	3	CS	1530	1830	3
17/02/2017	NBR 2016/2017	1	CS	1020	1320	3
17/02/2017	NBR 2016/2017	1	CS	1350	1650	3
02/03/2017	BR 2017	3	CS	0840	1140	3
02/03/2017	BR 2017	3	CS	1210	1510	3
05/03/2017	BR 2017	2	CS	0945	1245	3
05/03/2017	BR 2017	2	CS	1315	1615	3
06/03/2017	BR 2017	1	CS	0920	1220	3
06/03/2017	BR 2017	1	CS	1250	1550	3
17/04/2017	BR 2017	3	CS	0905	1205	3
17/04/2017	BR 2017	3	CS	1235	1535	3
18/04/2017	BR 2017	2	CS	0915	1215	3
18/04/2017	BR 2017	2	CS	1245	1545	3
09/05/2017	BR 2017	1	CS	0910	1210	3
09/05/2017	BR 2017	1	CS	1240	1540	3
10/05/2017	BR 2017	1	CS	0935	1235	3
10/05/2017	BR 2017	1	CS	1255	1555	3
11/05/2017	BR 2017	3	CS	0925	1225	3
11/05/2017	BR 2017	3	CS	1255	1555	3
12/05/2017	BR 2017	2	CS	0840	1140	3
12/05/2017	BR 2017	2	CS	1210	1510	3
14/06/2017	BR 2017	3	CS	0920	1220	3
14/06/2017	BR 2017	3	CS	1250	1550	3
15/06/2017	BR 2017	2	CS	0930	1230	3
15/06/2017	BR 2017	2	CS	1300	1600	3
16/06/2017	BR 2017	1	CS	1035	1335	3
16/06/2017	BR 2017	1	CS	1405	1705	3
06/07/2017	BR 2017	2	CS	1005	1305	3
06/07/2017	BR 2017	2	CS	1335	1635	3
07/07/2017	BR 2017	1	CS	1025	1325	3
07/07/2017	BR 2017	1	CS	1355	1655	3
08/07/2017	BR 2017	3	CS	0950	1250	3
08/07/2017	BR 2017	3	CS	1320	1620	3
05/08/2017	BR 2017	3	CS	0915	1215	3
05/08/2017	BR 2017	3	CS	1245	1545	3
08/08/2017	BR 2017	2	CS	0910	1210	3
08/08/2017	BR 2017	2	CS	1240	1540	3
15/08/2017	BR 2017	1	CS	0955	1255	3
15/08/2017	BR 2017	1	CS	1325	0000	3
17/09/2017	NBR 2017/2018	1	CS	0935	1235	3

Date	Season	VP	Observer	Survey start time	Survey finish time	No. hours[1] surveyed
17/09/2017	NBR 2017/2018	1	CS	1305	1605	3
18/09/2017	NBR 2017/2018	3	CS	0925	1225	3
18/09/2017	NBR 2017/2018	3	CS	1255	1555	3
19/09/2017	NBR 2017/2018	2	CS	0920	1220	3
19/09/2017	NBR 2017/2018	2	CS	1250	1550	3
08/10/2017	NBR 2017/2018	2	CS	0935	1235	3
08/10/2017	NBR 2017/2018	2	CS	1305	1605	3
09/10/2017	NBR 2017/2018	3	CS	0940	1240	3
09/10/2017	NBR 2017/2018	3	CS	1310	1610	3
15/10/2017	NBR 2017/2018	1	CS	1050	1350	3
15/10/2017	NBR 2017/2018	1	CS	1420	1720	3
11/11/2017	NBR 2017/2018	1	CS	0925	1225	3
11/11/2017	NBR 2017/2018	1	CS	1255	1555	3
12/11/2017	NBR 2017/2018	3	CS	0855	1155	3
12/11/2017	NBR 2017/2018	3	CS	1225	1525	3
13/11/2017	NBR 2017/2018	2	CS	0905	1205	3
13/11/2017	NBR 2017/2018	2	CS	1235	1535	3
14/11/2017	NBR 2017/2018	3	CS	0915	1215	3
14/11/2017	NBR 2017/2018	3	CS	1245	1545	3
18/11/2017	NBR 2017/2018	2	CS	0905	1205	3
18/11/2017	NBR 2017/2018	2	CS	1235	1535	3
19/11/2017	NBR 2017/2018	1	CS	0920	1220	3
19/11/2017	NBR 2017/2018	1	CS	1250	1550	3

Table C-3 Meteorological conditions during flight activity surveys at Tangy IV (sorted chronologically)

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
30/04/2012	3	HM	1030	1330	1	6	E	0	8	2	2	0	0
30/04/2012	3	HM	1030	1330	2	6	E	0	8	2	2	0	0
30/04/2012	3	HM	1030	1330	3	5	E	0	7	2	2	0	0
30/04/2012	2	HM	1345	1645	1	6	E	0	4	2	2	0	0
30/04/2012	2	HM	1345	1645	2	6	E	0	3	2	2	0	0
30/04/2012	2	HM	1345	1645	3	6	E	0	3	2	2	0	0
30/04/2012	1	MT	1255	1555	1	6	E	0	6	2	2	0	0
30/04/2012	1	MT	1255	1555	2	6	E	0	3	2	2	0	0
30/04/2012	1	MT	1255	1555	3	6	E	0	1	2	2	0	0
30/04/2012	1	MT	0945	1245	1	5	E	1	8	2	2	0	0
30/04/2012	1	MT	0945	1245	2	6	E	2	7	2	2	0	0
30/04/2012	1	MT	0945	1245	3	6	E	3	7	2	2	0	0
02/05/2012	3	HM	1100	1400	1	2	NW	0	2	2	2	0	0
02/05/2012	3	HM	1100	1400	2	3	NW	0	3	2	2	0	0
02/05/2012	3	HM	1100	1400	3	2	W	0	4	2	2	0	0
02/05/2012	2	HM	1430	1730	1	3	WNW	0	2	2	2	0	0
02/05/2012	2	HM	1430	1730	2	3	WNW	0	3	2	2	0	0
02/05/2012	2	HM	1430	1730	3	3	WNW	0	3	2	2	0	0
24/05/2012	3	HM	1030	1330	1	2	SE	0	0	2	2	0	0
24/05/2012	3	HM	1030	1330	2	2	SE	0	0	2	2	0	0
24/05/2012	3	HM	1030	1330	3	2	SW	0	0	2	2	0	0
24/05/2012	2	HM	1400	1700	1	6	NW	0	0	2	2	0	0
24/05/2012	2	HM	1400	1700	2	6	NW	0	0	2	2	0	0
24/05/2012	2	HM	1400	1700	3	6	NW	0	0	2	2	0	0
29/05/2012	3	HM	0830	1130	1	4	SSE	0	6	2	2	0	0
29/05/2012	3	HM	0830	1130	2	3	SW	0	5	2	2	0	0
29/05/2012	3	HM	0830	1130	3	3	SW	0	3	2	2	0	0
29/05/2012	1	MT	0830	1130	1	3	SE	0	1	2	2	0	0
29/05/2012	1	MT	0830	1130	2	4	SW	0	4	2	2	0	0
29/05/2012	1	MT	0830	1130	3	4	SW	0	5	2	2	0	0
29/05/2012	1	MT	1145	1445	1	4	SW	0	4	2	2	0	0
29/05/2012	1	MT	1145	1445	2	4	SW	0	6	2	2	0	0
29/05/2012	1	MT	1145	1445	3	4	SW	0	1	2	2	0	0
29/05/2012	2	HM	1200	1500	1	6	W	0	5	2	2	0	0
29/05/2012	2	HM	1200	1500	2	6	W	0	4	2	2	0	0
29/05/2012	2	HM	1200	1500	3	5	W	0	1	2	2	0	0
26/06/2012	3	HM	0615	0915	1	3	E	0	6	2	2	0	0
26/06/2012	3	HM	0615	0915	2	3	E	0	6	2	2	0	0
26/06/2012	3	HM	0615	0915	3	4	E	0	4	2	2	0	0
26/06/2012	2	HM	1015	1315	1	6	E	0	8	2	2	0	0
26/06/2012	2	HM	1015	1315	2	6	E	0	8	2	2	0	0
26/06/2012	2	HM	1015	1315	3	8	E	0	8	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
28/06/2012	1	HM	1500	1800	1	3	SW	3	8	1	1	0	0
28/06/2012	1	HM	1500	1800	2	3	SW	2	8	1	1	0	0
28/06/2012	1	HM	1500	1800	3	3	SW	3	8	1	1	0	0
28/06/2012	2	HM	1900	2200	1	4	SW	0	7	2	2	0	0
28/06/2012	2	HM	1900	2200	2	6	SW	1	8	1	2	0	0
28/06/2012	2	HM	1900	2200	3	5	SW	1	8	1	1	0	0
05/07/2012	3	HM	0930	1230	1	3	E	0	4	2	2	0	0
05/07/2012	3	HM	0930	1230	2	4	E	0	3	2	2	0	0
05/07/2012	3	HM	0930	1230	3	3	E	0	2	2	2	0	0
05/07/2012	1	HM	0510	0810	1	1	E	0	8	1	2	0	0
05/07/2012	1	HM	0510	0810	2	1	E	0	7	1	2	0	0
05/07/2012	1	HM	0510	0810	3	1	E	0	6	1	2	0	0
11/07/2012	3	HM	1600	1900	1	3	WNW	0	3	2	2	0	0
11/07/2012	3	HM	1600	1900	2	4	WNW	0	2	2	2	0	0
11/07/2012	3	HM	1600	1900	3	4	WNW	0	1	2	2	0	0
11/07/2012	2	HM	1930	2230	1	4	NW	0	2	2	2	0	0
11/07/2012	2	HM	1930	2230	2	5	NW	0	2	2	2	0	0
11/07/2012	2	HM	1930	2230	3	4	NW	0	2	2	2	0	0
11/07/2012	1	MT	1850	2150	1	4	WSW	0	1	2	2	0	0
11/07/2012	1	MT	1850	2150	2	3	SW	0	1	2	2	0	0
11/07/2012	1	MT	1850	2150	3	3	W	0	3	2	2	0	0
11/07/2012	1	MT	1520	1820	1	4	W	0	3	2	2	0	0
11/07/2012	1	MT	1520	1820	2	4	W	0	3	2	2	0	0
11/07/2012	1	MT	1520	1820	3	4	W	0	2	2	2	0	0
18/07/2012	2	HM	1015	1315	1	3	W	1	8	1	2	0	0
18/07/2012	2	HM	1015	1315	2	4	WNW	0	8	1	2	0	0
18/07/2012	2	HM	1015	1315	3	4	WNW	0	8	1	2	0	0
18/07/2012	3	HM	0640	0940	1	0	0	2	8	1	1	0	0
18/07/2012	3	HM	0640	0940	2	1	ENE	0	8	1	2	0	0
18/07/2012	3	HM	0640	0940	3	1	ESE	1	8	1	1	0	0
16/08/2012	1	CS	0835	1135	1	4	SSE	0	3	1	2	0	0
16/08/2012	1	CS	0835	1135	2	4	SSE	0	3	1	2	0	0
16/08/2012	1	CS	0835	1135	3	4	SSE	0	4	1	2	0	0
16/08/2012	1	CS	1205	1505	1	4	SSE	0	5	1	2	0	0
16/08/2012	1	CS	1205	1505	2	4	SSE	0	5	1	2	0	0
16/08/2012	1	CS	1205	1505	3	4	SSE	0	4	1	2	0	0
16/08/2012	2	HM	1200	1500	1	7	SSE	0	6	2	2	0	0
16/08/2012	2	HM	1200	1500	2	7	SSE	0	5	2	2	0	0
16/08/2012	2	HM	1200	1500	3	7	SSE	0	7	2	2	0	0
16/08/2012	2	HM	0830	1130	1	6	SSE	0	3	2	2	0	0
16/08/2012	2	HM	0830	1130	2	7	SSE	0	3	2	2	0	0
16/08/2012	2	HM	0830	1130	3	7	SSE	0	5	2	2	0	0
21/08/2012	1	CS	1335	1635	1	4	SE	0	7	2	2	0	0
21/08/2012	1	CS	1335	1635	2	4	SE	3	7	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
21/08/2012	1	CS	1335	1635	3	3	S	0	5	2	2	0	0
21/08/2012	1	CS	1705	2005	1	3	SW	3	7	1	2	0	0
21/08/2012	1	CS	1705	2005	2	2	SW	0	6	2	2	0	0
21/08/2012	1	CS	1705	2005	3	1	W	0	7	1	2	0	0
21/08/2012	3	HM	1345	1645	1	5	S	3	8	2	2	0	0
21/08/2012	3	HM	1345	1645	2	5	S	2	5	2	2	0	0
21/08/2012	3	HM	1345	1645	3	5	S	0	4	2	2	0	0
21/08/2012	3	HM	1715	2015	1	5	S	0	4	2	2	0	0
21/08/2012	3	HM	1715	2015	2	4	S	2	4	2	2	0	0
21/08/2012	3	HM	1715	2015	3	3	WSW	2	5	2	2	0	0
22/08/2012	3	HM	1400	1700	1	6	WSW	0	4	2	2	0	0
22/08/2012	3	HM	1400	1700	2	5	WSW	0	2	2	2	0	0
22/08/2012	3	HM	1400	1700	3	6	WSW	0	5	2	2	0	0
22/08/2012	3	HM	1030	1330	1	6	WSW	0	6	2	2	0	0
22/08/2012	3	HM	1030	1330	2	7	WSW	0	4	2	2	0	0
22/08/2012	3	HM	1030	1330	3	6	WSW	0	3	2	2	0	0
23/08/2012	2	HM	0730	1030	1	5	SW	0	7	2	2	0	0
23/08/2012	2	HM	0730	1030	2	6	SW	0	4	2	2	0	0
23/08/2012	2	HM	0730	1030	3	6	SW	0	2	2	2	0	0
23/08/2012	2	HM	1100	1400	1	6	SW	0	2	2	2	0	0
23/08/2012	2	HM	1100	1400	2	6	SW	0	1	2	2	0	0
23/08/2012	2	HM	1100	1400	3	6	SW	0	1	2	2	0	0
17/09/2012	1	HM	1400	1700	1	4	W	2	8	1	1	0	0
17/09/2012	1	HM	1400	1700	2	5	W	3	7	2	2	0	0
17/09/2012	1	HM	1400	1700	3	6	W	0	7	2	2	0	0
17/09/2012	1	HM	1730	2030	1	7	W	0	6	2	2	0	0
17/09/2012	1	HM	1730	2030	2	7	W	0	7	1	2	0	0
17/09/2012	1	HM	1730	2030	3	8	W	0	7	2	1	0	0
18/09/2012	2	HM	1400	1700	1	6	NW	3	5	2	2	0	0
18/09/2012	2	HM	1400	1700	2	6	NW	2	6	2	2	0	0
18/09/2012	2	HM	1400	1700	3	7	NW	3	4	2	2	0	0
18/09/2012	2	HM	1800	2100	1	7	NW	2	4	2	2	0	0
18/09/2012	2	HM	1800	2100	2	7	NW	2	4	2	2	0	0
18/09/2012	2	HM	1800	2100	3	7	NW	2	4	2	2	0	0
24/09/2012	3	HM	1730	2030	1	5	E	0	5	2	2	0	0
24/09/2012	3	HM	1730	2030	2	5	E	0	4	2	2	0	0
24/09/2012	3	HM	1730	2030	3	5	E	0	4	2	2	0	0
25/09/2012	2	HM	0700	1000	1	6	NW	3	8	1	2	0	0
25/09/2012	2	HM	0700	1000	2	7	NW	3	8	1	2	0	0
25/09/2012	2	HM	0700	1000	3	8	NW	3	8	1	2	0	0
25/09/2012	1	HM	1100	1400	1	8	NW	2	8	1	1	0	0
25/09/2012	1	HM	1100	1400	2	5	NW	0	8	1	2	0	0
25/09/2012	1	HM	1100	1400	3	8	NW	0	8	1	2	0	0
26/09/2012	3	HM	0630	0930	1	6	NE	0	4	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
26/09/2012	3	HM	0630	0930	2	5	NE	0	4	2	2	0	0
26/09/2012	3	HM	0630	0930	3	4	NE	0	2	2	2	0	0
26/09/2012	3	HM	1030	1330	1	4	NE	0	2	2	2	0	0
26/09/2012	3	HM	1030	1330	2	3	NE	0	2	2	2	0	0
26/09/2012	3	HM	1030	1330	3	3	NE	0	3	2	2	0	0
09/10/2012	2	HM	0700	1000	1	2	E	0	4	2	2	1	0
09/10/2012	2	HM	0700	1000	2	2	E	0	3	2	2	0	0
09/10/2012	2	HM	0700	1000	3	1	E	0	2	2	2	0	0
09/10/2012	2	HM	1030	1330	1	1	E	0	2	2	2	0	0
09/10/2012	2	HM	1030	1330	2	1	SE	0	3	2	2	0	0
09/10/2012	2	HM	1030	1330	3	1	NNW	0	3	2	2	0	0
12/10/2012	3	HM	1300	1600	1	6	WNW	0	6	2	2	0	0
12/10/2012	3	HM	1300	1600	2	6	WNW	0	4	2	2	0	0
12/10/2012	3	HM	1300	1600	3	6	WNW	0	4	2	2	0	0
12/10/2012	3	HM	1630	1930	1	6	WNW	0	4	2	2	0	0
12/10/2012	3	HM	1630	1930	2	6	WNW	0	4	2	2	0	0
12/10/2012	3	HM	1630	1930	3	6	WNW	0	5	2	2	0	0
16/10/2012	1	HM	0700	1000	1	1	NW	1	7	2	2	0	0
16/10/2012	1	HM	0700	1000	2	1	NW	0	7	2	2	0	0
16/10/2012	1	HM	0700	1000	3	1	NW	0	6	2	2	0	0
16/10/2012	1	HM	1030	1330	1	1	NW	0	6	2	2	0	0
16/10/2012	1	HM	1030	1330	2	1	NW	0	2	2	2	0	0
16/10/2012	1	HM	1030	1330	3	1	NW	0	2	2	2	0	0
17/10/2012	2	HM	1300	1600	1	7	E	0	7	2	2	0	0
17/10/2012	2	HM	1300	1600	2	7	E	3	7	1	2	0	0
17/10/2012	2	HM	1300	1600	3	7	ENE	2	7	1	2	0	0
18/10/2012	3	HM	0730	1030	1	5	E	2	8	2	2	0	0
18/10/2012	3	HM	0730	1030	2	5	E	0	8	2	2	0	0
18/10/2012	3	HM	0730	1030	3	5	E	1	8	2	2	0	0
18/10/2012	1	HM	1130	1430	1	3	E	1	8	2	2	0	0
18/10/2012	1	HM	1130	1430	2	3	E	1	8	2	2	0	0
18/10/2012	1	HM	1130	1430	3	3	E	1	8	2	2	0	0
08/11/2012	2	HM	0800	1030	1	6	W	1	8	1	2	0	0
08/11/2012	2	HM	0800	1030	2	6	W	3	7	1	2	0	0
08/11/2012	2	HM	0800	1030	2.5	6	W	3	8	1	1	0	0
08/11/2012	2	HM	1040	1310	1	6	W	2	7	1	2	0	0
08/11/2012	2	HM	1040	1310	2	6	W	0	6	2	2	0	0
08/11/2012	2	HM	1040	1310	2.5	6	W	0	6	2	2	0	0
15/11/2012	1	HM	1130	1400	1	5	WSW	1	8	1	1	0	0
15/11/2012	1	HM	1130	1400	2	5	WSW	1	8	1	1	0	0
15/11/2012	1	HM	1130	1400	2.5	5	WSW	0	8	1	1	0	0
15/11/2012	1	HM	1410	1640	1	4	WSW	0	8	1	1	0	0
15/11/2012	1	HM	1410	1640	2	4	WSW	0	8	1	1	0	0
15/11/2012	1	HM	1410	1640	2.5	5	WSW	0	8	1	1	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
26/11/2012	3	HM	1200	1430	1	6	N	0	1	2	2	0	0
26/11/2012	3	HM	1200	1430	2	5	N	0	1	2	2	0	0
26/11/2012	3	HM	1200	1430	2.5	6	N	0	4	2	2	0	0
26/11/2012	3	HM	1440	1710	1	5	N	0	4	2	2	0	0
26/11/2012	3	HM	1440	1710	2	5	N	0	4	2	2	0	0
26/11/2012	3	HM	1440	1710	2.5	5	N	0	5	2	2	0	0
10/12/2012	1	HM	1000	1200	1	0	0	0	0	0	2	1	0
10/12/2012	1	HM	1000	1200	2	0	0	0	0	0	2	0	0
10/12/2012	1	HM	1210	1410	1	0	0	0	0	0	2	0	0
10/12/2012	1	HM	1210	1410	2	0	0	0	0	0	2	1	0
11/12/2012	3	HM	0700	0930	1	2	SE	0	1	2	2	2	0
11/12/2012	3	HM	0700	0930	2	2	SE	0	1	2	2	2	0
11/12/2012	3	HM	1000	1200	1	1	SE	0	4	2	2	2	0
11/12/2012	3	HM	1000	1200	2	2	SE	0	6	2	2	2	0
13/12/2012	2	HM	1200	1400	1	6	SE	0	6	2	2	0	0
13/12/2012	2	HM	1200	1400	2	6	SE	0	5	2	2	0	0
13/12/2012	2	HM	1410	1610	1	6	SE	0	5	2	2	0	0
13/12/2012	2	HM	1410	1610	2	6	SE	0	5	2	2	0	0
07/01/2013	2	HM	1100	1300	1	4	SE	2	8	1	1	0	0
07/01/2013	2	HM	1100	1300	2	4	SE	2	8	0	0	0	0
07/01/2013	2	HM	1310	1510	1	4	SE	2	8	0	0	0	0
07/01/2013	2	HM	1310	1510	2	4	SE	2	8	0	0	0	0
09/01/2013	3	HM	0745	0945	1	2	W	0	5	2	2	0	0
09/01/2013	3	HM	0745	0945	2	1	W	0	7	1	2	0	0
09/01/2013	3	HM	0955	1155	1	1	W	0	7	2	2	0	0
09/01/2013	3	HM	0955	1155	2	3	W	0	7	2	2	0	0
10/01/2013	1	HM	1030	1230	1	4	SE	0	7	2	2	1	0
10/01/2013	1	HM	1030	1230	2	4	SE	0	6	2	2	0	0
10/01/2013	1	HM	1240	1440	1	5	ESE	0	3	2	2	0	0
10/01/2013	1	HM	1240	1440	2	5	SSE	0	4	2	2	0	0
06/02/2013	2	HM	1300	1500	1	6	NW	0	4	1	0	0	0
06/02/2013	2	HM	1300	1500	2	6	NNW	0	7	1	0	0	1
06/02/2013	2	HM	1520	1750	1	6	NNW	0	4	2	0	0	0
06/02/2013	2	HM	1520	1750	2	6	NNW	0	4	2	0	0	0
06/02/2013	2	HM	1520	1750	3	5	NNW	0	4	2	0	0	0
07/02/2013	1	HM	0930	1130	1	1	NNW	0	8	1	2	0	0
07/02/2013	1	HM	0930	1130	2	2	W	0	8	1	2	0	0
07/02/2013	1	HM	1200	1400	1	2	W	2	8	1	2	0	0
07/02/2013	1	HM	1200	1400	2	1	W	1	8	1	2	0	0
08/02/2013	3	HM	0700	0900	1	5	NNW	1	5	2	2	0	0
08/02/2013	3	HM	0700	0900	2	5	NNW	0	5	2	2	0	0
08/02/2013	3	HM	0930	1130	1	4	NNW	0	4	2	2	0	0
08/02/2013	3	HM	0930	1130	2	4	NNW	0	4	2	2	2	0
12/03/2013	2	HM	0630	0930	1	3	NW	0	4	2	2	1	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
12/03/2013	2	HM	0630	0930	2	3	NW	0	4	2	2	1	0
12/03/2013	2	HM	0630	0930	3	3	N	0	8	2	2	1	0
12/03/2013	2	HM	1000	1300	1	4	N	0	6	2	2	0	0
12/03/2013	2	HM	1000	1300	2	4	N	0	4	2	2	0	0
12/03/2013	2	HM	1000	1300	3	4	N	0	4	2	2	0	0
18/03/2013	3	HM	1300	1600	1	6	E	0	7	1	2	0	0
18/03/2013	3	HM	1300	1600	2	6	E	0	8	1	2	0	0
18/03/2013	3	HM	1300	1600	3	6	E	0	8	1	2	0	0
18/03/2013	3	HM	1630	1930	1	4	E	0	8	1	2	0	0
18/03/2013	3	HM	1630	1930	2	4	E	0	8	1	2	0	0
18/03/2013	3	HM	1630	1930	3	5	E	0	8	1	2	0	0
21/03/2013	1	HM	1200	1500	1	8	ESE	0	4	2	2	0	0
21/03/2013	1	HM	1200	1500	2	8	ESE	0	4	2	2	0	0
21/03/2013	1	HM	1200	1500	3	8	ESE	0	4	2	2	0	0
21/03/2013	2	HM	1530	1830	1	8	E	0	7	2	2	0	0
21/03/2013	2	HM	1530	1830	2	8	E	0	8	2	2	0	0
21/03/2013	2	HM	1530	1830	3	8	E	0	8	2	2	0	0
02/04/2013	1	HM	0900	1200	1	4	ESE	0	0	2	2	0	1
02/04/2013	1	HM	0900	1200	2	5	ESE	0	1	2	2	0	1
02/04/2013	1	HM	0900	1200	3	5	ESE	0	1	2	2	0	1
02/04/2013	1	HM	1230	1530	1	4	ESE	0	3	2	2	0	1
02/04/2013	1	HM	1230	1530	2	4	ESE	0	4	2	2	0	1
02/04/2013	1	HM	1230	1530	3	4	ESE	0	4	2	2	0	1
04/04/2013	3	HM	0930	1230	1	4	E	0	0	2	2	1	1
04/04/2013	3	HM	0930	1230	2	4	E	0	0	2	2	0	1
04/04/2013	3	HM	0930	1230	3	4	E	0	0	2	2	0	1
04/04/2013	3	HM	1300	1400	1	4	E	0	0	2	2	0	1
22/04/2013	1	CB	1525	1825	1	6	W	0	8	2	2	0	0
22/04/2013	1	CB	1525	1825	2	6	W	0	7	2	2	0	0
22/04/2013	1	CB	1525	1825	3	7	W	0	8	2	2	0	0
22/04/2013	1	CB	1835	2035	1	7	W	0	7	2	2	0	0
22/04/2013	1	CB	1835	2035	2	7	W	0	7	2	2	0	0
23/04/2013	3	CB	1005	1305	1	6	W	0	8	2	1	0	0
23/04/2013	3	CB	1005	1305	2	6	W	0	7	2	1	0	0
23/04/2013	3	CB	1005	1305	3	6	W	0	6	2	2	0	0
23/04/2013	3	CB	1315	1615	1	6	W	0	5	2	2	0	0
23/04/2013	3	CB	1315	1615	2	6	W	0	5	2	2	0	0
23/04/2013	3	CB	1315	1615	3	6	W	0	5	2	2	0	0
10/05/2013	3	CB	1150	1350	1	7	E	4	8	2	1	0	0
10/05/2013	3	CB	1150	1350	2	7	E	4	8	2	1	0	0
13/05/2013	2	HM	0800	1100	1	5	W	3	8	1	1	0	0
13/05/2013	2	HM	0800	1100	2	6	W	3	8	1	1	0	0
13/05/2013	2	HM	0800	1100	3	6	W	2	5	2	2	0	0
13/05/2013	2	HM	0800	1100	1	6	W	2	4	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
13/05/2013	2	HM	0800	1100	2	6	W	0	4	2	2	0	0
13/05/2013	2	HM	0800	1100	3	6	W	0	6	2	2	0	0
17/05/2013	1	HM	1000	1300	1	3	NNW	0	1	2	2	0	0
17/05/2013	1	HM	1000	1300	2	3	NNW	0	1	2	2	0	0
17/05/2013	1	HM	1000	1300	3	3	NNW	0	1	2	2	0	0
17/05/2013	1	HM	1330	1630	1	3	SW	0	1	2	2	0	0
17/05/2013	1	HM	1330	1630	2	3	SW	0	1	2	2	0	0
17/05/2013	1	HM	1330	1630	3	2	SW	0	1	2	2	0	0
20/05/2013	2	HM	1430	1730	1	5	NW	0	8	0	1	0	0
20/05/2013	2	HM	1430	1730	2	5	NW	0	8	0	2	0	0
20/05/2013	2	HM	1430	1730	3	5	NW	0	8	0	2	0	0
20/05/2013	2	HM	1800	2100	1	5	NW	0	8	0	2	0	0
20/05/2013	2	HM	1800	2100	2	5	NW	0	8	0	2	0	0
20/05/2013	2	HM	1800	2100	3	5	NW	0	8	0	2	0	0
21/05/2013	1	HM	1200	1500	1	2	N	0	6	1	2	0	0
21/05/2013	1	HM	1200	1500	2	2	N	0	7	2	2	0	0
21/05/2013	1	HM	1200	1500	3	1	N	0	7	2	2	0	0
21/05/2013	1	HM	1530	1830	1	1	N	0	6	2	2	0	0
21/05/2013	1	HM	1530	1830	2	2	NW	0	6	2	2	0	0
21/05/2013	1	HM	1530	1830	3	2	NW	0	6	2	2	0	0
28/05/2013	3	HM	0500	0800	1	3	E	0	6	1	2	0	0
28/05/2013	3	HM	0500	0800	2	3	E	0	6	1	2	0	0
28/05/2013	3	HM	0500	0800	3	3	E	0	7	2	2	0	0
28/05/2013	3	HM	0830	1130	1	3	E	0	7	2	2	0	0
28/05/2013	3	HM	0830	1130	2	3	E	0	7	2	2	0	0
28/05/2013	3	HM	0830	1130	3	4	E	0	8	2	2	0	0
10/06/2013	1	HM	0700	1000	1	5	SE	0	5	1	2	0	0
10/06/2013	1	HM	0700	1000	2	5	SE	0	4	1	2	0	0
10/06/2013	1	HM	0700	1000	3	5	SE	0	4	1	2	0	0
10/06/2013	1	HM	1030	1330	1	5	SE	0	4	1	2	0	0
10/06/2013	1	HM	1030	1330	2	6	SE	0	4	1	2	0	0
10/06/2013	1	HM	1030	1330	3	6	SE	0	4	1	2	0	0
11/06/2013	2	HM	0600	0900	1	5	SE	1	8	1	1	0	0
11/06/2013	2	HM	0600	0900	2	5	SE	1	8	1	1	0	0
11/06/2013	2	HM	0600	0900	3	5	ESE	1	8	1	1	0	0
11/06/2013	2	HM	0930	1230	1	5	E	1	8	1	1	0	0
11/06/2013	2	HM	0930	1230	2	6	E	0	8	1	1	0	0
11/06/2013	2	HM	0930	1230	3	6	SE	0	8	1	1	0	0
17/06/2013	3	HM	1000	1300	1	1	E	1	7	1	2	0	0
17/06/2013	3	HM	1000	1300	2	1	E	0	7	1	2	0	0
17/06/2013	3	HM	1000	1300	3	1	S	0	4	2	2	0	0
17/06/2013	3	HM	1330	1630	1	2	S	0	3	2	2	0	0
17/06/2013	3	HM	1330	1630	2	2	NW	0	4	2	2	0	0
17/06/2013	3	HM	1330	1630	3	1	SSW	0	3	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
18/06/2013	2	HM	0900	1200	1	3	ESE	0	0	-	2	0	0
18/06/2013	2	HM	0900	1200	2	3	SSE	0	6	2	2	0	0
18/06/2013	2	HM	0900	1200	3	3	SSE	0	6	2	2	0	0
18/06/2013	2	HM	1230	1330	1	3	SSW	0	6	2	2	0	0
18/06/2013	2	HM	1230	1330	2	2	SSW	0	6	2	2	0	0
18/06/2013	2	HM	1230	1330	3	2	SSW	0	4	2	2	0	0
19/06/2013	3	HM	1500	1800	1	3	W	0	6	2	2	0	0
19/06/2013	3	HM	1500	1800	2	3	W	0	2	2	2	0	0
19/06/2013	3	HM	1500	1800	3	3	W	0	1	2	2	0	0
19/06/2013	3	HM	1830	2130	1	3	WNW	0	1	2	2	0	0
19/06/2013	3	HM	1830	2130	2	4	WNW	0	0	2	2	0	0
19/06/2013	3	HM	1830	2130	3	3	WNW	0	0	2	2	0	0
01/07/2013	1	HM	1300	1600	1	4	W	0	5	1	2	0	0
01/07/2013	1	HM	1300	1600	2	4	W	0	4	1	2	0	0
01/07/2013	1	HM	1300	1600	3	4	W	0	3	2	2	0	0
01/07/2013	1	HM	1630	1930	1	4	W	0	5	2	2	0	0
01/07/2013	1	HM	1630	1930	2	3	W	0	5	2	2	0	0
01/07/2013	1	HM	1630	1930	3	2	W	0	5	2	2	0	0
08/07/2013	2	HM	0600	0900	1	0	0	0	0	2	2	0	0
08/07/2013	2	HM	0600	0900	2	1	E	0	0	2	2	0	0
08/07/2013	2	HM	0600	0900	3	0	0	0	0	2	2	0	0
08/07/2013	2	HM	0930	1230	1	1	SW	0	0	2	2	0	0
08/07/2013	2	HM	0930	1230	2	1	SW	0	0	2	2	0	0
08/07/2013	2	HM	0930	1230	3	1	SW	0	0	2	2	0	0
10/07/2013	3	HM	0600	0900	1	0	0	0	8	0	0	0	0
10/07/2013	3	HM	0600	0900	2	0	0	0	8	0	0	0	0
10/07/2013	3	HM	0600	0900	3	1	W	0	8	0	0	0	0
10/07/2013	3	HM	0930	1230	1	1	W	0	8	0	0	0	0
10/07/2013	3	HM	0930	1230	2	1	W	0	6	0	0	0	0
10/07/2013	3	HM	0930	1230	3	1	W	0	4	0	0	0	0
07/08/2013	1	HM	1000	1630	1	2	WNW	0	8	0	1	0	0
07/08/2013	1	HM	1000	1630	2	1	WNW	0	4	1	2	0	0
07/08/2013	1	HM	1000	1630	3	1	WNW	0	2	2	2	0	0
07/08/2013	1	HM	1000	1630	4	3	WNW	0	3	2	2	0	0
07/08/2013	1	HM	1000	1630	5	2	WNW	0	1	2	2	0	0
07/08/2013	1	HM	1000	1630	6	3	WNW	0	1	2	2	0	0
08/08/2013	2	HM	0930	1230	1	4	E	0	6	2	2	0	0
08/08/2013	2	HM	0930	1230	2	4	E	0	4	2	2	0	0
08/08/2013	2	HM	0930	1230	3	5	SE	0	8	2	2	0	0
08/08/2013	2	HM	1300	1600	1	4	SE	0	8	2	2	0	0
08/08/2013	2	HM	1300	1600	2	5	SE	0	8	2	2	0	0
12/08/2013	3	HM	1000	1300	1	3	W	1	7	0	2	0	0
12/08/2013	3	HM	1000	1300	2	4	W	2	5	1	2	0	0
12/08/2013	3	HM	1000	1300	3	4	W	0	4	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
12/08/2013	3	HM	1330	1630	1	4	W	3	7	1	2	0	0
12/08/2013	3	HM	1330	1630	2	4	W	3	6	1	2	0	0
12/08/2013	3	HM	1330	1630	3	4	W	2	7	1	2	0	0
25/09/2013	1	HM	1400	1700	1	4	E	0	2	2	2	0	0
25/09/2013	1	HM	1400	1700	2	5	E	0	1	2	2	0	0
25/09/2013	1	HM	1400	1700	3	4	E	0	1	2	2	0	0
25/09/2013	1	HM	1730	2030	1	6	E	0	1	2	2	0	0
25/09/2013	1	HM	1730	2030	2	5	E	0	2	2	2	0	0
25/09/2013	1	HM	1730	2030	3	5	E	0	7	2	2	0	0
24/09/2013	3	HM	0600	0900	1	4	SE	1	8	0	0	0	0
24/09/2013	3	HM	0600	0900	2	4	SE	1	8	0	0	0	0
24/09/2013	3	HM	0600	0900	3	4	SE	1	8	0	0	0	0
24/09/2013	3	HM	0930	1230	1	2	SE	1	8	0	0	0	0
24/09/2013	3	HM	0930	1230	2	1	SE	0	8	0	0	0	0
24/09/2013	3	HM	0930	1230	3	1	SE	0	8	0	0	0	0
23/09/2013	2	HM	1030	1330	1	4	S	0	6	0	2	0	0
23/09/2013	2	HM	1030	1330	2	4	SE	0	8	0	2	0	0
23/09/2013	2	HM	1030	1330	3	4	SE	0	8	0	2	0	0
23/09/2013	2	HM	1400	1700	1	4	SE	1	8	0	0	0	0
23/09/2013	2	HM	1400	1700	2	4	SE	0	8	0	0	0	0
23/09/2013	2	HM	1400	1700	3	6	SE	0	8	0	0	0	0
20/09/2013	1	HM	1430	1730	1	3	WSW	0	6	1	2	0	0
20/09/2013	1	HM	1430	1730	2	3	WSW	0	8	1	2	0	0
20/09/2013	1	HM	1430	1730	3	3	WSW	0	8	1	2	0	0
20/09/2013	1	HM	1800	2100	1	3	WSW	0	8	1	1	0	0
20/09/2013	1	HM	1800	2100	2	3	WSW	0	8	1	1	0	0
20/09/2013	1	HM	1800	2100	3	3	WSW	0	8	1	1	0	0
14/10/2013	1	HM	0600	0900	1	0	0	0	3	2	0	0	0
14/10/2013	1	HM	0600	0900	2	0	0	0	3	2	1	0	0
14/10/2013	1	HM	0600	0900	3	0	0	0	2	2	2	0	0
14/10/2013	1	HM	0930	1230	1	1	E	0	4	2	2	0	0
14/10/2013	1	HM	0930	1230	2	1	E	0	4	2	2	0	0
14/10/2013	1	HM	0930	1230	3	1	E	0	6	2	2	0	0
16/10/2013	2	HM	0600	0900	1	6	E	0	8	2	0	0	0
16/10/2013	2	HM	0600	0900	2	6	E	0	8	2	2	0	0
16/10/2013	2	HM	0600	0900	3	6	E	0	8	2	2	0	0
16/10/2013	2	HM	0930	1230	1	6	E	0	8	2	2	0	0
16/10/2013	2	HM	0930	1230	2	6	E	0	8	2	2	0	0
16/10/2013	2	HM	0930	1230	3	6	E	0	8	2	2	0	0
18/10/2013	2	HM	1300	1600	1	6	E	1	8	1	2	0	0
18/10/2013	2	HM	1300	1600	2	6	E	2	8	1	1	0	0
18/10/2013	2	HM	1300	1600	3	7	E	3	8	0	0	0	0
18/10/2013	2	HM	1630	1930	1	7	E	3	8	0	0	0	0
18/10/2013	2	HM	1630	1930	2	7	E	3	8	0	0	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
18/10/2013	2	HM	1630	1930	3	7	E	3	8	0	0	0	0
21/10/2013	3	HM	1300	1600	1	5	E	1	8	1	2	0	0
21/10/2013	3	HM	1300	1600	2	4	ESE	2	8	1	2	0	0
21/10/2013	3	HM	1300	1600	3	4	ESE	3	8	1	1	0	0
21/10/2013	3	HM	1630	1930	1	4	ESE	2	8	1	1	0	0
21/10/2013	3	HM	1630	1930	2	4	ESE	2	8	1	1	0	0
21/10/2013	3	HM	1630	1930	3	4	ESE	2	8	1	1	0	0
24/10/2013	3	HM	0900	1200	1	4	W	0	4	2	2	0	0
24/10/2013	3	HM	0900	1200	2	4	W	0	4	2	2	0	0
24/10/2013	3	HM	0900	1200	3	4	W	0	4	2	2	0	0
29/10/2013	1	HM	1300	1600	1	5	W	2	4	1	2	0	0
29/10/2013	1	HM	1300	1600	2	5	W	0	4	2	2	0	0
29/10/2013	1	HM	1300	1600	3	6	WNW	0	5	2	2	0	0
04/11/2013	3	HM	1300	1530	1	4	NNW	0	2	2	2	0	0
04/11/2013	3	HM	1300	1530	2	4	NNW	0	4	2	2	0	0
04/11/2013	3	HM	1300	1530	3	3	NNW	0	4	2	2	0	0
04/11/2013	3	HM	1600	1830	1	3	NNW	0	4	2	2	0	0
04/11/2013	3	HM	1600	1830	2	3	NNW	0	4	2	2	0	0
25/11/2013	1	HM	0700	0930	1	0	0	0	8	1	0	0	0
25/11/2013	1	HM	0700	0930	2	0	0	0	8	1	1	0	0
25/11/2013	1	HM	0700	0930	3	1	E	0	8	1	2	0	0
25/11/2013	1	HM	1000	1230	1	0	0	0	8	1	2	0	0
25/11/2013	1	HM	1000	1230	2	1	E	0	8	1	2	0	0
27/11/2013	2	HM	1030	1300	1	5	WNW	1	8	1	2	0	0
27/11/2013	2	HM	1030	1300	2	6	WNW	0	6	1	2	0	0
27/11/2013	2	HM	1030	1300	3	5	WNW	0	7	1	2	0	0
27/11/2013	2	HM	1330	1600	1	6	WNW	0	8	1	2	0	0
27/11/2013	2	HM	1330	1600	2	6	WNW	0	8	1	2	0	0
27/11/2013	2	HM	1330	1600	3	6	WNW	0	8	1	2	0	0
02/12/2013	1	HM	0700	0900	1	3	SW	0	8	1	1	0	0
02/12/2013	1	HM	0700	0900	2	4	SW	2	8	1	1	0	0
02/12/2013	1	HM	0930	1130	1	4	SW	2	8	1	1	0	0
02/12/2013	1	HM	0930	1130	2	6	SW	0	8	1	2	0	0
09/12/2013	2	HM	1130	1330	1	5	SE	0	4	2	2	0	0
09/12/2013	2	HM	1130	1330	2	5	SE	0	4	2	2	0	0
09/12/2013	2	HM	1400	1600	1	5	SSW	0	2	2	2	0	0
09/12/2013	2	HM	1400	1600	2	5	SSW	0	6	2	2	0	0
10/12/2013	3	HM	0800	1000	1	3	S	0	8	1	2	0	0
10/12/2013	3	HM	0800	1000	2	4	SSW	0	7	1	2	0	0
10/12/2013	3	HM	1030	1230	1	3	SSW	0	6	2	2	0	0
10/12/2013	3	HM	1030	1230	2	3	SSW	0	3	2	2	0	0
11/12/2013	3	HM	1230	1430	1	5	SSE	0	7	1	2	0	0
11/12/2013	3	HM	1230	1430	2	5	SSE	0	7	1	2	0	0
11/12/2013	3	HM	1500	1700	1	5	SSE	0	7	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
11/12/2013	3	HM	1500	1700	2	4	SSE	0	8	1	2	0	0
08/01/2014	1	HM	1030	1230	1	5	SW	0	2	2	2	0	0
08/01/2014	1	HM	1030	1230	2	5	SW	0	0	2	2	0	0
08/01/2014	1	HM	1300	1500	1	5	SW	0	3	2	2	0	0
08/01/2014	1	HM	1300	1500	2	4	SW	0	3	2	2	0	0
10/01/2014	3	HM	1200	1400	1	3	WSW	2	8	1	2	0	0
10/01/2014	3	HM	1200	1400	2	3	WSW	2	8	1	2	0	0
10/01/2014	3	HM	1430	1630	1	3	W	1	7	1	2	0	0
10/01/2014	3	HM	1430	1630	2	3	W	0	7	1	2	0	0
14/01/2014	2	HM	0900	1100	1	2	ESE	0	4	2	2	1	0
14/01/2014	2	HM	0900	1100	2	3	SE	0	8	2	2	0	0
14/01/2014	2	HM	1130	1330	1	4	SE	0	8	2	2	0	0
14/01/2014	2	HM	1130	1330	2	4	SE	0	8	2	2	0	0
04/02/2014	1	HM	0915	1145	1	1	SE	0	1	2	2	0	0
04/02/2014	1	HM	0915	1145	2	2	SE	0	2	2	2	0	0
04/02/2014	1	HM	0915	1145	3	3	SE	0	2	2	2	0	0
04/02/2014	1	HM	1215	1445	1	3	SE	0	4	2	2	0	0
04/02/2014	1	HM	1215	1445	2	4	SE	0	6	2	2	0	0
06/02/2014	2	HM	1300	1530	1	4	SW	0	1	2	2	0	0
06/02/2014	2	HM	1300	1530	2	6	SW	0	2	2	2	0	0
06/02/2014	2	HM	1300	1530	3	4	SW	0	3	2	2	0	0
06/02/2014	2	HM	1600	1830	1	4	SSW	0	4	2	2	0	0
06/02/2014	2	HM	1600	1830	2	4	SSE	0	4	2	2	0	0
19/02/2014	2	HM	1330	1630	1	3	SE	0	7	2	2	0	0
19/02/2014	2	HM	1330	1630	2	5	SE	0	8	0	2	0	0
19/02/2014	2	HM	1330	1630	3	5	SE	1	8	0	0	0	0
20/02/2014	3	HM	0700	0930	1	6	W	1	8	1	2	0	0
20/02/2014	3	HM	0700	0930	2	6	W	3	8	1	2	0	0
20/02/2014	3	HM	0700	0930	3	6	W	2	8	1	2	0	0
20/02/2014	3	HM	1000	1230	1	5	W	0	7	2	2	0	0
20/02/2014	3	HM	1000	1230	2	4	W	0	7	2	2	0	0
04/03/2014	1	HM	0700	1000	1	5	SW	0	3	2	2	0	0
04/03/2014	1	HM	0700	1000	2	6	SW	2	3	2	2	0	0
04/03/2014	1	HM	0700	1000	3	5	SW	0	4	2	2	0	0
04/03/2014	1	HM	1030	1330	1	5	SW	0	4	2	2	0	0
04/03/2014	1	HM	1030	1330	2	5	SW	0	4	2	2	0	0
04/03/2014	1	HM	1030	1330	3	5	SW	0	4	2	2	0	0
11/03/2014	2	HM	0630	0930	1	4	ESE	0	5	0	1	0	0
11/03/2014	2	HM	0630	0930	2	3	ESE	0	5	0	1	0	0
11/03/2014	2	HM	0630	0930	3	3	ESE	0	5	0	1	0	0
11/03/2014	2	HM	1000	1300	1	3	ESE	0	3	2	2	0	0
11/03/2014	2	HM	1000	1300	2	3	ESE	0	1	2	2	0	0
11/03/2014	2	HM	1000	1300	3	3	ESE	0	1	2	2	0	0
12/03/2014	3	HM	1350	1600	1	1	S	0	4	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
12/03/2014	3	HM	1350	1600	2	1	SW	0	4	2	2	0	0
12/03/2014	3	HM	1350	1600	3	1	SW	0	0	2	2	0	0
12/03/2014	3	HM	1630	1930	1	0	0	0	0	2	2	0	0
12/03/2014	3	HM	1630	1930	2	0	0	0	0	2	2	0	0
12/03/2014	3	HM	1630	1930	3	0	0	0	0	2	2	0	0
20/03/2014	3	HM	1330	1630	1	4	SW	0	7	2	2	0	0
20/03/2014	3	HM	1330	1630	2	5	SW	0	4	2	2	0	0
20/03/2014	3	HM	1330	1630	3	5	SW	3	4	2	2	0	0
20/03/2014	3	HM	1700	2000	1	6	SW	0	4	2	2	0	0
20/03/2014	3	HM	1700	2000	2	4	SW	0	5	2	2	0	0
20/03/2014	3	HM	1700	2000	3	4	SW	0	5	2	2	0	0
24/10/2016	2	CS	0945	1245	1	4	ENE	0	2	2	2	0	0
24/10/2016	2	CS	0945	1245	2	4	ENE	0	3	2	2	0	0
24/10/2016	2	CS	0945	1245	3	4	ENE	0	1	2	2	0	0
24/10/2016	2	CS	1315	1615	1	4	ENE	0	1	2	2	0	0
24/10/2016	2	CS	1315	1615	2	4	ENE	0	3	2	2	0	0
24/10/2016	2	CS	1315	1615	3	4	ENE	0	3	2	2	0	0
25/10/2016	3	CS	0910	1210	1	2	SE	0	5	2	2	0	0
25/10/2016	3	CS	0910	1210	2	1	SE	0	4	2	2	0	0
25/10/2016	3	CS	0910	1210	3	2	SE	0	2	2	2	0	0
25/10/2016	3	CS	1240	1540	1	3	SE	0	2	2	2	0	0
25/10/2016	3	CS	1240	1540	2	3	SE	0	5	2	2	0	0
25/10/2016	3	CS	1240	1540	3	3	SE	0	8	1	2	0	0
26/10/2016	3	CS	0835	1135	1	4	SW	0	7	1	2	0	0
26/10/2016	3	CS	0835	1135	2	4	SW	0	8	1	2	0	0
26/10/2016	3	CS	0835	1135	3	4	SW	0	8	1	2	0	0
26/10/2016	3	CS	1205	1505	1	4	SW	1	8	1	2	0	0
26/10/2016	3	CS	1205	1505	2	4	SW	3	8	1	2	0	0
26/10/2016	3	CS	1205	1505	3	4	SW	0	8	1	2	0	0
27/10/2016	1	CS	1040	1340	1	3	W	0	8	1	2	0	0
27/10/2016	1	CS	1040	1340	2	2	W	0	7	1	2	0	0
27/10/2016	1	CS	1040	1340	3	4	W	2	8	1	2	0	0
27/10/2016	1	CS	1410	1710	1	3	W	0	8	1	2	0	0
27/10/2016	1	CS	1410	1710	2	3	W	0	8	1	2	0	0
27/10/2016	1	CS	1410	1710	3	3	W	2	8	1	2	0	0
28/10/2016	2	CS	0725	1025	1	4	WNW	0	7	2	1	0	0
28/10/2016	2	CS	0725	1025	2	4	WNW	0	6	2	2	0	0
28/10/2016	2	CS	0725	1025	3	3	WNW	0	7	2	2	0	0
28/10/2016	2	CS	1055	1355	1	4	WNW	0	7	2	2	0	0
28/10/2016	2	CS	1055	1355	2	4	WNW	0	6	2	2	0	0
28/10/2016	2	CS	1055	1355	3	4	WNW	0	6	2	2	0	0
29/10/2016	1	CS	0935	1235	1	1	W	2	8	0	1	0	0
29/10/2016	1	CS	0935	1235	2	1	W	0	8	0	2	0	0
29/10/2016	1	CS	0935	1235	3	0	0	0	8	1	2	0	0
29/10/2016	1	CS	1305	1605	1	1	SW	0	7	1	2	0	0
29/10/2016	1	CS	1305	1605	2	2	SW	0	8	1	2	0	0
29/10/2016	1	CS	1305	1605	3	1	SW	0	8	1	2	0	0
10/11/2016	3	CS	1035	1335	1	4	NW	0	6	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
10/11/2016	3	CS	1035	1335	2	4	NW	3	7	1	2	0	0
10/11/2016	3	CS	1035	1335	3	4	NW	0	6	1	2	0	0
10/11/2016	3	CS	1405	1705	1	4	NW	3	7	1	2	0	0
10/11/2016	3	CS	1405	1705	2	3	NW	3	6	1	2	0	0
10/11/2016	3	CS	1405	1705	3	2	NW	3	6	1	2	0	0
11/11/2016	2	CS	0915	1215	1	4	S	0	8	2	2	0	0
11/11/2016	2	CS	0915	1215	2	4	S	0	8	2	2	0	0
11/11/2016	2	CS	0915	1215	3	4	S	0	8	2	2	0	0
11/11/2016	2	CS	1245	1545	1	4	SSE	0	8	2	2	0	0
11/11/2016	2	CS	1245	1545	2	4	SSE	0	8	2	2	0	0
11/11/2016	2	CS	1245	1545	3	5	SSE	2	8	1	2	0	0
12/11/2016	1	CS	0955	1255	1	2	WNW	2	8	1	2	0	0
12/11/2016	1	CS	0955	1255	2	2	WNW	0	5	1	2	0	0
12/11/2016	1	CS	0955	1255	3	2	WNW	0	6	1	2	0	0
12/11/2016	1	CS	1325	1625	1	2	WNW	2	7	1	2	0	0
12/11/2016	1	CS	1325	1625	2	3	WNW	0	7	1	2	0	0
12/11/2016	1	CS	1325	1625	3	3	WNW	2	8	1	2	0	0
14/11/2016	2	WS	1100	1400	1	3	W	1	8	0	0	0	0
14/11/2016	2	WS	1100	1400	2	3	W	1	8	0	0	0	0
14/11/2016	2	WS	1100	1400	3	3	W	1	8	0	0	0	0
14/11/2016	2	WS	1430	1730	1	3	W	0	8	1	2	0	0
14/11/2016	2	WS	1430	1730	2	3	W	0	8	1	2	0	0
14/11/2016	2	WS	1430	1730	3	3	W	0	7	1	2	0	0
23/11/2016	1	WS	1035	1335	1	2	E	0	0	2	2	1	0
23/11/2016	1	WS	1035	1335	2	2	E	0	0	2	2	0	0
23/11/2016	1	WS	1035	1335	3	1	E	0	0	2	2	0	0
23/11/2016	1	WS	1405	1705	1	1	E	0	0	2	2	0	0
23/11/2016	1	WS	1405	1705	2	2	E	0	0	2	2	0	0
23/11/2016	1	WS	1405	1705	3	2	E	0	1	2	2	0	0
29/11/2016	3	WS	1030	1330	1	3	SW	0	8	2	2	0	0
29/11/2016	3	WS	1030	1330	2	3	SW	0	8	2	2	0	0
29/11/2016	3	WS	1030	1330	3	3	SW	0	8	2	2	0	0
29/11/2016	3	WS	1400	1700	1	3	WSW	0	8	2	2	0	0
29/11/2016	3	WS	1400	1700	2	3	WSW	2	8	1	2	0	0
29/11/2016	3	WS	1400	1700	3	3	WSW	2	8	1	2	0	0
02/12/2016	3	WS	0725	1025	1	1	N	0	7	2	2	0	0
02/12/2016	3	WS	0725	1025	2	1	N	0	7	2	2	0	0
02/12/2016	3	WS	0725	1025	3	1	N	0	8	2	2	0	0
02/12/2016	3	WS	1055	1355	1	1	N	0	8	2	2	0	0
02/12/2016	3	WS	1055	1355	2	2	ENE	0	8	2	2	0	0
02/12/2016	3	WS	1055	1355	3	2	ENE	0	7	2	2	0	0
12/12/2016	1	WS	0825	1125	1	3	E	0	7	1	2	0	0
12/12/2016	1	WS	0825	1125	2	3	E	0	8	1	2	0	0
12/12/2016	1	WS	0825	1125	3	3	E	0	8	1	2	0	0
12/12/2016	1	WS	1155	1455	1	3	E	0	8	1	2	0	0
12/12/2016	1	WS	1155	1455	2	3	E	0	8	1	2	0	0
12/12/2016	1	WS	1155	1455	3	3	E	1	8	1	2	0	0
18/12/2016	2	WS	0730	1030	1	3	ESE	0	8	1	2	0	0
18/12/2016	2	WS	0730	1030	2	3	ESE	0	8	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
18/12/2016	2	WS	0730	1030	3	3	ESE	0	8	1	2	0	0
18/12/2016	2	WS	1100	1400	1	3	ESE	0	8	1	2	0	0
18/12/2016	2	WS	1100	1400	2	2	SE	1	8	1	2	0	0
18/12/2016	2	WS	1100	1400	3	2	ESE	1	8	1	2	0	0
01/01/2017	3	CS	1030	1330	1	3	NNW	0	1	1	2	0	0
01/01/2017	3	CS	1030	1330	2	3	NNW	0	1	1	2	0	0
01/01/2017	3	CS	1030	1330	3	3	NNW	0	1	1	2	0	0
01/01/2017	3	CS	1400	1700	1	3	NNW	0	1	1	2	0	0
01/01/2017	3	CS	1400	1700	2	3	NNW	0	1	1	2	0	0
01/01/2017	3	CS	1400	1700	3	3	NNW	0	1	1	2	0	0
04/01/2017	2	CS	0715	1015	1	3	NW	0	3	2	1	0	0
04/01/2017	2	CS	0715	1015	2	3	NW	0	3	2	1	0	0
04/01/2017	2	CS	0715	1015	3	3	NW	0	2	2	2	0	0
04/01/2017	2	CS	1042	1345	2	3	NW	0	2	2	2	0	0
04/01/2017	2	CS	1045	1345	1	3	NW	0	3	2	2	0	0
04/01/2017	2	CS	1045	1345	3	3	NW	0	3	2	2	0	0
25/01/2017	1	CS	0940	1240	1	4	S	0	5	2	2	0	0
25/01/2017	1	CS	0940	1240	2	4	S	0	6	2	2	0	0
25/01/2017	1	CS	0940	1240	3	4	S	0	6	2	2	0	0
25/01/2017	1	CS	1310	1610	1	4	S	0	7	2	2	0	0
25/01/2017	1	CS	1310	1610	2	4	S	0	8	2	2	0	0
25/01/2017	1	CS	1310	1610	3	4	S	0	8	1	2	0	0
01/02/2017	2	CS	0705	1005	1	4	SE	0	8	1	0	0	0
01/02/2017	2	CS	0705	1005	2	4	SE	0	8	1	2	0	0
01/02/2017	2	CS	0705	1005	3	4	SE	2	8	0	2	0	0
01/02/2017	2	CS	1035	1335	1	4	SE	1	8	0	1	0	0
01/02/2017	2	CS	1035	1335	2	4	SE	0	7	1	2	0	0
01/02/2017	2	CS	1035	1335	3	4	SE	0	7	1	2	0	0
13/02/2017	3	CS	1200	1500	1	4	E	0	4	2	2	0	0
13/02/2017	3	CS	1200	1500	2	4	E	0	3	2	2	0	0
13/02/2017	3	CS	1200	1500	3	4	E	0	4	2	2	0	0
13/02/2017	3	CS	1530	1830	1	4	E	0	4	2	2	0	0
13/02/2017	3	CS	1530	1830	2	4	E	0	5	2	2	0	0
13/02/2017	3	CS	1530	1830	3	4	E	0	6	2	2	0	0
17/02/2017	1	CS	1020	1320	1	4	SE	0	8	1	2	0	0
17/02/2017	1	CS	1020	1320	2	4	SE	0	8	1	2	0	0
17/02/2017	1	CS	1020	1320	3	4	SE	0	7	1	2	0	0
17/02/2017	1	CS	1350	1650	1	4	SE	0	8	1	2	0	0
17/02/2017	1	CS	1350	1650	2	4	SE	0	7	1	2	0	0
17/02/2017	1	CS	1350	1650	3	4	SE	2	8	1	2	0	0
02/03/2017	3	CS	0840	1140	1	4	WSW	2	8	2	2	0	0
02/03/2017	3	CS	0840	1140	2	4	WSW	0	7	2	2	0	0
02/03/2017	3	CS	0840	1140	3	4	WSW	0	7	2	2	0	0
02/03/2017	3	CS	1210	1510	1	4	W	0	7	1	2	0	0
02/03/2017	3	CS	1210	1510	2	4	W	0	8	1	2	0	0
02/03/2017	3	CS	1210	1510	3	4	W	2	8	1	2	0	0
05/03/2017	2	CS	0945	1245	1	3	SSW	0	7	2	2	0	0
05/03/2017	2	CS	0945	1245	2	2	SSW	0	6	2	2	0	0
05/03/2017	2	CS	0945	1245	3	2	S	0	3	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
05/03/2017	2	CS	1315	1615	1	3	SSW	0	2	2	2	0	0
05/03/2017	2	CS	1315	1615	2	3	SW	0	2	2	2	0	0
05/03/2017	2	CS	1315	1615	3	3	WSW	0	2	2	2	0	0
06/03/2017	1	CS	0920	1220	1	3	W	0	4	2	2	0	0
06/03/2017	1	CS	0920	1220	2	3	W	0	4	2	2	0	0
06/03/2017	1	CS	0920	1220	3	2	W	0	5	2	2	0	0
06/03/2017	1	CS	1250	1550	1	2	W	0	6	2	2	0	0
06/03/2017	1	CS	1250	1550	2	3	W	0	7	2	2	0	0
06/03/2017	1	CS	1250	1550	3	3	W	0	7	2	2	0	0
17/04/2017	3	CS	0905	1205	1	2	NW	0	7	1	2	0	0
17/04/2017	3	CS	0905	1205	2	2	NW	0	6	1	2	0	0
17/04/2017	3	CS	0905	1205	3	1	NW	0	6	1	2	0	0
17/04/2017	3	CS	1235	1535	1	2	NW	0	5	1	2	0	0
17/04/2017	3	CS	1235	1535	2	2	NW	0	4	1	2	0	0
17/04/2017	3	CS	1235	1535	3	3	NW	0	3	1	2	0	0
18/04/2017	2	CS	0915	1215	1	3	SE	0	8	2	2	0	0
18/04/2017	2	CS	0915	1215	2	3	SE	0	8	2	2	0	0
18/04/2017	2	CS	0915	1215	3	3	SE	0	8	2	2	0	0
18/04/2017	2	CS	1245	1545	1	3	SE	0	7	2	2	0	0
18/04/2017	2	CS	1245	1545	2	3	SE	0	8	2	2	0	0
18/04/2017	2	CS	1245	1545	3	3	SE	0	8	2	2	0	0
09/05/2017	1	CS	0910	1210	1	2	SW	0	3	2	2	0	0
09/05/2017	1	CS	0910	1210	2	2	W	0	2	2	2	0	0
09/05/2017	1	CS	0910	1210	3	3	WSW	0	3	2	2	0	0
09/05/2017	1	CS	1240	1540	1	2	SW	0	2	2	2	0	0
09/05/2017	1	CS	1240	1540	2	2	SW	0	1	2	2	0	0
09/05/2017	1	CS	1240	1540	3	2	SW	0	1	2	2	0	0
10/05/2017	1	CS	0935	1235	1	2	WNW	1	8	1	2	0	0
10/05/2017	1	CS	0935	1235	2	2	WNW	1	8	1	2	0	0
10/05/2017	1	CS	0935	1235	3	2	WNW	0	8	1	2	0	0
10/05/2017	1	CS	1255	1555	1	1	NW	0	7	1	2	0	0
10/05/2017	1	CS	1255	1555	2	1	NW	2	8	1	2	0	0
10/05/2017	1	CS	1255	1555	3	1	NW	0	7	2	2	0	0
11/05/2017	3	CS	0925	1225	1	2	ESE	0	3	2	2	0	0
11/05/2017	3	CS	0955	1225	2	3	ESE	0	2	2	2	0	0
11/05/2017	3	CS	0955	1225	3	2	ESE	0	3	2	2	0	0
11/05/2017	3	CS	1255	1555	1	2	SE	0	3	2	2	0	0
11/05/2017	3	CS	1255	1555	2	3	SE	0	1	2	2	0	0
11/05/2017	3	CS	1255	1555	3	3	SSE	0	1	2	2	0	0
12/05/2017	2	CS	0840	1140	1	4	NE	0	8	2	2	0	0
12/05/2017	2	CS	0840	1140	2	4	NE	0	8	2	2	0	0
12/05/2017	2	CS	0840	1140	3	4	NE	0	8	2	2	0	0
12/05/2017	2	CS	1210	1510	1	4	NE	0	8	2	2	0	0
12/05/2017	2	CS	1210	1510	2	3	NE	0	8	2	2	0	0
12/05/2017	2	CS	1210	1510	3	3	NE	0	8	2	2	0	0
14/06/2017	3	CS	0920	1220	1	3	ESE	0	8	1	2	0	0
14/06/2017	3	CS	0920	1220	2	3	ESE	0	8	1	2	0	0
14/06/2017	3	CS	0920	1220	3	3	ESE	2	8	1	2	0	0
14/06/2017	3	CS	1250	1550	1	4	SE	2	8	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
14/06/2017	3	CS	1250	1550	2	4	SE	0	5	1	2	0	0
14/06/2017	3	CS	1250	1550	3	4	SE	0	6	1	2	0	0
15/06/2017	2	CS	0930	1230	1	3	SW	0	7	2	2	0	0
15/06/2017	2	CS	0930	1230	2	3	SW	0	5	2	2	0	0
15/06/2017	2	CS	0930	1230	3	3	SW	0	6	2	2	0	0
15/06/2017	2	CS	1300	1600	1	3	SW	2	7	2	2	0	0
15/06/2017	2	CS	1300	1600	2	3	SW	0	8	2	2	0	0
15/06/2017	2	CS	1300	1600	3	3	SW	4	8	1	1	0	0
16/06/2017	1	CS	1035	1335	1	3	SE	1	8	0	1	0	0
16/06/2017	1	CS	1035	1335	2	2	SSE	1	8	0	1	0	0
16/06/2017	1	CS	1035	1335	3	2	SSE	0	8	1	2	0	0
16/06/2017	1	CS	1405	1705	1	2	SSE	0	8	1	2	0	0
16/06/2017	1	CS	1405	1705	2	2	S	0	8	2	2	0	0
16/06/2017	1	CS	1405	1705	3	2	S	0	8	2	2	0	0
06/07/2017	2	CS	1005	1305	1	2	SW	0	8	2	2	0	0
06/07/2017	2	CS	1005	1305	2	2	SW	0	8	2	2	0	0
06/07/2017	2	CS	1005	1305	3	2	SW	0	7	2	2	0	0
06/07/2017	2	CS	1335	1635	1	2	SW	0	7	2	2	0	0
06/07/2017	2	CS	1335	1635	2	2	WSW	0	8	2	2	0	0
06/07/2017	2	CS	1335	1635	3	2	WSW	0	8	2	2	0	0
07/07/2017	1	CS	1025	1325	1	2	WNW	0	8	1	2	0	0
07/07/2017	1	CS	1025	1325	2	2	WNW	2	8	1	2	0	0
07/07/2017	1	CS	1025	1325	3	2	WNW	2	8	1	2	0	0
07/07/2017	1	CS	1355	1655	1	2	WNW	0	7	2	2	0	0
07/07/2017	1	CS	1355	1655	2	2	WNW	0	6	2	2	0	0
07/07/2017	1	CS	1355	1655	3	2	WNW	0	7	2	2	0	0
08/07/2017	3	CS	0950	1250	1	2	W	0	6	2	2	0	0
08/07/2017	3	CS	0950	1250	2	2	W	0	5	2	2	0	0
08/07/2017	3	CS	0950	1250	3	2	W	0	4	2	2	0	0
08/07/2017	3	CS	1320	1620	1	2	WSW	0	3	2	2	0	0
08/07/2017	3	CS	1320	1620	2	2	WSW	0	3	2	2	0	0
08/07/2017	3	CS	1320	1620	3	2	WSW	0	3	2	2	0	0
05/08/2017	3	CS	0915	1215	1	2	WNW	0	7	1	2	0	0
05/08/2017	3	CS	0915	1215	2	2	WNW	2	8	1	2	0	0
05/08/2017	3	CS	0915	1215	3	3	WNW	0	6	2	2	0	0
05/08/2017	3	CS	1245	1545	1	3	WNW	0	3	2	2	0	0
05/08/2017	3	CS	1245	1545	2	3	WNW	0	4	2	2	0	0
05/08/2017	3	CS	1245	1545	3	3	WNW	0	4	2	2	0	0
08/08/2017	2	CS	0910	1210	1	3	WNW	0	7	1	2	0	0
08/08/2017	2	CS	0910	1210	2	3	WNW	2	8	1	2	0	0
08/08/2017	2	CS	0910	1210	3	2	WNW	0	8	1	2	0	0
08/08/2017	2	CS	1240	1540	1	2	WNW	0	7	1	2	0	0
08/08/2017	2	CS	1240	1540	2	2	WNW	0	7	1	2	0	0
08/08/2017	2	CS	1240	1540	3	2	WNW	0	8	1	2	0	0
15/08/2017	1	CS	0955	1255	1	3	WSW	0	7	2	2	0	0
15/08/2017	1	CS	0955	1255	2	3	WSW	0	5	2	2	0	0
15/08/2017	1	CS	0955	1255	3	3	WSW	2	7	1	2	0	0
15/08/2017	1	CS	1325	0000	1	2	WSW	3	8	1	1	0	0
15/08/2017	1	CS	1325	0000	2	2	WSW	0	7	1	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
15/08/2017	1	CS	1325	0000	3	2	WSW	0	7	2	2	0	0
17/09/2017	1	CS	0935	1235	1	2	N	0	2	2	2	0	0
17/09/2017	1	CS	0935	1235	2	2	N	0	3	2	2	0	0
17/09/2017	1	CS	0935	1235	3	1	N	0	4	2	2	0	0
17/09/2017	1	CS	1305	1605	1	1	N	0	5	2	2	0	0
17/09/2017	1	CS	1305	1605	2	2	N	0	6	2	2	0	0
17/09/2017	1	CS	1305	1605	3	2	N	0	6	2	2	0	0
18/09/2017	3	CS	0925	1225	1	2	NW	0	5	2	2	0	0
18/09/2017	3	CS	0925	1225	2	1	NW	0	5	2	2	0	0
18/09/2017	3	CS	0925	1225	3	2	NW	0	6	2	2	0	0
18/09/2017	3	CS	1255	1555	1	2	NW	0	5	2	2	0	0
18/09/2017	3	CS	1255	1555	2	2	NW	0	7	2	2	0	0
18/09/2017	3	CS	1255	1555	3	2	NW	0	7	2	2	0	0
19/09/2017	2	CS	0920	1220	1	1	S	0	2	2	2	0	0
19/09/2017	2	CS	0920	1220	2	1	S	0	3	2	2	0	0
19/09/2017	2	CS	0920	1220	3	2	S	0	5	2	2	0	0
19/09/2017	2	CS	1250	1550	1	2	S	0	7	2	2	0	0
19/09/2017	2	CS	1250	1550	2	2	S	0	7	2	2	0	0
19/09/2017	2	CS	1250	1550	3	2	S	0	8	2	2	0	0
08/10/2017	2	CS	0935	1235	1	3	WNW	0	8	1	2	0	0
08/10/2017	2	CS	0935	1235	2	3	WNW	1	8	1	2	0	0
08/10/2017	2	CS	0935	1235	3	3	WNW	0	8	1	2	0	0
08/10/2017	2	CS	1305	1605	1	3	WNW	1	8	1	2	0	0
08/10/2017	2	CS	1305	1605	2	3	W	0	7	2	2	0	0
08/10/2017	2	CS	1305	1605	3	3	W	0	8	1	2	0	0
09/10/2017	3	CS	0940	1240	1	2	SW	0	7	1	2	0	0
09/10/2017	3	CS	0940	1240	2	2	SW	0	7	1	2	0	0
09/10/2017	3	CS	0940	1240	3	2	SW	0	8	1	2	0	0
09/10/2017	3	CS	1310	1610	1	2	SW	0	8	1	2	0	0
09/10/2017	3	CS	1310	1610	2	2	SW	0	8	1	2	0	0
09/10/2017	3	CS	1310	1610	3	2	SW	2	8	1	2	0	0
15/10/2017	1	CS	1050	1350	1	4	S	0	7	2	2	0	0
15/10/2017	1	CS	1050	1350	2	4	S	0	6	2	2	0	0
15/10/2017	1	CS	1050	1350	3	4	SSW	0	7	2	2	0	0
15/10/2017	1	CS	1420	1720	1	4	SW	0	8	2	2	0	0
15/10/2017	1	CS	1420	1720	2	4	SW	2	8	1	2	0	0
15/10/2017	1	CS	1420	1720	3	3	W	2	8	1	2	0	0
11/11/2017	1	CS	0925	1225	1	2	NW	0	6	2	2	0	0
11/11/2017	1	CS	0925	1225	2	2	NW	0	7	2	2	0	0
11/11/2017	1	CS	0925	1225	3	2	NW	2	7	2	2	0	0
11/11/2017	1	CS	1255	1555	1	2	NW	2	8	2	2	0	0
11/11/2017	1	CS	1255	1555	2	2	NW	0	7	2	2	0	0
11/11/2017	1	CS	1255	1555	3	2	NW	2	7	2	2	0	0
12/11/2017	3	CS	0855	1155	1	3	NW	0	4	2	2	0	0
12/11/2017	3	CS	0855	1155	2	3	NW	0	3	2	2	0	0
12/11/2017	3	CS	0855	1155	3	3	NW	0	3	2	2	0	0
12/11/2017	3	CS	1225	1525	1	3	NW	0	3	2	2	0	0
12/11/2017	3	CS	1225	1525	2	3	NW	0	3	2	2	0	0
12/11/2017	3	CS	1225	1525	3	3	NW	0	4	2	2	0	0

Date	VP	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
13/11/2017	2	CS	0905	1205	1	2	SSW	0	8	2	2	0	0
13/11/2017	2	CS	0905	1205	2	2	SSW	0	8	2	2	0	0
13/11/2017	2	CS	0905	1205	3	2	SSW	0	8	2	2	0	0
13/11/2017	2	CS	1235	1535	1	2	SSW	0	8	2	2	0	0
13/11/2017	2	CS	1235	1535	2	2	SSW	2	8	1	2	0	0
13/11/2017	2	CS	1235	1535	3	2	SSW	2	8	1	2	0	0
14/11/2017	3	CS	0915	1215	1	2	SW	0	7	2	2	0	0
14/11/2017	3	CS	0915	1215	2	2	SW	0	7	2	2	0	0
14/11/2017	3	CS	0915	1215	3	2	SW	0	6	2	2	0	0
14/11/2017	3	CS	1245	1545	1	2	SW	2	8	1	2	0	0
14/11/2017	3	CS	1245	1545	2	2	SW	0	8	1	2	0	0
14/11/2017	3	CS	1245	1545	3	2	SW	2	8	1	2	0	0
18/11/2017	2	CS	0905	1205	1	4	WNW	0	4	2	2	0	0
18/11/2017	2	CS	0905	1205	2	4	WNW	0	7	2	2	0	0
18/11/2017	2	CS	0905	1205	3	4	WNW	0	5	2	2	0	0
18/11/2017	2	CS	1235	1535	1	4	WNW	0	3	2	2	0	0
18/11/2017	2	CS	1235	1535	2	4	WNW	2	7	2	2	0	0
18/11/2017	2	CS	1235	1535	3	4	WNW	0	6	2	2	0	0
19/11/2017	1	CS	0920	1220	1	1	S	0	8	2	2	0	0
19/11/2017	1	CS	0920	1220	2	1	S	0	8	2	2	0	0
19/11/2017	1	CS	0920	1220	3	2	S	0	8	2	2	0	0
19/11/2017	1	CS	1250	1550	1	2	S	0	8	2	2	0	0
19/11/2017	1	CS	1250	1550	2	2	S	0	8	2	2	0	0
19/11/2017	1	CS	1250	1550	3	2	S	0	8	2	2	0	0

C.2 Moorland Breeding Bird Surveys

Moorland breeding bird surveys were undertaken during the 2012 and 2017 breeding seasons. Table C-4 details survey dates and weather data recorded. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-4 Meteorological conditions during breeding bird surveys at Tangy IV (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
27/04/2012	1	CS	-	-	All	4	N	0	2	2	2	0	0
28/04/2012	1	CS	-	-	All	3	NE	0	3	2	2	0	0
29/04/2012	1	CS	-	-	All	3	NE	0	2	2	2	0	0
22/05/2012	2	CS	0745	1050	All	3	SE	0	2	2	2	0	0
23/05/2012	2	CS	0805	1030	All	2	S	0	2	2	2	0	0
24/05/2012	2	CS	0815	1045	All	1	SW	0	2	2	2	0	0
16/06/2012	3	CS	0710	1015	All	4	NE	2	8	1	2	0	0
17/06/2012	3	CS	0655	0945	All	4	NW	0	8	2	2	0	0
18/06/2012	3	CS	0720	1005	All	1	W	0	3	2	2	0	0
03/07/2012	4	CS	0650	1015	All	2	SE	2	7	1	2	0	0
04/07/2012	4	CS	0705	0950	All	3	SE	2	7	1	2	0	0
05/07/2012	4	CS	0715	1010	All	2	NE	3	7	1	2	0	0
15/04/2017	5	CS	0925	1505	1	4	W	2	8	1	2	0	0
15/04/2017	5	CS	0925	1505	2	4	W	0	7	1	2	0	0
15/04/2017	5	CS	0925	1505	3	4	W	0	7	1	2	0	0
15/04/2017	5	CS	0925	1505	4	4	W	2	8	1	2	0	0
15/04/2017	5	CS	0925	1505	5	4	W	0	7	1	2	0	0
15/04/2017	5	CS	0925	1505	6	4	W	0	6	1	2	0	0
16/04/2017	5	CS	0950	1525	1	2	W	3	8	1	2	0	0
16/04/2017	5	CS	0950	1525	2	2	W	2	8	1	2	0	0
16/04/2017	5	CS	0950	1525	3	2	W	0	7	1	2	0	0
16/04/2017	5	CS	0950	1525	4	2	W	0	7	1	2	0	0
16/04/2017	5	CS	0950	1525	5	2	W	2	8	1	2	0	0
16/04/2017	5	CS	0950	1525	6	2	W	0	7	1	2	0	0
08/05/2017	5	CS	0940	1515	1	2	NE	0	1	2	2	0	0
08/05/2017	5	CS	0940	1515	2	2	NE	0	1	2	2	0	0
08/05/2017	5	CS	0940	1515	3	3	NE	0	0	2	2	0	0
08/05/2017	5	CS	0940	1515	4	3	NE	0	0	2	2	0	0
08/05/2017	5	CS	0940	1515	5	2	NE	0	1	2	2	0	0
08/05/2017	5	CS	0940	1515	6	3	NE	0	1	2	2	0	0
18/05/2017	6	CS	1020	1605	1	2	SW	0	2	2	2	0	0
18/05/2017	6	CS	1020	1605	2	2	SW	0	2	2	2	0	0
18/05/2017	6	CS	1020	1605	3	2	SW	0	2	2	2	0	0
18/05/2017	6	CS	1020	1605	4	2	SW	2	1	2	2	0	0
18/05/2017	6	CS	1020	1605	5	2	SW	2	1	2	2	0	0
18/05/2017	6	CS	1020	1605	6	2	SW	0	1	2	2	0	0
19/05/2017	6	CS	0935	1520	1	1	S	0	3	2	2	0	0
19/05/2017	6	CS	0935	1520	2	1	S	0	4	2	2	0	0
19/05/2017	6	CS	0935	1520	3	2	S	0	3	2	2	0	0
19/05/2017	6	CS	0935	1520	4	2	S	0	3	2	2	0	0
19/05/2017	6	CS	0935	1520	5	2	S	0	2	2	2	0	0
19/05/2017	6	CS	0935	1520	6	2	S	0	4	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
20/05/2017	6	CS	0925	1510	1	1	SW	0	8	1	2	0	0
20/05/2017	6	CS	0925	1510	2	2	SW	2	8	1	2	0	0
20/05/2017	6	CS	0925	1510	3	2	SW	0	8	1	2	0	0
20/05/2017	6	CS	0925	1510	4	2	SW	0	8	1	2	0	0
20/05/2017	6	CS	0925	1510	5	3	SW	2	7	1	2	0	0
20/05/2017	6	CS	0925	1510	6	4	SW	0	6	1	2	0	0
04/06/2017	7	CS	0925	1445	1	4	SW	0	6	2	2	0	0
04/06/2017	7	CS	0925	1445	2	4	SW	0	6	2	2	0	0
04/06/2017	7	CS	0925	1445	3	4	SW	0	5	2	2	0	0
04/06/2017	7	CS	0925	1445	4	3	SW	0	5	2	2	0	0
04/06/2017	7	CS	0925	1445	5	3	SW	0	8	2	2	0	0
04/06/2017	7	CS	0925	1445	6	3	SW	2	8	2	2	0	0
05/06/2017	7	CS	0935	1505	1	2	NW	0	5	2	2	0	0
05/06/2017	7	CS	0935	1505	2	2	NW	0	5	2	2	0	0
05/06/2017	7	CS	0935	1505	3	2	NW	0	6	2	2	0	0
05/06/2017	7	CS	0935	1505	4	2	NW	0	7	2	2	0	0
05/06/2017	7	CS	0935	1505	5	3	NW	0	7	2	2	0	0
05/06/2017	7	CS	0935	1505	6	3	NW	0	6	2	2	0	0
06/06/2017	7	CS	0915	1440	1	4	NW	2	8	1	2	0	0
06/06/2017	7	CS	0915	1440	2	4	NW	2	8	1	2	0	0
06/06/2017	7	CS	0915	1440	3	5	NW	0	8	1	2	0	0
06/06/2017	7	CS	0915	1440	4	5	NW	0	8	1	2	0	0
06/06/2017	7	CS	0915	1440	5	5	NW	2	8	1	2	0	0
06/06/2017	7	CS	0915	1440	6	5	NW	2	8	1	2	0	0
01/07/2017	8	CS	0745	1320	1	2	SW	0	4	2	2	0	0
01/07/2017	8	CS	0745	1320	2	2	SW	0	6	2	2	0	0
01/07/2017	8	CS	0745	1320	3	2	SW	0	7	1	2	0	0
01/07/2017	8	CS	0745	1320	4	2	SW	2	8	1	2	0	0
01/07/2017	8	CS	0745	1320	5	2	SW	2	8	1	2	0	0
01/07/2017	8	CS	0745	1320	6	2	SW	2	8	1	2	0	0
02/07/2017	8	CS	1105	1640	1	3	SW	2	8	1	2	0	0
02/07/2017	8	CS	1105	1640	2	3	SW	2	8	1	2	0	0
02/07/2017	8	CS	1105	1640	3	3	SW	0	7	1	2	0	0
02/07/2017	8	CS	1105	1640	4	3	SW	0	7	2	2	0	0
02/07/2017	8	CS	1105	1640	5	3	SW	0	8	2	2	0	0
02/07/2017	8	CS	1105	1640	6	3	SW	0	7	2	2	0	0
03/07/2017	8	CS	0920	1510	1	4	WSW	2	8	1	2	0	0
03/07/2017	8	CS	0920	1510	2	4	WSW	0	8	1	2	0	0
03/07/2017	8	CS	0920	1510	3	4	WSW	0	7	1	2	0	0
03/07/2017	8	CS	0920	1510	4	4	WSW	2	8	1	2	0	0
03/07/2017	8	CS	0920	1510	5	4	WSW	0	7	1	2	0	0
03/07/2017	8	CS	0920	1510	6	4	WSW	0	6	2	2	0	0

C.3 Winter Walkover Surveys

Winter walkover surveys were undertaken during the 2012/2013 and 2016/2017 non-breeding seasons. Table C-5 details survey dates and weather data recorded. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-5 Meteorological conditions during winter walkover surveys at Tangy IV (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
15/11/2012	1	CS	0945	1505	1	3	SW	0	8	1	2	0	0
15/11/2012	1	CS	0945	1505	2	3	SW	2	8	0	2	0	0
15/11/2012	1	CS	0945	1505	3	4	SW	0	8	1	2	0	0
15/11/2012	1	CS	0945	1505	4	4	SW	2	8	0	2	0	0
15/11/2012	1	CS	0945	1505	5	4	SW	2	8	0	2	0	0
15/11/2012	1	CS	0945	1505	6	4	SW	0	8	0	2	0	0
16/11/2012	1	CS	0935	1440	1	3	S	1	8	0	2	0	0
16/11/2012	1	CS	0935	1440	2	3	S	1	8	0	2	0	0
16/11/2012	1	CS	0935	1440	3	3	S	0	8	1	2	0	0
16/11/2012	1	CS	0935	1440	4	3	S	0	8	0	2	0	0
16/11/2012	1	CS	0935	1440	5	3	S	1	8	0	2	0	0
17/01/2013	2	CS	1000	1450	1	5	SE	0	6	1	2	0	0
17/01/2013	2	CS	1000	1450	2	4	SE	0	7	1	2	0	0
17/01/2013	2	CS	1000	1450	3	4	SE	0	7	1	2	0	0
17/01/2013	2	CS	1000	1450	4	4	SE	0	8	1	2	0	0
17/01/2013	2	CS	1000	1450	5	4	SE	0	8	1	2	0	0
18/01/2013	2	CS	0935	1445	1	5	SE	0	8	1	2	1	0
18/01/2013	2	CS	0935	1445	2	5	SE	2	8	1	2	1	1
18/01/2013	2	CS	0935	1445	3	5	SE	2	8	1	2	0	1
18/01/2013	2	CS	0935	1445	4	5	SE	0	8	1	2	0	0
18/01/2013	2	CS	0935	1445	5	5	SE	2	8	1	2	0	1
18/01/2013	2	CS	0935	1445	6	5	SE	2	8	1	2	0	1
19/02/2013	3	CS	0950	1510	1	1	SE	0	0	0	2	1	0
19/02/2013	3	CS	0950	1510	2	1	SE	0	0	0	2	0	0
19/02/2013	3	CS	0950	1510	3	2	SE	0	0	0	2	0	0
19/02/2013	3	CS	0950	1510	4	2	SE	0	0	0	2	0	0
19/02/2013	3	CS	0950	1510	5	2	SE	0	0	0	2	0	0
19/02/2013	3	CS	0950	1510	6	2	SE	0	0	0	2	0	0
20/02/2013	3	CS	1035	1515	1	4	SE	0	8	1	2	0	0
20/02/2013	3	CS	1035	1515	2	4	SE	0	8	1	2	0	0
20/02/2013	3	CS	1035	1515	3	4	SE	0	7	1	2	0	0
20/02/2013	3	CS	1035	1515	4	5	SE	0	7	1	2	0	0
20/02/2013	3	CS	1035	1515	5	5	SE	0	7	1	2	0	0
23/11/2016	4	WS	0800	1030	1	2	E	0	0	2	2	1	0
23/11/2016	4	WS	0800	1030	2	2	E	0	0	2	2	1	1
23/11/2016	4	WS	0800	1030	3	2	E	0	0	2	2	1	1
24/11/2016	4	WS	0800	1200	1	3	E	0	0	2	2	1	0
24/11/2016	4	WS	0800	1200	2	3	E	0	0	2	2	1	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
24/11/2016	4	WS	0800	1200	3	2	E	0	1	2	2	1	0
24/11/2016	4	WS	0800	1200	4	2	E	0	1	2	2	1	0
26/11/2016	4	WS	0900	1200	1	2	E	0	6	1	2	0	0
26/11/2016	4	WS	0900	1200	2	1	E	0	8	1	2	0	0
26/11/2016	4	WS	0900	1200	3	2	E	0	8	1	2	0	0
29/11/2016	4	WS	0800	1030	1	3	SW	0	7	2	2	0	0
29/11/2016	4	WS	0800	1030	2	3	SW	0	8	2	2	0	0
29/11/2016	4	WS	0800	1030	3	3	SW	0	8	2	2	0	0
21/01/2017	5	CS	0925	1505	1	4	SE	0	2	2	2	0	0
21/01/2017	5	CS	0925	1505	2	4	SE	0	2	2	2	0	0
21/01/2017	5	CS	0925	1505	3	4	SE	0	3	2	2	0	0
21/01/2017	5	CS	0925	1505	4	4	SE	0	4	2	2	0	0
21/01/2017	5	CS	0925	1505	5	4	SE	0	6	2	2	0	0
21/01/2017	5	CS	0925	1505	6	4	SE	0	7	2	2	0	0
22/01/2017	5	CS	0935	1500	1	2	E	0	8	1	2	0	0
22/01/2017	5	CS	0935	1500	2	1	E	2	8	1	2	0	0
22/01/2017	5	CS	0935	1500	3	0	0	0	8	1	2	0	0
22/01/2017	5	CS	0935	1500	4	1	E	0	8	1	2	0	0
22/01/2017	5	CS	0935	1500	5	2	E	0	8	1	2	0	0
22/01/2017	5	CS	0935	1500	6	3	E	2	8	1	2	0	0
11/02/2017	6	CS	0925	1510	1	4	NE	0	4	2	2	1	0
11/02/2017	6	CS	0925	1510	2	4	NE	0	4	2	2	1	0
11/02/2017	6	CS	0925	1510	3	3	NE	0	5	2	2	0	0
11/02/2017	6	CS	0925	1510	4	3	NE	0	6	2	2	0	0
11/02/2017	6	CS	0925	1510	5	4	NE	0	5	2	2	0	0
11/02/2017	6	CS	0925	1510	6	4	NE	0	5	2	2	0	0
12/02/2017	6	CS	0935	1450	1	3	NE	0	6	2	2	1	0
12/02/2017	6	CS	0935	1450	2	3	NE	0	6	2	2	0	0
12/02/2017	6	CS	0935	1450	3	3	NE	0	7	2	2	0	0
12/02/2017	6	CS	0935	1450	4	3	NE	0	8	2	2	0	0
12/02/2017	6	CS	0935	1450	5	3	NE	0	8	2	2	0	0
12/02/2017	6	CS	0935	1450	6	3	NE	0	8	2	2	0	0

C.4 Scarce Breeding Bird Surveys

Scarce breeding bird surveys were undertaken during the 2012, 2013 and 2017 breeding seasons with checks for wintering barn owl undertaken during the 2012/2013 and 2016/2017 non-breeding seasons. Table C-6 details survey dates and weather data recorded. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-6 Meteorological conditions during scarce breeding bird surveys at Tangy IV (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
24/04/2012	1	CS	-	-	All	3	NW	0	4	2	2	0	0
25/04/2012	1	CS	-	-	All	4	NE	0	6	2	2	0	0
26/04/2012	1	CS	-	-	All	5	N	1	5	2	2	0	0
27/04/2012	1	CS	-	-	All	4	N	0	2	2	2	0	0
28/04/2012	1	CS	-	-	All	3	NE	0	3	2	2	0	0
29/04/2012	1	CS	-	-	All	3	NE	0	2	2	2	0	0
21/05/2012	2	CS	1045	1520	All	2	SE	0	1	2	2	0	0
23/05/2012	2	CS	1040	1530	All	2	SE	0	2	2	2	0	0
24/05/2012	2	CS	1120	1610	All	1	SW	0	2	2	2	0	0
16/06/2012	3	CS	1055	1445	All	4	NE	0	8	2	2	0	0
17/06/2012	3	CS	1030	1520	All	4	NW	0	8	2	2	0	0
18/06/2012	3	CS	1030	1505	All	1	W	0	3	2	2	0	0
03/07/2012	4	CS	1045	1525	All	2	SE	2	7	1	2	0	0
04/07/2012	4	CS	1025	1410	All	3	SE	2	7	1	2	0	0
05/07/2012	4	CS	1040	1625	All	2	NE	3	7	1	2	0	0
15/08/2012	5	CS	1010	1635	All	3	SW	2	8	1	2	0	0
17/08/2012	5	CS	0940	1620	All	2	SE	0	4	2	2	0	0
18/08/2012	5	CS	0945	1550	All	2	SE	0	4	2	2	0	0
18/02/2013	6	CS	1005	1540	1	3	SSE	0	8	1	2	1	0
18/02/2013	6	CS	1005	1540	2	3	SSE	0	8	1	2	0	0
18/02/2013	6	CS	1005	1540	3	4	SSE	0	8	1	2	0	0
18/02/2013	6	CS	1005	1540	4	4	SSE	0	6	1	2	0	0
18/02/2013	6	CS	1005	1540	5	4	SSE	0	4	2	2	0	0
18/02/2013	6	CS	1005	1540	6	4	SSE	0	2	2	2	0	0
09/04/2013	7	CS	0820	1505	1	2	ESE	0	4	2	2	0	1
09/04/2013	7	CS	0820	1505	2	2	ESE	0	4	2	2	0	1
09/04/2013	7	CS	0820	1505	3	2	ESE	0	3	2	2	0	1
09/04/2013	7	CS	0820	1505	4	3	ESE	0	3	2	2	0	1
09/04/2013	7	CS	0820	1505	5	3	ESE	0	4	2	2	0	1
09/04/2013	7	CS	0820	1505	6	3	ESE	0	4	2	2	0	1
10/04/2013	7	CS	0815	1315	1	1	E	0	5	2	2	0	1
10/04/2013	7	CS	0815	1315	2	2	E	0	4	2	2	0	1
10/04/2013	7	CS	0815	1315	3	2	E	0	4	2	2	0	1
10/04/2013	7	CS	0815	1315	4	2	E	0	3	2	2	0	1
10/04/2013	7	CS	0815	1315	5	2	E	0	3	2	2	0	1
10/04/2013	7	CS	0815	1315	6	2	E	0	3	2	2	0	1
11/04/2013	7	CS	0835	1510	1	4	NE	0	8	1	2	0	1
11/04/2013	7	CS	0835	1510	2	4	NE	0	7	1	2	0	1

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
11/04/2013	7	CS	0835	1510	3	4	NE	0	7	1	2	0	1
11/04/2013	7	CS	0835	1510	4	4	NE	0	8	1	2	0	1
11/04/2013	7	CS	0835	1510	5	4	NE	0	8	1	2	0	1
11/04/2013	7	CS	0835	1510	6	4	NE	0	8	1	2	0	1
01/05/2013	8	CS	0750	1230	1	4	WSW	0	4	2	2	0	0
01/05/2013	8	CS	0750	1230	2	4	WSW	0	4	2	2	0	0
01/05/2013	8	CS	0750	1230	3	4	W	0	3	2	2	0	0
01/05/2013	8	CS	0750	1230	4	4	W	0	3	2	2	0	0
01/05/2013	8	CS	0750	1230	5	4	WNW	0	3	2	2	0	0
02/05/2013	8	CS	0755	1220	1	2	S	0	6	1	2	0	0
02/05/2013	8	CS	0755	1220	2	2	S	0	6	1	2	0	0
02/05/2013	8	CS	0755	1220	3	3	S	0	7	1	2	0	0
02/05/2013	8	CS	0755	1220	4	3	S	0	8	1	2	0	0
02/05/2013	8	CS	0755	1220	5	4	S	0	8	1	2	0	0
03/05/2013	8	CS	0750	1115	1	4	S	2	8	1	2	0	0
03/05/2013	8	CS	0750	1115	2	4	S	2	8	1	2	0	0
03/05/2013	8	CS	0750	1115	3	4	S	0	8	1	2	0	0
03/05/2013	8	CS	0750	1115	4	4	S	3	8	1	2	0	0
03/06/2013	9	CS	905	1345	1	2	WNW	1	8	0	2	0	0
03/06/2013	9	CS	0905	1345	2	2	WNW	1	8	1	2	0	0
03/06/2013	9	CS	0905	1345	3	2	WNW	1	8	1	2	0	0
03/06/2013	9	CS	0905	1345	4	1	W	0	7	2	2	0	0
03/06/2013	9	CS	0905	1345	5	1	W	0	6	2	2	0	0
04/06/2013	9	CS	0755	1230	1	2	E	0	3	2	2	0	0
04/06/2013	9	CS	0755	1230	2	2	E	0	2	2	2	0	0
04/06/2013	9	CS	0755	1230	3	2	E	0	4	2	2	0	0
04/06/2013	9	CS	0755	1230	4	2	ESE	0	3	2	2	0	0
04/06/2013	9	CS	0755	1230	5	2	ESE	0	3	2	2	0	0
05/06/2013	9	CS	1035	1510	1	1	SE	0	5	2	2	0	0
05/06/2013	9	CS	1035	1510	2	1	SE	0	4	2	2	0	0
05/06/2013	9	CS	1035	1510	3	1	SE	0	4	2	2	0	0
05/06/2013	9	CS	1035	1510	4	1	SE	0	3	2	2	0	0
05/06/2013	9	CS	1035	1510	5	1	SE	0	2	2	2	0	0
14/07/2013	10	CS	0750	1235	1	3	SSW	0	6	1	2	0	0
14/07/2013	10	CS	0750	1235	2	3	SSW	0	7	1	2	0	0
14/07/2013	10	CS	0750	1235	3	3	SSW	1	8	1	2	0	0
14/07/2013	10	CS	0750	1235	4	3	SSW	2	8	1	2	0	0
14/07/2013	10	CS	0750	1235	5	3	SSW	0	8	1	2	0	0
15/07/2013	10	CS	0945	1420	1	2	SW	1	8	1	2	0	0
15/07/2013	10	CS	0945	1420	2	2	SW	1	8	1	2	0	0
15/07/2013	10	CS	0945	1420	3	2	SW	0	8	1	2	0	0
15/07/2013	10	CS	0945	1420	4	2	SW	0	7	1	2	0	0
15/07/2013	10	CS	0945	1420	5	2	SW	0	7	1	2	0	0
19/07/2013	10	CS	0820	1305	1	2	SE	0	1	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
19/07/2013	10	CS	0820	1305	2	2	SE	0	1	2	2	0	0
19/07/2013	10	CS	0820	1305	3	2	SE	0	1	2	2	0	0
19/07/2013	10	CS	0820	1305	4	2	SE	0	1	2	2	0	0
19/07/2013	10	CS	0820	1305	5	2	SE	0	1	2	2	0	0
03/08/2013	11	CS	0925	1510	1	4	S	0	6	1	2	0	0
03/08/2013	11	CS	0925	1510	2	4	S	2	8	1	2	0	0
03/08/2013	11	CS	0925	1510	3	4	S	0	7	1	2	0	0
03/08/2013	11	CS	0925	1510	4	4	S	2	8	1	2	0	0
03/08/2013	11	CS	0925	1510	5	4	S	0	7	1	2	0	0
03/08/2013	11	CS	0925	1510	6	4	S	0	6	1	2	0	0
04/08/2013	11	CS	1040	1515	1	4	S	2	7	1	2	0	0
04/08/2013	11	CS	1040	1515	2	3	S	0	6	1	2	0	0
04/08/2013	11	CS	1040	1515	3	3	S	2	7	1	2	0	0
04/08/2013	11	CS	1040	1515	4	2	S	0	6	1	2	0	0
04/08/2013	11	CS	1040	1515	5	2	S	0	5	1	2	0	0
05/08/2013	11	CS	0955	1530	1	2	NW	0	7	2	2	0	0
05/08/2013	11	CS	0955	1530	2	2	NW	0	7	2	2	0	0
05/08/2013	11	CS	0955	1530	3	3	NW	0	6	2	2	0	0
05/08/2013	11	CS	0955	1530	4	3	NW	0	6	2	2	0	0
05/08/2013	11	CS	0955	1530	5	3	NW	0	5	2	2	0	0
23/11/2016	12	WS	1745	1845	1	2	E	0	2	2	2	1	0
24/11/2016	12	WS	1200	1700	1	2	E	0	0	2	2	0	0
24/11/2016	12	WS	1200	1700	2	2	E	0	0	2	2	0	0
24/11/2016	12	WS	1200	1700	3	2	E	0	0	2	2	0	0
24/11/2016	12	WS	1200	1700	4	2	E	0	0	2	2	0	0
24/11/2016	12	WS	1200	1700	5	2	E	0	0	2	2	1	0
26/11/2016	12	WS	1200	1600	1	1	E	0	8	1	2	0	0
26/11/2016	12	WS	1200	1600	2	1	W	0	8	1	2	0	0
26/11/2016	12	WS	1200	1600	3	2	N	0	8	1	2	0	0
26/11/2016	12	WS	1200	1600	4	2	N	0	8	1	2	0	0
29/11/2016	12	WS	1720	1820	1	3	WSW	2	8	1	2	0	0
26/01/2017	13	CS	0910	1445	1	5	SE	0	4	2	2	0	0
26/01/2017	13	CS	0910	1445	2	5	SE	0	5	2	2	0	0
26/01/2017	13	CS	0910	1445	3	4	ESE	0	7	2	2	0	0
26/01/2017	13	CS	0910	1445	4	4	ESE	0	5	2	2	0	0
26/01/2017	13	CS	0910	1445	5	3	E	0	7	2	2	0	0
26/01/2017	13	CS	0910	1445	6	3	E	0	6	2	2	0	0
10/04/2017	14	CS	0730	1120	1	2	WNW	0	8	1	2	0	0
10/04/2017	14	CS	0730	1120	2	3	NW	0	7	1	2	0	0
10/04/2017	14	CS	0730	1120	3	3	NW	0	5	1	2	0	0
10/04/2017	14	CS	0730	1120	4	4	NW	0	5	1	2	0	0
11/04/2017	14	CS	0730	1110	1	3	SW	0	7	1	2	0	0
11/04/2017	14	CS	0730	1110	2	4	SW	2	8	1	2	0	0
11/04/2017	14	CS	0730	1110	3	4	SW	0	7	1	2	0	0
11/04/2017	14	CS	0730	1110	4	4	SW	2	8	1	2	0	0
12/04/2017	14	CS	0725	1115	1	4	NW	0	7	1	2	0	0
12/04/2017	14	CS	0725	1115	2	4	NW	0	7	1	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
12/04/2017	14	CS	0725	1115	3	4	NW	0	7	1	2	0	0
12/04/2017	14	CS	0725	1115	4	4	NW	2	8	1	2	0	0
13/04/2017	14	CS	0725	1105	1	4	W	2	8	1	2	0	0
13/04/2017	14	CS	0725	1105	2	4	W	2	8	1	2	0	0
13/04/2017	14	CS	0725	1105	3	4	W	0	7	1	2	0	0
13/04/2017	14	CS	0725	1105	4	4	W	0	8	1	2	0	0
14/04/2017	14	CS	0720	1110	1	3	W	2	8	1	2	0	0
14/04/2017	14	CS	0720	1110	2	3	W	2	8	1	2	0	0
14/04/2017	14	CS	0720	1110	3	3	W	0	7	1	2	0	0
14/04/2017	14	CS	0720	1110	4	3	W	2	8	1	2	0	0
13/05/2017	15	CS	0610	1025	1	2	SE	2	8	1	2	0	0
13/05/2017	15	CS	0610	1025	2	2	SE	0	7	1	2	0	0
13/05/2017	15	CS	0610	1025	3	2	SSE	0	7	1	2	0	0
13/05/2017	15	CS	0610	1025	4	2	S	2	8	1	2	0	0
14/05/2017	15	CS	0610	0940	1	3	SSW	0	5	2	2	0	0
14/05/2017	15	CS	0610	0940	2	3	SSW	0	6	2	2	0	0
14/05/2017	15	CS	0610	0940	3	3	SSW	0	8	1	2	0	0
14/05/2017	15	CS	0610	0940	4	3	SSW	2	8	1	2	0	0
15/05/2017	15	CS	0615	0930	1	4	S	2	8	1	2	0	0
15/05/2017	15	CS	0615	0930	2	4	S	2	8	1	2	0	0
15/05/2017	15	CS	0615	0930	3	4	S	0	8	1	2	0	0
15/05/2017	15	CS	0615	0930	4	4	S	0	8	1	2	0	0
16/05/2017	15	CS	0910	1455	1	4	S	2	8	1	2	0	0
16/05/2017	15	CS	0910	1455	2	4	S	0	8	1	2	0	0
16/05/2017	15	CS	0910	1455	3	4	S	0	8	1	2	0	0
16/05/2017	15	CS	0910	1455	4	5	S	2	8	1	2	0	0
16/05/2017	15	CS	0910	1455	5	5	S	0	8	1	2	0	0
16/05/2017	15	CS	0910	1455	6	4	S	2	8	1	2	0	0
17/05/2017	15	CS	1055	1620	1	2	SSW	0	3	2	2	0	0
17/05/2017	15	CS	1055	1620	2	2	SSW	0	3	2	2	0	0
17/05/2017	15	CS	1055	1620	3	2	SSW	0	4	2	2	0	0
17/05/2017	15	CS	1055	1620	4	2	SSW	0	5	2	2	0	0
17/05/2017	15	CS	1055	1620	5	2	SSW	0	7	1	2	0	0
17/05/2017	15	CS	1055	1620	6	2	SSW	2	8	1	2	0	0
01/06/2017	16	CS	0805	1310	1	4	S	0	8	1	2	0	0
01/06/2017	16	CS	0805	1310	2	4	S	0	8	1	2	0	0
01/06/2017	16	CS	0805	1310	3	4	S	2	8	1	2	0	0
01/06/2017	16	CS	0805	1310	4	4	S	2	8	1	2	0	0
01/06/2017	16	CS	0805	1310	5	4	S	2	8	1	2	0	0
01/06/2017	16	CS	0805	1310	6	4	S	3	8	1	1	0	0
02/06/2017	16	CS	1050	1635	1	3	SW	0	5	2	2	0	0
02/06/2017	16	CS	1050	1635	2	3	SW	0	5	2	2	0	0
02/06/2017	16	CS	1050	1635	3	4	SW	0	6	2	2	0	0
02/06/2017	16	CS	1050	1635	4	4	SW	2	7	2	2	0	0
02/06/2017	16	CS	1050	1635	5	3	SW	0	7	2	2	0	0
02/06/2017	16	CS	1050	1635	6	3	SW	2	8	2	2	0	0
03/06/2017	16	CS	0915	1500	1	3	SW	0	6	2	2	0	0
03/06/2017	16	CS	0915	1500	2	3	SW	0	6	2	2	0	0
03/06/2017	16	CS	0915	1500	3	3	SW	0	7	2	2	0	0

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
03/06/2017	16	CS	0915	1500	4	3	SW	2	8	2	2	0	0
03/06/2017	16	CS	0915	1500	5	3	SW	0	7	2	2	0	0
03/06/2017	16	CS	0915	1500	6	3	SW	2	7	2	2	0	0
04/07/2017	17	CS	1220	1755	1	3	E	2	8	1	2	0	0
04/07/2017	17	CS	1220	1755	2	3	E	2	8	1	2	0	0
04/07/2017	17	CS	1220	1755	3	3	E	0	8	1	2	0	0
04/07/2017	17	CS	1220	1755	4	3	E	0	7	2	2	0	0
04/07/2017	17	CS	1220	1755	5	3	E	0	6	2	2	0	0
04/07/2017	17	CS	1220	1755	6	3	E	0	6	2	2	0	0
05/07/2017	17	CS	0925	1515	1	3	NE	0	6	2	2	0	0
05/07/2017	17	CS	0925	1515	2	3	NE	0	6	2	2	0	0
05/07/2017	17	CS	0925	1515	3	3	ENE	0	7	2	2	0	0
05/07/2017	17	CS	0925	1515	4	3	ENE	0	7	2	2	0	0
05/07/2017	17	CS	0925	1515	5	3	E	0	6	2	2	0	0
05/07/2017	17	CS	0925	1515	6	3	ESE	0	6	2	2	0	0
06/08/2017	18	CS	1150	1730	1	4	S	2	8	1	2	0	0
06/08/2017	18	CS	1150	1730	2	4	S	2	8	1	2	0	0
06/08/2017	18	CS	1150	1730	3	3	SSW	0	8	1	2	0	0
06/08/2017	18	CS	1150	1730	4	3	SSW	0	8	1	2	0	0
06/08/2017	18	CS	1150	1730	5	3	SSW	0	7	1	2	0	0
06/08/2017	18	CS	1150	1730	6	3	SSW	0	7	1	2	0	0
07/08/2017	18	CS	0915	1525	1	2	W	0	6	2	2	0	0
07/08/2017	18	CS	0915	1525	2	2	W	0	7	2	2	0	0
07/08/2017	18	CS	0915	1525	3	2	W	0	5	2	2	0	0
07/08/2017	18	CS	0915	1525	4	2	W	0	5	2	2	0	0
07/08/2017	18	CS	0915	1525	5	2	W	0	6	2	2	0	0
07/08/2017	18	CS	0915	1525	6	2	W	0	6	2	2	0	0

C.5 Black Grouse Surveys

Black grouse surveys were undertaken during the 2012, 2013 and 2017 breeding seasons. Table C-7 details survey dates and weather data recorded. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-7 Meteorological conditions during black grouse surveys at Tangy IV (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
25/04/2012	1	CS	0550	0730	All	4	NE	0	6	2	2	0	0
28/04/2012	1	CS	0610	0825	All	3	NE	0	3	2	2	0	0
20/05/2012	2	CS	0530	0730	All	5	S	0	5	2	2	0	0
22/05/2012	2	CS	0545	0725	All	3	SE	0	2	2	2	0	0
09/04/2013	3	CS	0540	0750	1	2	ESE	0	5	2	1	0	1
09/04/2013	3	CS	0540	0750	2	2	ESE	0	5	2	2	0	1
09/04/2013	3	CS	0540	0750	3	2	ESE	0	4	2	2	0	1
10/04/2013	3	CS	0550	0745	1	1	E	0	6	2	1	0	1
10/04/2013	3	CS	0550	0745	2	1	E	0	5	2	2	0	1
10/04/2013	3	CS	0550	0745	3	1	E	0	5	2	2	0	1
11/04/2013	3	CS	0535	0810	1	4	NE	0	8	1	0	0	1
11/04/2013	3	CS	0535	0810	2	4	NE	0	8	1	2	0	1
11/04/2013	3	CS	0535	0810	3	4	NE	0	8	1	2	0	1
01/05/2013	4	CS	0520	0740	1	4	SW	0	5	2	2	0	0
01/05/2013	4	CS	0520	0740	2	4	SW	1	7	2	2	0	0
01/05/2013	4	CS	0520	0740	3	4	SW	0	4	2	2	0	0
02/05/2013	4	CS	0530	0745	1	2	S	0	6	1	2	0	0
02/05/2013	4	CS	0530	0745	2	2	S	0	6	1	2	0	0
02/05/2013	4	CS	0530	0745	3	2	S	0	6	1	2	0	0
03/05/2013	4	CS	0535	0745	1	4	S	2	8	1	2	0	0
03/05/2013	4	CS	0535	0745	2	4	S	2	8	1	2	0	0
03/05/2013	4	CS	0535	0745	3	4	S	2	8	1	2	0	0
10/04/2017	5	CS	0530	0730	1	2	WNW	0	8	1	1	0	0
10/04/2017	5	CS	0530	0730	2	2	WNW	2	8	1	2	0	0
11/04/2017	5	CS	0530	0730	1	3	SW	0	8	1	1	0	0
11/04/2017	5	CS	0530	0730	2	3	SW	0	8	1	2	0	0
12/04/2017	5	CS	0525	0725	1	4	NW	0	8	1	1	0	0
12/04/2017	5	CS	0525	0725	2	4	NW	2	8	1	2	0	0
13/04/2017	5	CS	0525	0725	1	4	W	0	8	1	1	0	0
13/04/2017	5	CS	0525	0725	2	4	W	0	7	1	2	0	0
14/04/2017	5	CS	0520	0720	1	3	W	0	8	1	1	0	0
14/04/2017	5	CS	0520	0720	2	3	W	0	8	1	2	0	0
13/05/2017	6	CS	0410	0610	1	2	ESE	2	8	1	1	0	0
13/05/2017	6	CS	0410	0610	2	2	ESE	0	8	1	2	0	0
14/05/2017	6	CS	0410	0610	1	3	SSW	0	2	2	1	0	0
14/05/2017	6	CS	0410	0610	2	3	SSW	0	3	2	2	0	0
15/05/2017	6	CS	0415	0615	1	5	S	1	8	1	1	0	0
15/05/2017	6	CS	0415	0615	2	4	S	0	8	1	2	0	0

C.6 Goose Roost Surveys

Surveys for roosting geese were undertaken during the 2012/2013 and 2013/2014 non-breeding seasons. Table C-9 details survey effort and Table C-10 details weather data recorded. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-8 Summary of goose roost surveys undertaken at Tangy IV (sorted chronologically)

Date	Season	Observer	Survey Start	Survey Finish	Survey Hours
24/09/2012	NBR 2012/2013	HM	1400	1700	3
17/10/2012	NBR 2012/2013	HM	1700	1900	2
26/11/2012	NBR 2012/2013	HM	1100	1200	1
26/11/2012	NBR 2012/2013	HM	1710	1755	0.75
13/12/2012	NBR 2012/2013	HM	1610	1710	1
07/01/2013	NBR 2012/2013	HM	1530	1715	1.75
06/02/2013	NBR 2012/2013	HM	1115	1230	1.25
06/02/2013	NBR 2012/2013	HM	1115	1230	1.25
24/10/2013	NBR 2013/2014	HM	0630	0900	3.5
29/10/2013	NBR 2013/2014	HM	1620	1820	2
27/11/2013	NBR 2013/2014	HM	1615	1715	1
14/01/2014	NBR 2013/2014	HM	0745	0845	1
19/02/2014	NBR 2013/2014	HM	1700	1830	1.5

Table C-9 Meteorological conditions during goose roost surveys at Tangy IV (sorted chronologically)

Date	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
24/09/2012	HM	1400	1700	1	5	E	0	5	2	2	0	0
24/09/2012	HM	1400	1700	2	5	E	0	5	2	2	0	0
24/09/2012	HM	1400	1700	3	5	E	0	4	2	2	0	0
17/10/2012	HM	1700	1900	1	7	E	3	7	1	2	0	0
17/10/2012	HM	1700	1900	2	7	ENE	2	7	1	2	0	0
26/11/2012	HM	1100	1200	1	6	N	0	4	2	2	0	0
26/11/2012	HM	1710	1755	1	5	N	0	5	2	2	0	0
13/12/2012	HM	1610	1710	1	6	SE	0	5	2	2	0	0
07/01/2013	HM	1530	1715	2	2	S	0	8	0	0	0	0
07/01/2013	HM	1530	1715	1	2	S	0	8	0	1	0	0
07/01/2013	HM	1530	1715	2	2	S	0	8	0	0	0	0
06/02/2013	HM	1115	1230	1	6	NW	0	4	1	0	0	0
24/10/2013	HM	0630	0900	1	4	W	0	6	1	0	0	0
24/10/2013	HM	0630	0900	2	4	W	0	5	1	1	0	0
24/10/2013	HM	0630	0900	3	4	W	0	5	1	2	0	0
29/10/2013	HM	1620	1820	1	4	WNW	0	5	1	2	0	0
29/10/2013	HM	1620	1820	2	4	WNW	0	5	1	2	0	0
27/11/2013	HM	1615	1715	1	6	WNW	0	8	1	2	0	0
14/01/2014	HM	0745	0845	1	2	ESE	0	4	2	2	1	0
19/02/2014	HM	1700	1830	1	5	SE	1	8	0	0	0	0
19/02/2014	HM	1700	1830	2	5	SE	1	8	0	0	0	0

C.7 Woodland Point Count Surveys

Woodland point count surveys were undertaken during the 2012 breeding season and 2012/2013 non-breeding season. Table C-8 details survey dates and weather data recorded. Refer to Annex B for survey methodology and Annex D for survey results.

Table C-10 Meteorological conditions during woodland point count surveys at Tangy IV (sorted chronologically)

Date	Survey visit	Observer	Survey start time	Survey finish time	Survey hour	Wind speed	Wind direction	Rain	Cloud cover	Cloud height	Visibility	Frost	Snow
25/04/2012	BR 1	CS	0745	1050	All	4	NE	0	6	2	2	0	0
26/04/2012	BR 1	CS	0820	1130	All	5	NS	2	5	2	2	0	0
20/05/2012	BR 2	CS	0755	1045	All	3	S	0	5	2	2	0	0
21/05/2012	BR 2	CS	0705	1020	All	2	SE	0	1	2	2	0	0
13/06/2012	BR 3	CS	0635	0945	All	2	NE	0	4	2	2	0	0
14/06/2012	BR 3	CS	0620	0935	All	3	E	0	7	2	2	0	0
10/11/2012	NBR 1	CS	0920	1455	1	4	SW	0	7	2	2	0	0
10/11/2012	NBR 1	CS	0920	1455	2	4	SW	0	7	2	2	0	0
10/11/2012	NBR 1	CS	0920	1455	3	4	SW	0	6	2	2	0	0
10/11/2012	NBR 1	CS	0920	1455	4	4	SW	0	7	2	2	0	0
10/11/2012	NBR 1	CS	0920	1455	5	4	SW	0	7	2	2	0	0
10/11/2012	NBR 1	CS	0920	1455	6	4	SW	0	7	2	2	0	0
11/11/2012	NBR 1	CS	0935	1510	1	3	NW	0	3	2	2	0	0
11/11/2012	NBR 1	CS	0935	1510	2	3	NW	0	3	2	2	0	0
11/11/2012	NBR 1	CS	0935	1510	3	3	NW	0	3	2	2	0	0
11/11/2012	NBR 1	CS	0935	1510	4	3	NW	0	4	1	2	0	0
11/11/2012	NBR 1	CS	0935	1510	5	3	NW	0	4	1	2	0	0
11/11/2012	NBR 1	CS	0935	1510	6	3	NW	0	4	1	2	0	0
15/01/2013	NBR 2	CS	0945	1510	1	2	NE	0	5	2	2	1	0
15/01/2013	NBR 2	CS	0945	1510	2	2	NE	0	5	2	2	1	0
15/01/2013	NBR 2	CS	0945	1510	3	3	NE	0	4	2	2	1	0
15/01/2013	NBR 2	CS	0945	1510	4	3	NE	0	4	2	2	1	0
15/01/2013	NBR 2	CS	0945	1510	5	3	NE	0	4	2	2	1	0
15/01/2013	NBR 2	CS	0945	1510	5.5	3	NE	0	5	2	2	1	0
16/01/2013	NBR 2	CS	1005	1455	1	4	SE	1	8	1	2	1	0
16/01/2013	NBR 2	CS	1005	1455	2	4	SE	0	8	1	2	1	0
16/01/2013	NBR 2	CS	1005	1455	3	4	SE	0	8	1	2	1	0
16/01/2013	NBR 2	CS	1005	1455	4	4	SE	0	8	1	2	1	0
16/01/2013	NBR 2	CS	1005	1455	5	4	SE	0	8	1	2	1	0

ANNEX D ORNITHOLOGICAL SURVEY RESULTS

D.1 Flight Activity Records: Target Species

In accordance with SNH Guidance (2014), target species are those which may be considered to be at risk from the potential effects of wind farms. All flights of target species within the turbine area and the surrounding area were mapped and are detailed in Table D-1. Goose records in *italics* were only identified as grey goose – for the purposes of the collision modelling, they have been considered as both Greenland white-fronted goose and greylag goose.

Table D-1 Details of target species recorded during flight activity surveys (sorted by species)

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
26/10/2016	3	CS	1424	Barnacle goose	6	150	0.00	150.00	0.00	0.00	0.00
17/04/2017	3	CS	0947	Common sandpiper	1	5	0.00	0.00	5.00	0.00	0.00
17/04/2017	3	CS	1330	Common sandpiper	1	10	10.00	0.00	0.00	0.00	0.00
17/04/2017	3	CS	1517	Common sandpiper	1	5	5.00	0.00	0.00	0.00	0.00
11/05/2017	3	CS	1011	Common sandpiper	2	10	10.00	0.00	0.00	0.00	0.00
14/06/2017	3	CS	1007	Common sandpiper	1	10	10.00	0.00	0.00	0.00	0.00
14/06/2017	3	CS	1408	Common sandpiper	1	5	5.00	0.00	0.00	0.00	0.00
08/07/2017	3	CS	1031	Common sandpiper	1	5	5.00	0.00	0.00	0.00	0.00
08/07/2017	3	CS	1227	Common sandpiper	1	5	5.00	0.00	0.00	0.00	0.00
08/07/2017	3	CS	1525	Common sandpiper	1	5	5.00	0.00	0.00	0.00	0.00
28/05/2013	3	HM	0610	Curlew	1	75	75.00	0.00	0.00	0.00	0.00
18/06/2013	2	HM	1218	Curlew	1	90	90.00	0.00	0.00	0.00	0.00
02/03/2017	3	CS	0919	Curlew	1	20	20.00	0.00	0.00	0.00	0.00
02/03/2017	3	CS	1002	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
02/03/2017	3	CS	1331	Curlew	1	45	30.00	15.00	0.00	0.00	0.00
17/04/2017	3	CS	1051	Curlew	2	10	0.00	0.00	10.00	0.00	0.00
17/04/2017	3	CS	1431	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
17/04/2017	3	CS	1512	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
18/04/2017	2	CS	1359	Curlew	1	30	0.00	30.00	0.00	0.00	0.00
11/05/2017	3	CS	1126	Curlew	1	15	15.00	0.00	0.00	0.00	0.00
11/05/2017	3	CS	1209	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
11/05/2017	3	CS	1358	Curlew	1	20	20.00	0.00	0.00	0.00	0.00
11/05/2017	3	CS	1429	Curlew	1	5	5.00	0.00	0.00	0.00	0.00
11/05/2017	3	CS	1525	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
12/05/2017	2	CS	1327	Curlew	1	20	5.00	15.00	0.00	0.00	0.00
12/05/2017	2	CS	1452	Curlew	1	15	0.00	15.00	0.00	0.00	0.00
15/06/2017	2	CS	1138	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
15/06/2017	2	CS	1153	Curlew	1	10	10.00	0.00	0.00	0.00	0.00
15/06/2017	2	CS	1210	Curlew	1	5	5.00	0.00	0.00	0.00	0.00
15/06/2017	2	CS	1317	Curlew	2	240	0.00	75.00	165.00	0.00	0.00
15/06/2017	2	CS	1327	Curlew	2	75	0.00	45.00	30.00	0.00	0.00
15/06/2017	2	CS	1455	Curlew	1	20	0.00	20.00	0.00	0.00	0.00
18/04/2017	2	CS	1242	Golden eagle	1	420	0.00	0.00	0.00	0.00	420.00
18/10/2012	3	HM	0810	*Greenland white-fronted goose*	30	105	0.00	20.00	60.00	25.00	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
18/10/2012	3	HM	0818	*Greenland white-fronted goose*	200	135	0.00	25.71	77.14	32.14	0.00
18/10/2012	3	HM	0824	*Greenland white-fronted goose*	40	90	0.00	17.14	51.43	21.43	0.00
18/10/2012	3	HM	0850	*Greenland white-fronted goose*	7	105	0.00	20.00	60.00	25.00	0.00
11/12/2012	3	HM	0740	*Greenland white-fronted goose*	80	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0743	*Greenland white-fronted goose*	150	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0750	*Greenland white-fronted goose*	240	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0757	*Greenland white-fronted goose*	360	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0810	*Greenland white-fronted goose*	60	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0819	*Greenland white-fronted goose*	50	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0827	*Greenland white-fronted goose*	40	45	0.00	8.57	25.71	10.71	0.00
09/01/2013	3	HM	0822	*Greenland white-fronted goose*	50	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0826	*Greenland white-fronted goose*	26	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0832	*Greenland white-fronted goose*	400	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0833	*Greenland white-fronted goose*	60	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0838	*Greenland white-fronted goose*	15	90	0.00	17.14	51.43	21.43	0.00
06/02/2013	2	HM	1740	*Greenland white-fronted goose*	40	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1742	*Greenland white-fronted goose*	60	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1743	*Greenland white-fronted goose*	20	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1745	*Greenland white-fronted goose*	200	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1745	*Greenland white-fronted goose*	300	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1746	*Greenland white-fronted goose*	300	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1748	*Greenland white-fronted goose*	150	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1750	*Greenland white-fronted goose*	250	45	0.00	8.57	25.71	10.71	0.00
08/02/2013	3	HM	0740	*Greenland white-fronted goose*	40	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0741	*Greenland white-fronted goose*	200	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0741	*Greenland white-fronted goose*	30	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0743	*Greenland white-fronted goose*	350	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0745	*Greenland white-fronted goose*	400	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0747	*Greenland white-fronted goose*	60	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0750	*Greenland white-fronted goose*	250	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0751	*Greenland white-fronted goose*	120	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0810	*Greenland white-fronted goose*	100	45	0.00	0.00	0.00	9.00	36.00
12/03/2013	2	HM	0640	*Greenland white-fronted goose*	40	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0641	*Greenland white-fronted goose*	200	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0643	*Greenland white-fronted goose*	150	60	0.00	11.43	34.29	14.29	0.00
12/03/2013	2	HM	0646	*Greenland white-fronted goose*	300	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0647	*Greenland white-fronted goose*	240	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0649	*Greenland white-fronted goose*	80	60	0.00	11.43	34.29	14.29	0.00
12/03/2013	2	HM	0650	*Greenland white-fronted goose*	25	70	0.00	8.57	25.71	15.71	20.00
18/03/2013	3	HM	1840	*Greenland white-fronted goose*	40	25	0.00	4.76	14.29	5.95	0.00
18/03/2013	3	HM	1841	*Greenland white-fronted goose*	60	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1850	*Greenland white-fronted goose*	140	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1852	*Greenland white-fronted goose*	220	30	0.00	5.71	17.14	7.14	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
18/03/2013	3	HM	1853	*Greenland white-fronted goose*	30	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1855	*Greenland white-fronted goose*	15	30	0.00	5.71	17.14	7.14	0.00
21/03/2013	2	HM	1810	*Greenland white-fronted goose*	50	20	0.00	3.81	11.43	4.76	0.00
21/03/2013	2	HM	1815	*Greenland white-fronted goose*	20	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1818	*Greenland white-fronted goose*	150	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1822	*Greenland white-fronted goose*	250	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1823	*Greenland white-fronted goose*	300	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1824	*Greenland white-fronted goose*	25	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1826	*Greenland white-fronted goose*	250	25	0.00	4.76	14.29	5.95	0.00
16/10/2013	2	HM	0750	Greenland white-fronted goose	10	120	120.00	0.00	0.00	0.00	0.00
16/10/2013	2	HM	0810	Greenland white-fronted goose	150	180	0.00	34.29	102.86	42.86	0.00
16/10/2013	2	HM	0814	Greenland white-fronted goose	30	120	0.00	22.86	68.57	28.57	0.00
16/10/2013	2	HM	0820	Greenland white-fronted goose	50	120	0.00	22.86	68.57	28.57	0.00
04/11/2013	3	HM	1820	*Greenland white-fronted goose*	60	45	0.00	8.57	25.71	10.71	0.00
04/11/2013	3	HM	1820	*Greenland white-fronted goose*	120	45	0.00	8.57	25.71	10.71	0.00
04/11/2013	3	HM	1820	*Greenland white-fronted goose*	60	45	0.00	8.57	25.71	10.71	0.00
04/11/2013	3	HM	1820	*Greenland white-fronted goose*	50	45	0.00	8.57	25.71	10.71	0.00
26/10/2016	3	CS	0847	Greenland white-fronted goose	12	75	30.00	45.00	0.00	0.00	0.00
28/10/2016	2	CS	0826	Greenland white-fronted goose	160	135	15.00	45.00	45.00	30.00	0.00
10/11/2016	3	CS	1659	Greenland white-fronted goose	91	45	15.00	15.00	15.00	0.00	0.00
14/11/2016	2	WS	1616	Greenland white-fronted goose	27	65	50.00	15.00	0.00	0.00	0.00
14/11/2016	2	WS	1636	Greenland white-fronted goose	16	90	0.00	0.00	0.00	15.00	75.00
14/11/2016	2	WS	1658	Greenland white-fronted goose	35	60	30.00	30.00	0.00	0.00	0.00
29/11/2016	3	WS	1518	Greenland white-fronted goose	9	310	70.00	30.00	180.00	30.00	0.00
29/11/2016	3	WS	1547	Greenland white-fronted goose	47	180	60.00	60.00	60.00	0.00	0.00
29/11/2016	3	WS	1552	Greenland white-fronted goose	53	195	75.00	60.00	60.00	0.00	0.00
29/11/2016	3	WS	1614	Greenland white-fronted goose	8	90	30.00	30.00	30.00	0.00	0.00
29/11/2016	3	WS	1616	Greenland white-fronted goose	45	105	45.00	30.00	30.00	0.00	0.00
29/11/2016	3	WS	1621	Greenland white-fronted goose	23	80	20.00	30.00	30.00	0.00	0.00
29/11/2016	3	WS	1625	Greenland white-fronted goose	50	120	30.00	45.00	45.00	0.00	0.00
29/11/2016	3	WS	1632	Greenland white-fronted goose	40	90	15.00	15.00	60.00	0.00	0.00
29/11/2016	3	WS	1635	Greenland white-fronted goose	9	35	20.00	15.00	0.00	0.00	0.00
29/11/2016	3	WS	1640	Greenland white-fronted goose	250	160	25.00	60.00	75.00	0.00	0.00
29/11/2016	3	WS	1644	Greenland white-fronted goose	35	60	15.00	30.00	15.00	0.00	0.00
29/11/2016	3	WS	1645	Greenland white-fronted goose	9	16	1.00	15.00	0.00	0.00	0.00
02/12/2016	3	WS	0751	Greenland white-fronted goose	25	80	80.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0752	Greenland white-fronted goose	40	80	80.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0758	Greenland white-fronted goose	120	90	90.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0759	Greenland white-fronted goose	50	145	120.00	25.00	0.00	0.00	0.00
02/12/2016	3	WS	0800	Greenland white-fronted goose	20	125	0.00	0.00	0.00	125.00	0.00
02/12/2016	3	WS	0801	Greenland white-fronted goose	250	120	120.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0801	Greenland white-fronted goose	60	120	0.00	0.00	120.00	0.00	0.00
02/12/2016	3	WS	0802	Greenland white-fronted goose	30	75	75.00	0.00	0.00	0.00	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
02/12/2016	3	WS	0802	Greenland white-fronted goose	20	60	15.00	30.00	15.00	0.00	0.00
02/12/2016	3	WS	0804	Greenland white-fronted goose	400	150	150.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0806	Greenland white-fronted goose	20	85	85.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0808	Greenland white-fronted goose	20	85	85.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	1242	Greenland white-fronted goose	29	150	0.00	90.00	0.00	60.00	0.00
02/12/2016	3	WS	1248	Greenland white-fronted goose	3	125	0.00	0.00	0.00	0.00	125.00
02/12/2016	3	WS	1250	Greenland white-fronted goose	55	180	0.00	0.00	0.00	0.00	180.00
02/12/2016	3	WS		Greenland white-fronted goose	80	80	80.00	0.00	0.00	0.00	0.00
18/12/2016	2	WS	0755	Greenland white-fronted goose	50	30	30.00	0.00	0.00	0.00	0.00
18/12/2016	2	WS	0759	Greenland white-fronted goose	100	70	70.00	0.00	0.00	0.00	0.00
18/12/2016	2	WS	0805	Greenland white-fronted goose	250	160	75.00	45.00	40.00	0.00	0.00
18/12/2016	2	WS	0811	Greenland white-fronted goose	250	160	60.00	45.00	55.00	0.00	0.00
18/12/2016	2	WS	0821	Greenland white-fronted goose	200	120	75.00	45.00	0.00	0.00	0.00
18/12/2016	2	WS	0833	Greenland white-fronted goose	400	180	0.00	30.00	150.00	0.00	0.00
18/12/2016	2	WS	0846	Greenland white-fronted goose	200	180	0.00	180.00	0.00	0.00	0.00
01/01/2017	3	CS	1705	Greenland white-fronted goose	110	45	15.00	15.00	15.00	0.00	0.00
01/01/2017	3	CS	1708	Greenland white-fronted goose	60	45	15.00	15.00	15.00	0.00	0.00
01/01/2017	3	CS	1711	Greenland white-fronted goose	70	45	15.00	15.00	15.00	0.00	0.00
01/01/2017	3	CS	1713	Greenland white-fronted goose	130	45	15.00	15.00	15.00	0.00	0.00
01/01/2017	3	CS	1715	Greenland white-fronted goose	70	45	15.00	15.00	15.00	0.00	0.00
01/01/2017	3	CS	1718	Greenland white-fronted goose	810	45	15.00	15.00	15.00	0.00	0.00
04/01/2017	2	CS	0738	Greenland white-fronted goose	90	90	0.00	15.00	45.00	30.00	0.00
04/01/2017	2	CS	0751	Greenland white-fronted goose	730	90	0.00	15.00	45.00	30.00	0.00
04/01/2017	2	CS	0758	Greenland white-fronted goose	710	90	0.00	15.00	45.00	30.00	0.00
01/02/2017	2	CS	0732	Greenland white-fronted goose	80	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0733	Greenland white-fronted goose	90	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0736	Greenland white-fronted goose	470	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0740	Greenland white-fronted goose	650	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0746	Greenland white-fronted goose	230	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0748	Greenland white-fronted goose	75	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0750	Greenland white-fronted goose	220	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0754	Greenland white-fronted goose	120	105	15.00	15.00	15.00	60.00	0.00
01/02/2017	2	CS	0755	Greenland white-fronted goose	30	105	15.00	15.00	15.00	60.00	0.00
13/02/2017	3	CS	1757	Greenland white-fronted goose	23	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1759	Greenland white-fronted goose	11	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1801	Greenland white-fronted goose	9	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1803	Greenland white-fronted goose	6	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1808	Greenland white-fronted goose	30	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1813	Greenland white-fronted goose	55	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1816	Greenland white-fronted goose	20	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1818	Greenland white-fronted goose	70	45	15.00	15.00	15.00	0.00	0.00
13/02/2017	3	CS	1825	Greenland white-fronted goose	75	45	15.00	15.00	15.00	0.00	0.00
09/10/2017	3	CS	1219	Greenland white-fronted goose	24	120	30.00	30.00	60.00	0.00	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
09/10/2017	3	CS	1234	Greenland white-fronted goose	20	45	15.00	15.00	15.00	0.00	0.00
12/11/2017	3	CS	1453	Greenland white-fronted goose	1	210	0.00	0.00	210.00	0.00	0.00
18/10/2012	3	HM	0750	Greylag goose	4	30	30.00	0.00	0.00	0.00	0.00
18/10/2012	3	HM	0810	*Greylag goose*	30	105	0.00	20.00	60.00	25.00	0.00
18/10/2012	3	HM	0818	*Greylag goose*	200	135	0.00	25.71	77.14	32.14	0.00
18/10/2012	3	HM	0824	*Greylag goose*	40	90	0.00	17.14	51.43	21.43	0.00
18/10/2012	3	HM	0850	*Greylag goose*	7	105	0.00	20.00	60.00	25.00	0.00
11/12/2012	3	HM	0740	*Greylag goose*	80	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0743	*Greylag goose*	150	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0745	Greylag goose	5	45	45.00	0.00	0.00	0.00	0.00
11/12/2012	3	HM	0750	*Greylag goose*	240	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0757	*Greylag goose*	360	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0800	Greylag goose	23	60	60.00	0.00	0.00	0.00	0.00
11/12/2012	3	HM	0810	*Greylag goose*	60	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0819	*Greylag goose*	50	45	0.00	8.57	25.71	10.71	0.00
11/12/2012	3	HM	0820	Greylag goose	32	60	60.00	0.00	0.00	0.00	0.00
11/12/2012	3	HM	0827	*Greylag goose*	40	45	0.00	8.57	25.71	10.71	0.00
09/01/2013	3	HM	0822	*Greylag goose*	50	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0826	*Greylag goose*	26	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0832	*Greylag goose*	400	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0833	*Greylag goose*	60	90	0.00	17.14	51.43	21.43	0.00
09/01/2013	3	HM	0838	*Greylag goose*	15	90	0.00	17.14	51.43	21.43	0.00
06/02/2013	2	HM	1740	*Greylag goose*	40	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1742	*Greylag goose*	60	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1743	*Greylag goose*	20	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1745	*Greylag goose*	200	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1745	*Greylag goose*	300	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1746	*Greylag goose*	300	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1748	*Greylag goose*	150	45	0.00	8.57	25.71	10.71	0.00
06/02/2013	2	HM	1750	*Greylag goose*	250	45	0.00	8.57	25.71	10.71	0.00
08/02/2013	3	HM	0740	*Greylag goose*	40	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0741	*Greylag goose*	200	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0741	*Greylag goose*	30	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0743	*Greylag goose*	350	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0745	*Greylag goose*	400	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0747	*Greylag goose*	60	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0750	*Greylag goose*	250	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0751	*Greylag goose*	120	15	0.00	2.86	8.57	3.57	0.00
08/02/2013	3	HM	0810	*Greylag goose*	100	45	0.00	0.00	0.00	9.00	36.00
12/03/2013	2	HM	0640	*Greylag goose*	40	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0641	*Greylag goose*	200	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0643	*Greylag goose*	150	60	0.00	11.43	34.29	14.29	0.00
12/03/2013	2	HM	0646	*Greylag goose*	300	45	0.00	8.57	25.71	10.71	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
12/03/2013	2	HM	0647	*Greylag goose*	240	45	0.00	8.57	25.71	10.71	0.00
12/03/2013	2	HM	0649	*Greylag goose*	80	60	0.00	11.43	34.29	14.29	0.00
12/03/2013	2	HM	0650	*Greylag goose*	25	70	0.00	8.57	25.71	15.71	20.00
18/03/2013	3	HM	1840	*Greylag goose*	40	25	0.00	4.76	14.29	5.95	0.00
18/03/2013	3	HM	1841	*Greylag goose*	60	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1850	*Greylag goose*	140	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1852	*Greylag goose*	220	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1853	*Greylag goose*	30	30	0.00	5.71	17.14	7.14	0.00
18/03/2013	3	HM	1855	*Greylag goose*	15	30	0.00	5.71	17.14	7.14	0.00
21/03/2013	2	HM	1810	*Greylag goose*	50	20	0.00	3.81	11.43	4.76	0.00
21/03/2013	2	HM	1815	*Greylag goose*	20	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1818	*Greylag goose*	150	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1822	*Greylag goose*	250	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1823	*Greylag goose*	300	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1824	*Greylag goose*	25	25	0.00	4.76	14.29	5.95	0.00
21/03/2013	2	HM	1826	*Greylag goose*	250	25	0.00	4.76	14.29	5.95	0.00
16/10/2013	2	HM	0747	Greylag goose	50	60	60.00	0.00	0.00	0.00	0.00
04/11/2013	3	HM	1820	*Greylag goose*	60	45	0.00	8.57	25.71	10.71	0.00
04/11/2013	3	HM	1820	*Greylag goose*	120	45	0.00	8.57	25.71	10.71	0.00
04/11/2013	3	HM	1820	*Greylag goose*	60	45	0.00	8.57	25.71	10.71	0.00
04/11/2013	3	HM	1820	*Greylag goose*	50	45	0.00	8.57	25.71	10.71	0.00
10/12/2013	3	HM	0805	Greylag goose	8	45	30.00	2.86	8.57	3.57	0.00
24/10/2016	2	CS	1014	Greylag goose	6	120	0.00	0.00	0.00	120.00	0.00
25/10/2016	3	CS	0958	Greylag goose	11	150	15.00	45.00	60.00	30.00	0.00
26/10/2016	3	CS	847	Greylag goose	13	75	30.00	45.00	0.00	0.00	0.00
26/10/2016	3	CS	0853	Greylag goose	120	75	30.00	45.00	0.00	0.00	0.00
26/10/2016	3	CS	0859	Greylag goose	38	75	30.00	45.00	0.00	0.00	0.00
27/10/2016	1	CS	1201	Greylag goose	27	60	0.00	60.00	0.00	0.00	0.00
27/10/2016	1	CS	1203	Greylag goose	115	135	0.00	0.00	90.00	45.00	0.00
27/10/2016	1	CS	1221	Greylag goose	16	105	0.00	0.00	75.00	30.00	0.00
27/10/2016	1	CS	1441	Greylag goose	32	90	0.00	0.00	90.00	0.00	0.00
28/10/2016	2	CS	0803	Greylag goose	92	135	75.00	60.00	0.00	0.00	0.00
28/10/2016	2	CS	0833	Greylag goose	37	150	15.00	0.00	105.00	30.00	0.00
28/10/2016	2	CS	0847	Greylag goose	31	120	0.00	45.00	75.00	0.00	0.00
28/10/2016	2	CS	0851	Greylag goose	28	135	30.00	30.00	75.00	0.00	0.00
28/10/2016	2	CS	0856	Greylag goose	9	120	0.00	45.00	30.00	45.00	0.00
28/10/2016	2	CS	0859	Greylag goose	5	135	0.00	0.00	135.00	0.00	0.00
23/11/2016	1	WS	1411	Greylag goose	1	50	0.00	0.00	50.00	0.00	0.00
02/12/2016	3	WS	0814	Greylag goose	22	165	0.00	0.00	0.00	165.00	0.00
02/12/2016	3	WS	0904	Greylag goose	3	120	0.00	0.00	0.00	120.00	0.00
18/12/2016	2	WS	0818	Greylag goose	17	160	160.00	0.00	0.00	0.00	0.00
01/02/2017	2	CS	0753	Greylag goose	45	75	15.00	30.00	30.00	0.00	0.00
01/02/2017	2	CS	0758	Greylag goose	62	75	15.00	15.00	45.00	0.00	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
17/02/2017	1	CS	1147	Greylag goose	31	45	0.00	0.00	45.00	0.00	0.00
09/10/2017	3	CS	1220	Greylag goose	62	180	0.00	0.00	180.00	0.00	0.00
11/11/2017	1	CS	1133	Greylag goose	8	20	0.00	0.00	20.00	0.00	0.00
12/11/2017	3	CS	1148	Greylag goose	37	195	0.00	0.00	195.00	0.00	0.00
12/11/2017	3	CS	1312	Greylag goose	14	135	30.00	30.00	75.00	0.00	0.00
12/11/2017	3	CS	1428	Greylag goose	8	60	15.00	0.00	45.00	0.00	0.00
12/11/2017	3	CS	1502	Greylag goose	8	90	30.00	30.00	30.00	0.00	0.00
13/11/2017	2	CS	1504	Greylag goose	26	150	45.00	45.00	60.00	0.00	0.00
14/11/2017	3	CS	1103	Greylag goose	125	45	15.00	15.00	15.00	0.00	0.00
14/11/2017	3	CS	1303	Greylag goose	9	45	15.00	15.00	15.00	0.00	0.00
14/11/2017	3	CS	1320	Greylag goose	379	600	45.00	30.00	345.00	180.00	0.00
14/11/2017	3	CS	1335	Greylag goose	95	165	0.00	0.00	0.00	165.00	0.00
14/11/2017	3	CS	1340	Greylag goose	95	120	0.00	0.00	0.00	120.00	0.00
14/11/2017	3	CS	1340	Greylag goose	12	120	0.00	0.00	0.00	120.00	0.00
14/11/2017	3	CS	1401	Greylag goose	3	45	15.00	15.00	15.00	0.00	0.00
18/11/2017	2	CS	1138	Greylag goose	2	165	0.00	0.00	45.00	120.00	0.00
24/05/2012	2	HM	1542	Hen harrier	1	1080	1080.00	0.00	0.00	0.00	0.00
17/09/2012	1	HM	1430	Hen harrier	1	60	60.00	0.00	0.00	0.00	0.00
17/09/2012	1	HM	1601	Hen harrier	1	120	120.00	0.00	0.00	0.00	0.00
21/03/2013	1	HM	1411	Hen harrier	1	80	80.00	0.00	0.00	0.00	0.00
22/04/2013	1	CB	1707	Hen harrier	1	7	7.00	0.00	0.00	0.00	0.00
22/04/2013	1	CB	1944	Hen harrier	1	13	13.00	0.00	0.00	0.00	0.00
10/07/2013	2	HM	1050	Hen harrier	1	60	60.00	0.00	0.00	0.00	0.00
07/08/2013	1	HM	1538	Hen harrier	1	120	120.00	0.00	0.00	0.00	0.00
12/08/2013	3	HM	1016	Hen harrier	1	30	30.00	0.00	0.00	0.00	0.00
23/09/2013	2	HM	1525	Hen harrier	1	20	20.00	0.00	0.00	0.00	0.00
24/09/2013	3	HM	1052	Hen harrier	1	45	45.00	0.00	0.00	0.00	0.00
21/10/2013	3	HM	1810	Hen harrier	1	30	30.00	0.00	0.00	0.00	0.00
29/10/2013	1	HM	1450	Hen harrier	1	120	120.00	0.00	0.00	0.00	0.00
29/10/2013	1	HM	1530	Hen harrier	1	90	90.00	0.00	0.00	0.00	0.00
02/12/2013	1	HM	0940	Hen harrier	1	20	30.00	0.00	0.00	0.00	0.00
04/02/2014	1	HM	1233	Hen harrier	1	30	60.00	0.00	0.00	0.00	0.00
12/03/2014	2	HM	1430	Hen harrier	1	50	45.00	0.00	0.00	0.00	0.00
10/11/2016	3	CS	1544	Hen harrier	1	345	345.00	0.00	0.00	0.00	0.00
11/11/2016	2	CS	1315	Hen harrier	1	30	30.00	0.00	0.00	0.00	0.00
02/12/2016	3	WS	0758	Hen harrier	1	110	0.00	110.00	0.00	0.00	0.00
12/12/2016	1	WS	1322	Hen harrier	1	168	168.00	0.00	0.00	0.00	0.00
05/08/2017	3	CS	1304	Hen harrier	1	10	0.00	10.00	0.00	0.00	0.00
17/09/2017	1	CS	1204	Hen harrier	1	105	0.00	45.00	60.00	0.00	0.00
08/10/2017	2	CS	1153	Hen harrier	1	255	210.00	45.00	0.00	0.00	0.00
30/04/2012	1	MT	1327	Herring gull	3	20	0.00	3.81	11.43	4.76	0.00
30/04/2012	1	MT	1330	Herring gull	10	30	0.00	5.71	17.14	7.14	0.00
29/05/2012	1	MT	1018	Herring gull	3	60	0.00	0.00	0.00	12.00	48.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
05/07/2012	1	HM	0638	Herring gull	1	30	30.00	0.00	0.00	0.00	0.00
11/07/2012	3	HM	1654	Herring gull	40	10	10.00	0.00	0.00	0.00	0.00
11/07/2012	3	HM	1706	Herring gull	40	240	45.00	37.14	111.43	46.43	0.00
18/07/2012	3	HM	0917	Herring gull	2	25	25.00	0.00	0.00	0.00	0.00
18/07/2012	3	HM	0922	Herring gull	11	30	30.00	0.00	0.00	0.00	0.00
16/08/2012	1	CS	1104	Herring gull	21	80	40.00	7.62	22.86	9.52	0.00
16/08/2012	1	CS	1311	Herring gull	3	45	45.00	0.00	0.00	0.00	0.00
16/08/2012	1	CS	1354	Herring gull	3	15	15.00	0.00	0.00	0.00	0.00
21/08/2012	1	CS	1522	Herring gull	1	35	0.00	0.00	0.00	7.00	28.00
21/08/2012	3	HM	1525	Herring gull	1	150	0.00	28.57	85.71	35.71	0.00
21/08/2012	3	HM	1630	Herring gull	16	180	0.00	34.29	102.86	42.86	0.00
22/08/2012	3	HM	1448	Herring gull	1	180	180.00	0.00	0.00	0.00	0.00
22/08/2012	3	HM	1548	Herring gull	1	120	15.00	20.00	60.00	25.00	0.00
07/01/2013	2	HM	1256	Herring gull	1	40	40.00	0.00	0.00	0.00	0.00
10/05/2013	3	CB	1255	Herring gull	1	2	2.00	0.00	0.00	0.00	0.00
10/05/2013	3	CB	1310	Herring gull	3	11	11.00	0.00	0.00	0.00	0.00
13/05/2013	2	HM	?	Herring gull	1	45	30.00	2.86	8.57	3.57	0.00
20/05/2013	2	HM	1530	Herring gull	1	20	0.00	3.81	11.43	4.76	0.00
20/05/2013	2	HM	1545	Herring gull	2	60	0.00	11.43	34.29	14.29	0.00
10/06/2013	1	HM	0935	Herring gull	2	30	30.00	0.00	0.00	0.00	0.00
10/06/2013	1	HM	1038	Herring gull	4	30	30.00	0.00	0.00	0.00	0.00
18/06/2013	2	HM	1251	Herring gull	2	45	0.00	8.57	25.71	10.71	0.00
08/07/2013	2	HM	0935	Herring gull	1	60	60.00	0.00	0.00	0.00	0.00
08/07/2013	2	HM	0935	Herring gull	1	60	60.00	0.00	0.00	0.00	0.00
14/11/2016	2	WS	1616	Herring gull	95	180	180.00	0.00	0.00	0.00	0.00
12/12/2016	1	WS	1305	Herring gull	1	18	18.00	0.00	0.00	0.00	0.00
17/02/2017	1	CS	1301	Herring gull	17	30	0.00	30.00	0.00	0.00	0.00
06/03/2017	1	CS	1421	Herring gull	24	25	0.00	25.00	0.00	0.00	0.00
09/05/2017	1	CS	1027	Herring gull	1	30	0.00	30.00	0.00	0.00	0.00
09/05/2017	1	CS	1414	Herring gull	4	15	0.00	15.00	0.00	0.00	0.00
09/05/2017	1	CS	1526	Herring gull	9	25	15.00	10.00	0.00	0.00	0.00
16/06/2017	1	CS	1430	Herring gull	1	15	0.00	15.00	0.00	0.00	0.00
16/06/2017	1	CS	1433	Herring gull	5	15	0.00	15.00	0.00	0.00	0.00
06/07/2017	2	CS	1126	Herring gull	3	45	0.00	45.00	0.00	0.00	0.00
06/07/2017	2	CS	1155	Herring gull	5	45	0.00	30.00	15.00	0.00	0.00
07/07/2017	1	CS	1438	Herring gull	2	10	10.00	0.00	0.00	0.00	0.00
08/07/2017	3	CS	1116	Herring gull	1	25	10.00	15.00	0.00	0.00	0.00
08/07/2017	3	CS	1443	Herring gull	1	30	15.00	15.00	0.00	0.00	0.00
15/08/2017	1	CS	1521	Herring gull	4	15	15.00	0.00	0.00	0.00	0.00
30/04/2012	3	HM	1312	Merlin	1	30	30.00	0.00	0.00	0.00	0.00
17/09/2012	1	HM	1614	Merlin	1	30	30.00	0.00	0.00	0.00	0.00
16/10/2012	1	HM	1015	Merlin	1	10	10.00	0.00	0.00	0.00	0.00
16/10/2012	1	HM	1105	Merlin	1	70	70.00	0.00	0.00	0.00	0.00

Date	VP	Observer	Flight start time	Species	No. of birds	Duration (s)	Seconds per height band				
							0-20m	21-40m	41-100m	101-150m	>150m
16/10/2012	1	HM	1150	Merlin	1	120	120.00	0.00	0.00	0.00	0.00
21/03/2013	1	HM	1310	Merlin	1	12	12.00	0.00	0.00	0.00	0.00
17/05/2013	1	HM	1315	Merlin	1	20	20.00	0.00	0.00	0.00	0.00
25/11/2013	1	HM	0929	Merlin	1	30	30.00	0.00	0.00	0.00	0.00
13/05/2013	2	HM	0800	Oystercatcher	2	45	30.00	2.86	8.57	3.57	0.00
20/03/2014	3	HM	1450	Oystercatcher	2	30	30.00	0.00	0.00	0.00	0.00
09/10/2012	2	HM	1040	Peregrine falcon	1	25	25.00	0.00	0.00	0.00	0.00
12/03/2013	2	HM	0655	Peregrine falcon	1	10	10.00	0.00	0.00	0.00	0.00
18/12/2016	2	WS	1109	Peregrine falcon	1	5	5.00	0.00	0.00	0.00	0.00
11/05/2017	3	CS	1317	Peregrine falcon	1	465	0.00	0.00	30.00	90.00	345.00
15/06/2017	2	CS	1321	Peregrine falcon	1	105	0.00	0.00	105.00	0.00	0.00
02/03/2017	3	CS	1456	Red-throated diver	1	75	15.00	15.00	30.00	15.00	0.00
23/11/2016	1	WS	1500	Snipe	2	240	75.00	165.00	0.00	0.00	0.00
01/01/2017	3	CS	1241	Snipe	1	15	15.00	0.00	0.00	0.00	0.00
17/04/2017	3	CS	1018	Snipe	1	5	0.00	0.00	5.00	0.00	0.00
27/11/2013	2	HM	1357	Whooper swan	1	120	15.00	20.00	60.00	25.00	0.00
13/02/2017	3	CS	1815	Woodcock	1	5	5.00	0.00	0.00	0.00	0.00

D.2 Flight Activity Records: Secondary Species

Table D-2 details secondary species recorded per season during flight activity surveys. Secondary species were recorded to give an indication of the use of the site by these species. Refer to Annex B for survey methodology and Annex C for weather data.

Table D-2 Summary of secondary species recorded during flight activity surveys

Species	2012 breeding season		2012/2013 non-breeding season		2013 breeding season		2013/2014 non-breeding season		2016/2017 non-breeding season		2017 breeding season		2017/2018 non-breeding season	
	No. of records	No. of birds	No. of records	No. of birds	No. of records	No. of birds	No. of records	No. of birds	No. of records	No. of birds	No. of records	No. of birds	No. of records	No. of birds
Buzzard	26	41	6	7	17	21	12	17	32	43	58	62	54	57
Canada goose	10	78	1	2	2	10	2	33	20	504	7	110	2	82
Carrion crow	1	1							1	34				
Common gull	5	13			5	13					14	77		
Cormorant	2	2												
Corvus species[1]									3	300				
Goldeneye									4	16	1	1		
Great black-backed gull	4	9			5	8			2	4	13	26		
Grey heron			1	1			3	3	3	3	6	6	7	7
Hooded crow	24	49					1	9	20	92				
Jackdaw									1	33				
Kestrel	3	3	3	3			1	1	25	25	5	5	26	27
Lesser black-backed gull	4	5	1	2	2	3					6	22		
Mallard							2	7	3	12	6	35	3	25
Pochard													1	1
Raven	18	85	6	17	2	2	25	64	54	87	28	49	19	27
Rook	1	200							10	332				
Snipe			1	1			4	11						
Sparrowhawk	1	1			1	1	2	2	6	6	6	6	4	4
Teal									4	16	5	30	1	2
Tufted duck									4	28	5	26	4	20
Wigeon									7	355	1	114	3	200
Woodcock							1	1						

[1] Mixed flocks of carrion crow, jackdaw and rook.

D.3 Moorland Breeding Bird Records

Moorland breeding bird surveys were undertaken during the 2012 and 2017 breeding seasons and focussed on recording activity of upland wader species within the survey area (Table D-3). Survey methodology is detailed in Annex B and survey timing/weather conditions in Annex C.

Table D-3 Wader activity recorded during moorland breeding bird surveys

Date	Observer	Species	Number recorded	Notes
27-29/04/2012	CS	Oystercatcher	2	At nest
27-29/04/2012	CS	Curlew	4	Singing in flight
22-24/05/2012	CS	Curlew	2	Singing in flight
22-24/05/2012	CS	Oystercatcher	3	Nest plus individual
16-18/06/2012	CS	Curlew	3	Pair and individual in flight and calling
16-18/06/2012	CS	Common sandpiper	2	Calling in flight at edge of loch
16-18/06/2012	CS	Oystercatcher	2	At nest
03-05/07/2012	CS	Curlew	2	At nest
15/04/2017	CS	Common sandpiper	1	
15/04/2017	CS	Curlew	2	Calling
15/04/2017	CS	Snipe	1	
16/04/2017	CS	Curlew	2	
18/05/2017	CS	Curlew	2	In flight
19/05/2017	CS	Curlew	2	
20/05/2017	CS	Common sandpiper	2	
20/05/2017	CS	Curlew	2	Took flight, calling
02/06/2017	CS	Common sandpiper	2	In flight
02/06/2017	CS	Common sandpiper	4	In flight
05/06/2017	CS	Curlew	2	

Date	Observer	Species	Number recorded	Notes
06/06/2017	CS	Curlew	2	
05/07/2017	CS	Common sandpiper	2	
05/07/2017	CS	Common sandpiper	6	
07/08/2017	CS	Common sandpiper	2	
07/08/2017	CS	Common sandpiper	4	

D.4 Winter Walkover Records

Table D-4 details all the species recorded. Refer to Annex B for survey methodology and Annex C for weather data.

Table D-4 Winter walkover survey records: number of birds recorded per month

Species	2012/2013 non-breeding season			2016/2017 non-breeding season		
	November 2012	January 2013	February 2013	November 2016	January 2017	February 2017
Blackbird	6	-	-	9	-	1
Blue tit	-	-	-	3	-	-
Buzzard	3	3	5	6	5	4
Canada goose	-	-	16	-	-	13
Carrion crow	-	-	-	-	9	15
Chaffinch	1	3	-	20	-	-
Chiffchaff	3	-	-	-	-	-
Coal tit	-	-	-	23	-	-
Common gull	-	11	-	-	8	2
Dunnock	-	-	-	6	-	-
Fieldfare	64	11				8
Goldcrest	-	-	-	4	-	-
Golden plover	-	-	-	4	-	-
Goldeneye	-	1	5	5	9	5
Great black-backed gull	-	-	3	-	3	2
Great tit	-	-	-	4	-	-
Grey heron	1	-	-	1	3	-
Grey wagtail	-	-	1	-	-	-
Greylag goose	-	-	24	-	-	-
Hen harrier	-	-	1	-	-	-
Herring gull	-	41	-	21	82	22
Hooded crow	14	20	18	37	61	34
Jackdaw	50	18	84	22	45	88
Kestrel	1	-	-	-	1	1
Mallard	1	6	9	-	8	6
Meadow pipit	3	14	5	-	17	2
Mistle thrush	-	2	-	-	9	6
Pied wagtail	-	-	-	6	-	-
Raven	1	-	8	16	9	1
Redwing	88	13	-	15	18	-

Species	2012/2013 non-breeding season November 2012	January 2013	February 2013	2016/2017 non-breeding season November 2016	January 2017	February 2017
Reed bunting	-	1	2	-	5	2
Robin	-	-	-	28	-	1
Rook	208	289	56	85	146	67
Skylark	-	-	5	-	2	-
Snipe	-	-	-	3	-	-
Song thrush	3	1	4	6	3	1
Sparrowhawk	1	-	-	1	-	1
Starling	-	19	-	263	285	57
Stock dove	-	-	8	-	-	-
Stonechat	-	3	4	9	5	2
Tufted duck	-	-	-	-	3	13
Twite	-	-	-	10	-	-
Wigeon	-	-	-	-	17	9
Woodcock	-	-	-	2	-	-
Woodpigeon	-	-	2	-	-	6
Wren	3	1	1	26	5	2

D.5 Scarce Breeding Bird Records

Table D-5 details all records of raptors, divers and owls recording during surveys, however only Annex 1[2] or Schedule 1[3] species are considered to be scarce breeding birds (i.e. target species). Refer to Annex B for survey methodology, Annex C for weather data and Confidential Figure 9.23 for confidential data relating to osprey.

Table D-5 Raptor, owl and diver records: 2012, 2012/2013, 2013, 2016/2017 and 2017

Date	Species	Protection status	Number recorded	Age/sex	Notes
24-29/04/2012	Buzzard	BoCC[4] Green	8	-	Total records across all survey days
24-29/04/2012	Kestrel	BoCC Amber	2	-	Total records across all survey days
24/04/2012	Sparrowhawk	BoCC Green	1	-	
24/04/2012	Short-eared owl	Annex 1, BoCC Amber	1	-	
21/05/2012	Buzzard	BoCC Green	3	-	
21/05/2012	Kestrel	BoCC Amber	1	-	
21/05/2012	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Male	
23/05/2012	Buzzard	BoCC Green	9	-	One pair
24/05/2012	Buzzard	BoCC Green	4	-	
16/06/2012	Buzzard	BoCC Green	1	-	
16/06/2012	Kestrel	BoCC Amber	1	-	
17/06/2012	Buzzard	BoCC Green	1	-	
18/06/2012	Buzzard	BoCC Green	2	-	
03/07/2012	Buzzard	BoCC Green	2	-	
05/07/2012	Buzzard	BoCC Green	4	-	
15,17,18/08/2012	Buzzard	BoCC Green	22	-	11 pairs
15,17,18/08/2012	Kestrel	BoCC Amber	4	-	One pair

[2] Annex 1 of the EU Bird Directive
[3] Schedule 1 of the Wildlife and Countryside Act 1981, as amended by the Nature Conservation Act (Scotland) 2004
[4] BoCC – Birds of Conservation Concern (Eaton *et al.* 2015)

Date	Species	Protection status	Number recorded	Age/sex	Notes
15,17,18/08/2012	Sparrowhawk	BoCC Green	4	-	One pair
09/04/2013	Kestrel	BoCC Amber	1	-	
10/04/2013	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Male	
11/04/2013	Merlin	Annex 1, Schedule 1, BoCC Red	1	-	
09/04/2013	Sparrowhawk	BoCC Green	1	-	
09/04/2013	Buzzard	BoCC Green	4	-	
10/04/2013	Buzzard	BoCC Green	3	-	
11/04/2013	Buzzard	BoCC Green	4	-	
01/05/2013	Kestrel	BoCC Amber	1	-	
01/05/2013	Buzzard	BoCC Green	1	-	
02/05/2013	Buzzard	BoCC Green	3	-	
02/05/2013	Sparrowhawk	BoCC Green	1	Male	
03/05/2013	Buzzard	BoCC Green	4	-	
04/06/2013	Kestrel	BoCC Amber	1	-	
03/06/2013	Buzzard	BoCC Green	4	-	
04/06/2013	Buzzard	BoCC Green	2	-	
05/06/2013	Buzzard	BoCC Green	2	-	
05/06/2013	Sparrowhawk	BoCC Green	1	-	
14/07/2013	Buzzard	BoCC Green	3	-	
14/07/2013	Sparrowhawk	BoCC Green	1	-	
15/07/2013	Buzzard	BoCC Green	2	-	
19/07/2013	Buzzard	BoCC Green	4	-	
03/08/2013	Peregrine falcon	Annex 1, Schedule 1, BoCC Green	1	Juvenile	
03/08/2013	Buzzard	BoCC Green	9	-	
04/08/2013	Buzzard	BoCC Green	3	-	
05/08/2013	Buzzard	BoCC Green	3	-	
05/08/2013	Sparrowhawk	BoCC Green	1	-	
23/11/2016	Barn owl	Schedule 1, BoCC Green	1	-	
23/11/2016	Barn owl	Schedule 1, BoCC Green	1	-	

Date	Species	Protection status	Number recorded	Age/sex	Notes
26/01/2017	Barn owl	Schedule 1, BoCC Green	Checks undertaken for barn owl - none found		
26/01/2017	Kestrel	BoCC Amber	1	-	Hunting
26/01/2017	Kestrel	BoCC Amber	1	-	In flight
26/01/2017	Kestrel	BoCC Amber	1	-	In flight
26/01/2017	Peregrine falcon	Annex 1, Schedule 1, BoCC Green	1	-	In flight
02/03/2017	Red-throated diver	Annex 1, Schedule 1, BoCC Green	1	-	On Tangy loch (0840 - 1456)
10/04/2017	Buzzard	BoCC Green	1	-	
10/04/2017	Buzzard	BoCC Green	2	-	
10/04/2017	Kestrel	BoCC Amber	1	-	
11/04/2017	Buzzard	BoCC Green	1	-	
11/04/2017	Buzzard	BoCC Green	1	-	
11/04/2017	Buzzard	BoCC Green	2	-	
11/04/2017	Buzzard	BoCC Green	2	-	
11/04/2017	Hen harrier	Annex 1, Schedule 1, BoCC Red	2	Male/Female	Displaying
11/04/2017	Sparrowhawk	BoCC Green	1	-	
11/04/2017	Sparrowhawk	BoCC Green	1	-	
12/04/2017	Buzzard	BoCC Green	1	-	
12/04/2017	Buzzard	BoCC Green	1	-	
12/04/2017	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Male	Displaying
12/04/2017	Osprey	Annex 1, Schedule 1, BoCC Amber	1	-	Carrying fish
13/04/2017	Buzzard	BoCC Green	1	-	
13/04/2017	Buzzard	BoCC Green	1	-	
13/04/2017	Kestrel	BoCC Amber	1	-	
13/04/2017	Sparrowhawk	BoCC Green	1	-	
14/04/2017	Buzzard	BoCC Green	2	-	
15/04/2017	Buzzard	BoCC Green	1	-	
16/04/2017	Buzzard	BoCC Green	1	-	
16/04/2017	Buzzard	BoCC Green	1	-	
13/05/2017	Buzzard	BoCC Green	1	-	

Date	Species	Protection status	Number recorded	Age/sex	Notes
13/05/2017	Sparrowhawk	BoCC Green	1	-	Male
14/05/2017	Buzzard	BoCC Green	1	-	
14/05/2017	Kestrel	BoCC Amber	1	-	
15/05/2017	Buzzard	BoCC Green	1	-	
15/05/2017	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Male	
15/05/2017	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Female	
15/05/2017	Osprey	Annex 1, Schedule 1, BoCC Amber	1	-	
15/05/2017	Sparrowhawk	BoCC Green	1	-	
16/05/2017	Buzzard	BoCC Green	1	-	
16/05/2017	Buzzard	BoCC Green	1	-	
16/05/2017	Buzzard	BoCC Green	1	-	
16/05/2017	Buzzard	BoCC Green	2	-	
16/05/2017	Peregrine falcon	Annex 1, Schedule 1, BoCC Green	1	Male	
17/05/2017	Buzzard	BoCC Green	1	-	
17/05/2017	Kestrel	BoCC Amber	1	-	
18/05/2017	Buzzard	BoCC Green	1	-	In flight
20/05/2017	Buzzard	BoCC Green	1	-	In flight
01/06/2017	Buzzard	BoCC Green	1	-	In flight
01/06/2017	Buzzard	BoCC Green	1	-	In flight
01/06/2017	Kestrel	BoCC Amber	1	-	In flight
02/06/2017	Buzzard	BoCC Green	1	-	In flight
02/06/2017	Buzzard	BoCC Green	1	-	In flight
02/06/2017	Buzzard	BoCC Green	1	-	In flight
02/06/2017	Buzzard	BoCC Green	2	-	In flight
02/06/2017	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Male	in flight
02/06/2017	Osprey	Annex 1, Schedule 1, BoCC Amber	1	-	In flight
02/06/2017	Red-throated diver	Annex 1, Schedule 1, BoCC Green	1	-	In flight
02/06/2017	Sparrowhawk	BoCC Green	1	-	In flight
03/06/2017	Buzzard	BoCC Green	1	-	In flight

Date	Species	Protection status	Number recorde d	Age/sex	Notes
03/06/2017	Buzzard	BoCC Green	1	-	In flight
03/06/2017	Buzzard	BoCC Green	1	-	In flight
03/06/2017	Buzzard	BoCC Green	1	-	In flight
03/06/2017	Kestrel	BoCC Amber	1	-	In flight
03/06/2017	Peregrine falcon	Annex 1, Schedule 1, BoCC Green	1	-	In flight
05/06/2017	Buzzard	BoCC Green	1	-	In flight
06/06/2017	Buzzard	BoCC Green	1	-	In flight
04/07/2017	Buzzard	BoCC Green	1	-	
04/07/2017	Buzzard	BoCC Green	1	-	In flight
04/07/2017	Buzzard	BoCC Green	1	-	In flight
04/07/2017	Kestrel	BoCC Amber	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	1	-	In flight
05/07/2017	Buzzard	BoCC Green	2	-	In flight
05/07/2017	Buzzard	BoCC Green	3	-	In flight
06/08/2017	Buzzard	BoCC Green	1	-	
06/08/2017	Buzzard	BoCC Green	1	-	
06/08/2017	Buzzard	BoCC Green	1	-	
06/08/2017	Buzzard	BoCC Green	1	-	
06/08/2017	Buzzard	BoCC Green	1	-	
06/08/2017	Buzzard	BoCC Green	2	-	
06/08/2017	Buzzard	BoCC Green	2	-	
07/08/2017	Buzzard	BoCC Green	1	-	Flying to north west of Lussa Loch
07/08/2017	Buzzard	BoCC Green	1	-	Flying to west of Lussa Loch
07/08/2017	Buzzard	BoCC Green	1	-	Flying to east of Lussa Loch
07/08/2017	Buzzard	BoCC Green	1	-	Flying to west of Skeroblin Cruach
07/08/2017	Buzzard	BoCC Green	2	-	Flying up western shore of Lussa Loch

Date	Species	Protection status	Number recorded	Age/sex	Notes
07/08/2017	Hen harrier	Annex 1, Schedule 1, BoCC Red	1	Female	
07/08/2017	Kestrel	BoCC Amber	1	-	
07/08/2017	Sparrowhawk	BoCC Green	1	-	

D.6 Black Grouse Records

Table D-6 details all black grouse records with lek numbers indicated where appropriate. Refer to Annex B for survey methodology and Annex C for weather data.

Table D-6 Black grouse activity records: 2012, 2013 and 2017

Date	Observer	Survey visit	Lek no.	No. males	No. Females
25/04/2012	CS	1	No black grouse/signs of black grouse recorded		
28/04/2012	CS	1	No black grouse/signs of black grouse recorded		
20/05/2012	CS	2	No black grouse/signs of black grouse recorded		
22/05/2012	CS	2	No black grouse/signs of black grouse recorded		
09/04/2013	CS	3	No black grouse/signs of black grouse recorded		
10/04/2013	CS	3	No black grouse/signs of black grouse recorded		
11/04/2013	CS	3	No black grouse/signs of black grouse recorded		
01/05/2013	CS	4	No black grouse/signs of black grouse recorded		
02/05/2013	CS	4	No black grouse/signs of black grouse recorded		
03/05/2013	CS	4	No black grouse/signs of black grouse recorded		
12/04/2017	CS	5	2	1	0
12/04/2017	CS	5	1	2	0
15/05/2017	CS	6	1	0	1
15/05/2017	CS	6	2	3	0

D.7 Goose Roost Surveys

Table D-7 details all goose activity recorded during goose roost surveys. Table D-8 details additional sightings of geese recorded during surveys. Refer to Annex B for survey methodology and Annex C for weather data.

Table D-7 Goose roost survey flight records

Date	Flight Start Time	Species	No. Of Birds	Duration (s)	Height band 1 (0-20m)	Height band 2 (21-125m)	Height band 3 (>126m)
26/11/2012	1715	Grey goose[5]	40	75		60	15
26/11/2012	1718	Grey goose	50	45		30	15
26/11/2012	1721	Grey goose	45	60		45	15
26/11/2012	1725	Grey goose	15	40		30	10
13/12/2012	1640	Grey goose	30	30		30	
13/12/2012	1642	Grey goose	60	30		30	
13/12/2012	1643	Grey goose	150	30		30	
13/12/2012	1645	Grey goose	45	30		30	
13/12/2012	1645	Grey goose	15	30		30	
07/01/2013	1700	Greenland white-fronted goose	50	900	900	0	0
07/01/2013	1703	Greylag goose	45	720	720	0	0
07/01/2013	1705	Greenland white-fronted goose	20	600	600	0	0

[5] Grey goose is a term used here to categorise mixed flocks of Greenland white-fronted geese and greylag geese, or flocks of geese where the species could not be reliably identified (for instance due to distance or flying within cloud). Where flocks of grey geese have been recorded these have been assumed to be wholly comprised of Greenland white fronted geese for the assessment and are assumed to be part of the Kintyre Goose Roosts SPA population.

Date	Flight Start Time	Species	No. Of Birds	Duration (s)	Height band 1 (0-20m)	Height band 2 (21-125m)	Height band 3 (>126m)
24/10/2013	0750	Greylag goose	6	60	15	45	0
24/10/2013	0750	Whooper swan	5	120	45	75	0
24/10/2013	0750	Whooper swan	9	120	45	75	0
24/10/2013	0755	Grey goose	50	60		60	
24/10/2013	0758	Greenland white-fronted goose	25	45		60	
24/10/2013	0802	Grey goose	40	45		45	
24/10/2013	0805	Grey goose	20	45		45	
24/10/2013	0812	Grey goose	70	45		45	
24/10/2013	0818	Grey goose	200	45		45	
24/10/2013	0835	Grey goose	60	45		45	
24/10/2013	0845	Grey goose	80	45		45	
24/10/2013	0850	Grey goose	12	45		45	
29/10/2013	1740	Grey goose	150	25	20		
29/10/2013	1742	Grey goose	230	30	25		
29/10/2013	1745	Grey goose	70	30	30		
29/10/2013	1748	Grey goose	150	30	30		
29/10/2013	1752	Grey goose	200	30	30		
29/10/2013	1754	Grey goose	25	30	30		
27/11/2013	1640	Greylag goose	8	45	15	30	

Date	Flight Start Time	Species	No. Of Birds	Duration (s)	Height band 1 (0-20m)	Height band 2 (21-125m)	Height band 3 (>126m)
14/01/2014	0815	Grey goose	40	45		45	
14/01/2014	0818	Grey goose	90	45		45	
14/01/2014	0820	Grey goose	50	45		45	
14/01/2014	0835	Grey goose	60	45		45	

Table D-8 Incidental goose records

Date	Observer	Species	Number recorded	Notes
11/12/2012	HM	Greylag/White-fronted goose	1000	1000 geese flying off Lussa Loch between 0745-0900 (mix of greylag and white-fronted)
04/11/2013	HM	Greylag/White fronted goose	50	flying into Tangy Loch after VP finished
04/11/2013	HM	Greylag/White fronted goose	80	flying into Tangy Loch after VP finished
04/11/2013	HM	Greylag/White fronted goose	70	flying into Tangy Loch after VP finished
04/11/2013	HM	Greylag/White fronted goose	90	flying into Tangy Loch after VP finished
04/11/2013	HM	Greylag/White fronted goose	120	flying into Tangy Loch after VP finished
04/11/2013	HM	Greylag/White fronted goose	70	flying into Tangy Loch after VP finished
10/01/2014	HM	Greylag/White fronted goose	120	Recorded as target but outside VP hours
11/12/2012	HM	Greylag/White fronted goose	1000	<1000 geese flying off Lussa Loch between 0745-0900 (greylag and white-fronted)
25/10/2016	CS	Greylag goose	11	On Tangy Loch

Date	Observer	Species	Number recorded	Notes
26/10/2016	CS	Greenland white-fronted goose	12	On Tangy Loch
26/10/2016	CS	Greylag goose	171	On Tangy Loch
13/02/2017	CS	Greenland white-fronted goose	-	1830-1845, heard several hundered greenland white-fronted geese coming to roost, too dark to see but coming in from South
15/04/2017	CS	Greylag goose	4	on Tangy Loch
17/04/2017	CS	Greenland white-fronted goose	1	On Tangy Loch
17/04/2017	CS	Greylag goose	6	On Tangy Loch
05/07/2017	CS	Barnacle goose	5	
09/10/2017	CS	Greenland white-fronted goose	24	Seen at 1310 and 0940 On Tangy loch
12/11/2017	CS	Greylag goose	14	On Tangy Loch
14/11/2017	CS	Greylag goose	245	On Tangy Loch
14/11/2017	CS	Greylag goose	370	Still on loch, joined by additional birds before start of second VP survey.

D.8 Woodland Point Count Surveys

Table D-9 summarises the birds recorded during woodland point count surveys. Refer to Annex B for survey methodology and Annex C for weather data.

Table D-9 Woodland point count records: 2012 – 2013

Species	Percentage of points birds were recorded at				
	April 2012	May 2012	June 2012	November 2012	January 2013
Blackbird	0.00%	0.00%	0.00%	5.71%	2.86%
Chaffinch	36.00%	72.00%	72.00%	8.57%	2.86%
Coal tit	36.00%	16.00%	68.00%	17.14%	2.86%
Common crossbill	0.00%	0.00%	4.00%	0.00%	0.00%
Cuckoo	0.00%	4.00%	0.00%	0.00%	0.00%
Dunnock	0.00%	0.00%	8.00%	11.43%	2.86%
Fieldfare	0.00%	0.00%	0.00%	2.86%	0.00%
Goldcrest	48.00%	56.00%	96.00%	40.00%	11.43%
Herring gull	0.00%	0.00%	0.00%	0.00%	2.86%
Hooded crow	4.00%	0.00%	12.00%	0.00%	0.00%
Jay	0.00%	0.00%	4.00%	0.00%	0.00%
Lesser redpoll	4.00%	28.00%	0.00%	5.71%	0.00%
Meadow pipit	4.00%	8.00%	12.00%	0.00%	0.00%
Mistle thrush	0.00%	0.00%	4.00%	0.00%	0.00%
Pied wagtail	0.00%	0.00%	4.00%	0.00%	0.00%
Raven	0.00%	0.00%	0.00%	5.71%	5.71%
Robin	4.00%	44.00%	60.00%	20.00%	8.57%
Siskin	8.00%	4.00%	20.00%	0.00%	0.00%
Song thrush	0.00%	4.00%	12.00%	0.00%	2.86%
Willow warbler	60.00%	68.00%	88.00%	0.00%	0.00%
Woodpigeon	0.00%	4.00%	8.00%	0.00%	0.00%
Woodcock	0.00%	0.00%	0.00%	2.86%	5.71%
Wren	44.00%	56.00%	76.00%	25.71%	17.14%

D.9 Bird Species Index

A total of 70 bird species or signs were recorded at, or adjacent, to the site during the ornithological surveys. Table D-10 comprises a list of all these species along with their conservation status.

Table D-10 All bird species recorded at Tangy IV (April 2012 to November 2017)

Species	Conservation status	Species	Conservation status
Blackbird	BoCC Green	Mallard	BoCC Amber
Buzzard	BoCC Green	Meadow pipit	BoCC Amber
Canada goose	Not assessed	Merlin	Annex 1, Schedule 1, BoCC Red
Carrion crow	BoCC Green	Mistle thrush	BoCC Red
Chaffinch	BoCC Green	Oystercatcher	BoCC Amber
Chiffchaff	BoCC Green	Peregrine falcon	Annex 1, Schedule 1, BoCC Green
Coal tit	BoCC Green	Pied wagtail	BoCC Green
Common crossbill	Schedule 1, BoCC Green	Raven	BoCC Green
Common gull	BoCC Amber	Red-breasted merganser	BoCC Green
Common sandpiper	BoCC Amber	Red-throated diver	Annex 1, Schedule 1, BoCC Green
Cormorant	BoCC Green	Redwing	Schedule 1, BoCC Red
Cuckoo	BoCC Red	Reed bunting	BoCC Amber
Curlew	BoCC Red	Robin	BoCC Green
Dipper	BoCC Amber	Rook	BoCC Green
Dunnock	BoCC Amber	Sedge warbler	BoCC Green
Fieldfare	Schedule 1, BoCC Red	Short-eared owl	Annex 1, BoCC Amber
Goldcrest	BoCC Green	Siskin	BoCC Green
Goldeneye	Schedule 1, BoCC Amber	Skylark	BoCC Red
Goldfinch	BoCC Green	Snipe	BoCC Amber
Grasshopper warbler	BoCC Red	Song thrush	BoCC Red
Great black-backed gull	BoCC Amber	Sparrowhawk	BoCC Red
Greenland white-fronted goose	Annex 1, BoCC Red	Starling	BoCC Red
Grey heron	BoCC Green	Stock dove	BoCC Amber
Grey wagtail	BoCC Red	Stonechat	BoCC Green
Greylag goose	BoCC Amber	Swallow	BoCC Green

Species	Conservation status	Species	Conservation status
Hen harrier	Annex 1, Schedule 1, BoCC Red	Swift	BoCC Amber
Herring gull	BoCC Red	Teal	BoCC Amber
Hooded crow	BoCC Green	Tufted duck	BoCC Green
House martin	BoCC Amber	Wheatear	BoCC Green
House sparrow	BoCC Red	Whitethroat	BoCC Green
Jack snipe	BoCC Green	Whooper swan	Annex 1, Schedule 1, BoCC Amber
Jackdaw	BoCC Green	Willow warbler	BoCC Amber
Jay	BoCC Green	Woodcock	BoCC Red
Kestrel	BoCC Amber	Woodpigeon	BoCC Green
Lesser black-backed gull	BoCC Amber	Wren	BoCC Green
Lesser redpoll	BoCC Red	Yellowhammer	BoCC Red
Linnet	BoCC Red		

ANNEX E COLLISION RISK ASSESSMENTS

Table E-1, Table E-2 and Table E-5 present the parameters which apply to each Collision Risk Model (CRM).

Table E-1 Wind farm parameters

	Vestas 4.2	Vestas 3.6	Siemens 4.3	Siemens 4.2	Enercon E126	
Wind farm envelope	602.38					hectares (ha)
Number of turbines	16					turbines
Rotor diameter	117	126	120	130	127	metres (m)
Hub height	91.4	86.9	89.9	84.9	86.4	m
Max. rotor depth	1.04	1.04	0.98	1.09	1.23	m (at 15° pitch angle)
Max. chord	4	4	3.8	4.2	4.752	m
Pitch	15	15	15	15	15	degrees (°)
Rotation period	3.43	3.75	4.38	4.8	4.96	seconds (secs)
Turbine operation time	0.88	0.88	0.88	0.88	0.88	percent (%)
Risk height: lowest	32.9	23.9	29.9	19.9	22.9	m
Rick height: highest	149.9	149.9	149.9	149.9	149.9	m
Flight risk volume	704783463	758997576	722854834	783092737	765021366	m^3

Table E-2 CRM parameters per species

Species	Length (m)	Wingspan (m)	Assumed flight speed, v (ms^{-1})	Avoidance rate
Barnacle goose	0.7	1.45	17	0.998
Curlew	0.6	1	13	0.98
Greenland white-fronted goose	0.715	1.475	17.1	0.998
Greylag goose	0.825	1.635	17.1	0.998
Hen harrier	0.48	1.1	12	0.99
Herring gull	0.64	1.5	12.8	0.98
Merlin	0.28	0.56	13	0.98
Oystercatcher	0.45	0.86	13	0.98
Peregrine falcon	0.48	1.1	12.1	0.98
Snipe	0.27	0.47	17.1	0.98

Table E-3 Probability of collision per species per turbine type

Species	Vestas 4.2	Vestas 3.6	Siemens 4.3	Siemens 4.2	Enercon E126
Barnacle goose	0.0822	0.0758	0.0699	0.0679	0.0730
Curlew	0.0903	0.0830	0.0740	0.0717	0.0764
Greenland white-fronted goose	0.0828	0.0763	0.0704	0.0683	0.0734
Greylag goose	0.0885	0.0815	0.0750	0.0725	0.0775
Hen harrier	0.0878	0.0807	0.0718	0.0699	0.0748
Herring gull	0.0954	0.0878	0.0786	0.0760	0.0808
Merlin	-	-	-	0.0561	-
Oystercatcher	0.0803	0.0739	0.0661	0.0646	0.0695
Peregrine falcon	0.0872	0.0802	0.0714	0.0696	0.0745
Snipe	0.0579	0.0535	0.0499	0.0495	0.0549

Table E-4 Bird transit time (seconds) per species per turbine type

Species	Vestas 4.2	Vestas 3.6	Siemens 4.3	Siemens 4.2	Enercon E126
Barnacle goose	0.1021	0.1021	0.0990	0.1051	0.1135
Curlew	0.1258	0.1258	0.1218	0.1298	0.1408
Greenland white-fronted goose	0.1024	0.1024	0.0993	0.1054	0.1137
Greylag goose	0.1088	0.1088	0.1058	0.1118	0.1202
Hen harrier	0.1263	0.1263	0.1220	0.1306	0.1425
Herring gull	0.1309	0.1310	0.1270	0.1350	0.1460
Merlin	-	-	-	0.1052	-
Oystercatcher	0.1143	0.1143	0.1103	0.1182	0.1292
Peregrine falcon	0.1252	0.1252	0.1210	0.1295	0.1413
Snipe	0.0763	0.0763	0.0733	0.0794	0.0877

Table E-5 Visible area within the CRAA per vantage point

VP	Area (ha)
1	244.6330
2	240.9930
3	194.3620
Total	**679.9880**

Birds are assumed to be active during all the daylight hours and this is estimated by calculating the number of hours per day between sunrise and sunset (adjusting for correct latitude) for the survey seasons as defined in Table E-6 below.

Table E-6 Season definitions per species/species group

Species	Breeding season			Non-breeding season		
	Start date	End date	Hours presumed present	Start date	End date	Hours presumed present
Geese and swans	15th May	31st August	1,793	1st September	14th May	2,703
Raptors	15th March	31st August	2,645	1st September	14th March	1,850
Waders	1st April	31st July	1,969	1st August	31st March	2,526
Other	15th March	31st August	2,645	1st September	14th March	1,850

Outputs for the CRM for the following species are presented in the following order below:

- Barnacle goose;
- Curlew;
- Greenland white-fronted goose;
- Greylag goose;
- Hen harrier;
- Herring gull;
- Oystercatcher;
- Peregrine falcon; and
- Snipe.

E.1 Vestas 4.2

Barnacle Goose

Non-Breeding Season 2016/2017

Table E-7 Barnacle goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	104.94	14677.9797	7.3176E-07

Table E-8 Barnacle goose mortality estimates

Mean activity in wind farm at rotor height	0.0004	hr^{-1}
Total Combined rotor swept volume	298504	m^3
Bird occupancy	1.1913	hrs/season
Bird occupancy of rotor swept volume	1.8165	bird-sec
No. of transits through rotors	17.7957	per season
Estimated collisions	1.4636	per season
Estimated collisions after correction for operation	1.2880	per season
Estimated collisions after avoidance factor	0.0026	per season
Equivalent to 1 bird every	388.20	seasons

Curlew

Non-Breeding Season 2016/2017

Table E-9 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	1.68	11742.3838	1.4764E-08

Table E-10 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.000009	hr^{-1}
Total Combined rotor swept volume	281302	m^3
Bird occupancy	0.0225	hrs/season
Bird occupancy of rotor swept volume	0.0323	bird-sec
No. of transits through rotors	0.2566	per season
Estimated collisions	0.0232	per season
Estimated collisions after correction for operation	0.0204	per season
Estimated collisions after avoidance factor	0.0004	per season
Equivalent to 1 bird every	2451.88	seasons

Breeding Season 2017

Table E-11 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	476.58	5783.8319	8.1119E-06
3	15.48	5871.1919	2.6356E-07

Table E-12 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.0050	hr^{-1}
Total Combined rotor swept volume	281302	m^3
Bird occupancy	9.9363	hrs/season
Bird occupancy of rotor swept volume	14.2772	bird-sec
No. of transits through rotors	113.5002	per season
Estimated collisions	10.2492	per season
Estimated collisions after correction for operation	9.0193	per season
Estimated collisions after avoidance factor	0.1804	per season
Equivalent to 1 bird every	5.54	seasons

Greenland White-Fronted Goose

Non-Breeding Season 2012/2013

Table E-13 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-14 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	301084	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	13.8162	bird-sec
No. of transits through rotors	134.9829	per season
Estimated collisions	11.1729	per season
Estimated collisions after correction for operation	9.8321	per season
Estimated collisions after avoidance factor	0.0197	per season
Equivalent to 1 bird every	50.85	seasons

Non-Breeding Season 2016/2017

Table E-15 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	3614.42	14677.9797	2.5204E-05

Table E-16 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0152	hr^{-1}
Total Combined rotor swept volume	301084	m^3
Bird occupancy	41.0333	hrs/season
Bird occupancy of rotor swept volume	63.1061	bird-sec
No. of transits through rotors	616.5397	per season
Estimated collisions	51.0325	per season
Estimated collisions after correction for operation	44.9086	per season
Estimated collisions after avoidance factor	0.0898	per season
Equivalent to 1 bird every	11.13	seasons

Non-Breeding Season 2017/2018

Table E-17 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	0.00	5783.8319	0.0000
3	310.77	5871.1919	5.2896E-06

Table E-18 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0032	hr^{-1}
Total Combined rotor swept volume	301084	m^3
Bird occupancy	8.6117	hrs/season
Bird occupancy of rotor swept volume	13.2442	bird-sec
No. of transits through rotors	129.3945	per season
Estimated collisions	10.7103	per season
Estimated collisions after correction for operation	9.4251	per season
Estimated collisions after avoidance factor	0.0189	per season
Equivalent to 1 bird every	53.05	seasons

Greylag Goose

Non-Breeding Season 2012/2013

Table E-19 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-20 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	320007	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	14.6845	bird-sec
No. of transits through rotors	134.9829	per season
Estimated collisions	11.9504	per season
Estimated collisions after correction for operation	10.5163	per season
Estimated collisions after avoidance factor	0.0210	per season
Equivalent to 1 bird every	47.55	seasons

Non-Breeding Season 2013/2014

Table E-21 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8746.2900	0.0000
2	0.00	10844.6848	0.0000
3	47.81	11742.3838	4.2386E-07

Table E-22 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0003	hr^{-1}
Total Combined rotor swept volume	320007	m^3
Bird occupancy	0.6901	hrs/season
Bird occupancy of rotor swept volume	1.1280	bird-sec
No. of transits through rotors	10.3685	per season
Estimated collisions	0.9180	per season
Estimated collisions after correction for operation	0.8078	per season
Estimated collisions after avoidance factor	0.0016	per season
Equivalent to 1 bird every	618.97	seasons

Non-Breeding Season 2016/2017

Table E-23 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	1680.00	11661.7200	1.1715E-05
2	4598.40	13495.6078	3.2065E-05
3	2279.30	14677.9797	1.5894E-05

Table E-24 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0359	hr^{-1}
Total Combined rotor swept volume	320007	m^3
Bird occupancy	97.1527	hrs/season
Bird occupancy of rotor swept volume	158.8037	bird-sec
No. of transits through rotors	1459.7530	per season
Estimated collisions	129.2358	per season
Estimated collisions after correction for operation	113.7275	per season
Estimated collisions after avoidance factor	0.2275	per season
Equivalent to 1 bird every	4.40	seasons

Non-Breeding Season 2017/2018

Table E-25 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	44.97	4664.6880	7.6542E-07
2	246.82	5783.8319	4.2011E-06
3	41715.17	5871.1919	7.1003E-04

Table E-26 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.4307	hr^{-1}
Total Combined rotor swept volume	320007	m^3
Bird occupancy	1164.0582	hrs/season
Bird occupancy of rotor swept volume	1902.7447	bird-sec
No. of transits through rotors	17490.3784	per season
Estimated collisions	1548.4701	per season
Estimated collisions after correction for operation	1362.6537	per season
Estimated collisions after avoidance factor	2.7253	per season
Equivalent to 1 bird every	0.37	seasons

Hen Harrier

Non-Breeding Season 2016/2017

Table E-27 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	6.73	11742.3838	5.8988E-08

Table E-28 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.000036	hr^{-1}
Total Combined rotor swept volume	260659	m^3
Bird occupancy	0.0657	hrs/season
Bird occupancy of rotor swept volume	0.0875	bird-sec
No. of transits through rotors	0.6932	per season
Estimated collisions	0.0608	per season
Estimated collisions after correction for operation	0.0535	per season
Estimated collisions after avoidance factor	0.0005	per season
Equivalent to 1 bird every	1867.66	seasons

Breeding Season 2017

Table E-29 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	0.00	7229.7899	0.0000
3	1.44	7338.9899	1.9621E-08

Table E-30 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.000012	hr^{-1}
Total Combined rotor swept volume	260659	m^3
Bird occupancy	0.0313	hrs/season
Bird occupancy of rotor swept volume	0.0416	bird-sec
No. of transits through rotors	0.3297	per season
Estimated collisions	0.0289	per season
Estimated collisions after correction for operation	0.0255	per season
Estimated collisions after avoidance factor	0.0003	per season
Equivalent to 1 bird every	3927.00	seasons

Non-Breeding Season 2017/2018

Table E-31 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	6.59	4664.6880	1.1213E-07
2	0.00	5783.8319	0.0000
3	0.00	5871.1919	0.0000

Table E-32 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00007	hr^{-1}
Total Combined rotor swept volume	260659	m^3
Bird occupancy	0.1250	hrs/season
Bird occupancy of rotor swept volume	0.1664	bird-sec
No. of transits through rotors	1.3177	per season
Estimated collisions	0.1157	per season
Estimated collisions after correction for operation	0.1018	per season
Estimated collisions after avoidance factor	0.0010	per season
Equivalent to 1 bird every	982.51	seasons

Herring Gull

Breeding Season 2012

Table E-33 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6997.0320	0.0000
2	0.00	8675.7479	0.0000
3	1315.11	8806.7878	1.4923E-05

Table E-34 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0090	hr^{-1}
Total Combined rotor swept volume	288183	m^3
Bird occupancy	23.7803	hrs/season
Bird occupancy of rotor swept volume	35.0052	bird-sec
No. of transits through rotors	267.4583	per season
Estimated collisions	25.5257	per season
Estimated collisions after correction for operation	22.4626	per season
Estimated collisions after avoidance factor	0.4493	per season
Equivalent to 1 bird every	2.23	seasons

Breeding Season 2013

Table E-35 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8551.9280	0.0000
2	92.83	9398.7269	8.6840E-07
3	0.00	11742.3838	0.0000

Table E-36 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0005	hr^{-1}
Total Combined rotor swept volume	288183	m^3
Bird occupancy	1.3838	hrs/season
Bird occupancy of rotor swept volume	2.0370	bird-sec
No. of transits through rotors	15.5639	per season
Estimated collisions	1.4854	per season
Estimated collisions after correction for operation	1.3071	per season
Estimated collisions after avoidance factor	0.0261	per season
Equivalent to 1 bird every	38.25	seasons

Breeding Season 2017

Table E-37 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	3.31	5830.8600	4.5041E-08
2	93.61	7229.7899	1.2746E-06
3	1.68	7338.9899	2.2888E-08

Table E-38 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0008	hr^{-1}
Total Combined rotor swept volume	288183	m^3
Bird occupancy	2.1394	hrs/season
Bird occupancy of rotor swept volume	3.1492	bird-sec
No. of transits through rotors	24.0619	per season
Estimated collisions	2.2964	per season
Estimated collisions after correction for operation	2.0209	per season
Estimated collisions after avoidance factor	0.0404	per season
Equivalent to 1 bird every	24.74	seasons

Oystercatcher

Breeding Season 2013

Table E-39 Oystercatcher flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	26.31	7229.7899	3.2004E-07
3	0.00	8806.7878	0.0000

Table E-40 Oystercatcher mortality estimates

Mean activity in wind farm at rotor height	0.0002	hr^{-1}
Total Combined rotor swept volume	255499	m^3
Bird occupancy	0.3797	hrs/season
Bird occupancy of rotor swept volume	0.4955	bird-sec
No. of transits through rotors	4.3371	per season
Estimated collisions	0.3482	per season
Estimated collisions after correction for operation	0.3064	per season
Estimated collisions after avoidance factor	0.0061	per season
Equivalent to 1 bird every	163.17	seasons

Peregrine Falcon

Breeding Season 2017

Table E-41 Peregrine falcon flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	63.02	7229.7899	8.5819E-07
3	99.11	7338.9899	1.3495E-06

Table E-42 Peregrine falcon mortality estimates

Mean activity in wind farm at rotor height	0.0013	hr^{-1}
Total Combined rotor swept volume	260659	m^3
Bird occupancy	3.5181	hrs/season
Bird occupancy of rotor swept volume	4.6841	bird-sec
No. of transits through rotors	37.4040	per season
Estimated collisions	3.2632	per season
Estimated collisions after correction for operation	2.8716	per season
Estimated collisions after avoidance factor	0.0574	per season
Equivalent to 1 bird every	17.41	seasons

Snipe

Non-Breeding Season 2016/2017

Table E-43 Snipe flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	83.71	9329.3760	7.3405E-07
2	0.00	10603.6918	0.0000
3	0.00	11742.3838	0.0000

Table E-44 Snipe mortality estimates

Mean activity in wind farm at rotor height	0.0004	hr^{-1}
Total Combined rotor swept volume	224535	m^3
Bird occupancy	1.1170	hrs/season
Bird occupancy of rotor swept volume	1.2811	bird-sec
No. of transits through rotors	16.7831	per season
Estimated collisions	0.9723	per season
Estimated collisions after correction for operation	0.8557	per season
Estimated collisions after avoidance factor	0.0171	per season
Equivalent to 1 bird every	58.43	seasons

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Barnacle Goose

Non-Breeding Season 2016/2017

Table E-45 Barnacle goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	237.96	14677.9797	1.6593E-06

Table E-46 Barnacle goose mortality estimates

Mean activity in wind farm at rotor height	0.0010	hr^{-1}
Total Combined rotor swept volume	346194	m^3
Bird occupancy	2.7015	hrs/season
Bird occupancy of rotor swept volume	4.4359	bird-sec
No. of transits through rotors	43.4577	per season
Estimated collisions	3.2941	per season
Estimated collisions after correction for operation	2.8988	per season
Estimated collisions after avoidance factor	0.0058	per season
Equivalent to 1 bird every	172.48	seasons

Curlew

Non-Breeding Season 2016/2017

Table E-47 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	3.82	11742.3838	3.3479E-08

Table E-48 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.00002	hr^{-1}
Total Combined rotor swept volume	326244	m^3
Bird occupancy	0.0509	hrs/season
Bird occupancy of rotor swept volume	0.0788	bird-sec
No. of transits through rotors	0.6267	per season
Estimated collisions	0.0520	per season
Estimated collisions after correction for operation	0.0458	per season
Estimated collisions after avoidance factor	0.0009	per season
Equivalent to 1 bird every	1092.33	seasons

Breeding Season 2017

Table E-49 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	614.25	5783.8319	1.0455E-05
3	15.48	5871.1919	2.6356E-07

Table E-50 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.0065	hr^{-1}
Total Combined rotor swept volume	326244	m^3
Bird occupancy	12.7162	hrs/season
Bird occupancy of rotor swept volume	19.6771	bird-sec
No. of transits through rotors	156.4278	per season
Estimated collisions	12.9838	per season
Estimated collisions after correction for operation	11.4258	per season
Estimated collisions after avoidance factor	0.2285	per season
Equivalent to 1 bird every	4.38	seasons

Greenland White-Fronted Goose

Non-Breeding Season 2012/2013

Table E-51 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-52 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	349187	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	14.8790	bird-sec
No. of transits through rotors	145.3662	per season
Estimated collisions	11.0889	per season
Estimated collisions after correction for operation	9.7582	per season
Estimated collisions after avoidance factor	0.0195	per season
Equivalent to 1 bird every	51.24	seasons

Non-Breeding Season 2016/2017

Table E-53 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	3859.78	14677.9797	2.6915E-05

Table E-54 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0162	hr^{-1}
Total Combined rotor swept volume	349187	m^3
Bird occupancy	43.8187	hrs/season
Bird occupancy of rotor swept volume	72.5738	bird-sec
No. of transits through rotors	709.0374	per season
Estimated collisions	54.0871	per season
Estimated collisions after correction for operation	47.5967	per season
Estimated collisions after avoidance factor	0.0952	per season
Equivalent to 1 bird every	10.50	seasons

Non-Breeding Season 2017/2018

Table E-55 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	0.00	5783.8319	0.0000
3	350.17	5871.1919	5.9603E-06

Table E-56 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0036	hr^{-1}
Total Combined rotor swept volume	349187	m^3
Bird occupancy	9.7036	hrs/season
Bird occupancy of rotor swept volume	16.0714	bird-sec
No. of transits through rotors	157.0161	per season
Estimated collisions	11.9776	per season
Estimated collisions after correction for operation	10.5403	per season
Estimated collisions after avoidance factor	0.0211	per season
Equivalent to 1 bird every	47.44	seasons

Greylag Goose

Non-Breeding Season 2012/2013

Table E-57 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-58 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	371132	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	15.8141	bird-sec
No. of transits through rotors	145.3662	per season
Estimated collisions	11.8533	per season
Estimated collisions after correction for operation	10.4309	per season
Estimated collisions after avoidance factor	0.0209	per season
Equivalent to 1 bird every	47.93	seasons

Non-Breeding Season 2013/2014

Table E-59 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8746.2900	0.0000
2	0.00	10844.6848	0.0000
3	52.48	11742.3838	4.6528E-07

Table E-60 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0003	hr^{-1}
Total Combined rotor swept volume	371132	m^3
Bird occupancy	0.7575	hrs/season
Bird occupancy of rotor swept volume	1.3334	bird-sec
No. of transits through rotors	12.2573	per season
Estimated collisions	0.9995	per season
Estimated collisions after correction for operation	0.8795	per season
Estimated collisions after avoidance factor	0.0018	per season
Equivalent to 1 bird every	568.48	seasons

Non-Breeding Season 2016/2017

Table E-61 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	1680.00	11661.7200	1.1715E-05
2	5617.26	13495.6078	3.9170E-05
3	4536.39	14677.9797	3.1633E-05

Table E-62 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0497	hr^{-1}
Total Combined rotor swept volume	371132	m^3
Bird occupancy	134.3434	hrs/season
Bird occupancy of rotor swept volume	236.4868	bird-sec
No. of transits through rotors	2173.8304	per season
Estimated collisions	177.2565	per season
Estimated collisions after correction for operation	155.9857	per season
Estimated collisions after avoidance factor	0.3120	per season
Equivalent to 1 bird every	3.21	seasons

Non-Breeding Season 2017/2018

Table E-63 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	44.97	4664.6880	7.6542E-07
2	312.61	5783.8319	5.3209E-06
3	42859.28	5871.1919	7.2951E-04

Table E-64 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.4431	hr^{-1}
Total Combined rotor swept volume	371132	m^3
Bird occupancy	1197.5858	hrs/season
Bird occupancy of rotor swept volume	2108.1287	bird-sec
No. of transits through rotors	19378.3055	per season
Estimated collisions	1580.1278	per season
Estimated collisions after correction for operation	1390.5125	per season
Estimated collisions after avoidance factor	2.7810	per season
Equivalent to 1 bird every	0.36	seasons

Hen Harrier

Non-Breeding Season 2016/2017

Table E-65 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	15.25	11742.3838	1.3376E-07

Table E-66 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00008	hr^{-1}
Total Combined rotor swept volume	302303	m^3
Bird occupancy	0.1491	hrs/season
Bird occupancy of rotor swept volume	0.2138	bird-sec
No. of transits through rotors	1.6928	per season
Estimated collisions	0.1366	per season
Estimated collisions after correction for operation	0.1202	per season
Estimated collisions after avoidance factor	0.0012	per season
Equivalent to 1 bird every	832.13	seasons

Breeding Season 2017

Table E-67 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	0.00	7229.7899	0.0000
3	3.27	7338.9899	4.4492E-08

Table E-68 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.000027	hr^{-1}
Total Combined rotor swept volume	302303	m^3
Bird occupancy	0.0709	hrs/season
Bird occupancy of rotor swept volume	0.1017	bird-sec
No. of transits through rotors	0.8051	per season
Estimated collisions	0.0649	per season
Estimated collisions after correction for operation	0.0572	per season
Estimated collisions after avoidance factor	0.0006	per season
Equivalent to 1 bird every	1749.66	seasons

Non-Breeding Season 2017/2018

Table E-69 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	8.34	4664.6880	1.42017E-07
2	0.00	5783.8319	0.0000
3	0.00	5871.1919	0.0000

Table E-70 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00009	hr^{-1}
Total Combined rotor swept volume	302303	m^3
Bird occupancy	0.1583	hrs/season
Bird occupancy of rotor swept volume	0.2269	bird-sec
No. of transits through rotors	1.7973	per season
Estimated collisions	0.1450	per season
Estimated collisions after correction for operation	0.1276	per season
Estimated collisions after avoidance factor	0.0013	per season
Equivalent to 1 bird every	783.75	seasons

Herring Gull

Breeding Season 2012

Table E-71 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6997.0320	0.0000
2	0.00	8675.7479	0.0000
3	1443.62	8806.7878	1.6381E-05

Table E-72 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0099	hr^{-1}
Total Combined rotor swept volume	334224	m^3
Bird occupancy	26.1041	hrs/season
Bird occupancy of rotor swept volume	41.3817	bird-sec
No. of transits through rotors	316.1784	per season
Estimated collisions	27.7450	per season
Estimated collisions after correction for operation	24.4156	per season
Estimated collisions after avoidance factor	0.4883	per season
Equivalent to 1 bird every	2.05	seasons

Breeding Season 2013

Table E-73 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8551.9280	0.0000
2	101.90	9398.7269	9.5326E-07
3	0.00	11742.3838	0.0000

Table E-74 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0006	hr^{-1}
Total Combined rotor swept volume	334224	m^3
Bird occupancy	1.5190	hrs/season
Bird occupancy of rotor swept volume	2.4081	bird-sec
No. of transits through rotors	18.3990	per season
Estimated collisions	1.6145	per season
Estimated collisions after correction for operation	1.4208	per season
Estimated collisions after avoidance factor	0.0284	per season
Equivalent to 1 bird every	35.19	seasons

Breeding Season 2017

Table E-75 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	7.50	5830.8600	1.0213E-07
2	156.98	7229.7899	2.1376E-06
3	3.81	7338.9899	5.1901E-08

Table E-76 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0014	hr^{-1}
Total Combined rotor swept volume	334224	m^3
Bird occupancy	3.6518	hrs/season
Bird occupancy of rotor swept volume	5.7890	bird-sec
No. of transits through rotors	44.2311	per season
Estimated collisions	3.8813	per season
Estimated collisions after correction for operation	3.4156	per season
Estimated collisions after avoidance factor	0.0683	per season
Equivalent to 1 bird every	14.64	seasons

Oystercatcher

Breeding Season 2013

Table E-77 Oystercatcher flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	28.89	7229.7899	3.5132E-07
3	0.00	8806.7878	0.0000

Table E-78 Oystercatcher mortality estimates

Mean activity in wind farm at rotor height	0.0002	hr^{-1}
Total Combined rotor swept volume	296318	m^3
Bird occupancy	0.4168	hrs/season
Bird occupancy of rotor swept volume	0.5858	bird-sec
No. of transits through rotors	5.1271	per season
Estimated collisions	0.3786	per season
Estimated collisions after correction for operation	0.3332	per season
Estimated collisions after avoidance factor	0.0067	per season
Equivalent to 1 bird every	150.06	seasons

Peregrine Falcon

Breeding Season 2017

Table E-79 Peregrine falcon flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	63.02	7229.7899	8.5819E-07
3	99.11	7338.9899	1.3495E-06

Table E-80 Peregrine falcon mortality estimates

Mean activity in wind farm at rotor height	0.0013	hr^{-1}
Total Combined rotor swept volume	302303	m^3
Bird occupancy	3.5181	hrs/season
Bird occupancy of rotor swept volume	5.0444	bird-sec
No. of transits through rotors	40.2813	per season
Estimated collisions	3.2306	per season
Estimated collisions after correction for operation	2.8429	per season
Estimated collisions after avoidance factor	0.0569	per season
Equivalent to 1 bird every	17.59	seasons

Snipe

Non-Breeding Season 2016/2017

Table E-81 Snipe flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	189.81	9329.3760	1.6645E-06
2	0.00	10603.6918	0.0000
3	0.00	11742.3838	0.0000

Table E-82 Snipe mortality estimates

Mean activity in wind farm at rotor height	0.0010	hr^{-1}
Total Combined rotor swept volume	260407	m^3
Bird occupancy	2.5329	hrs/season
Bird occupancy of rotor swept volume	3.1285	bird-sec
No. of transits through rotors	40.9850	per season
Estimated collisions	2.1926	per season
Estimated collisions after correction for operation	1.9295	per season
Estimated collisions after avoidance factor	0.0386	per season
Equivalent to 1 bird every	25.91	seasons

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Barnacle Goose

Non-Breeding Season 2016/2017

Table E-83 Barnacle goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	149.28	14677.9797	1.0410E-06

Table E-84 Barnacle goose mortality estimates

Mean activity in wind farm at rotor height	0.0006	hr^{-1}
Total Combined rotor swept volume	304641	m^3
Bird occupancy	1.6947	hrs/season
Bird occupancy of rotor swept volume	2.5712	bird-sec
No. of transits through rotors	25.9641	per season
Estimated collisions	1.8159	per season
Estimated collisions after correction for operation	1.5980	per season
Estimated collisions after avoidance factor	0.0032	per season
Equivalent to 1 bird every	312.89	seasons

Curlew

Non-Breeding Season 2016/2017

Table E-85 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	2.39	11742.3838	2.1002E-08

Table E-86 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.000013	hr^{-1}
Total Combined rotor swept volume	286546	m^3
Bird occupancy	0.0320	hrs/season
Bird occupancy of rotor swept volume	0.0456	bird-sec
No. of transits through rotors	0.3744	per season
Estimated collisions	0.0277	per season
Estimated collisions after correction for operation	0.0244	per season
Estimated collisions after avoidance factor	0.0005	per season
Equivalent to 1 bird every	2052.01	seasons

Breeding Season 2017

Table E-87 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	522.47	5783.8319	8.8929E-06
3	15.48	5871.1919	2.6356E-07

Table E-88 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.0055	hr^{-1}
Total Combined rotor swept volume	286546	m^3
Bird occupancy	10.8629	hrs/season
Bird occupancy of rotor swept volume	15.5022	bird-sec
No. of transits through rotors	127.2666	per season
Estimated collisions	9.4118	per season
Estimated collisions after correction for operation	8.2823	per season
Estimated collisions after avoidance factor	0.1656	per season
Equivalent to 1 bird every	6.04	seasons

Greenland White-Fronted Goose

Non-Breeding Season 2012/2013

Table E-89 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-90 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	307356	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	13.7514	bird-sec
No. of transits through rotors	138.4440	per season
Estimated collisions	9.7476	per season
Estimated collisions after correction for operation	8.5779	per season
Estimated collisions after avoidance factor	0.0172	per season
Equivalent to 1 bird every	58.29	seasons

Non-Breeding Season 2016/2017

Table E-91 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	3696.21	14677.9797	2.5774E-05

Table E-92 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0155	hr^{-1}
Total Combined rotor swept volume	307356	m^3
Bird occupancy	41.9618	hrs/season
Bird occupancy of rotor swept volume	64.2313	bird-sec
No. of transits through rotors	646.6568	per season
Estimated collisions	45.5302	per season
Estimated collisions after correction for operation	40.0666	per season
Estimated collisions after avoidance factor	0.0801	per season
Equivalent to 1 bird every	12.48	seasons

Non-Breeding Season 2017/2018

Table E-93 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	0.00	5783.8319	0.0000
3	323.90	5871.1919	5.5132E-06

Table E-94 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	307356	m^3
Bird occupancy	8.9757	hrs/season
Bird occupancy of rotor swept volume	13.7392	bird-sec
No. of transits through rotors	138.3213	per season
Estimated collisions	9.7390	per season
Estimated collisions after correction for operation	8.5703	per season
Estimated collisions after avoidance factor	0.0171	per season
Equivalent to 1 bird every	58.34	seasons

Greylag Goose

Non-Breeding Season 2012/2013

Table E-95 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height ($secsHahr^{-1}$)
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-96 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	327261	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	14.6420	bird-sec
No. of transits through rotors	138.4440	per season
Estimated collisions	10.3835	per season
Estimated collisions after correction for operation	9.1375	per season
Estimated collisions after avoidance factor	0.0183	per season
Equivalent to 1 bird every	54.72	seasons

Non-Breeding Season 2013/2014

Table E-97 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height ($secsHahr^{-1}$)
1	0.00	8746.2900	0.0000
2	0.00	10844.6848	0.0000
3	49.37	11742.3838	4.3767E-07

Table E-98 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0003	hr^{-1}
Total Combined rotor swept volume	327261	m^3
Bird occupancy	0.7125	hrs/season
Bird occupancy of rotor swept volume	1.1613	bird-sec
No. of transits through rotors	10.9808	per season
Estimated collisions	0.8236	per season
Estimated collisions after correction for operation	0.7247	per season
Estimated collisions after avoidance factor	0.0014	per season
Equivalent to 1 bird every	689.90	seasons

Non-Breeding Season 2016/2017

Table E-99 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	1680.00	11661.7200	1.1715E-05
2	4938.02	13495.6078	3.4434E-05
3	3031.66	14677.9797	2.1140E-05

Table E-100 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0405	hr^{-1}
Total Combined rotor swept volume	327261	m^3
Bird occupancy	109.5496	hrs/season
Bird occupancy of rotor swept volume	178.5485	bird-sec
No. of transits through rotors	1688.2266	per season
Estimated collisions	126.6191	per season
Estimated collisions after correction for operation	111.4248	per season
Estimated collisions after avoidance factor	0.2228	per season
Equivalent to 1 bird every	4.49	seasons

Non-Breeding Season 2017/2018

Table E-101 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	44.97	4664.6880	7.6542E-07
2	268.75	5783.8319	4.5744E-06
3	42096.54	5871.1919	7.1653E-04

Table E-102 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.4348	hr^{-1}
Total Combined rotor swept volume	327261	m^3
Bird occupancy	1175.2341	hrs/season
Bird occupancy of rotor swept volume	1915.4447	bird-sec
No. of transits through rotors	18111.0761	per season
Estimated collisions	1358.3533	per season
Estimated collisions after correction for operation	1195.3509	per season
Estimated collisions after avoidance factor	2.3907	per season
Equivalent to 1 bird every	0.42	seasons

Hen Harrier

Non-Breeding Season 2016/2017

Table E-103 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	9.57	11742.3838	8.3912E-08

Table E-104 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00005	hr^{-1}
Total Combined rotor swept volume	264831	m^3
Bird occupancy	0.0935	hrs/season
Bird occupancy of rotor swept volume	0.1233	bird-sec
No. of transits through rotors	1.0114	per season
Estimated collisions	0.0726	per season
Estimated collisions after correction for operation	0.0639	per season
Estimated collisions after avoidance factor	0.0006	per season
Equivalent to 1 bird every	1564.61	seasons

Breeding Season 2017

Table E-105 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	0.00	7229.7899	0.0000
3	2.05	7338.9899	2.7911E-08

Table E-106 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00002	hr^{-1}
Total Combined rotor swept volume	264831	m^3
Bird occupancy	0.0445	hrs/season
Bird occupancy of rotor swept volume	0.0587	bird-sec
No. of transits through rotors	0.4810	per season
Estimated collisions	0.0345	per season
Estimated collisions after correction for operation	0.0304	per season
Estimated collisions after avoidance factor	0.0003	per season
Equivalent to 1 bird every	3289.80	seasons

Non-Breeding Season 2017/2018

Table E-107 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	7.17	4664.6880	1.2209E-07
2	0.00	5783.8319	0.0000
3	0.00	5871.1919	0.0000

Table E-108 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00007	hr^{-1}
Total Combined rotor swept volume	264831	m^3
Bird occupancy	0.1361	hrs/season
Bird occupancy of rotor swept volume	0.1795	bird-sec
No. of transits through rotors	1.4715	per season
Estimated collisions	0.1057	per season
Estimated collisions after correction for operation	0.0930	per season
Estimated collisions after avoidance factor	0.0009	per season
Equivalent to 1 bird every	1075.33	seasons

Herring Gull

Breeding Season 2012

Table E-109 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6997.0320	0.0000
2	0.00	8675.7479	0.0000
3	1357.95	8806.7878	1.5409E-05

Table E-110 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0093	hr^{-1}
Total Combined rotor swept volume	293784	m^3
Bird occupancy	24.5549	hrs/season
Bird occupancy of rotor swept volume	35.9268	bird-sec
No. of transits through rotors	283.2516	per season
Estimated collisions	22.2637	per season
Estimated collisions after correction for operation	19.5921	per season
Estimated collisions after avoidance factor	0.3918	per season
Equivalent to 1 bird every	2.55	seasons

Breeding Season 2013

Table E-111 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8551.9280	0.0000
2	95.85	9398.7269	8.9668E-07
3	0.00	11742.3838	0.0000

Table E-112 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0005	hr^{-1}
Total Combined rotor swept volume	293784	m^3
Bird occupancy	1.4289	hrs/season
Bird occupancy of rotor swept volume	2.0906	bird-sec
No. of transits through rotors	16.4829	per season
Estimated collisions	1.2956	per season
Estimated collisions after correction for operation	1.1401	per season
Estimated collisions after avoidance factor	0.0228	per season
Equivalent to 1 bird every	43.86	seasons

Breeding Season 2017

Table E-113 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	4.71	5830.8600	6.4072E-08
2	114.73	7229.7899	1.5623E-06
3	2.39	7338.9899	3.2559E-08

Table E-114 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0010	hr^{-1}
Total Combined rotor swept volume	293784	m^3
Bird occupancy	2.6435	hrs/season
Bird occupancy of rotor swept volume	3.8678	bird-sec
No. of transits through rotors	30.4942	per season
Estimated collisions	2.3969	per season
Estimated collisions after correction for operation	2.1092	per season
Estimated collisions after avoidance factor	0.0422	per season
Equivalent to 1 bird every	23.71	seasons

Oystercatcher

Breeding Season 2013

Table E-115 Oystercatcher flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	27.17	7229.7899	3.3047E-07
3	0.00	8806.7878	0.0000

Table E-116 Oystercatcher mortality estimates

Mean activity in wind farm at rotor height	0.0002	hr^{-1}
Total Combined rotor swept volume	259402	m^3
Bird occupancy	0.3921	hrs/season
Bird occupancy of rotor swept volume	0.5065	bird-sec
No. of transits through rotors	4.5932	per season
Estimated collisions	0.3037	per season
Estimated collisions after correction for operation	0.2673	per season
Estimated collisions after avoidance factor	0.0053	per season
Equivalent to 1 bird every	187.06	seasons

Peregrine Falcon

Breeding Season 2017

Table E-117 Peregrine falcon flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	63.02	7229.7899	8.5819E-07
3	99.11	7338.9899	1.3495E-06

Table E-118 Peregrine falcon mortality estimates

Mean activity in wind farm at rotor height	0.0013	hr^{-1}
Total Combined rotor swept volume	264831	m^3
Bird occupancy	3.5181	hrs/season
Bird occupancy of rotor swept volume	4.6401	bird-sec
No. of transits through rotors	38.3631	per season
Estimated collisions	2.7408	per season
Estimated collisions after correction for operation	2.4119	per season
Estimated collisions after avoidance factor	0.0482	per season
Equivalent to 1 bird every	20.73	seasons

Snipe

Non-Breeding Season 2016/2017

Table E-119 Snipe flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	119.07	9329.3760	1.0442E-06
2	0.00	10603.6918	0.0000
3	0.00	11742.3838	0.0000

Table E-120 Snipe mortality estimates

Mean activity in wind farm at rotor height	0.0006	hr^{-1}
Total Combined rotor swept volume	226830	m^3
Bird occupancy	1.5890	hrs/season
Bird occupancy of rotor swept volume	1.7950	bird-sec
No. of transits through rotors	24.4867	per season
Estimated collisions	1.2211	per season
Estimated collisions after correction for operation	1.0746	per season
Estimated collisions after avoidance factor	0.0215	per season
Equivalent to 1 bird every	46.53	seasons

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Barnacle Goose

Non-Breeding Season 2016/2017

Table E-121 Barnacle goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	295.60	14677.9797	2.0613E-06

Table E-122 Barnacle goose mortality estimates

Mean activity in wind farm at rotor height	0.0012	hr^{-1}
Total Combined rotor swept volume	379517	m^3
Bird occupancy	3.3559	hrs/season
Bird occupancy of rotor swept volume	5.8550	bird-sec
No. of transits through rotors	55.6985	per season
Estimated collisions	3.7828	per season
Estimated collisions after correction for operation	3.3289	per season
Estimated collisions after avoidance factor	0.0067	per season
Equivalent to 1 bird every	150.20	seasons

Curlew

Breeding Season 2013

Table E-123 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	0.00	7229.7899	0.0000
3	0.37	8806.7878	4.4592E-09

Table E-124 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.000003	hr^{-1}
Total Combined rotor swept volume	358279	m^3
Bird occupancy	0.0053	hrs/season
Bird occupancy of rotor swept volume	0.0087	bird-sec
No. of transits through rotors	0.0671	per season
Estimated collisions	0.0048	per season
Estimated collisions after correction for operation	0.0042	per season
Estimated collisions after avoidance factor	0.000085	per season
Equivalent to 1 bird every	11797.64	seasons

Non-Breeding Season 2016/2017

Table E-125 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	4.81	11742.3838	4.2172E-08

Table E-126 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.00003	hr^{-1}
Total Combined rotor swept volume	358279	m^3
Bird occupancy	0.0642	hrs/season
Bird occupancy of rotor swept volume	0.1057	bird-sec
No. of transits through rotors	0.8145	per season
Estimated collisions	0.0584	per season
Estimated collisions after correction for operation	0.0514	per season
Estimated collisions after avoidance factor	0.0010	per season
Equivalent to 1 bird every	972.58	seasons

Breeding Season 2017

Table E-127 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	15.58	5871.1919	2.6523E-07
3	674.05	5783.8319	1.1473E-05

Table E-128 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.0071	hr^{-1}
Total Combined rotor swept volume	358279	m^3
Bird occupancy	13.9258	hrs/season
Bird occupancy of rotor swept volume	22.9368	bird-sec
No. of transits through rotors	176.7465	per season
Estimated collisions	12.6777	per season
Estimated collisions after correction for operation	11.1563	per season
Estimated collisions after avoidance factor	0.2231	per season
Equivalent to 1 bird every	4.48	seasons

Greenland White-Fronted Goose

Non-Breeding Season 2012/2013

Table E-129 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-130 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	382702	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	15.8054	bird-sec
No. of transits through rotors	149.9810	per season
Estimated collisions	10.2498	per season
Estimated collisions after correction for operation	9.0198	per season
Estimated collisions after avoidance factor	0.0180	per season
Equivalent to 1 bird every	55.43	seasons

Non-Breeding Season 2016/2017

Table E-131 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	3968.24	14677.9797	2.7671E-05

Table E-132 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0167	hr^{-1}
Total Combined rotor swept volume	382702	m^3
Bird occupancy	45.0501	hrs/season
Bird occupancy of rotor swept volume	79.2586	bird-sec
No. of transits through rotors	752.1039	per season
Estimated collisions	51.3994	per season
Estimated collisions after correction for operation	45.2315	per season
Estimated collisions after avoidance factor	0.0905	per season
Equivalent to 1 bird every	11.05	seasons

Non-Breeding Season 2017/2018

Table E-133 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	0.00	5783.8319	0.0000
3	367.68	5871.1919	6.2584E-06

Table E-134 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0038	hr^{-1}
Total Combined rotor swept volume	382702	m^3
Bird occupancy	10.1889	hrs/season
Bird occupancy of rotor swept volume	17.9258	bird-sec
No. of transits through rotors	170.1025	per season
Estimated collisions	11.6249	per season
Estimated collisions after correction for operation	10.2300	per season
Estimated collisions after avoidance factor	0.0205	per season
Equivalent to 1 bird every	48.88	seasons

Greylag Goose

Non-Breeding Season 2012/2013

Table E-135 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-136 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	406063	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	16.7702	bird-sec
No. of transits through rotors	149.9810	per season
Estimated collisions	10.8797	per season
Estimated collisions after correction for operation	9.5742	per season
Estimated collisions after avoidance factor	0.0191	per season
Equivalent to 1 bird every	52.22	seasons

Non-Breeding Season 2013/2014

Table E-137 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8746.2900	0.0000
2	0.00	10844.6848	0.0000
3	55.05	11742.3838	4.8806E-07

Table E-138 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0003	hr^{-1}
Total Combined rotor swept volume	406063	m^3
Bird occupancy	0.7946	hrs/season
Bird occupancy of rotor swept volume	1.4833	bird-sec
No. of transits through rotors	13.2656	per season
Estimated collisions	0.9623	per season
Estimated collisions after correction for operation	0.8468	per season
Estimated collisions after avoidance factor	0.0017	per season
Equivalent to 1 bird every	590.45	seasons

Non-Breeding Season 2016/2017

Table E-139 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	1680.00	11661.7200	1.1715E-05
2	6069.03	13495.6078	4.2320E-05
3	5530.76	14677.9797	3.8567E-05

Table E-140 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0558	hr^{-1}
Total Combined rotor swept volume	406063	m^3
Bird occupancy	150.7610	hrs/season
Bird occupancy of rotor swept volume	281.4310	bird-sec
No. of transits through rotors	2516.9299	per season
Estimated collisions	182.5800	per season
Estimated collisions after correction for operation	160.6704	per season
Estimated collisions after avoidance factor	0.3213	per season
Equivalent to 1 bird every	3.11	seasons

Non-Breeding Season 2017/2018

Table E-141 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	44.97	4664.6880	7.6542E-07
2	341.85	5783.8319	5.8185E-06
3	43373.12	5871.1919	7.3825E-04

Table E-142 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.4487	hr^{-1}
Total Combined rotor swept volume	406063	m^3
Bird occupancy	1212.6350	hrs/season
Bird occupancy of rotor swept volume	2263.6690	bird-sec
No. of transits through rotors	20244.7338	per season
Estimated collisions	1468.5682	per season
Estimated collisions after correction for operation	1292.3400	per season
Estimated collisions after avoidance factor	2.5847	per season
Equivalent to 1 bird every	0.39	seasons

Hen Harrier

Non-Breeding Season 2012/2013

Table E-143 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.34	6802.6700	3.6711E-09
2	0.00	10001.2093	0.0000
3	0.00	8684.4713	0.0000

Table E-144 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.000002	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.0041	hrs/season
Bird occupancy of rotor swept volume	0.0063	bird-sec
No. of transits through rotors	0.0479	per season
Estimated collisions	0.0034	per season
Estimated collisions after correction for operation	0.0029	per season
Estimated collisions after avoidance factor	0.000029	per season
Equivalent to 1 bird every	33914.55	seasons

Breeding Season 2013

Table E-145 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.02	8551.9280	2.2258E-10
2	0.00	9398.7269	0.0000
3	0.00	11742.3838	0.0000

Table E-146 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.0000001	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.0004	hrs/season
Bird occupancy of rotor swept volume	0.0005	bird-sec
No. of transits through rotors	0.0042	per season
Estimated collisions	0.0003	per season
Estimated collisions after correction for operation	0.0003	per season
Estimated collisions after avoidance factor	0.0000026	per season
Equivalent to 1 bird every	391213.74	seasons

Non-Breeding Season 2013/2014

Table E-147 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.36	8746.2900	3.3525E-09
2	0.06	10844.6848	5.9972E-10
3	0.05	10274.5858	4.7864E-10

Table E-148 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.000003	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.0049	hrs/season
Bird occupancy of rotor swept volume	0.0076	bird-sec
No. of transits through rotors	0.0579	per season
Estimated collisions	0.0040	per season
Estimated collisions after correction for operation	0.0036	per season
Estimated collisions after avoidance factor	0.000036	per season
Equivalent to 1 bird every	28099.3687	seasons

Non-Breeding Season 2016/2017

Table E-149 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.33	9329.3760	2.8858E-09
2	0.00	10603.6918	0.0000
3	20.08	11742.3838	1.7606E-07

Table E-150 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.0001	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.1994	hrs/season
Bird occupancy of rotor swept volume	0.3051	bird-sec
No. of transits through rotors	2.3365	per season
Estimated collisions	0.1633	per season
Estimated collisions after correction for operation	0.1437	per season
Estimated collisions after avoidance factor	0.0014	per season
Equivalent to 1 bird every	695.77	seasons

Breeding Season 2017

Table E-151 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	0.00	7229.7899	0.0000
3	4.06	7338.9899	5.5270E-08

Table E-152 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00003	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.0881	hrs/season
Bird occupancy of rotor swept volume	0.1347	bird-sec
No. of transits through rotors	1.0318	per season
Estimated collisions	0.0721	per season
Estimated collisions after correction for operation	0.0635	per season
Estimated collisions after avoidance factor	0.0006	per season
Equivalent to 1 bird every	1575.50	seasons

Non-Breeding Season 2017/2018

Table E-153 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	9.10	4664.6880	1.5497E-07
2	0.00	5783.8319	0.0000
3	0.00	5871.1919	0.0000

Table E-154 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00009	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.1727	hrs/season
Bird occupancy of rotor swept volume	0.2642	bird-sec
No. of transits through rotors	2.0234	per season
Estimated collisions	0.1414	per season
Estimated collisions after correction for operation	0.1245	per season
Estimated collisions after avoidance factor	0.0012	per season
Equivalent to 1 bird every	803.43	seasons

Herring Gull

Breeding Season 2012

Table E-155 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6997.0320	0.0000
2	0.00	8675.7479	0.0000
3	1499.90	8806.7878	1.7020E-05

Table E-156 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0103	hr^{-1}
Total Combined rotor swept volume	366774	m^3
Bird occupancy	27.1218	hrs/season
Bird occupancy of rotor swept volume	45.7305	bird-sec
No. of transits through rotors	338.9330	per season
Estimated collisions	25.7708	per season
Estimated collisions after correction for operation	22.6783	per season
Estimated collisions after avoidance factor	0.4536	per season
Equivalent to 1 bird every	2.20	seasons

Non-Breeding Season 2012/2013

Table E-157 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	0.05	10001.2093	5.1195E-10
3	0.00	8684.4713	0.0000

Table E-158 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0000003	hr^{-1}
Total Combined rotor swept volume	366774	m^3
Bird occupancy	0.0006	hrs/season
Bird occupancy of rotor swept volume	0.0010	bird-sec
No. of transits through rotors	0.0071	per season
Estimated collisions	0.0005	per season
Estimated collisions after correction for operation	0.0005	per season
Estimated collisions after avoidance factor	0.00001	per season
Equivalent to 1 bird every	104801.61	seasons

Breeding Season 2013

Table E-159 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.60	8551.9280	5.6130E-09
2	105.98	9398.7269	9.9143E-07
3	0.00	11742.3838	0.0000

Table E-160 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0006	hr^{-1}
Total Combined rotor swept volume	366774	m^3
Bird occupancy	1.5888	hrs/season
Bird occupancy of rotor swept volume	2.6789	bird-sec
No. of transits through rotors	19.8551	per season
Estimated collisions	1.5097	per season
Estimated collisions after correction for operation	1.3285	per season
Estimated collisions after avoidance factor	0.0266	per season
Equivalent to 1 bird every	37.64	seasons

Breeding Season 2017

Table E-161 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	9.32	5830.8600	1.2688E-07
2	184.44	7229.7899	2.5115E-06
3	4.75	7338.9899	6.4688E-08

Table E-162 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0016	hr^{-1}
Total Combined rotor swept volume	366774	m^3
Bird occupancy	4.3075	hrs/season
Bird occupancy of rotor swept volume	7.2629	bird-sec
No. of transits through rotors	53.8295	per season
Estimated collisions	4.0929	per season
Estimated collisions after correction for operation	3.6018	per season
Estimated collisions after avoidance factor	0.0720	per season
Equivalent to 1 bird every	13.88	seasons

Merlin

Non-Breeding Season 2012/2013

Table E-163 Merlin flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.27	6802.6700	2.9418E-09
2	0.00	10001.2093	0.0000
3	0.00	8684.4713	0.0000

Table E-164 Merlin mortality estimates

Mean activity in wind farm at rotor height	0.000002	hr^{-1}
Total Combined rotor swept volume	290321	m^3
Bird occupancy	0.0033	hrs/season
Bird occupancy of rotor swept volume	0.0044	bird-sec
No. of transits through rotors	0.0416	per season
Estimated collisions	0.0023	per season
Estimated collisions after correction for operation	0.0021	per season
Estimated collisions after avoidance factor	0.000041	per season
Equivalent to 1 bird every	24359.36	seasons

Non-Breeding Season 2013/2014

Table E-165 Merlin flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.09	8746.2900	7.9897E-10
2	0.00	10844.6848	0.0000
3	0.00	10274.5858	0.0000

Table E-166 Merlin mortality estimates

Mean activity in wind farm at rotor height	0.0000005	hr^{-1}
Total Combined rotor swept volume	290321	m^3
Bird occupancy	0.0009	hrs/season
Bird occupancy of rotor swept volume	0.0012	bird-sec
No. of transits through rotors	0.0113	per season
Estimated collisions	0.0006	per season
Estimated collisions after correction for operation	0.0006	per season
Estimated collisions after avoidance factor	0.00001	per season
Equivalent to 1 bird every	89690.70	seasons

Oystercatcher

Breeding Season 2013

Table E-167 Oystercatcher flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	30.30	7229.7899	3.6852E-07
3	0.00	8806.7878	0.0000

Table E-168 Oystercatcher mortality estimates

Mean activity in wind farm at rotor height	0.0002	hr^{-1}
Total Combined rotor swept volume	326424	m^3
Bird occupancy	0.4372	hrs/season
Bird occupancy of rotor swept volume	0.6561	bird-sec
No. of transits through rotors	5.5489	per season
Estimated collisions	0.3584	per season
Estimated collisions after correction for operation	0.3154	per season
Estimated collisions after avoidance factor	0.0063	per season
Equivalent to 1 bird every	158.53	seasons

Peregrine Falcon

Non-Breeding Season 2012/2013

Table E-169 Peregrine falcon flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	0.16	10001.2093	1.7741E-09
3	0.00	8684.4713	0.0000

Table E-170 Peregrine falcon mortality estimates

Mean activity in wind farm at rotor height	0.000001	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	0.0020	hrs/season
Bird occupancy of rotor swept volume	0.0030	bird-sec
No. of transits through rotors	0.0234	per season
Estimated collisions	0.0016	per season
Estimated collisions after correction for operation	0.0014	per season
Estimated collisions after avoidance factor	0.000029	per season
Equivalent to 1 bird every	34966.82	seasons

Breeding Season 2017

Table E-171 Peregrine falcon flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	63.02	7229.7899	8.5819E-07
3	99.11	7338.9899	1.3495E-06

Table E-172 Peregrine falcon mortality estimates

Mean activity in wind farm at rotor height	0.0013	hr^{-1}
Total Combined rotor swept volume	332795	m^3
Bird occupancy	3.5181	hrs/season
Bird occupancy of rotor swept volume	5.3823	bird-sec
No. of transits through rotors	41.5601	per season
Estimated collisions	2.8913	per season
Estimated collisions after correction for operation	2.5443	per season
Estimated collisions after avoidance factor	0.0509	per season
Equivalent to 1 bird every	19.65	seasons

Snipe

Non-Breeding Season 2016/2017

Table E-173 Snipe flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	236.33	9329.3760	2.0725E-06
2	0.00	10603.6918	0.0000
3	0.00	11742.3838	0.0000

Table E-174 Snipe mortality estimates

Mean activity in wind farm at rotor height	0.0012	hr^{-1}
Total Combined rotor swept volume	288197	m^3
Bird occupancy	3.1536	hrs/season
Bird occupancy of rotor swept volume	4.1781	bird-sec
No. of transits through rotors	52.6487	per season
Estimated collisions	2.6080	per season
Estimated collisions after correction for operation	2.2950	per season
Estimated collisions after avoidance factor	0.0459	per season
Equivalent to 1 bird every	21.79	seasons

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Barnacle Goose

Non-Breeding Season 2016/2017

Table E-175 Barnacle goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	252.74	14677.9797	1.7624E-06

Table E-176 Barnacle goose mortality estimates

Mean activity in wind farm at rotor height	0.0011	hr^{-1}
Total Combined rotor swept volume	391160	m^3
Bird occupancy	2.8693	hrs/season
Bird occupancy of rotor swept volume	5.2815	bird-sec
No. of transits through rotors	46.5233	per season
Estimated collisions	3.3962	per season
Estimated collisions after correction for operation	2.9886	per season
Estimated collisions after avoidance factor	0.0060	per season
Equivalent to 1 bird every	167.30	seasons

Curlew

Non-Breeding Season 2016/2017

Table E-177 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	4.05	11742.3838	3.5558E-08

Table E-178 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.00002	hr^{-1}
Total Combined rotor swept volume	370891	m^3
Bird occupancy	0.0541	hrs/season
Bird occupancy of rotor swept volume	0.0944	bird-sec
No. of transits through rotors	0.6709	per season
Estimated collisions	0.0513	per season
Estimated collisions after correction for operation	0.0451	per season
Estimated collisions after avoidance factor	0.0009	per season
Equivalent to 1 bird every	1108.35	seasons

Breeding Season 2017

Table E-179 Curlew flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	4664.6880	0.0000
2	629.54	5783.8319	1.0715E-05
3	15.48	5871.1919	2.6356E-07

Table E-180 Curlew mortality estimates

Mean activity in wind farm at rotor height	0.0066	hr^{-1}
Total Combined rotor swept volume	370891	m^3
Bird occupancy	13.0251	hrs/season
Bird occupancy of rotor swept volume	22.7330	bird-sec
No. of transits through rotors	161.4991	per season
Estimated collisions	12.3405	per season
Estimated collisions after correction for operation	10.8596	per season
Estimated collisions after avoidance factor	0.2172	per season
Equivalent to 1 bird every	4.60	seasons

Greenland White-Fronted Goose

Non-Breeding Season 2012/2013

Table E-181 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-182 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	394200	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	16.6648	bird-sec
No. of transits through rotors	146.5199	per season
Estimated collisions	10.7582	per season
Estimated collisions after correction for operation	9.4672	per season
Estimated collisions after avoidance factor	0.0189	per season
Equivalent to 1 bird every	52.81	seasons

Non-Breeding Season 2016/2017

Table E-183 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height ($secsHahr^{-1}$)
1	0.00	11661.7200	0.0000
2	0.00	13495.6078	0.0000
3	3887.04	14677.9797	2.7105E-05

Table E-184 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0163	hr^{-1}
Total Combined rotor swept volume	394200	m^3
Bird occupancy	44.1282	hrs/season
Bird occupancy of rotor swept volume	81.8581	bird-sec
No. of transits through rotors	719.7123	per season
Estimated collisions	52.8446	per season
Estimated collisions after correction for operation	46.5033	per season
Estimated collisions after avoidance factor	0.0930	per season
Equivalent to 1 bird every	10.75	seasons

Non-Breeding Season 2017/2018

Table E-185 Greenland white-fronted goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height ($secsHahr^{-1}$)
1	0.00	4664.6880	0.0000
2	0.00	5783.8319	0.0000
3	354.55	5871.1919	6.0348E-06

Table E-186 Greenland white-fronted goose mortality estimates

Mean activity in wind farm at rotor height	0.0036	hr^{-1}
Total Combined rotor swept volume	394200	m^3
Bird occupancy	9.8250	hrs/season
Bird occupancy of rotor swept volume	18.2254	bird-sec
No. of transits through rotors	160.2409	per season
Estimated collisions	11.7656	per season
Estimated collisions after correction for operation	10.3538	per season
Estimated collisions after avoidance factor	0.0207	per season
Equivalent to 1 bird every	48.29	seasons

Greylag Goose

Non-Breeding Season 2012/2013

Table E-187 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9523.7380	0.0000
2	0.00	12170.1463	0.0000
3	690.94	13087.8653	5.5181E-06

Table E-188 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0033	hr^{-1}
Total Combined rotor swept volume	416495	m^3
Bird occupancy	8.9837	hrs/season
Bird occupancy of rotor swept volume	17.6073	bird-sec
No. of transits through rotors	146.5199	per season
Estimated collisions	11.3556	per season
Estimated collisions after correction for operation	9.9929	per season
Estimated collisions after avoidance factor	0.0200	per season
Equivalent to 1 bird every	50.04	seasons

Non-Breeding Season 2013/2014

Table E-189 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8746.2900	0.0000
2	0.00	10844.6848	0.0000
3	53.00	11742.3838	4.6988E-07

Table E-190 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0003	hr^{-1}
Total Combined rotor swept volume	416495	m^3
Bird occupancy	0.7650	hrs/season
Bird occupancy of rotor swept volume	1.4993	bird-sec
No. of transits through rotors	12.4767	per season
Estimated collisions	0.9670	per season
Estimated collisions after correction for operation	0.8509	per season
Estimated collisions after avoidance factor	0.0017	per season
Equivalent to 1 bird every	587.59	seasons

Non-Breeding Season 2016/2017

Table E-191 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	1680.00	11661.7200	1.1715E-05
2	5730.47	13495.6078	3.9959E-05
3	4787.17	14677.9797	3.3382E-05

Table E-192 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.0512	hr^{-1}
Total Combined rotor swept volume	416495	m^3
Bird occupancy	138.4758	hrs/season
Bird occupancy of rotor swept volume	271.4016	bird-sec
No. of transits through rotors	2258.4791	per season
Estimated collisions	175.0366	per season
Estimated collisions after correction for operation	154.0322	per season
Estimated collisions after avoidance factor	0.3081	per season
Equivalent to 1 bird every	3.25	seasons

Non-Breeding Season 2017/2018

Table E-193 Greylag goose flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	44.97	4664.6880	7.6542E-07
2	319.92	5783.8319	5.4453E-06
3	42986.40	5871.1919	7.3167E-04

Table E-194 Greylag goose mortality estimates

Mean activity in wind farm at rotor height	0.4445	hr^{-1}
Total Combined rotor swept volume	416495	m^3
Bird occupancy	1201.3110	hrs/season
Bird occupancy of rotor swept volume	2354.4752	bird-sec
No. of transits through rotors	19592.8592	per season
Estimated collisions	1518.4849	per season
Estimated collisions after correction for operation	1336.2667	per season
Estimated collisions after avoidance factor	2.6725	per season
Equivalent to 1 bird every	0.37	seasons

Hen Harrier

Non-Breeding Season 2016/2017

Table E-195 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	9329.3760	0.0000
2	0.00	10603.6918	0.0000
3	16.20	11742.3838	1.4207E-07

Table E-196 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00009	hr^{-1}
Total Combined rotor swept volume	346569	m^{3}
Bird occupancy	0.1583	hrs/season
Bird occupancy of rotor swept volume	0.2582	bird-sec
No. of transits through rotors	1.8122	per season
Estimated collisions	0.1356	per season
Estimated collisions after correction for operation	0.1193	per season
Estimated collisions after avoidance factor	0.0012	per season
Equivalent to 1 bird every	838.17	seasons

Breeding Season 2017

Table E-197 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	0.00	7229.7899	0.0000
3	3.47	7338.9899	4.7256E-08

Table E-198 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00003	hr^{-1}
Total Combined rotor swept volume	346569	m^{3}
Bird occupancy	0.0753	hrs/season
Bird occupancy of rotor swept volume	0.1228	bird-sec
No. of transits through rotors	0.8619	per season
Estimated collisions	0.0645	per season
Estimated collisions after correction for operation	0.0567	per season
Estimated collisions after avoidance factor	0.0006	per season
Equivalent to 1 bird every	1762.37	seasons

Non-Breeding Season 2017/2018

Table E-199 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	8.54	4664.6880	1.4534E-07
2	0.00	5783.8319	0.0000
3	0.00	5871.1919	0.0000

Table E-200 Hen harrier mortality estimates

Mean activity in wind farm at rotor height	0.00009	hr^{-1}
Total Combined rotor swept volume	346569	m^3
Bird occupancy	0.1620	hrs/season
Bird occupancy of rotor swept volume	0.2642	bird-sec
No. of transits through rotors	1.8539	per season
Estimated collisions	0.1387	per season
Estimated collisions after correction for operation	0.1221	per season
Estimated collisions after avoidance factor	0.0012	per season
Equivalent to 1 bird every	819.32	seasons

Herring Gull

Breeding Season 2012

Table E-201 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6997.0320	0.0000
2	0.00	8675.7479	0.0000
3	1457.90	8806.7878	1.6543E-05

Table E-202 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0100	hr^{-1}
Total Combined rotor swept volume	378999	m^3
Bird occupancy	26.3623	hrs/season
Bird occupancy of rotor swept volume	47.0165	bird-sec
No. of transits through rotors	321.8400	per season
Estimated collisions	25.9996	per season
Estimated collisions after correction for operation	22.8797	per season
Estimated collisions after avoidance factor	0.4576	per season
Equivalent to 1 bird every	2.19	seasons

Breeding Season 2013

Table E-203 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	8551.9280	0.0000
2	102.91	9398.7269	9.6269E-07
3	0.00	11742.3838	0.0000

Table E-204 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0006	hr^{-1}
Total Combined rotor swept volume	378999	m^3
Bird occupancy	1.5341	hrs/season
Bird occupancy of rotor swept volume	2.7360	bird-sec
No. of transits through rotors	18.7284	per season
Estimated collisions	1.5130	per season
Estimated collisions after correction for operation	1.3314	per season
Estimated collisions after avoidance factor	0.0266	per season
Equivalent to 1 bird every	37.55	seasons

Breeding Season 2017

Table E-205 Herring gull flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	7.97	5830.8600	1.0848E-07
2	164.02	7229.7899	2.2335E-06
3	4.05	7338.9899	5.5124E-08

Table E-206 Herring gull mortality estimates

Mean activity in wind farm at rotor height	0.0014	hr^{-1}
Total Combined rotor swept volume	378999	m^3
Bird occupancy	3.8198	hrs/season
Bird occupancy of rotor swept volume	6.8126	bird-sec
No. of transits through rotors	46.6337	per season
Estimated collisions	3.7673	per season
Estimated collisions after correction for operation	3.3152	per season
Estimated collisions after avoidance factor	0.0663	per season
Equivalent to 1 bird every	15.08	seasons

Oystercatcher

Breeding Season 2013

Table E-207 Oystercatcher flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	6802.6700	0.0000
2	29.17	7229.7899	3.5479E-07
3	0.00	8806.7878	0.0000

Table E-208 Oystercatcher mortality estimates

Mean activity in wind farm at rotor height	0.0002	hr^{-1}
Total Combined rotor swept volume	340489	m^3
Bird occupancy	0.4209	hrs/season
Bird occupancy of rotor swept volume	0.6744	bird-sec
No. of transits through rotors	5.2189	per season
Estimated collisions	0.3628	per season
Estimated collisions after correction for operation	0.3193	per season
Estimated collisions after avoidance factor	0.0064	per season
Equivalent to 1 bird every	156.61	seasons

Peregrine Falcon

Breeding Season 2017

Table E-209 Peregrine falcon flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0.00	5830.8600	0.0000
2	63.02	7229.7899	8.5819E-07
3	99.11	7338.9899	1.3495E-06

Table E-210 Peregrine falcon mortality estimates

Mean activity in wind farm at rotor height	0.0013	hr^{-1}
Total Combined rotor swept volume	346569	m^3
Bird occupancy	3.5181	hrs/season
Bird occupancy of rotor swept volume	5.7375	bird-sec
No. of transits through rotors	40.6010	per season
Estimated collisions	3.0238	per season
Estimated collisions after correction for operation	2.6610	per season
Estimated collisions after avoidance factor	0.0532	per season
Equivalent to 1 bird every	18.79	seasons

Snipe

Non-Breeding Season 2016/2017

Table E-211 Snipe flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	201.60	9329.3760	1.7679E-06
2	0.00	10603.6918	0.0000
3	0.00	11742.3838	0.0000

Table E-212 Snipe mortality estimates

Mean activity in wind farm at rotor height	0.0011	hr^{-1}
Total Combined rotor swept volume	304006	m^3
Bird occupancy	2.6902	hrs/season
Bird occupancy of rotor swept volume	3.8485	bird-sec
No. of transits through rotors	43.8761	per season
Estimated collisions	2.4080	per season
Estimated collisions after correction for operation	2.1190	per season
Estimated collisions after avoidance factor	0.0424	per season
Equivalent to 1 bird every	23.60	seasons

ANNEX F REVIEW OF THE EFFECTS OF ARTIFICIAL LIGHT ON BIRDS IN RELATION TO DEPLOYMENT OF OBSTRUCTION LIGHTING ON WIND TURBINES

F.1 Introduction

With the increase in height of wind turbines, it is now a requirement for obstruction lighting to be added to tall turbines to make the structures more visible to pilots of aircraft. This review summarises the impacts of artificial light on birds and considers whether any of the known impacts might arise in birds as a consequence of deployment of obstruction lighting on wind turbines. This review was undertaken by Professor Bob Furness in September 2017.

F.2 Methods

A literature search was carried out, using tools such as Web of Knowledge and Google scholar, to identify relevant published work. Identified publications were obtained and read, in order to prepare this review paper.

F.3 Results Obtained from Literature Search

There is a large literature identifying a wide range of impacts of artificial lights on birds. The identified impacts all relate to effects occurring at night. These include:

- Disruption of photoperiod physiology of birds due to artificial light;
- Extension of daytime activity (earlier start at dawn, later end at dusk);
- Phototaxis of seabirds (birds attracted to light sources and grounded on land);
- Phototaxis of nocturnal migrants (birds attracted to light sources and grounded or killed);
- Ability of some birds to use nocturnal feeding assisted by artificial light;
- Increased predation risk for nocturnal birds resulting from artificial lighting;
- Birds better able to avoid collision when structures are illuminated; and
- Displacement of birds due to avoidance of lights.

These impacts are considered in turn below.

Disruption of photoperiod physiology of birds due to artificial light

In theory, low levels of artificial light have the potential to affect the physiological photoperiod experienced by birds, and thereby to affect the timing of their onset of activity in the morning and end of activity in the evening, as well as potentially affecting the seasonal triggers for activities such as deposition or shedding of fat stores, moult, breeding and migration (Titulaer et al. 2012, Gaston et al. 2013, 2015, De Jong et al. 2017, Da Silva et al. 2017). However, there are no published studies or observations reporting clear examples of any seasonal activities of birds being affected by exposure to artificial light. There are a few anecdotal examples of urban birds starting to nest in winter, and this could possibly be interpreted as birds coming into breeding condition early because their photoperiod had been affected by artificial light. However, such early breeding is generally seen only in a few bird species that are often able to breed successfully in winter if weather conditions permit. That suggests that such cases represent opportunistic breeding in urban environments rather than disruption of natural photoperiod responses. De Jong et al. (2017) experimented with birds in captivity, exposing them to different colours of light at night. Birds advanced their onset of activity in the morning when exposed to light at night, and advanced timing more in response to red and white light than to green light. Birds advanced timing more in response to higher intensity of artificial light. However, there have not been similar experiments with free-living wild birds, so it is uncertain if such effects occur in wild birds. Since such effects have not been reported, it seems more likely that there is very little, if any, effect of artificial light on photoperiod responses of wild birds.

Extension of daytime activity

Da Silva et al. (2017) used an experimental approach with wild birds, exposing the area around an automated feeding station in a forest to artificial light at night. They found a small response in some bird species, with blue tit and great tit starting to forage earlier during experimentally lighted mornings. However, no response was shown by willow/marsh tit, nuthatch, jay or blackbird, and the response of great tits was weak. The authors concluded that '*our results suggest that artificial light during winter has only small effects on timing of foraging*'. Da Silva et al. (2017) used an experimental approach to test whether birds start singing earlier in the morning when their forest habitat was illuminated with artificial light. They found no effect of artificial light (testing a variety of different light colours) on the timing of the dawn chorus. These results suggest that artificial light has very little, if any, impact on the available daylength for day-active birds, possibly because the natural variation in light levels is so large that artificial light makes very little difference to the natural diurnal cycle of light levels.

Phototaxis of seabirds

Most burrow-nesting shearwaters and petrels are nocturnally active. Adults rear a single chick, and 'desert' the fully-grown chick to leave it to fledge independently. Chicks fledge at night, usually just after dark, and show strong positive phototaxis; they are attracted to light. This allows them to navigate from the dark burrows at the colony to the sea, as light intensity is naturally higher over the sea than onshore. This phototaxic response is therefore important to allow fledglings to find the sea when they first leave their burrow (especially important for those petrel species that breed at colonies some distance inland from the sea). This phototaxis behavioural response is also seen, for example, in hatchling sea turtles and has the same function. Puffins also show this same response as petrels. There are numerous examples of shearwater, petrel, and puffin chicks being attracted to artificial lights at fledging, and being grounded (Wilhelm et al. 2013, Rodriguez et al. 2014, Gineste et al. 2017). This is well known, for example, at colonies in the Hawaii, Balearic islands, Canary Islands and Azores where fledglings will collide with street lights and car headlights (Fontaine et al. 2011, Troy et al. 2011, 2013, Rodriguez et al. 2012a,b,c, 2015a,b). It also occurs in Scotland, for example at the islands of Rum and St Kilda (Miles et al. 2010) where Manx shearwaters, European storm-petrels, Leach's storm-petrels and Atlantic puffin fledglings are grounded at street lights and illuminated windows. In virtually all of these examples, only fledglings are attracted and grounded, during the short period in late summer when chicks are departing from nesting burrows. Adults appear to be unaffected by artificial lights. Although for most colonies the numbers of fledglings distracted by artificial lights is trivial, the impact on survival of fledglings can be significant in a few cases where large colonies are close to extensive artificial lighting. In Reunion Island, 13,200 tropical shearwater fledglings were found grounded due to artificial lights, with numbers increasing from 1996 to 2015 (Gineste et al. 2017). At Phillip Island, Australia, 8,871 short-tailed shearwater fledglings were found grounded by lights along the roadsides, with at least 40% of these dead or dying (Rodriguez et al. 2014). Turning off the street lights mitigated this mortality (Rodriguez et al. 2014). In Kauai, Hawaii, more than 30,000 grounded fledglings of the federally threatened Newell's shearwater have been collected under lights, an impact that may be contributing to the decline of this population (Troy et al. 2011).

Lights on wind farm turbines in Scotland are unlikely to affect fledging puffins, shearwaters or petrels from Scottish colonies, as most of those colonies are on offshore islands immediately overlooking the sea. Fledglings are likely to disperse over the sea without seeing lights on wind turbines. Exceptions to this might be puffins from Isle of May fledging past offshore wind farms in the Forth and Tay area, Manx shearwaters and European storm petrels fledging from Sanda Islands, Kintyre, past terrestrial wind farms on the Kintyre peninsula, puffins fledging from the Shiants Islands passing terrestrial wind farms in the Western Isles, Manx shearwaters fledging from the small isles (especially Rum) and the Treshnish Isles passing terrestrial wind farms on Skye or Mull. However, the lights involved on wind turbines would be likely to represent a trivial amount of lighting relative to the street lights and house lights of local towns, villages, lighthouses, ships and fishing vessels. These fledglings are also thought to tend to fly low rather than at high altitudes, and so would not be likely to be particularly close to lights at the tops of turbines. Phototaxis of fledging seabirds in Scotland is, therefore, very unlikely to be a problem in relation to obstruction lighting on wind turbines.

Phototaxis of nocturnal migrants

It has been recognised for a very long time that nocturnal migrant birds are attracted to artificial light while migrating (Harvie Brown et al. 1881, Horring 1926, Mehlum 1977, Jones and Francis 2003). This topic has recently received considerable attention specifically in relation to lighting at communication towers (Longcore et al. 2008, Gehring et al. 2009), wind farms (Kerlinger et al. 2010, Hüppop and Hilgerloh 2012), oil and gas production platforms (Day et al. 2015, Ronconi et al. 2015), cruise ships (Bocetti 2011), and in general in relation to bird ecology (Zhao et al. 2014, Watson et al. 2016).

The strongest and most dramatic examples of phototaxis in nocturnal migration birds are the 'falls' of migrants that can occur at lighthouses and lightships, especially during foggy weather in autumn. These were studied in detail in the 1880s to 1920s. For example, Harvie Brown and Alfred Newton established a committee of the British Association for the Advancement of Science in the 1870s and sent questionnaires to lighthouse keepers throughout the British Isles to obtain data on nocturnal bird migration and the numbers of birds killed by collision with lights. As long ago as 1881, they reported that '*the brightest, whitest, fixed lights attract the most birds*', that most collisions occurred during autumn migration rather than during spring migration, and that most collisions occurred when the weather was foggy and windy (as also concluded over 100 years later by Mehlum 1977). These same factors were identified as affecting collision rates in a study by Zhao et al. (2014). The British association annual reports show the large numbers of birds that can be killed; for example, 600 thrushes killed by collision with Skerryvore lighthouse in October 1877. A high proportion of the birds killed were juveniles, which probably at least in part explains why numbers killed tended to be much higher in autumn than in spring. Similar surveys were conducted around the same period in many different European countries. For example, the 41st annual report on birds at Danish lighthouses, for the year 1923, was published in 1926 (Horring 1926). That report mentions that at least 4,600 birds, mostly thrushes and starlings, were killed by collision at Danish lighthouses and lightships in 1923. Study of birds at lighthouses fell out of favour around the 1930s, and there is very little literature on this topic after that period, although it was recognised that large numbers of migrating birds were still being killed by collision at lighthouses (e.g. Mehlum 1977, Jones and Francis 2003). Jones and Francis (2003) reported that from 1960-1989 there were kills of up to 2,000 birds in a single night in autumn at Long Point lighthouse (Ontario, Canada). However, this light was fitted with a new beam in 1989, which was narrower and less powerful, and this resulted in a huge decrease in numbers of migrant birds killed. From 1990 to 2002 the mean numbers known to be killed were reduced to only about 30 birds per year. The authors point out that this highlights the '*effectiveness of simple changes in light signatures in reducing avian light attraction and mortality during migration*'.

Ronconi et al. (2015) and Day et al. (2015) both report that poor weather (e.g. fog, rain, low cloud cover) exacerbate nocturnal attraction of bird migrants to lights at oil and gas production platforms, with on occasions thousands of birds being killed in a night, especially where gas is being flared. Kerlinger et al. (2010) report that bright artificial lighting may have caused '*multi-bird fatality events*' at wind farms in North America, but that obstruction lighting at turbines as recommended by the Federal Aviation Administration (FAA) (flashing red lights) had no influence on bird collisions compared with turbines at the same wind farm, where there was no obstruction lighting (see also this same conclusion in Manville 2009). Gehring et al. (2009) reported that communication towers equipped with non-flashing/steady-burning lights in addition to red or white flashing obstruction lights were responsible for much higher numbers of bird collisions; towers with fixed lights and flashing lights were responsible for 13 bird fatalities per season, whereas towers with only flashing obstruction lights were responsible for 3.7 bird fatalities per season. They concluded that having only flashing obstruction lights reduced bird collisions significantly, a conclusion supported by Patterson (2012). Longcore et al. (2008) reported that steady-burning lights increased the numbers of birds colliding with communication towers.

Watson et al. (2016) report that more nocturnal flight calls can be detected over artificially lit areas than over dark areas. They conclude that artificial lighting changes behaviour of nocturnal migrant birds, either by changing their flight paths to pass over lit areas, by flying at lower altitudes over lit areas, by increasing their call rates over lit areas, or by remaining longer over lit areas. Hüppop and Hilgerloh (2012) suggest that nocturnal migrants are more vocal when conditions are adverse, so that vocalisations do not indicate bird numbers but rather the stress levels of the birds. Bocetti (2011) identified that cruise ships, which often have bright external lighting during the night, also represent a collision hazard for nocturnal migrant birds, although it seems likely that the numbers of birds killed at cruise ships are rather small compared to numbers killed at lighthouses.

The evidence indicates that lights on wind turbines are likely to increase numbers of nocturnal migrant birds that collide. However, that increase is mainly seen if lights are steady-burning, whereas there is very little increase in collisions when lights are flashing. Obstruction lighting on wind turbines appears to be several orders of magnitude less effective than the light from lighthouses and lightships in attracting nocturnal migrant birds. Survival rates of small birds are low, and it is recognised that many birds die during migration, especially juvenile birds during autumn migration (Newton 2008). Birds that are attracted by artificial light are likely to be birds that are already at high risk of mortality because they are facing adverse weather conditions and are lost or exhausted (Newton 2008). Furthermore, Welcker et al. (2017) reported that, despite the apparent attraction of nocturnal migrating birds to lights, nocturnal migrants represented only 8.6% of all fatalities at a sample of German wind farms. They concluded that '*nocturnal migrants do not have a higher risk of collision with wind energy facilities than do diurnally active species, but rather appear to circumvent collision more effectively*'.

Phototaxis of other birds

Attraction of fledgling shearwaters, petrels and puffins, and attraction of nocturnal migrating birds to lights is well established and has been studied in detail. In contrast, there is no clear evidence from research studies or observations to suggest that other kinds of birds show attraction to lights. There seems to be little or no phototaxis shown by adult shearwaters, petrels or puffins around the British Isles, despite the strong response seen in fledglings. There is some evidence of adult petrels being attracted to bright artificial lights at night at colonies in the sub-Antarctic (e.g. Furness 19xx), but that may simply be a disorientation and grounding of birds that fly into strong beams of light such that they are unable to see where they are going. There is little evidence to suggest that those birds are attracted towards artificial light. There is little or no evidence to suggest that birds that are not undertaking migration are attracted to artificial light. While nocturnal migrants are found as collision casualties at lighthouses during the migration seasons, resident birds in summer or winter, wintering birds in winter or breeding birds in summer are not found as collision casualties in summer or winter. Seabirds breeding close to lighthouses are not found as collision casualties at lighthouses. The evidence strongly indicates that resident, breeding and wintering birds do not show phototaxis. Therefore, there is no risk due to phototaxis for resident birds, breeding or wintering birds in the vicinity of wind farms as a direct consequence of deployment of obstruction lighting on wind turbines.

Ability of some birds to use nocturnal feeding assisted by artificial light

Birds that are visual feeders and feed only during the day may benefit from artificial light that allows them to feed visually at night. This has been reported, for example, in intertidal waders. Santos et al. (2010) found that visual feeding shorebirds fed at night in areas of the Tagus Estuary (Portugal) where artificial light allowed them to see prey. Tactile-feeding waders did not show any change in distribution attributable to the distribution of artificial light. Similarly, Da Silva et al. (2017) found that blue tits and great tits started foraging earlier in the morning when artificial light was available. The availability of artificial light did not alter feeding times of willow/marsh tits, nuthatches, jays or blackbirds, and the effect on great tits was weak and only evident during nights when weather was poor. There are anecdotal observations of birds such as robins feeding under street lights during winter darkness in urban environments.

In the context of obstruction lighting on wind turbines, it is highly unlikely that the amount of light provided would allow birds to feed at times when natural light levels were low, so this effect is very unlikely to be seen at wind farms.

Increased predation risk for nocturnal birds resulting from artificial lighting

Canario et al. (2012) observed short-eared owls and long-eared owls catching migrating songbirds that had been attracted to artificial lights. Oro et al. (2005) found significantly lower survival rates of breeding adult European storm-petrels at a colony in Benidorm Island (Spain) that was illuminated by artificial lighting shining across the sea from Benidorm city compared to a control colony on the dark side of Benidorm Island. The low survival of the population exposed to artificial light was due to yellow-legged gull predation on the storm petrels which was facilitated by the artificial light allowing gulls to see, and catch, storm petrels attending the colony at night.

Amounts of light produced by obstruction lighting at the top of wind turbines will be far less than produced by the lights in the studies reported above. It is, therefore, extremely unlikely that the lighting on wind turbines would affect predation risk for nocturnal birds in the vicinity of wind farms.

Birds better able to avoid collision when structures are illuminated

Blackwell et al. (2012) showed that artificial lights on aircraft reduced the risk of bird strike because lights made the aircraft more detectable to birds so allowed earlier avoidance behaviour. A study of bat collisions at wind farms in Texas found that bat fatalities were more frequent at turbines without aviation lights compared with turbines with synchronised red flashing aviation lights. The lower mortality at turbines with lights applied for only one species of bat, the other species showing no difference in mortality between turbines with or without aviation lights. However, the study suggests that at least one of the bat species avoided turbines more successfully when the turbine was equipped with obstruction lighting.

Displacement of birds due to avoidance of lights

Day et al. (2017) reported that migrating eiders showed higher avoidance at night of an oil-production facility in Alaska when it was illuminated with a hazing light system. However, this seems to be a rare example of birds being displaced by artificial lights, and there seem to be more examples of birds using artificial lights to their benefit, such as the use by shorebirds of artificial lights to allow them to feed visually at night.

Cumulative assessment

Loss et al. (2015) assessed the scale of anthropogenic mortality of birds in the United States and concluded that cause-specific annual mortality was billions due to predation by domestic cats, hundreds of millions due to collisions with buildings (mainly windows) and vehicles, tens of millions due to collisions with power lines, millions due to collisions with communication towers and electrocution at power lines, and hundreds of thousands due to collisions with wind turbines. These relative impacts are likely to be in a similar ranking in Scotland, and indeed throughout most of Europe.

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ANNEX G TANGY I AND TANGY II HISTORICAL INFORMATION AND DATA

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Appendix G Bird Distribution

General

There is a variety of survey information available on the birds which occur on or around Tangy Farm (Seabird Colony Register 1986; Maguire 1989; Maguire & Angus 1989; Gibbons et.al. 1993; SNH 1993). The wintering birds were assessed by Lawrence (1993 unpublished). The bird fauna has been characterised by winter records (Table 1) and summer breeding species (Table 2). Tangy Farm was surveyed using the Moorland Bird Survey technique during the summer of 1994. The most notable birds (in a local context) of the 33 species which breed at Tangy are Tufted Duck, Redshank, Snipe and Curlew (Table 2) and these are concentrated around Tangy Loch ca. 1.5km east of the development site. Supplementary records were collected by E. Maguire and R. Angus for the New Breeding Bird Atlas for Britain and Ireland (Gibbons et. al. 1993): supplementary records for grid squares NR6828, NR6928, NR6727 & NR6827.

Hen Harrier, Short-Eared Owl and Sparrowhawk do not breed on the site, but they occasionally hunt over the areas adjacent to the younger forestry at the east end of the farm (Fig. 2). Tangy Farm does not appear to support any breeding birds listed under Schedule 1 of the Wildlife & Countryside Act 1981 or Annex 1 of EC's Directive (79/409) on the conservation of Wild Birds. In comparison with the sites surveyed by NCCS (1990) Tangy Farm would be ranked ninth of the nine sites surveyed in Mid and South Argyll in 1990 and also lower in rank than the eleven sites surveyed in 1991 (NCCS 1991). The breeding bird community at Tangy does not meet the threshold criteria for selection as a Site of Special Scientific Interest, but it supports a notable collection of birds in local terms which is centred around the Loch.

Raptors

Lawrence (1993 unpublished) carried out a survey of birds which utilise or fly over Tangy Farm from late autumn 1993 to spring 1994. This involved 12 hours of observations over twelve visits (visit duration 1-3 hours) (Table 1) and covered all areas within the farm boundary. There were 17 individual sightings of birds of prey (including Hen Harrier, Buzzard, Kestrel, Sparrowhawk) Table 1. Three species of owl (Tawny, Barn and Short-Eared) are known to use Tangy farm (Maguire pers comm 1994.)

The index of bird abundance at Tangy is on average 1.7 birds/10min scan/km² which is between 5-18 times less than the autumn abundance in two wind resource areas in California 2.6 - 31.0 raptors/10min scan/km² (Orloff & Flannery 1992). Twenty percent of these observations were within the development site at Tangy which is an average contact rate of <0.55 individuals per hr. The majority of records of these species of large bird which fly over Tangy Farm refer to corvids and gulls.

A map-based compilation of these records (Fig. 2) shows that 90% of the flight paths and associated activity occurred over three well demarcated areas: (i) wildfowl enter and exit Tangy Loch SW over the boat house to their feeding grounds around Machrihanish Airfield and leave for the Lussa Loch on a NE flight line (ii) Corvids and gulls move E & W along the lower slopes to the north of Tangy Burn, using the uplift from W & SW winds accelerating over this slope and (ii) these same species traverse the lower parts of the valley to the south of Tangy Burn on a S & SE bearing. Approximately 10% of the flight records at Tangy cross the development site and the species concerned were Hooded Crow, Rook, Herring Gull and Starling. Therefore any potential collisions would involve a few individuals of these species per annum during periods of poor visibility- by extrapolation from records from other European sites (Winkelman refs. 1985 -1992). The expected collision rate with wind turbines would be considerably less than that recorded from over-head power lines (Rose & Baillie 1989; Winkelman 1985-1992; Still et. al. 1994).

Geese

Historically Tangy Loch was used by Greenland White-fronted Geese to a greater extent than today (e.g. ca. 400 1984; N. Russell SNH pers comm. 1994). The use of Tangy Loch as a roost for Greenland White-fronted Geese over the last 5-10 years has been sporadic and this is confirmed by a variety of sources (R. Bullock pers comm. 1994; E. Maguire pers comm. 1994; A. Garden pers comm. 1994; S. Lawrence pers. obi. 1993/1994). The maximum number of geese (unknown species) recorded on Tangy Loch was ca. 20 (Nov. 1993) and 4 Greenland White-fronted Geese used the Loch on one occasion in February 1994 out of eleven survey visits in 1993/94 (Table 3). One of the principle roost lochs used by both Greylag and Greenland White-fronted Geese during the 1993/94 winter is the Lussa Loch (RSPB 1994; pers. comm. 1994 Table 3). The main dawn and dusk flight line to the Lussa Loch is in a N-S direction from High Ranachan Farm to Skeroblin Cruach (Fig. 2). Records of goose movements over Gobnagrenan cottage were made by A. Strang (Forestry Enterprise) from Dec. 15th 1993 - April 4th. 1994 and these show that the Lussa loch was used on 90% of the 110 night- records (A. Strang pers. comm. 1994). The flight lines of geese to Tangy Loch follow a SW-NE direction over the boat house and this route has been used by small numbers of both species which flew on towards the Lussa Loch (Table 3). Historically geese have been recorded flying up the west Kintyre coast to an alternative feeding site at Glenacardoch Point (Bignal 1988) and this could be the destination for a N-S flight line of Greenland White-fronted Geese over Killarow Farm (Table 3; Fig. 2).

In conclusion the best available evidence indicates that the siting of the proposed wind farm at Tangy will not obstruct the movements or alter the roost usage by both species of geese. In addition there is evidence from Europe that geese acclimatise to wind farms which have a closer proximity to feeding/resting sites than would be the case here (Winkelman 1989; 1992).

Migration

Observations from Westport 1.5km south of Tangy Farm by Maguire & Angus (1989) indicate that the main flight paths follow a N-S direction along the shore. The majority of species are marine/ coastal (e.g. auks, gulls, waders, wildfowl) and most of the passage takes place offshore. A number of land species such as wagtails, pipits, skylarks, starlings, thrushes and finches also use this route both along the coast and offshore. These flight paths are confirmed by the observations of Goodbody (1956) who studied bird migration on the Mull of Kintyre. These sources confirm that there is very little migrant bird traffic concentrated directly over the high ground at Tangy.

Conclusion

In summary Tangy supports a moderate to poor breeding bird community in comparison with other areas surveyed in Argyll and Scotland (NCCS 1990), but is relatively rich in local terms. Birds utilise Tangy for feeding, flying and resting at low/moderate densities (even during peak periods of the year) and this use is concentrated in specific zones or along well demarcated flyways. The windfarm will present a potential density of 0.3 turbines/km^2 on the west side of Kintyre which is ca. 100 times lower density than exists in wind resource areas in California (Altamont 34 turbines/km^2). The scale, design and location of the windfarm is expected to have minimal impact on the birds at this site (Winkelman 1985, 1987, 1989, 1992; Crockford 1992; Meek et al. 1993; Still et.al. 1994).

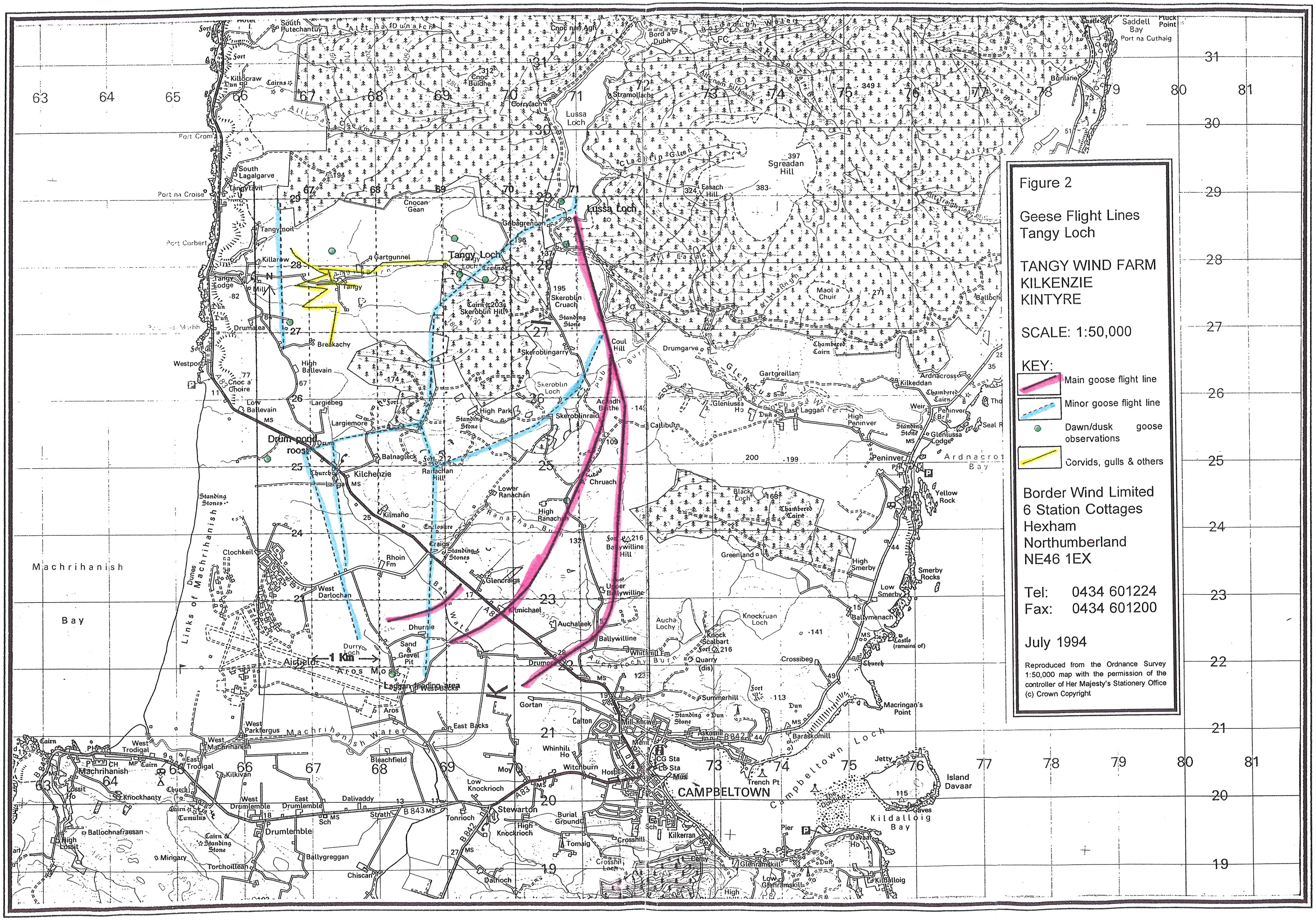
Figure 2
Geese Flight Lines
Tangy Loch
TANGY WIND FARM
KILKENZIE
KINTYRE
SCALE: 1:50,000
KEY:
Main goose flight line
Minor goose flight line
Dawn/dusk goose observations
Corvids, gulls & others
Border Wind Limited
6 Station Cottages
Hexham
Northumberland
NE46 1EX
Tel: 0434 601224
Fax: 0434 601200
July 1994
Reproduced from the Ordnance Survey 1:50,000 map with the permission of the controller of Her Majesty's Stationery Office (c) Crown Copyright
Tangy Loch
Lussa Loch
Drum pond roost
Laggan feeding area
1 Km
Machrihanish
Bay
CAMPBELTOWN
Kilchenzie

Appendix 2

Birds Assessment

TANGY WIND FARM EXTENSION

REVIEW OF IMPACT ON GREENLAND WHITE-FRONTED GEESE

March 2004

V2

A report to:
SSE GENERATION Ltd.

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1 SUMMARY

This report presents the assessment of the impacts of the proposed expansion of the Tangy wind farm by an additional seven wind turbines on Greenland White-fronted Geese (*Anser albifrons flavirostris*).

The baseline situation is the presence of 15 wind turbines within the southern part of Kintyre in the vicinity of a European level conservation area- a SPA (Special Protection Area).

The applicant SSE Generation Limited consulted with Argyll & Bute Council, SNH and RSPB who recommended that an environmental review be undertaken in the light of a potential adverse impact on the SPA.

Monitoring of the reactions of geese to the existing wind farm at Tangy is described both before and after construction/operation started in 2003. To date there appears to be no change in behaviour or habitat use by the geese as a result of the Tangy windfarm.

An evaluation of the potential for additional disturbance effects or adverse changes to the habitats of the SPA by the extension of the Tangy wind farm is predicted to be negligible. Hence this aspect of the application is assessed as non-significant.

An evaluation of the potential for collision mortality is based on a theoretical model and this predicts that there could be an average of one goose lost per four year period. The model is based on conservative assumptions and this level of additional mortality is not predicted to result in a population decline and hence loss of integrity of the SPA. This aspect of the application is assessed as a non-significant impact on the qualifying species.

CONTENTS

2 INTRODUCTION & METHODS

Scope of review & methods

The following report presents an independent review by Lawrence Environmental Consultants of the potential impacts of the proposed extension of the Tangy wind farm, Kintyre on Greenland White-fronted Geese (*Anser albifrons flavirostris*). The proposal lies within the wider countryside on land with no conservation designation, but in the vicinity of part of the Kintyre Goose Roost Special Protection Area.

This application refers to the proposed extension (by an additional seven wind turbines) of the existing wind farm at Tangy, Kintyre of fifteen 850kW wind turbines (75m to blade tip height).

The scope of this review has been agreed in correspondence between the applicant SSE Generation Limited and the Argyll & Bute Council (the competent authority) (Ref. Argyll & Bute: MAKI/DC/RK/14 01.08.03; S&SE Ref. 381112/001 02.07.03). A preliminary assessment by SNH concluded that there would be the potential for a significant impact via the probability of Greenland White-fronted Geese colliding with the additional wind turbines of the proposed extension (SNH Ref. Annex 2). The review considers the following:

- The conservation status of Greenland White-fronted Geese and the Kintyre Goose Roosts Special Protection Area
- The baseline Kintyre SPA population of Greenland White-fronted Goose
- Appraisal of the existing surveys: geese roosting on Tangy Loch, their flight lines and bird strikes
- Assessment of land take/habitat displacement effects
- Assessment of collision risk
- Magnitude of predicted effects and significance
- Mitigation measures (where appropriate) and residual impacts

Apart from the pre and post-construction monitoring of geese at the Tangy wind farm itself there is no additional evidence of direct applicability in this area or in Scotland. Of relevance are studies on the reaction of a variety of other species of geese to wind farms in Europe.

There have been a number of studies of geese at existing wind farms published since review of evidence undertaken for the public inquiry for the proposed wind farm at Largie, Kintyre 1996. The most comprehensive has been that by Larsen and Madsen (2000) who studied pink-footed geese in Denmark and primarily looked at the disturbance to feeding or resting that the wind turbines may cause to the geese. They found small-scale displacement of 1-200m around the turbines, but of particular relevance to Tangy the population in their study area increased from 1,000 to over 11,000 geese in a period during which 61 wind turbines were constructed within their main feeding area.

Further studies of goose collisions with wind turbines have not found any further casualties in addition to the single Brent goose at Kreekrak in the Netherlands (Musters *et al.* 1996). No collisions were reported at a major spring staging area in Gotland where 3,700 barnacle geese fed and roosted in close proximity to 69 wind turbines (Percival 1998). In a comprehensive review of bird collisions at wind farms in the USA, Erickson *et al.* (2001) did not report any goose collisions.

Recent studies using radar have demonstrated the likely reason why waterfowl collision rates with wind turbines are so low. Flocks and individual duck species (as well as swans) were tracked by radar whilst flying at night. On brighter moonlit nights they frequently approached close to the wind turbines but flew around the rotor blades. It is assumed that these structures would have been clearly visible to them. On darker nights without moonlight they maintained a larger distance from the wind turbines, clearly still aware of their location and clearly not just flying along a 'set' route blindly (Dirksen *et al.* 1998, Tulp *et al.* 1999). There is evidence of diversion around wind turbines by other geese species in an in/offshore context as well as flights between offshore wind turbines by Brent Geese (Pettersson, 2001 & 2002).

3 CONSERVATION STATUS OF GREENLAND WHITE-FRONTED GOOSE

Designated Nature Conservation Sites

There are no designated or non-designated conservation sites for birds within the existing wind farm area or the proposed extension area.

At its closest the current wind farm lies 800m from Tangy Loch.

Tangy Loch is included within the Kintyre Goose Roost Special Protection Area which was formally classified under EU's Birds and Habitats Directive on 28.10.98. There are five lochs within the SPA, each loch is also designated as SSSI's and this suite of lochs is also within the RAMSAR designation.

The Lussa Loch is regarded as the core/main roost sites for the Laggan (or Machrihanish) sub population and lochs such as Tangy are regarded as satellite roosts (used on an irregular basis). Lussa Loch lies 3.5km northeast from the site centre of the Tangy wind farm.

Species conservation status

The Greenland White-fronted Goose (*Anser albifrons flavirostris)* is not protected under Schedules 1 or 2 of the 1981 Wildlife and Countryside Act. It is listed on Annex 1 of the EU Directive on the Conservation of Wild Birds (79/409/EEC).

4 KINTYRE SPA POPULATION OF GREENLAND WHITE-FRONTED GOOSE

The Kintyre population at the time of formal classification of the SPA was 2300 geese. This was based on the mean winter peak count on the feeding fields for the years 1991/92 and 1995/96. The 2002/03 mean field count for Kintyre was 2749 and the average of the last five years counts is 2822 Greenland White-fronted Geese.

In line with the Kintyre population the local Laggan sub-population has now increased three-fold since 1982 to a current level of over 1300 individuals based on the 2002/03 winter average count (S. Philips, SNH).

5 SURVEYS OF GEESE ROOSTING, THEIR FLIGHT LINES ON/NEAR TANGY LOCH AND BIRD STRIKES WITHIN THE OPERATIONAL WINDFARM

Roost occupancy and flight lines

The available information on roost use and flight lines is based on surveys from the 1993/94 winter onwards and includes pre- and post construction monitoring of the Tangy wind farm (Thompson & Harding 1994; Border Wind Ltd. 1994; Harding et. al. 1995; Brooks & Mitchell 1996; Lawrence 2002; 2003). An additional survey on the roosting activity of geese on the Lussa Loch was undertaken over the 1999/2000 winter (Lawrence 2000).

Greenland White-fronted geese were most recently recorded on Tangy Loch in 1994 (4 geese on 04.02.94; recorded by E.S. Lawrence cited in Harding & Thompson 1994) and since then only Greylag geese have roosted at this loch.

From an accumulated total of 46 survey visits between the 1993/94 winter and the 20001/01 winter there were nine Greenland White-fronted geese that flew across the Tangy wind farm area (Fig.1).

The repeated pattern of roost access from the feeding fields on the Laggan (between Machrihanish and Campbeltown to the south) is north-south along a valley system over Skeroblin Cruach to the Lussa Loch (*loc. cit;* Lawrence 2003).

The limitations of the surveys relate to observer efficiency (flight lines may have gone un-detected), species identification in flight would not be 100% accurate and the intensity of sampling was low (typically <5% of a possible maximum of 360 survey visits per winter season). For this assessment a precautionary approach is taken where species identification in flight was uncertain or not possible- thus the category 'unidentified geese' is assumed to be the qualifying species of the SPA.

For a significant proportion of the dusk or dawn flight observations the estimated number of geese accessing the Lussa Loch matches the daytime field count on the Laggan. The implication from these data is that the majority (and often the total) local goose population was accounted for flighting to or from the Lussa Loch along its relatively predefined corridor.

Flight behaviour /reaction to the Tangy wind farm

The post construction flight line observations over the 2002/03 winter detected one flock of four Greenland White-fronted geese on a northerly bearing towards Tangy wind farm (Lawrence 2003). This group of four geese was in the context of an estimated 13,500 goose movements recorded over this single season. Their approach height exceeded the blade tip height by a significant margin (>150m) and they made a measured diversion north east around the wind farm area and continued on their original course. Reactions of this nature (measured diversions at long approach distances around wind turbines or wind farms) are a consistent finding from all the relevant surveys in Europe.

The relatively infrequent flight lines that deviate from the regular north-south corridor to the Lussa Loch (c. 1% of those recorded) are correlated with the dawn exit from the Lussa Loch under bright weather conditions rather than the dusk arrival (Lawrence 2003). In contrast with the routine arrival/departure period of the Laggan flock which takes 30-50min., these irregular flight lines occur over a longer period (up to 3h post dawn). In addition there appears to be a correlation with bright weather conditions, low or no wind speeds and an inversion layer of low-lying mist or transient cloud. Although the sample size is small, the number of geese involved is an order of magnitude less than the average flock size typical of the main departure from the Lussa Loch.

The estimated width of the regular flight corridor to the Lussa Loch varied over the accumulated pre and post construction observations (Lawrence 2002; 2003). A minimum of ninety five percent of flocks of Greenland White-fronted Geese (or unidentified geese) flew north/south within a 1.5km wide zone bounded on its western edge by longitude NR 70 and this parameter showed no significant change after the construction of the wind farm (Figs. 1 & 2; Lawrence 2000). A significant proportion of observations coincided with strong side/cross winds (>F5 Beaufort

Scale) that resulted in the zig-zag of individual flocks about their north/south route or the drift of a flight line. The latter phenomenon was witnessed from an observation point directly under the flight corridor (Lawrence 2000).

Bird Strike

The search for geese corpses beneath the Tangy wind turbines during their first winter of operation (2002/03) detected no evidence of bird strike (Lawrence 2003). The preliminary data from the current autumn/winter (2003/04) to date confirm the absence of geese bird strike.

The limitations of the surveys relate to the detection efficiency of the observer and potential of the removal of bird strike corpses by scavengers. The surveyor's experience of the detection of goose corpses from the margins of lochs indicates that there are frequently signs of scavenger/predator removal such as light coloured feathers (where no corpse is located). On balance there is predicted to be a low to very low probability that cases of goose bird strike with the Tangy wind turbines have gone undetected.

6 EVALUATION OF IMPACTS

Land take and habitat displacement.

The integrity of the Kintyre Goose Roosts SPA could theoretically deteriorate if the planned wind farm extension at Tangy resulted in:

(i) reduced/restricted distribution of the geese within the site (6.1.1);

(ii) a reduction in the area or extent of habitats that support the designated species (6.1.2);

(iii) interference or loss of the structure, function and supporting processes of habitats that support the species and (6.1.3)

(iv) significant disturbance of the species (6.1.4).

A direct reduction in the qualifying species population is assessed below under 'Bird Collisions'.

6.1.1 Reduced/restricted distribution of the geese within the site

The application area lies 2.2km west from the flight line access point at the south end of the main roost (Lussa Loch) and it does not lie between this loch and the feeding area of this local population of geese. Based on the species known flight corridor and variation under a variety of weather conditions the proposed change is predicted not to result in a significant adverse impact on the local population's ability to exploit the key resource within the SPA.

Historically Tangy Loch represents a satellite roost site within the SPA (*loc. cit.*) and recent pre and post construction observations indicate that it functions as a satisfactory roost resource for the co-occurring Greylag geese. As above there is no evidence that the application area lies between the satellite roost (Tangy Loch) and the Greenland White-fronted (and Greylag) goose feeding area. With an expanding population or some unforeseen change in the suitability of the main roost, it is possible that the Greenland White-fronted Geese would use Tangy Loch at some point in the future. Based on this species accommodation to and assumed awareness of the existing Tangy wind farm (wind turbine No. 1 at 800m from Tangy Loch) it is predicted that the extension at its closest (wind turbine No. 18 at 1000m) would not result in a significant degradation in Tangy Loch as one component of the SPA.

6.1.2 A reduction in the area or extent of habitats that support the designated species

Neither the application site nor the original wind farm site area occupy ground or pasture that are known to be utilised by Greenland White-fronted Geese for either feeding or resting. There is assessed to be a negligible probability that the local goose population would switch to use the land of the application site at some point in the future (Larsen & Madsen 2000). The additional land take of the seven wind turbines and access tracks is therefore predicted to result in a negligible impact on the area and extent of habitats that lie outside of the SPA. Therefore the proposed extension to the wind farm is likely to result in a negligible magnitude effect on a species component of the SPA that is classified as of very high sensitivity. Consequently the effect is classified as of negligible significance.

6.1.3 Interference or loss of the structure, function and supporting processes of habitats that support the species

The direct and indirect effects of the proposed wind farm extension are predicted to result in negligible magnitude interference or loss of the structure, function and supporting processes of the SPA habitats (i.e. pollution, deterioration and reduction of the water quality of the roost lochs or feeding areas).

6.1.4 Significant disturbance of the species

The routine operation and maintenance activity that is normally more frequent during the first year or two of the operational life of the wind farm has not resulted in displacement of Greylag geese (or migratory Schedule 1 listed species such as Whooper Swan) from Tangy Loch. There is not anticipated to be a step change in the intensity or nature of operation and maintenance activity associated with the enlarged wind farm. There is therefore predicted to be no significant disturbance to the qualifying species during the operational life span of the project.

There could be a significant disturbance effect if certain aspects of the construction of the wind farm extension coincided with the nocturnal period of use. For example the sudden and repeated production of noise from quarrying could potentially have an effect over 600m to Tangy Loch (refer to mitigation section below). With reference to the potential impacts of quarrying on flight activity reference is made to the active quarry at Calliburn (NR717255) that lies beneath the flight route to the Lussa without apparent displacement of the geese. In addition observations have been made on the reaction of roosting geese to forestry heavy goods vehicles at close proximity on the Lussa Loch (Lawrence 2000).

Bird collisions

In order to predict the potential for bird strike with the additional seven wind turbines of this application the theoretical risk of collision on a worst case scenario is calculated for the expanded wind farm of 22 wind turbines. The SNH/BWEA collision risk model has been applied (Band et. al. 2003) (stage 2) and the observed flight line frequency through the wind farm development boundary has been input from the survey information (pre-construction) (stage 1). Since the observed flight lines west of Tangy Loch including those through the wind farm area were of variable direction, the stage 1 'less predictable bird movements model' has been applied (Band et al. 2003).

6.1.5 *Stage 1*

The estimate of the number of geese co-occupying the wind farm volume is based on the accumulated flight lines that crossed the development area over the four winter surveys (93/94, 94/95, 95/96 & 01/02). During the total of 46 survey visits there were a total of 9 Greenland White-fronted Geese and as a precautionary approach they were assumed to have all flown at the risk height (even though observation conditions were optimal for these observations and they flew above the maximum blade tip height). An additional conservative assumption is made that each goose spent 60 s within the wind farm boundary, whereas the transit time was less than this and involved just two separate flocks. Thus the contact time of 9 x 60s (i.e. nine individual flights) over estimates the observed frequency of activity.

The total watch duration is conservatively calculated at 46 x 1.5h although some watches extended for 3h (Lawrence 2002; 2003).

Over the 180 days geese wintering period it is assumed that the 1.5h dawn and 1.5h dusk period would cover the 'potential flight hours per day' (*loc. cit*).

The conservative assumption that departs from the observed flights is that the wind turbines would be in full production (i.e. at nominal/rated output and rotation speed of 26 r.p.m) whereas the observed flights occurred during still or cut in wind speeds (0-11 r.p.m).

Due to the small number of studies that have measured avoidance rates specifically for wildfowl, a precautionary avoidance rate for wildfowl of 95% is adopted. A more probable avoidance rate of more than 99% is also applied to the model (Percival 2000). A worst-case avoidance rate for waterfowl estimated from the initial Blyth harbour study (Still *et al.* 1996) produces an avoidance rate of 99.62%.

The estimated average number of transits by geese through the rotor risk volume per year is 17.6 geese/year (Table 1).

6.1.6 *Stage 2*

The theoretical rate that an object the size of a goose would come in contact with a rotor (of the wind turbine dimensions at Tangy) is just over 13% of transits (Table 2). This refers to random transits with the assumption that the object maintains a predetermined and unaltered course (no avoidance).

6.1.7 *Estimated theoretical collision rate*

For an expanded wind farm of 22 wind turbines the product of stage 1 and stage 2 equates to one goose collision every 8.6 years for the precautionary avoidance rate (Table 1). This compares with one goose collision every 12.6 years predicted on the baseline situation (15 wind turbines). The addition of seven wind turbines thus increases the theoretical collision rate by 31%.

Application of the more probable avoidance rate results in an estimated single goose collision every 113 years for the 22 wind turbines.

7 MAGNITUDE AND SIGNIFICANCE OF EFFECTS

As a guide to the magnitude of the mortality rate from section 6.1.7 above, reference is made to a Population Viability Analysis used to assess the significance of the predicted collision frequency of the Largie wind farm proposal in 1996 (Pettifor et. al. 1996). The reference Kintyre population in 1996 was 1,956 Greenland White-fronted Geese and an estimated additional 2% mortality from the Rhunahaorine population of

1100 (equivalent to geese 22/yr.) was calculated to be sustainable (Scottish Office Inquiry Reporters Unit 1997).

The conservative increase in collision frequency due to the Tangy wind farm extension is 0.04 geese/yr (6.1.7).

The 2003 estimate of the Kintyre population is 2,749 (section 4) and a sustainable additional 2% mortality equates to 55 geese/yr. The additional predicted mortality from the Tangy wind farm extension is an order of magnitude less than the 2% figure adopted above and thus it would not have an adverse impact on the SPA population. The magnitude of mortality is assessed as negligible and therefore the significance of this effect is negligible.

8 MITIGATION/ BEST PRACTICE RECOMMENDATIONS

Since the predicted effects of this proposal are below the level of low or negligible significance the term mitigation does not apply. The following recommendations thus refer to best practice methodology.

Observations indicate that (i) minor numbers of Greenland White-fronted geese pass over the development area on an infrequent basis and (ii) that individuals of this species make measured diversions in flight over and around the existing wind turbines at Tangy that match the reactions of geese to wind turbines elsewhere in Europe.

The proposed extension to the Tangy wind farm includes the following general features that will maintain the effects below the significant level on the SPA population of Greenland White-fronted Geese:

The location of the Tangy wind farm incorporating the extension is 2.2 km from the major flight corridor to the main roost – the Lussa Loch (6.1.1). In addition the extension occupies a landform feature that is discrete from the valley landform feature that the geese follow to the Lussa Loch.

The proposal is not located between the main feeding area (the Laggan) and main roost (the Lussa Loch).

The nearest part of the SPA to the proposed extension (Tangy Loch) has not attracted the qualifying species over the last decade, but it currently serves as a viable roost for other species of goose and wildfowl.

The proposal is not located between the main feeding area (the Laggan) and the satellite roost (Tangy Loch).

The blade tip profile of the seven wind turbines of the extension and their fit within the overall wind farm envelope do not present a significant step change to the collision risk profile of the existing wind farm.

To reduce the potential of noise disturbance it is recommended that a timing constraint is applied to significant sounds that may arise from quarrying activity or other construction activity. This should apply to the dusk to dawn period over the 180 day period of residence of the qualifying species.

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Appendix I

Sensitivity/magnitude matrices

Table App. 1 Value of ecological/ornithological/mammalian resources.

Level of Value/Sensitivty	**Examples**
International VERY HIGH	Internationally designated or proposed sites such as Ramsar Sites, Special Protected Areas, Biosphere Reserves and Special Areas of Conservation, or otherwise meeting criteria for international designation. Sites supporting populations of internationally important species.
National HIGH	Nationally designated sites such as SSSI's, or non-designated sites meeting SSSI selection criteria, NNR's, Marine Nature Reserves, NCR Grade 1 sites. Those containing viable areas of any key habitat identified in the UK BAP. Sites supporting viable breeding populations of Red Data Book species (excluding scarce species), or supplying critical elements of their habitat requirements.
Regional MODERATE	Sites containing viable areas of threatened habitats of importance within a regional context i.e. SNH West, East or North area, comfortably exceeding SINC criteria, but not meeting SSSI selection criteria. Sites supporting viable breeding populations of Nationally Scarce species or those included in the Regional BAP (if present) on account of their rarity, or supplying critical elements of their habitat requirements.
High Local LOW	Sites meeting the criteria for a county area designation (such as SINC), which may include amenity and educational criteria in urban areas. Ancient semi-natural woodland. Designated Local Nature Reserves. Sites containing viable areas of any key habitat identified in the County LBAP. Sites supporting viable breeding populations of species known to be county rarities (e.g. featuring in a county 'red data book' or included in the county LBAP), or supplying critical elements of their habitat requirements.
Moderate Local LOW	Undesignated sites, or features or species considered to appreciably enrich the resource within the context of the Parish (i.e. approx. 10km radius from the site).
Low Local LOW	Undesignated sites, or features or species considered to appreciably enrich the habitat resource within the immediate environs of the site (e.g. a species-rich hedgerow).
Negligible NEGLIGIBLE	Low grade and widespread habitats.

Table App. 2: Guideline Criteria for assessing magnitude of Impacts

Impact	**Guideline Criteria**
High	A large permanent reduction in area, total loss of key species, numbers or species-richness likely- baseline changed
Medium	Medium term-temporary reduction in area, numbers or key species likely; small permanent reduction in numbers or species-richness likely baseline partially changed
Low	Minor shift in baseline, minor reduction in area, numbers or species richness likely, but population made more vulnerable to further impacts; short term, temporary reduction in area, numbers or species richness likely
Negligible	No/slight impacts on a species. Disturbance to species/habitats of a temporary nature that will not affect the longer term population viability or carrying capacity of a site.

Table App. 3 Significance of Impacts in relation to magnitude of impact and value of mammalian resource.

Value of Feature	**Magnitude of Impact**			
	High	**Medium**	**Low**	**Negligible**
International	Very High	High	Medium	Negligible
National	Very High	Moderate	Low	Negligible
Regional	High	Low	Low/negligible	Negligible
High Local	High	Low	Low/negligible	Negligible
Moderate Local	Low	Low/negligible	Low/negligible	Negligible
Low Local	Low/negligible	Low/negligible	Low/negligible	Negligible
Negligible	Low/negligible	Low/negligible	Low/negligible	Negligible
Negative	High	Moderate	Moderate	Negligible

Tables & Figures:

Table 1 Theoretical collision risk- geese flight frequency at Tangy

Table 2 Theoretical collision risk- SNH Band model.

Figure. 1 Accumulated geese flight lines pre construction of the Tangy wind farm 2001/02. Geese = both Greenland White-fronted geese and unidentified geese. Arrows represent variable numbers of geese.

Figure. 2 Accumulated geese flight lines post construction of the Tangy wind farm 2002/03. Geese = both Greenland White-fronted geese and unidentified geese.

TABLE 1b THEORETICAL COLLISION RISK MODEL (Stage 1)

TANGY EXTENSION
SSE Generation Ltd.

VERSION: 1.3
DATA: Lawrence Environmental Consulta
DATE: 2nd March 2004

1	VP area visible	300	ha		
2	total duration birds visible	540	s		
3	total vantage point watch duration	69	h	248,400	s
4	proportion time visible	0.002174			
5	proportion time visible per hectare	7.24638E-06			
6	risk area (wind farm site)	155	ha		
7	bird presence ratio	0.001123			
8	flight height correction 20-100m	1			
9	corrected bird presence ratio	0.001123			
10	occupancy days per annum	180	days		
11	flight hours per day	3	h/day		
12	occupancy	540	h/year		
13	actual bird presence	0.606522	h/year	2,183	s/year
14	rotor diameter	52	m		
15	wind farm risk volume	80,600,000	m3		
16	number of turbines	22			
17	bird length	0.75	m		
18	rotor depth	2.3	m		
19	rotor swept volume	142,501	m3		
20	rotor volume / wind farm volume	0.001768			
21	total time bird in rotor volume	3.860405	s/year		
22	GWF speed	13.89	m/s		
23	GWF transit time through rotor	0.219582433			
24	total number of transits	17.580666	transits/year		
25	SNH BAND collision rate	13.19%			
26	GWF strikes (no avoidance)	2.318235	strikes/year		
27	SNH avoidance rate	0.05			
28	GWFstrikes (with avoidance)	0.115912	strikes/year		
29	= 1 bird every	8.63	years		

ants

TABLE 2. CALCULATION OF COLLISION RISK FOR AN OBJECT PASSING THROUGH ROTOR AREA

TANGY

VERSION:	1.3
DATA:	LEC Tangy
DATE:	29th Oct 2003
TURBINE:	V52

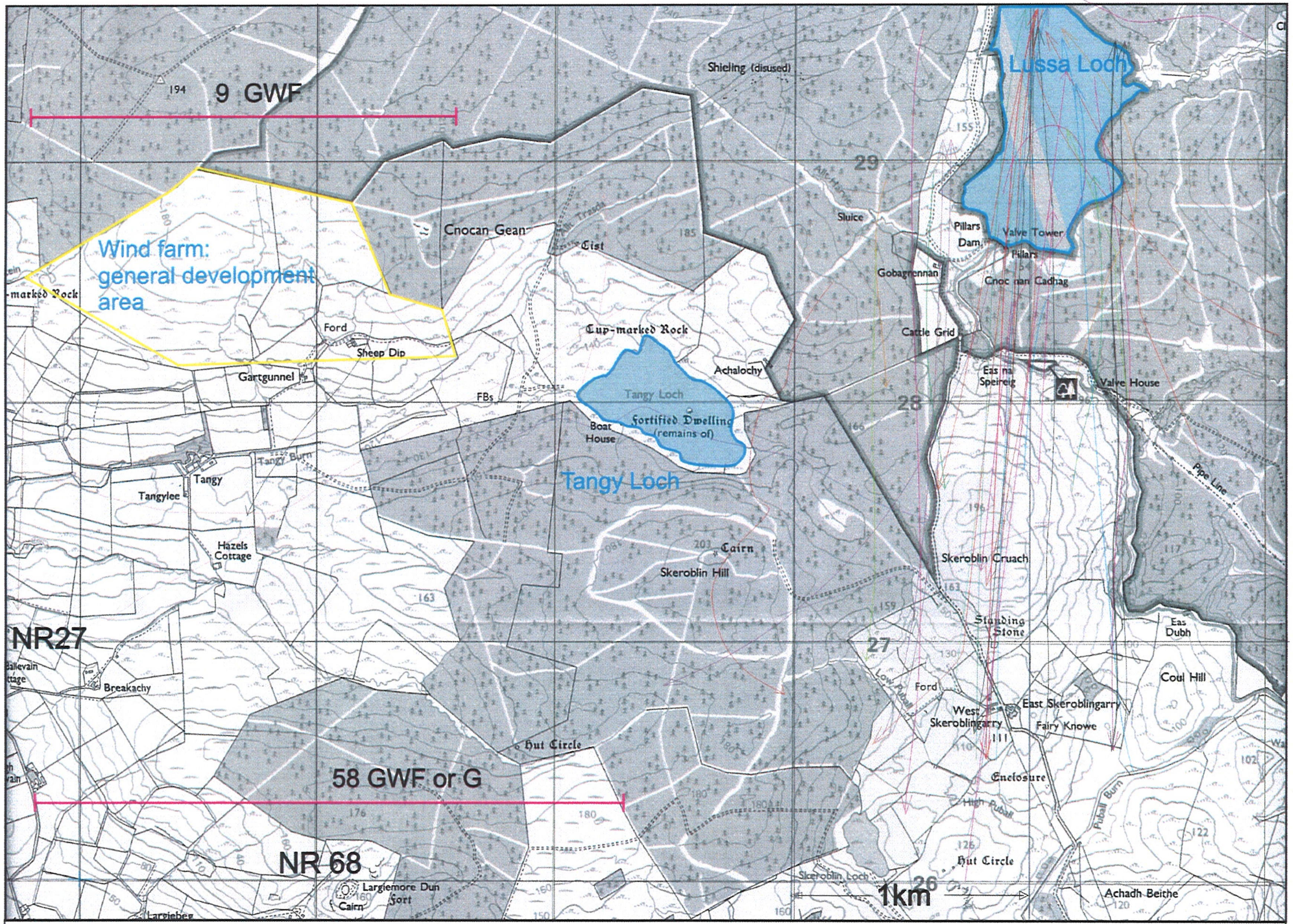
Parameter	Value	Unit
K: [1D or [3D	1	
NoBlades	3	
MaxChord	2.3	m
Pitch (degree:	16	degrees
BirdLength	0.75	m
Wingspan	1.5	m
F: Flapping (0	0	
Bird speed	13.89	m/s
RotorDiam	52	m
RotationPerio	2.30	s
Bird aspect ra	0.50	

Calculation of alpha and p(collision) as a function of radius

r/R radius	c/C chord	α alpha	Upwind: collide length	Upwind: p(collision)	Upwind: contribution from radius r	Downwind: collide length	Downwind: p(collision)	Downwind: contribution from radius r
0.025	0.575	7.82	22.04	1.00	0.00125	21.31	1.00	0.00125
0.075	0.575	2.61	7.59	0.71	0.00535	6.86	0.64	0.00483
0.125	0.702	1.56	5.22	0.49	0.00612	4.33	0.41	0.00508
0.175	0.860	1.12	4.35	0.41	0.00714	3.26	0.31	0.00535
0.225	0.994	0.87	3.84	0.36	0.00812	2.58	0.24	0.00546
0.275	0.947	0.71	3.16	0.30	0.00815	1.95	0.18	0.00505
0.325	0.899	0.60	2.67	0.25	0.00814	1.53	0.14	0.00467
0.375	0.851	0.52	2.30	0.22	0.00811	1.22	0.11	0.00431
0.425	0.804	0.46	2.08	0.20	0.00829	1.06	0.10	0.00422
0.475	0.756	0.41	1.92	0.18	0.00855	0.96	0.09	0.00428
0.525	0.708	0.37	1.78	0.17	0.00879	0.88	0.08	0.00436
0.575	0.660	0.34	1.67	0.16	0.00899	0.83	0.08	0.00447
0.625	0.613	0.31	1.56	0.15	0.00917	0.79	0.07	0.00461
0.675	0.565	0.29	1.47	0.14	0.00932	0.75	0.07	0.00478
0.725	0.517	0.27	1.39	0.13	0.00944	0.77	0.07	0.00524
0.775	0.470	0.25	1.31	0.12	0.00953	0.79	0.07	0.00572
0.825	0.422	0.24	1.24	0.12	0.00960	0.80	0.07	0.00617
0.875	0.374	0.22	1.17	0.11	0.00963	0.80	0.08	0.00659
0.925	0.327	0.21	1.11	0.10	0.00964	0.80	0.08	0.00699
0.975	0.279	0.20	1.05	0.10	0.00962	0.80	0.08	0.00735

Overall p(collision) =	Upwind	16.30%	Downwind	10.08%
	Average	**13.19%**		

Fig. 1 Accumulated flight lines of Greenland White-fronted Geese. Tangy wind farm

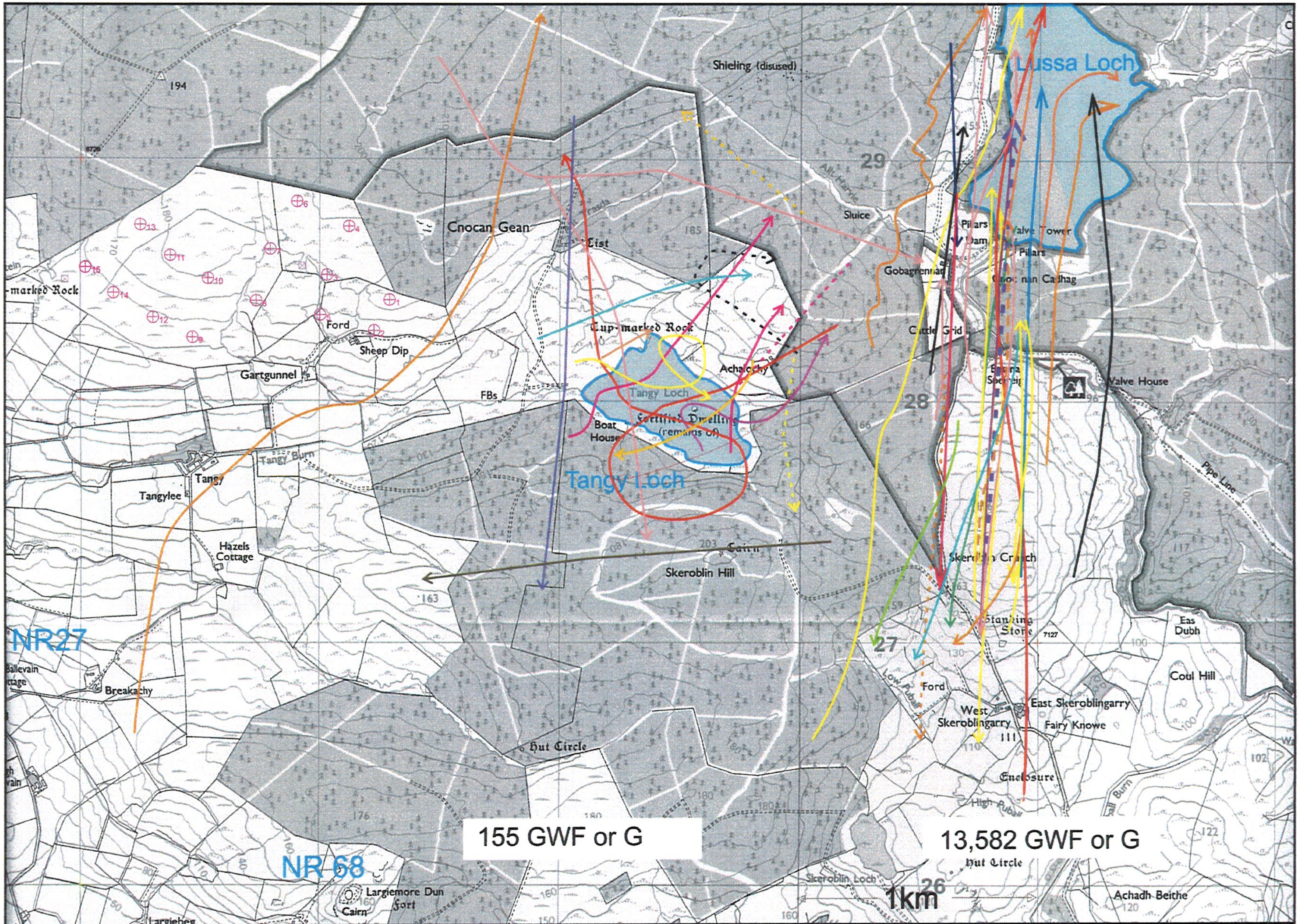


Pre-construction 2001/02 winter

17,327 GWF or G

KEY: Flight lines include Greenland White-fronted Geese and routes of unidentified geese species over 17 surveys
Line colour based on individual surveys and unrelated to numbers of geese.
Total accumulated geese movements shown in three sectors denoted by: ⊢—⊣

Fig. 2. Accumulated flight lines GWF Tangy wind farm 2002/03



Operation 2003 (operating)

KEY: GWF= Greenland White-fronted Goose or unidentified geese only - - - - denotes assumed route- auditory cues alone

Geese flight surveys: Tangy windfarm: summary from pre-construction 2001 to operation phase 2004

1.1 Introduction & Survey methods

The flight lines of geese using their dawn or dusk commuting routes between their feeding areas around Machrihanish and their principal roost loch at the Lussa, Kintyre were surveyed during the winter of 2003/2004 (Fig. 3). Note that the accumulated flight maps (Fig. 1-3) depict observations of Greenland White-fronted geese only. The individual survey flight maps contain flights of other species as well. These data provide a sample of the behaviour of the geese for the second post-construction winter and can be compared with the flight lines recorded pre-construction (winter 2001/02) (Fig. 1). There were three flight line surveys per month over the winter residence of the Greenland White-fronted geese (total 17 from October to April) and the spreadsheet tables detail the records of individual flocks.

An image intensifier was employed in order to maximize detection of birds in low light or dark conditions.

Surveys were also undertaken along the shoreline of Tangy Loch to detect the presence of roosting geese- from signs such as feathers, droppings, remains of grazed plants, footprints etc.

1.2 Results- geese flight lines and roost usage

The pattern detected during the 2003/2004 winter matched that sampled from the previous two winters. Apart from small flocks of greylag geese, all the flight routes recorded in the dawn and dusk periods were related to the roost on the north end of the Lussa Loch. As estimated in Fig. 1, the main north-south flight route involved more than 15,000 goose movements during both post-construction years of monitoring.

There were semi-regular flights of greylag geese onto or from Tangy Loch that involved usually less than 20 birds.

Both species, but mainly greylag geese, showed flights en route to or from the Lussa Loch that over-flew Tangy Loch without landing.

The flights of Greenland White-fronted geese that were in closest proximity to the wind farm and Tangy Loch involved small flocks and were associated with only one of the surveys in 2003/04. In this case there were conditions of reduced visibility (<100m) (Table Survey No. 25 22.01.04) and similar to such surveys in previous winters the total duration of the dawn movement lasted longer than the average. This survey was the first time that a flock of

Greenland White-fronted geese roosted on Tangy Loch over the three winters surveys, although species identification was uncertain in this instance.

Unlike flight No. 14 (Fig. 2) from 12.02.03 (Table flight No. 15), there were no observed flight lines on course for or through the Tangy windfarm.

There were also only two surveys (No. 2 30.11.01 and No. 10 15.02.02) that accounted for the variable–direction flights in proximity to the development area during the pre-construction phase. In total three of the four surveys of such behaviour occurred during the dawn exit from the Lussa Loch. Based on this low sample size, this dawn correlation may simply reflect the association of low-wind, low visibility conditions with dawn rather than with dusk.

1.3 Use of Tangy Loch by geese

The shoreline surveys detected geese feathers (of unknown species) in relatively good correspondence with the presence of greylag geese detected during the sample of flight line surveys (Refer to Table). This gives some confidence that the sample of seventeen surveys per winter was representative of the full residence period of the geese. For example if high densities of feathers or droppings had been detected in the context of sporadic sightings of small flocks of greylag geese, then actual usage might be suspected to have been higher than observed.

1.3.1 Conclusions

The wind turbines appear to have resulted in no measurable changes to the roosting or flight behaviour of the local population of Greenland White-fronted geese.

There has been one instance of a measured diversion around the wind farm area by a flock of five Greenland White-fronted geese (which were already at an altitude of >100m above the blade tips).

Diversion from their regular dawn or dusk routes occurred during conditions of reduced visibility c. less than 100m distance visibility from low cloud/mist. These often coincided with low wind speeds or still air and inversion strata in the low atmosphere. Under these conditions the geese appeared to undertake more circuitous flight routes, often re-tracing their routes, although the quality of observations was inevitably low.

What would be considered adverse weather, but typical for this location in the West of Scotland (strong winds > F 4, rain or snow), did not appear to result in significant deviation of the main flights north-south to the principal roost Loch at the Lussa. Strong side winds resulted in flights at lower altitude (presumably to seek a more efficient flight route in the lee of terrain) and a sinuous flight line, in which the flocks tacked into the prevailing wind and alternated with a down-wind course.

Lawrence Environmental Consultants

Date	Weather	Visibility	Audibility	Sun	Start	End	Map	Flight Line	Roost location	Bank/shoreline activity	GPS
	Moon Phase			**set**			**code**				
VISIT 1	W then NW F2-3	poor/mod	moderate	16.06		19.30				Tangy: no clear evidence of activity on bank/deltas	track route
15-11-01					16.30			80 c. G (smaller size ID?) N over Skeroblin Cruach (60-100m)	Assumed Lussa	A, E F Occasional FGBF (1/10m bank)	
	100% Cloud				17.13			<20c. GJ low N (at > 1500m ENE NE of Tangy)	Assumed Lussa	B & C Occasional GBF, plus swan feathers	
	mist at 200m mild;							approximately over Gobagrennan		D Occasional white small GBF- older plus other sectors	
	occas. Rain/drizzle				16.15		(1)+ 3	Total estimated 1410 GWF in N to roost Lussa		NE and E strandline rolls of Isoetes + Canadian pond weed + Equisetum	
	New Moon	image intensifier							No roost on Tangy Loch	No evidence that shoots grazed by geese.	
							5 + (1)	335 Greylag geese N		No goose droppings	
					17.00	peak	2 + 4	36 Barnacle Geese N			
								movement period = 65min		Lussa: landed off Stramollach Point E bank (off map print out)	
						17.20		proportion of daytime field count=c. 100%		small group west side of Lussa, SE of Corylach	
VISIT 2	S F2-3 100%	poor/mod	good	8.24	7.15	9.15					
30-11-01	fine drizzle				8.00			G started moving calls only from E assume over Skeroblin Cruach	Assumed Lussa	Tangy: no evidence of activity on bank/deltas (duck droppings only)	
	cloud 180-200m				8.04		1	40-50 GWF* NNE 80-120m 1 skein fast direct flight		A-C Few/No. FGBF	
	full moon, obscured				8.10		2	10 GJ sweep circle 50m over centre Tangy Loch		E-I Occasional old (> c. 4 days old) MGBF, (1/100m bank)	
	mod light				8.15	8.20		more distant G calls to E over Skeorblin Cruach Fly S		D slight increase in old feathers along parts of north bank (2-3/100m)	
	dry from 8.00	telescope			8.24		3	8G SW over Gartgunnel 120-150m slower into wind		N strandline small rolls of Isoetes + Canadian pond weed + Equisetum white stems	
					8.25			GJ calls over SkeroblinHill? NE?		No evidence that shoots grazed by geese.	
					8.27	8.31	4	G calls over Skeroblin Cruach; + calls (GJ) fly SW over Skeroblin Hill direction		No goose droppings	
					8.40		5	8GWF occ. Calls 60-90m S weaving into wind			
					8.50		6	3GJ no calls S weaving into wind 80-100m			
					8.55		7	8GJ? S 70m rising & weaving into wind			
					9.02		8	2 GJ + 1 GWF 150-200m SE E variable direction from Cnocan Gean lose flock			
					9.04		9	44-50 S ?G GWF*? >120m at ?500m W of Tangy Farm (refer to A?)			
						9.15				*speculate- return of same individual flock?	
								movement period =c. 60min (extended re-assortment?)	No roost on Tangy Loch		
VISIT 3	E F3-4 then NE F4/5	poor(mod)	poor	8.15	7.15	9.15					
05.12.01	rain										
	100% cloud >300m?				8.16		1	100 c. G S over Gobnagrennan at c. 100m	Assumed Lussa	Tangy: no evidence of activity on bank/deltas (no duck droppings ?washed away)	
	2/3 full moon, obscured						2	50 + 50 c. two skeins G S at 120m c. slightly closer to E end Tangy Loch		A Few<4 OGBF	
	waning, mod light						3	c. 80 G S at c. 80-120m above Skeroblin Cruach		B & C Occasional OGBF, (<2/100m bank) (current strand weed line)	
	drier from 9.00	binoculars			8.23		4	2 GJ ? E c. 80m above Tangy Burn to Skeroblin Hill		C medium OGBF	
					8.34			no further movement		D East end Tangy Loch strandline small rolls of weed (previous wind direction)	
										D-F-A 0-1 OGBF/100m north bank	
VISIT 4	SEF2-4 0% cloud,	v.good	good	15.52	15.30	17.40				Tangy: no evidence of activity on bank/deltas (no droppings) occ. FDF	
09.12.01	cold				16.16		1	10GJ E then NE 30-40m few calls inspection flight	Assumed Lussa	A-B 10 OGBF among weed roll	
	extended bright light W				16.47		2	c.800 G (GWF calls included) >150m (200m) one large group, rapid	Assumed Lussa	C Occasional OGBF, (<3/100m bank) + single med. OBF	69547 28135
	quarter moon not risen				16.50		2	8 skeins (30-40) G (GWF calls) >150m in long lines rapid flight		D 1 OBF/100m	
		binoculars			16.58		2	4 skeins (40-50) G >120-150m rapid flight		E 2 med. FBF 5 marked blue	69722 28018
		Telescope								F v.old swan? F, = 2 med. OGBF/100m	
								movement period =c. 11min (excl. first over flight)		G 2/100m light med. FGBF marked blue	69379 27873
								Total estimated 1420 G in N to roost on Lussa		H 2/100m light MGBF marked 1 blue	69191 27958
										H-I 5/50m med. GBF marked 1 blue	
VISIT 5	NWF0 0-60% cloud,	v.good	v. good	16.00	16.15	18.30				Tangy: evidence of activity on rocks/ (<6 droppings) occ. Fresh geese body feathers	
18.12.01	cold (5% loch frozen)				16.44		1	(250-300) G (incl. GWF calls) N variable skein height 50m -150m	Assumed Lussa	A-B 2 FGBF (1 marked)	69374 28221
	extended bright light W						1	c.250 G (GWF calls included) >150m	Assumed Lussa	C 0/100m + ocassional (3) OGBF	69547 28135
	crescent moon risen				16.47		1	c.(340) G (GWF calls) >150m in long lines		D 1 medium GBF + droppings (photo)	69530 28155
		binoculars					1	c. 420 G >100 + 150m tiers of skeins		D marked GBF (20m east of first D)	69549 28133
		Telescope			16.56		1	GWF calls alone from NE sector		E rocks with G droppings + 5 OGF	
		image intensifier			17.01		2	GJ calls distinct & lower approaching from E	5 GJ landed Tangy Loch	F 3 marked blue relocated GBFs photo	69746 27994
					17.07		2	GJ calls distinct 2nd flock & lower approaching from E	8 GJ landed Tangy Loch	G 10 GBF/50m medium fresh, marked 1 Black	69811 27794
					17.11		1	40-50 G N at c. 80m, quick flight, fewer/no calls apparent	Assummed Lussa	H 3 FGBF/50m	
					17.24			All quiet- no calls from GJ on Tangy Loch surface		I 2 FGBF (marked 1 black); 5 to 10 FGBF/50m	69485 27809
								Total estimated 1420 G in N to roost on Lussa		J 5-10 GBF medium fresh/50m marked 1 black	69167 27978
										K outlet ice- 12 FGBF	
					16.50		1	1125 (GWF) N incl. GJ & Barnacle Geese (300 of which E then N)			
					16.51		3	200 GWF N low at <30m			
					17.00		4	300 GWF 100m N			
					17.03		5	9 Barnacle Geese N 40m			
								Total Baracle Geese=49 total GJ=120+13			
								movement period = 25min; proportion of daytime field count=> 100%			
						17.30		Total estimated 1465 GWF in N to roost Lussa (13 GJ on Tangy)			
VISIT 6	N F0 0% cloud,	v.good	v. good	15.53	16.15	18.30				Tangy: no evidence of activity on rocks/ margins	
22.12.01	cold (margins of loch frozen)				16.54		1	GJ calls to NE	Assumed Lussa	A- 1 FGBF (1 marked) green; 4 FBF/50m	69112 28022
	extended bright light W				17.04		2	3 skeins G 8 + 5 +20 N <50m no calls	Assumed Lussa	B 2 FGBF (2 marked) green	69159 27980
	half moon risen				17.06		2	6 skeins of 20-30 each G (incl. GWF calls) N c. 40m	Assumed Lussa	C 3 OGBF/100m	
	starlight	binoculars			17.06	17.11	2	c. 900 G (major call GWF) N at three height tiers 40m, 60m, 150m	Assumed Lussa	D 2 FGBF/100m	
		Telescope			17.12		3	GJ calls closer at <30m height?	of which 2 GJ onto Tangy	E 2 OGBF/100m	
					17.12		3	GJ calls +visual fix 4 skeins (c. 100?) N at 40-50m	Assumed Lussa	F 1 medium age GBF/100m; strand roll from previous gales	
					17.12		4	GJ calls approaching, closer (assume <20m) no visual fix	14 GJ landed Tangy Loch	G 2 medium age GBF/100m	
					17.42			GJ on Tangy Loch, visual count, silent until now		H re-located blue marked F 2m above water margin	69746 27993
					17.42			no further activity- quiet		I 2 medium GBF/50m; + 3 MGBF/50m	
										J 1 medium GBF/50m; old ?swan F	
								Total estimated 1050 GWF + Barnacle N to roost on Lussa		K 5 medium GBF/100m; + 1/100m	
VISIT 7	SSW F3(4) 100% cloud	good	good	8.21	7.15	9.00				Tangy: no evidence of activity on rocks/ margins	
29.01.02	mild				8.07		1	10 G silent S at >60m f.leisurely speed, changed SSW over Skeroblin Hil	Assumed Lussa	A- 0 fresh/medium age GBF /100m	
	bright conditions				8.11		2	44 GJ S 80m few calls		B- 0 fresh/medium age GBF /100m; 2 OSF	
	full moon (obscurred)				8.13		3	15 GJ S > 80m bendy course, f. slow wing beats, then SSW at 120m		C 0/100m	
		binoculars			8.16		4	26 GJ S 60-80m then SW		D 0/100m 2 OSF	
	1 day post 50m/s	Telescope								E 0/100m 5 ODF	
	storm							No geese on Tangy Loch, (1 Whooper Swan)		F 2 OGF/100m; 0/100m	
								No sign or calls of GWF assume not used Lussa?		G 5 OSF/100m	
								Total estimated 95 G (of which 85 GJ)		H 0/100m 0/100m 0/100m 3 OSF; 0/100m to outflow	
										Gale cleared most signs from margins; no evidence of marked feathers	
VISIT 8	WF0 100% cloud,	moderate	good	17.04	16.30	18.45				Tangy: no evidence of Goose activity on rocks/ (3 droppings duck at H)	
05.02.02	fine rain				16.45		1	7 GWF N 50m	all Lussa	A-C 0/100m x 2 1/100m MGBF	
					17.05		2	c.45 GWF W 50m	1 Whooper Swan	D 0/100 x 3 3 ODF	
	crescent moon obscured				17.13		3	17GWF N 60m	on Tangy Loch	E 0/100m location of FDBF	
		binoculars			17.15		3	65 GWF N 70-80m		F1 FGBF/100m; 0/100m; 0/100m 2 FSBF	
		Telescope			17.16		3	200 GWF N 70-80m		G 1 MGBF /100m 3 OSBF	
		image intensifier			17.17		3	180 GWF N 40-50m (incl. 9 GJ)		H 2 F duck droppings + FBF	
					17.23		4	160 GWF 40-30m		I 0/100m 5 OSBF; 0/15m to outlfow	
							4	50 BA N 20-30m			
					17.25		4	48 GWF N 50m			
							4	210 GWF N 50m			
							4	90 GWF N 50m			
					17.30		3	150 GWF N 60m			
					17.40		4	45 GJ N 50m			
					17.48		5	150 GJ N 50m			
							3	30 GJ N 60m			
					17.50		4	20 GJ N 50m			
					18.03		4	40 GJ N 50m			
						18.30		Total Baracle Geese=50 total GJ=285			
								movement period = 65min; proportion of daytime field count=c. 100%			
								Total estimated 1220 GWF in N to roost Lussa			
VISIT 9	NWF6 20-100% cloud,	moderate	nil	8.06	6.30	8.30				Tangy: no evidence of Goose activity on rocks wave height increased	
06.02.02	cold but not freezing				7.20		1	90 GWF S 30m difficulty maintaining skeins- cross wind	all Lussa	A-C 0/100m x 4	
							1	10 GWF S 30m	1 Whooper Swan	D 0/100m x 3 ODF	
	crescent moon				7.23		2	20GWF N 20m assumed circled and returned S	off Tangy Loch 7.41	E 0/100m location of main weed strand roll	
		binoculars			7.40		1	110GWF S 20-40m varying flight height in cross wind		F2 FSBF/100m;	
		Telescope			7.45		1 & 3	400-500 GWF S 20-40m then up to 60m over Skeoblin Cruach*		G 0/100m x2	
		image intensifier			7.48		2	3 GWF N 5m then circled S			
					7.48		4	14 GJ 70-30m turned from S to W			
					7.49		2	30-40 GWF N 30-40m then turned S			
					7.52		1	100 GWF S 30m then rose to 130m over Skeoblin Cruach			
					7.54		1	59 GWF S 30m then to 130-150m			
						8.30					
								* multiple small skeins in cross wind -low count accuracy			
								movement period = 34min; proportion of daytime field count=< 100%			
								Total estimated 889-1080 GWFoff S from Lussa			

Date	Weather / Moon Phase	Visibility	Audibility	Sun set	Start	End	Map code	Flight Line	Roost location	Bank/shoreline activity	GPS
VISIT 10	Variable F0; then NWF(	moderate	very good	7.47	7.00	9.30				Tangy: no evidence of Goose activity on rocks- flat calm	
15.02.02	100% cloud, hill mist				7.33		1	2GWF? S 30m then 50m rose into mist	all assumed from Lussa	A 1/100m MGBF+ 1 SBF; FDBF	
	cold but not freezing				7.34		2	2 GJ? (poss same birds as above) SW then SE 30m then 60m		B 0/100m; 0/100m 2-5 OSBF; 2/100m 2/100m FDBF	
	no moon				7.40		1	7G S 80-100m rose into mist above Skeroblin Cruach S		C 2/100m ODBF; 2/100m OSBF	
		binoculars			7.40		1	110GWF S 20-40m varying flight height in cross wind		D 1/100m MGBF; 1/100m MGBF; 0/100m	
		Telescope			7.50		1	60 GWF S >100m detected early before crossing dam on Lussa		E 3/100m OSBF; 3/100m OSBF; 4/100m OSBF; 1/100m MGBF; 2/100m OSBF	
							3	60 GWF S >70m		F 0/100m; 1/100m OSBF (re-located marked 2 blue spots); 1/110m MGBF	69180 27959
					7.55		1	40 GWF S >60m		originals marked H & I Survey 4 - 09.12.01	
							1	40+ 200 + 50 GWF S 60m			
					7.56		1	30 GWF S 40m then rose to 60m			
					7.57		1	24 +14 + 140 + 80 + 60 GWF(G) S 80m then to 100m over west side Skeroblin Cruach			
					8.00		1	50 + 56 GWF; 80 GJ S 100-150m			
					8.05		4	66 GJ turned W 150m, split 14 NW; 49 cont. W 80-200m			
					8.07		1	100+ GWF 120m at dam			
					8.08		1	40G S >100m rose high early over Lussa			
					8.10		1	20 + 20 G S 40-60m- quieter in flight			
					8.19		5	30 GJ SW, W NW 30m			
							1	>200 G S 50-100m over west side SkeroblinCruach			
					8.23		1	3 G S 100m			
					8.30		6	7 G > 80m S then SW over Skeroblin Hill			
					8.33		7	1 GJ SW from dam at >150m to 200m, then NW			
					9.26		8	8 GWF SW then W >100m then split 2 GWF gliding W			
								movement period = 60min; proportion of daytime field count=c. 100%			
								Total estimated 1182 GWF(incl. G) +179 GJ from Lussa			
VISIT 11	W F3 then F1	moderate	moderate	17.52	17.00	19.15				Tangy: one possible small size goose dropping- ?or large duck? activity on bank at A	
27.02.02	10% cloud, cold				18.21		1	130G (GWF?) NW then N 60m then 40m	all assumed to Lussa	A 0/100m 20 OSBF; 0/100m	
					18.24		1	12 (G) GWF? NW >100m		B 0/100m; 0/100m Molinia in strand roll 1m distance up bank	
	2/3 full moon not risen				18.34		2	90 G (GWF assumed on size); N 30m skeins just level/below Skeroblin Cruach skyline		C 2/100m MGBF;	
		binoculars			18.37		2	200; then 120 (GWF assumed) N <30, 40-50m (no calls)		D 1/100m MGBF + 15 MDBF; 0/100m	
		Telescope			18.39		2	500 G (GWF assumed), N 60m		E 1/100m FGBF; 1/100m FGBF	
					18.41		3	60 G (GWF assumed) N 40-50m		F 0/100m + 2 OGBF; 0/100m + 5 FDBF	
					18.42		3	30 G (assumed GWF) N 40-50m		G 1/100m MGBF; 2/100m O+M GBF; 0/100m	
					18.44		2	30-40 G (assumed GWF) N 50m			
								movement period = 23min; proportion of daytime field count=c. 80-90%			
								Total estimated 1182 assummed GWF			
VISIT 12	WNW F3 then F1-2	moderate	moderate	17.57	17.00	19.30				Tangy: one possible dropping- ?evidence of Goose activity on rocks- some wave action	
02.03.02	90-100% cloud,				18.14		1	9GWF? N >120m unhuried , in-line skein	all assumed to Lussa	A 0/100m ODBF+ fresh duck droppings; 0/100m 3 OSBF	
					18.21		1	7 + 70 GWF (from size) N 30-40m some below Skeroblin Cruach skyline		B 0/100m; 0/100m 2 OSBF	
	Full moon not risen				18.23		2 & 3	330 GWF assumed; N <40m some skeins just level Skeroblin Cruach skyline		C 1/100m MDBF (marked green+black) ; 0/100m 8OSBF	69455 27825
		binoculars			18.25		1 & 2	20; then 80 + 30 GWF assumed N <40m (no few calls)		D 0/100m 5OSBF; 0/100m 3OSBF; 2/100m MGBF marked 2 (green black	69746 27739
		Telescope			18.30		2	40; then 70 GWF assumed, N 40-50m		E 1/100m OGBF; 0/100m 7 OSBF	
										F 1/100m MGBF marked 2 blue spots)	69742 28000
								movement period = 16min; proportion of daytime field count=c. 50%		G 0/100m + fresh Goose? droppings; 2 FDF/100m	
								Total estimated 656 assummed GWF		2 F + MGBF/100m 2 marked blue	69526 28151
								obs. conditions & flock heights - undetected flights probable		H 0/100m 10 OSBF; 0/100m 2 OSBF	
										I 1/100m MGBF marked blue	69272 28171
VISIT 13	NW F2-3 then FO	exceptional	exceptional	18.18	17.00	19.50				Tangy: no droppings or bank activity; wave action then calm	
12.03.02	0% cloud,				18.46		1	6 GWF N >70m, in-line skein (colour & size=spp ID no calls)	all assumed to Lussa	A 0/100m; 0/100m 3 OSBF	
					18.53		1	150-160 GWF (from size & calls) N 80m long thin skein		B 0/100m; 1/100m marked 1 FGBFsilver	69470 28232
	moon not risen				18.57		1	200 GWF; N <80m		C 0/100m FDBF 2OSBF	
	starlight	binoculars			19.02		1	300 GWF N 150m + others at 60m		D 4/100m FGBF; marked 2 (silver)	69753 27972
		Telescope			19.05		1	600-700 GWF N 120m + 80m		E 1/100m MGBF; recovered 1 silver; 2/100m MGBF; 0/100m	69807 27817
					19.10		1	60 GJ (with GWF) (calls both spp.) N >120m		F 0/100m recovered MGBF marked black green spots large	69454 27825
					19.15		1	50 + 50 GJ, N 120m + 150m		G 0/100m; 2 OGBF/100m to outflow	
					19.23		1	60? GJ (?) N 150m (count light limited)			
					19.25		1	60 ?GJ N 120m calls			
					19.27		1	40? GJ N 150m calls		gales SW on previous week end	
								movement period = 41min; proportion of daytime field count=c. 90-100%			
								Total estimated 1686- assummed GWF 1366 and GJ= 320			
VISIT 14	EF1-2 then FO	moderate	exceptional	18.50	18.00	20.30				Tangy: no droppings or bank activity; small wave action then calm	
28.03.02	0% cloud,				19.09		1	50 GWF N 150m	all assumed to Lussa	A 0/100m; 0/100m 7 FDBF	
					19.11		1	130-150 GWF (from size & calls) N 150m		B 0/100m; 0/100m 3FDBF	
	full moon				19.12		1	50 GWF; N 200m		C 0/100m; 0/100m 2FDBF	
	starlight	binoculars			19.13		1	16 G N 200m in line, slower flight		D 0/100m; 0/100m 2 OGBF;	
		Telescope			19.14		1	2 G N 200m		E 0/100m; 0/100m 2 OSBF	
					19.15		1	140 GWF(calls) N 100m		F 0/100m	
					19.19		1	680 GWF, N 80-200m (may include few GJ)			
					19.25		1	400 GWF (incl. GJ) N 80m			
					19.29		1	56 GWF (occassional GJ calls) N 150m			
					19.46		1	40 GJ N 60-80m calls clear			
					20.10		2	< 5 GJ NW/NE? <50m no visual fix			
					20.16		3	30 GJ N 70m			
								movement period = 67min; proportion of daytime field count=c. 90-100%			
								Total estimated 1624- assummed GWF 1544 and GJ= 80-?200			
VISIT 15	NE then E F1-0	moderate	exceptional	6.02	05.00	7.30				Tangy: no droppings or bank activity; wave action calm	
29.03.02	70% cloud, high cold	poor			05.50		1	GWF calls S no visual fix still dark	all assumed from Lussa	A 0/100m; 0/100m 6 FDBF	
	with hill mist				05.58		1	GWF calls S no visual fix still dark		B 0/100m; 0/100m 1FDBF	
	full moon				06.18		1	GJ calls to NE; fly S (plus possible GWFcalls)		C 0/100m; 0/100m 2FDBF	
		binoculars			06.22		2	100 GWF S 50m		D 0/100m; 0/100m 4 OGBF;	
		Telescope			06.27		1	GWF calls only, S (larger flocks from duration?)		E 0/100m; 0/100m 1 OSBF	
					06.30		1	600 GWF(calls clear & visual) S 50-60m (incl GJ calls)		F 0/100m	
					06.34		1	240GWF, S 50m			
					06.47		1	40-60 GWF (incl. GJ larger %) S 40-50m			
					06.58		1	36 GJ S >60m			
								movement period = 68min; proportion of daytime field count=c. 80-90%			
								Total estimated 1036- assummed GWF 1000 and GJ= >36			
VISIT 16	E F2	moderate	good	05.50	05.00	7.15				Tangy: no droppings or bank activity; wave action moderate	
03.04.02	100% cloud,	poor			06.09		1	70 + 40 G calls S 40m	all assumed from Lussa	A 0/100m; 0/100m 15 F gull F	
	with hill mist				06.11		1	120 GWF calls S 40-50m		B 0/100m; 0/100m	
	full moon not visible				06.15		1	340 GWF & GJ calls to NE in advance of visual fix, fly S 50m		C 0/100m; 0/100m 2 ODBF	
		binoculars			06.16		1	20 GJ by size? S 60m		D 0/100m; 0/100m	
		Telescope			06.19		3	160 & 12 GWF? calls, S 60m		E 0/100m; 0/100m; 0/100m 2 OSF	
					06.22		3	100 & 12 GWF S 40-80m			
					06.23		2	75GWF & GJ calls, S 40 then rising to 80m		low water level	
					06.24		1	80& 30 GJ S 40-60m			
					06.25		3	180 G S 40 then 80m			
					06.29		1	24 G S 40 then 80m			
					06.30		3	120 GWF S rising to 100m			
					06.32		3	240 GWF S 30m rising to 120m			
					06.35		1 & 2	25& 25 GJ & GWF S 30-80m			
					06.36		2	120 GWF S 40-70m			
					06.38		2	3 G S 40m			
					06.40		2	70 + 18 GWF S 40-80m			
					06.40		2	130 GWF S 30m-80m			
					06.44		2	22 GJ S 30-50			
								movement period = 35min; proportion of daytime field count=c. 100-120%			
								Total estimated 2036- assummed GWF 1542 and GJ/G= 494			
VISIT 17	NF1 then FO	v good	exceptional	19.12	18.00	20.30				Tangy: no droppings or bank activity; wave action calm low water level	
08.04.02	90% then 50% cloud,				18.46		1	114 + 50 GWF N 60-80m	all assumed to Lussa	A 0/100m; 0/100m 8 FDF + Gull F	
	at >1000m				18.47		1	50 GWF N 60m then 40m		B 0/100m; 5FDBF 2 Gull F	
	moon				19.08		2	50 GWF; N 30m		C 0/100m; 0/100m 2FDBF	
	starlight	binoculars			19.09		2	280 GWF N 40m then 60m		D 0/100m 2 FDF	
		Telescope			19.11		2	100 GWF N 40m		E 1/100m recovered Blue L Black R ; 0/100m; 0/100m 2 OSBF 2 ODF	69753 27742
		image intensifier			19.12		2	86 GWF N 120m		F 1/100m recovered Black R; 0/100m; 0/100m 3 OSF 2OGF	69461 27824
					19.18		1	78 GWF N 30-40m			
					19.34		1	42 GWF N 120m then 40m			
					19.36		2	2 G NW? then N 40m			
					19.41		1	13 GWF N 60m			
					19.42		3	46 GJ N 120m			
					19.45		1 & 2	120 GJ + (GWF?) N 40m then 50m			
					19.47		1	24 GJ N 50m			
					19.55		2	80 GJ N 30m			
					19.58		1	80 GJ N 30m			
					19.59		3	56 GJ N 80m then 50m			
								movement period = 73min; proportion of daytime field count= 66-84%			
								Total estimated 1249- assummed GWF 843 and GJ=406			

GJ= Greylag Goose GWF= Greenland White-fronted Goose G= un-identified grey goose 30m= height above ground level

time GMT; letters A to G refer to Tangy bank survey; numeral 1-8 flight lines on maps

FDBF= fresh duck body feather OGBF= old goose body feather OSF=old swan feather

Date	Weather	Visibility	Audibility	Sun	Start	End	Map	No.	species	height m	Flight Line	Roost location	Bank/shoreline activity					
	Moon Phase	& equipment		set/rise			code				direction & location			f/100m				
VISIT 1	S then SSE F2-3	moderate	moderate/	16.39		19.30							Tangy: no evidence of activity on bank/deltas					
04-11-02			good		17.08		1	300 - 360	GWF	100 - 200	N over Skeroblin Cruach	Assumed Lussa	A, 2 white BF; cattle along shoreline; minor strand line weed roll	4	6	0		
	60-100% Cloud				17.10		2	10	G	100	NNE skirting south east flank Cruach Skeorblin	Assumed Lussa	B, remains gull predated; occassional shoot grazed? C. nigra?	0	1	4	2	
	cloud base 400-500m;				17.11		1	700 - 840	G	100	in eight flocks		C (strand line occ. Isoetes + Canadian pond weed)	1	0	0	2	
	occas. Rain/drizzle				17.13		1	320	G	200 - 250			D	1				
	9°C	telescope,						20	G	250		No roost on Tangy Loch						
		binoculars			17.15		1	40	G	250	few calls as above flocks		No goose droppings					
	New crescent moon				17.20		1	240	GWF		calls							
	not visible				17.22		1	60 - 80	GWF		calls							
					17.24		1	?	GWF		calls only at distance of flight line 1 too dark							
					17.28		1	?	GWF		calls only two flocks							
						17.43					movement lasted 20min.							
								1680 - 1910			Total estimated G in N to roost: Lussa							
											proportion of daytime field count=c. %							
VISIT 2	W F2-3	moderate	moderate;	16.3									Tangy: no evidence of activity on bank/deltas					
11-11-02	100% high		locally around		16.59		1	20	G	80	N rapid flight over Skeroblin Cruach, not audible	Assumed Lussa	A, Froth along NE shoreline from wave action. Some cattle disturbance	3	2	4	1	
	cloud >800m		Tangy good		17.00		1	70 - 80	GWF	80	infrequent calls		B, Rolled weed along N shoreline from wave action.	0	1	1	0	
	half moon, visible to start						1	30	G	80			C, Fresh duck down feathers - widgeon?	2	0	2		
	mod light				17.01		1	100	G	80								
		telescope					1	60	G	80			No goose droppings					
		binoculars					1	580 - 620	G (GWF)	60 - 100	some calls audible							
					17.04		1	20	GWF	80	last flock in main movement							
					17.06		2	12	GJ	20 - 30	E; single call; over head landed Tangy Loch v. quiet	Tangy Loch						
							1	60	G	60								
					17.13		1	120	GJ	80 - 100	calls audible; in two flocks							
					17.16		1	150	GJ	80 - 100								
						17.35					movement period =c. 17min							
								1210 - 1260			Total estimated G in N to roost: Lussa; + 12 GJ roosted on Tangy Loch							
											proportion of daytime field count=c. 80%							
VISIT 3	W F 1	good	moderate	07:59									Tangy Loch level lower					
17-11-2002					07:19						10 GJ on Loch Tangy calling close to NW shore		A: High cattle disturbance, some duck droppings and feathers and sedges pulled	3	4	0	0	
	30- 60% high cloud > 1000m				07:24						Further 9 G on Loch Tangy viz far E side		B: Some livestock disturbance at W, 3 goose droppings. Spraints with feathers	0	0	1	1	1
	Moon not viz.				07:25		1	25	G	50	S over Skeroblin Cruach. No Calls. Origin assumed Lussa	Assumed Lussa	C:	0	1			
	Mod light at start				07:27		1	11	G	50								
		telescope			07:23		2	10	GJ	0 - 70	From L Tangy to SW calls	Tangy Loch						
		binoculars			07:33		3	9	GJ	0 - 70	No calls.	Tangy Loch						
					07:38		1	40	G(GWF)	80	1 or 2 calls. Origin assumed Lussa	Assumed Lussa						
					07:39		1	15	G	80								
					07:40		1	2	G	80								
					07:42		4	16	GJ	200	Origin assumed Lussa. Skein flying to S of Tangy Wind Farm							
					07:43		1	13	G(GWF)	80	Few calls							
					07:44		1	100 - 110	GWF	80	More calls							
					07:47		1	25	G	50 - 80								
					07:48		1	50	GWF	50 - 80								
					07:49		1	15	G	50 - 80								
					07:50		1	31	GWF	50 - 80	some calling							
					07:51		1	170 - 195	G(GWF)	50 - 80	50 - 60 & 100 - 115 & 20							
					07:54		1	110	GWF	30 - 60	calls							
					07:55		1	20	GWF	30 - 60								
					07:57		1	2	G	50 - 80								
					07:58		1	75	GWF	50 - 80	50 & 15							
					07:59		1	46	GWF	80								
					08:00		1	270 - 295	GWF	80	11 & 260+							
					08:01		1	50	GWF	80	10 & 40							
					08:03		1	100 - 110	GWF	100								
					08:04		1	30	G	100	No calls		2 Whooper swans rise from L Tangy, circle and leave to N					
					08:05		1	11	G	100			2 Tufted duck, 8 Mallard remain. Cows move down to drink.					
					08:09		1	65	G(GWF)	150	Few calls. Last skein.							
					08:27													
											Movement period = c 43 mins							
								1311 - 1381			Total estimated G departing: Lussa & Tangy (includes 19 GJ roosted on Tangy Loch)							
VISIT 4	0-1 NE wind	good	moderate	08:28														
03-12-2002					07:42						Some duck viz at W end of loch Tangy. No GJ or swans.							
	0 - 30% cloud				07:45		1	40	G	80 - 100	S over Skeroblin Cruach. No Calls.	Assumed Lussa	Tangy loch level high but had recently been very high.					
	No moon				07:46		1	180 - 200	G	80 - 100			A: Rolled veg high on banks, unevenly distributed - evidence of sizeable waves	3	2	1	1	0
	Moderate light at start				07:54		1	30	G	80 - 100			B: Less and older veg washed up (no green veg). Froth.	0	0	0	1	1
		telescope			07:55		2	7	GJ	100	Some calls audible		C: Livestock disturbance.	1	2			
		binoculars			08:05						Feint calls audible. Assumed GWF behind Skeroblin Cruach.							
					08:13													
					08:21													
					08:30													
					08:37													
					08:43		1	10	G	50 - 100								
					08:54						Feint calls audible. Assumed GWF behind Skeroblin Cruach.							
								267 - 287			Total estimated G departing: Lussa							
VISIT 5																		
10-12-2002	6 - 7 E wind	good	poor	15:52									Tangy Loch level medium.					
					16:44		1	2	G	70 - 50			A: Very frothy shore line. Livestock disturbance. Some veg thrown up recently	1	3	8	0	1
	20% - 70% cloud cover < 500m				16:45						some calls feintly audible		B: Little wave or livestock disturbance. Rolled weed at far E side. Some froth.	0	0	1	2	1
	half moon												C: One large white breast feather - assumed whooper swan	1	3			
		telescope									Only 2 geese seen between 15:03 and 17:11. Assume not roosting Lussa.							
		binoculars									No activity on L Tangy.							
VISIT 6																		
16-12-2002	2 NE wind	good	good	15:45								Assumed Lussa	Tangy Loch level med - low. Loch frozen at E side. No evidence of recent waves.					
	5% cloud building to E				16:38		2	5	GWF	250 - 40	N; landed south east side of Lussa Loch		A: Some livestock disturbance.	3	6	4	2	1
	Clear 3/4 moon				16:42		3	8	GWF	250 - 50	N along western shore of Lussa Loch		B: High cattle disturbance at E end	1	0	2	0	2
		telescope			16:46		1	6	BY		N to Lussa Loch		C: Some Livestock disturbance	3	0			
		binoculars			16:48		1	400 - 500	GWF	100 - 50	Calls. N; Numbers estimated.							
					16:49		1	350 - 700	GWF	250 - 100	N; 5 large skeins at different heights. Numbers estimated.							
					16:50		1	120 - 130	GJ	250 - 30	N; 2 skeins. Few calls.							
					16:51		3	70	BY	100 - 30	N; (Some duck also arrive at L Tangy)							
					16:52		1	180	GWF	250 - 50								
					16:56		1	200	GWF	20	Large skein heard							
							4	200	GJ	40 - 20	NE;							
					16:58		1	20	G		Skein heard							
								1559 - 2019			Total estimated G in N to roost: Lussa; period of movement 20min.							
											proportion of daytime field count=c. 90-110%							
VISIT 7	N F0	V good	v good	16									Tangy: 0.75 frozen; no evidence of activity on bank/deltas					
04-01-2003	0% cloud				17.02		1	200 - 250	G	40	N rapid flight over Skeroblin Cruach, few calls	Assumed Lussa	A, 1 fresh DF; ice concealled signs	0	0	0		
					17.05		1	60	G	40	infrequent calls	Assumed Lussa	B, 1 old GBF	0	0	0		
	new crescent moon,				17.06		2	20 - 22	GJ	20 - 30	V quiet on approach, landed east end	Tangy Loch	C, duck droppings on rocks	0	0	0		
	visible to start						1	500 - 600	GWF + G	50 - 80	few calls; f. rapid flight higher than first flocks	Assumed Lussa	D, unfrozen, but ice on strand line	0	0	0	0	
	bright to W	telescope			17.08		1	200 - 250	G	80 - 100		Assumed Lussa	E, 2 medium Mallard F	0	0			
		binoculars			17.11		1	50 - 60	G (GJ)	100 - 120	some GJ calls audible	Assumed Lussa						
					17.14		1	400	GWF & GJ	80 - 120		Assumed Lussa	No goose droppings					
					17.16		1	260 - 280	GWF & GJ	100		Assumed Lussa						
						17.24					no futher movements; movement period =c. 14min							
								1430 - 1922			Total estimated G in N to roost: Lussa; + 22 GJ roosted on Tangy Loch							
											proportion of daytime field count=c. 80-120%							
VISIT 8																		
20-01-2003	1 - 2 SSW wind	good	poor	16:30	17:20		1	7	G	20	Landed on E side of LTangy. No calls.	Tangy Loch	Tangy Loch level very high. Old vegetation washed up on W side.					
					17:23		2	23	GWF	30	N	Over Lussa	A: High livestock disturbance.	9	3	2	2	0
	5% cloud				17:28		1	35	G(J)	20 - 50	Landed on E side of LTangy. Some calls.		B: Some livestock disturbance.	0	0	1	0	0
	Becoming Dark - No moon				17:34		3	120	GWF	50	N	Over Lussa	C: Some livestock disturbance.	0	2			
	heavy rain in						3	60	GWF	50	N	Over Lussa						
	morning	telescope					3	40	GWF	50	N	Over Lussa						
		binoculars			17:35		2	80	GWF	50	N	Over Lussa						
					17:45		3	50	G	50	N uncertain number	Over Lussa						
					17:55		3		G		N uncertain number	Assumed Lussa						
								415			Total estimated G in N to roost: Lussa; + 42 GJ roosted on Tangy Loch							
											proportion of daytime field count=c. 24%							
VISIT 9																		
27-01-2003	3 W wind	becoming good	poor - mod	08:25														
	100% cloud	low cloud			07:44						Solitary GJ call heard from Tangy Loch		Tangy Loch level medium.					
					08:03		1	20	G	40	No calls	Assumed Lussa	A: Many duck feathers	9	1	2	0	0
		telescope			08:04		2	12	GJ	0 - 10	No calls	Tangy Loch	B: Froth on N side	4	0	1	1	2
		binoculars			08:09		1	120 - 140	G(WF)	20 - 40		Assumed Lussa	C:	1	3			
					08:11		1	40	G(WF)	20 - 40								
					08:13		1	500 - 600	G(WF)	20 - 40								
					08:15		1	250 - 300	G(WF)	20 - 40								
								942 - 1112			Total estimated G off: Lussa; + 12 GJ roosted and departed from Tangy Loch							
											proportion of daytime field count=c. 90%							
VISIT 10	NW 1-2 wind	poor becoming mod.	moderate	17:01														
04-02-2003	cloud 100% - 85 %				17:41		1	25 - 35	GJ	30 - 0	E Landed on Tangy Loch	Tangy Loch	Tangy loch level medium. Snow lying up to edge.					
	heavy snow shower at start				17:52		2		GWF		Calls heard to E, moving N but nothing visible	Assumed Lussa	A:	1	2	0	2	1
	crescent moon	telescoope											B: Some rolled old veg.	4	5	1	0	0
	later	binoculars						**25 - 35**			Range numbers GJ roosted on Tangy Loch		C:	0	0			

Bank shoreline activity: f/100 = number of goose feathers per 100m; with replicates

No. Geese and flight height (m) subdivided into min. - max. estimates
GJ= Greylag goose; GWF= Greenland White-fronted goose
G= unidentified goose

Date	Weather	Visibility	Audibility	Sun	Start	End	Map			Flight Line				Roost location	Bank/shoreline activity					
	Moon Phase	& equipment		set/rise			code	No.		species	height m		direction & location			f/100m				
VISIT 11	E var F0 1	good	v good	07:54																
12-02-2003		varaible			07:47		1			GWF			S short duration calls (<15s)	Assumed Lussa	A:	3	3	3	5	4
	0% cloud patchy mist				07:59		1			GWF & GJ			S longer duration calls (<30s)		B:	1	2	3	2	15
	locally dense;				08:02		2			GJ	20 -	30	S		C:	20	11	25	12	5
	lifted 09.15				08:08		3			GJ		< 20	SW?		D:	0	1	1	0	1
	Half moon not viz.	telescope			08:10		4			GWF			S single bird call?			0				
		binoculars			08:23		3,4& 5?			GWF	20		S then semi circling							
					08:26		6			GWF	20		SW over Skeoblin Hill	Assumed Lussa						
					08:31		2			GWF			S							
					08:33		7	2		GWF	40		SW variable curve, see below							
					08:34		7						N over Tangy Loch							
					08:36		6		< 10	GJ	80		SW occassional call <15s							
					08:37		1			GWF			N possibly split off GJ flock above							
					08:39		8			GWF			direction uncertain location to the NE							
					08:40		8			GWF			not moving to S, uncertain direction							
					08:47		9			GJ & GWF		> 50	flock split- some SSE & some E							
					08:53		2		< 10	GWF			brief calls <10s							
					09:13		3		< 10	GWF		> 40	S							
					09:16		2			GWF			S							
					09:23		11			GWF			uncertain direction							
					09:26		1			GWF			S longer duration calls >20s)							
					09:28		6 or 2			G (GJ?)			S over Skeroblin Hill							
					09:37		8			GWF	30 -	40	S							
					09:39		1			GWF	80		S calls >15s							
					09:42		1			GWF			S							
					09:43		1			GWF			S for >40s duration							
					09:46	09:48	1	11		GWF & GJ			S plus single call from NE direction							
					09:53		12	10		GWF	60 -	80	S slow flight skein.							
					09:54		1		< 10	GWF			S							
					10:02		2			GWF	20 -	40	S							
					10:10		3	8		GJ	100		S							
					10:13		3	6		GWF	100		S							
					10:21		3	13		GWF	80 -	100	S then SW							
					10:34		13	5		GJ			N up above the western edge of the Luss Loch							
					10:37		14	4		GWF	100 -	180	N overTangy Loch							
					10:46		15	5		GWF	150 -	200	N then gentle diversion to NE around wind farm- resumed course N							
					10:50		16	1		GWF	150		W							
													Movement period = c 180 mins							
								105					Total visual estimate G flighting							
VISIT 12																				
18-02-2003	SE 5 - 7 wind	good / poor	moderate	17:31																
	No cloud				17:20		1	2		GWF	70		S	unknown destination	Tangy loch level medium. Waves from SE					
	No moon	telescope			17:31	17:40	2	19		GWF	40 -	50	N in three skeins, zig-zag route across side wind	Lussa	A: Old rolled veg. Froth. Duck feathers. Some newly rolled veg.	4	6	4	4	8
	Dry	binoculars			17:43	18:04	2	1140 -	1240	GWF	40 -	70	N in 11 skeins, rise and fall 20-30 in gusts	Lussa	B: Calm water at E side of loch	36	39	25	5	1
					17:58		3	18		GWF	40		NE slow headway made across wind	Assumed Lussa	C:	0	0			
					18:06	18:18	2	401		GJ	30 -	50	N in four skeins	Lussa						
					18:27		4	25 -	30	GJ	20 -	0	Landed far side of Tangy Loch behind cranog	Tangy Loch						
													Movement period = c 180 mins							
								1605	**1710**				Total estimate G flighting of which GWF 1179-1280 (80% of Machrihanish flock)							
VISIT 13																				
05-03-2003	SW 1 wind	fair	fair	18:03																
	25% cloud				18:21		1	200 -	240	GWF	50			Assumed Lussa	Tangy loch level medium / high. Calm. Many duck feathers					
	New moon	telescope			18:22		1	40		GWF	50			Assumed Lussa	A:	12	18	5	2	1
		binoculars			18:23		1	110		GWF	50			Assumed Lussa	B: many old duck feathers	13	11	14	1	0
					18:32		1	90		G	50		No calls audible	Assumed Lussa	C:	0	0			
					18:42		1	200 -	230	GWF	50			Assumed Lussa						
					18:43		1	100 -	120	G	50			Assumed Lussa						
					18:44		1	70 -	80	GWF	50			Assumed Lussa						
					18:45		1	120 -	150	G	50		No calls audible	Assumed Lussa						
					18:46		1	70 -	80	G(J)	60			Assumed Lussa						
					18:47		2	18		GJ	10			Tangy Loch						
													Movement period = c 26 mins							
								1018	**1158**				Total estimate G flighting of which GWF 1000-1130 (80% of Machrihanish flock)							
VISIT 14																				
10-03-2003	SW 5+ wind	good	moderate	06:52																
	No cloud				06:27		1	24		G	30		S	Assumed Lussa	Tangy Loch					
	No moon	telescope			06:32		1	18		GJ	50		S	Lussa	A: MGBF.	15	2	0	0	1
	Dry $8^{o}C$	binoculars			06:33		2	5		GJ	50		S	Lussa	B: MGBF	3	8	13	2	8
					06:36		1	120 -	140	G	20 -	80	S rising and falling in height into wind	Lussa	C: 20-40% FGBF	1	1	0	0	3
					06:39		1	55 -	60	G	20 -	50	S	Lussa		0	2	12		
					06:40		1	220		G	40 -	60	S	Lussa						
					06:43		2	90		GWF	20 -	40	S	Lussa						
					06:44		1 & 2	180		GWF	80 -	120	S	Lussa						
					06:45		1	23		G			S	Lussa						
					07:12		1	1		GWF	80 -	100	S	Lussa						
													Movement period = c 45 mins							
								736	**761**				Total estimate G flighting of which GWF c. 713 (50% of Machrihanish flock)							
VISIT 15																				
25-03-2003	E 0 - 1 wind	Very poor	Locally good	18:43																
	100% Local fog	max height viz 40m	surf v. noisy in parts		17:40		1	31		GJ	20		E then SE Audible for long time as they back tracked in fog. Eventually visible	Tangy Loch	Tangy Loch level low					
	Vis < 500m		also airport		17:46	17:49	2	2		RETDI	5		Calls clearly audible; then calls to E		A: Froth on shore. Some duck feathers.	4	6	5	3	2
	No moon visible		audible		17:48		3	2		GJ	20		SW	unknown	B: Shoreline survey abandoned as geese flighting early to roost					
															C:					
					18:05		4	31		GJ	10		S Took off from Tangy Loch and headed into mist	Tangy then unknown						
					18:08		5			GWF			N Audible not visible (refer to FY counts)	Assumed Lussa						
					18:16		5			GWF			N Audible not visible	Assumed Lussa						
					18:18		5			GWF			N Audible not visible	Assumed Lussa						
					18:33		6	30		G(WF)	40		ENE	Assumed Lussa						
					18:38		5			GWF			N Large numbers of geese audible but not visible	Assumed Lussa						
					18:40		5			GWF			N Audible not visible	Assumed Lussa						
					18:45					GWF			Some calls heard to E	Assumed Lussa						
					18:51		5			GWF			N Long duration skein heard	Assumed Lussa						
					18:54		7	c40		GWF	20		N	Assumed Lussa						
					18:57					GWF			Skein audible not visible to E	Assumed Lussa						
					19:00		5			GWF			N Large skein audible not visible to E	Assumed Lussa						
					19:06					G			Heard distant to E	Assumed Lussa						
					19:09		8	9		G(WF)	30		NE	Assumed Lussa						
					19:13					G(WF)			Audible in E	Assumed Lussa						
					19:14		9	35 -	40	GWF	20		N then NE	Assumed Lussa						
					19:24		10			GJ			variable direction -audible high up	unknown						
					19:25		10	15		GJ	10		Landed Tangy	Tangy Loch						
					19:26		11			GJ (GWF)			E Cacophany of low, local calls also some high and moving E	unknown						
					19:26		10	c30		GJ			Individuals and small groups circling above Tangy Loch	unknown						
					19:27		12	c40		G	15		Flock heading WSW	unknown						
					19:28		10	14		GJ	10		variable							
					19:28		10	10		GJ	10		7 landed Tangy Loch	Tangy Loch						
					19:29		10	13		GJ	10		Landed Tangy	Tangy Loch						
					19:30		11			GJ			Small group heading E then N E	unknown						
					19:30		10	16		GJ	10		Landed Tangy from N	Tangy Loch						
					19:30		12	c15		GJ	10		SW Crossed over SE sector of Tangy Loch	unknown						
					19:33		13	12		GJ	10		E Landed Tangy	Tangy Loch						
					19:34		13	3		GJ	10		E Landed Tangy	Tangy Loch						
					19:35		13	c15		GJ	10		E Landed Tangy	Tangy Loch						
					19:38		14	30		GJ	40		N to land Lussa Loch	Lussa Loch						
					19:40								Some geese at far end of Tangy Loch take off (and land again?)							
					19:41		15	1		G	15		Lone goose heading NE	unknown						
					20:00								Frequent calls still heard from Tangy Loch in the darkness with possible movement							
													81 GJ landed Tangy Loch (with 31 off initially); 622 onto Lussa Loch=FY							
													Movement period = c 121 mins							
								1601		GWF			Total estimate GWF c. 1601 (120% of Machrihanish flock)							
VISIT 16																				
05-04-2003	W 0 - 1 wind	good	good	05:44																
	100% cloud				05:21								33 GJ swim out from N to middle of Tangy Loch							
	No moon visible	telescope			05:21								11 further GJ join group							
		binoculars			05:25								GJ calling							
					05:55		1	48		GJ	10		take off from Tangy Loch							
					05:58			2		CANGO			Swam out from behind cranog							
					06:05		2	11		GWF	30			Assumed Lussa	Tangy Loch level low					
					06:06		3	40		G	40		No calls audible		A:	9	6	18	0	0
					06:14		3				50		No calls audible		B:	5	4	3	0	10
					06:15		3	85		G	50		No calls audible		C:	0	1			
					06:16		3	40		G	50		No calls audible							
					06:20		5	25		G	30		No calls audible							
					06:21		3	110 -	120	G	50		No calls audible							
					06:22		3	115		G	30		No calls audible							
					06:24		4	4		GWF	50		No calls audible							
					06:25		5	40		G	20		No calls audible							
					06:27		3	35		G	50		No calls audible							
					06:28		5	40		G	30		No calls audible							
					06:29		3	140		G	40		No calls audible							
					06:30		6	15		G	60		No calls audible							
					06:39		6	190		GWF	70		Calls audible							
					06:40		6	95		GWF	60		Calls audible							
					06:41		5	53		GWF	20		Calls audible							
					06:42		3	50		GWF	30		Calls audible							
					06:44		5	20		GWF	20		Calls audible							
					06:48		6	22		GWF	50		Calls audible							
					06:49		5	14		GWF	30		Calls audible							
					06:49		6	40		GWF	40		Calls audible							
					06:54		3	11		G	60		No calls audible							
					06:57		6	67		GWF	70		Calls audible							
					07:00		5	30		GWF	10		Calls audible							
					07:05		6	5		G	60		No calls audible							
					07:06		6	14		GWF	80		Calls audible							
					07:07		5	35		GWF	30		Calls audible							
					07:08		5	14		GWF	60		Calls audible							
					07:13		6	30		GWF	100		Calls audible							
					07:15		6	12		GWF	70		Calls audible							
					07:16		3	16		GWF	50		Calls audible							
					07:17		5	10		G	10		No calls audible							
					07:25		6	45		G	40		No calls audible							
					07:30		6	4		G	50		No calls audible							
					07:35		6	25		G	50		No calls audible							
					07:37		6	25 -	35	G	50		No calls audible							
					07:38		6	23		G	70		No calls audible							
													Movement period = c 103 mins							
								1598	**1618**				Total estimate G flighting of which GWF c. 1570 (100% of Machrihanish flock)							
VISIT 17																				
09-04-2003	calm	moderate	good	19:13																
	100% cloud				19:48		1	60		G	20		No calls audible	Assumed Lussa	Very low water level on Tangy Loch					
	half moon later	telescope													A:	8	3	4	0	0
	haze	binoculars													B:	2	1	2	0	0
								60								1	0			
VISIT 18																				
24-10-2003	still	optimum	v. good	17:03											Very low water level on Tangy Loch; small weed roll south bank					
	0% cloud				17:20	17:21	1 & 2	410		G	30 -	50	No calls audible; 6 skeins	Assumed Lussa	A:	0	1	1	1	1
	no moon	telescope			17:34		1	1		G	30 -	40		Assumed Lussa	B:	2	0	20	0	0

Bank shoreline activity: f/100 = number of goose feathers per 100m; with replicates

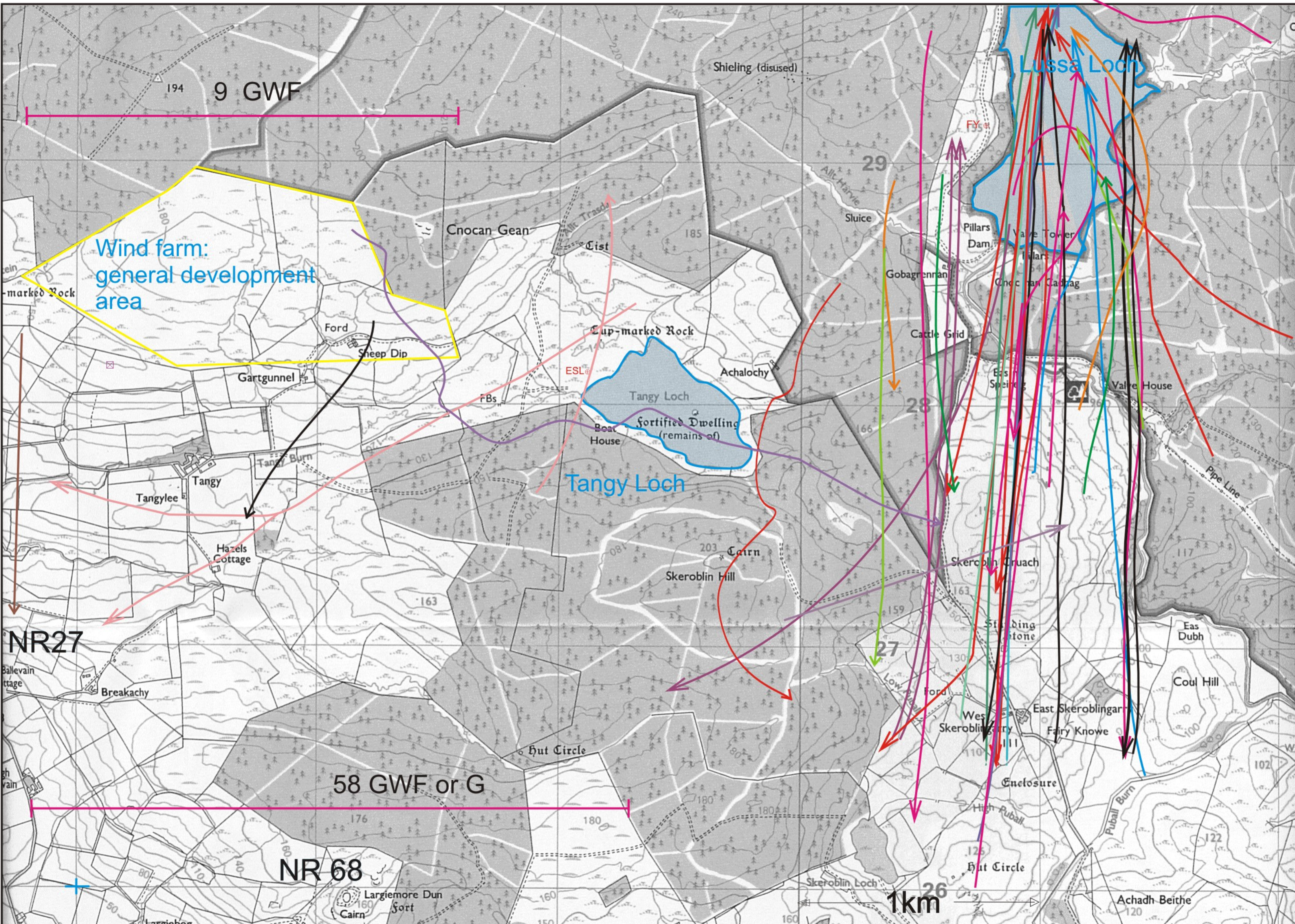
No. Geese and flight height (m) subdivided into min. - max. estimates
GJ= Greylag goose; GWF= Greenland White-fronted goose
G= unidentified goose

Date	Weather	Visibility	Audibility	Sun	Start	End	Map	Flight Line								Roost location	Bank/shoreline activity					
	Moon Phase	& equipment		set/rise			code	No.			species	height m			direction & location			f/100m				
		binoculars			17:36		1	24			G	40				Assumed Lussa	C:	0	0	1	0	2
		image intensifier			17:42		1	160			GWF	70			calls feint, three skeins	Assumed Lussa	D:	1	0	3	2	
					17:43		1	40			GWF	50	-	70		Assumed Lussa						
					17:50		1	380			GWF (GJ)	30	-	80		Assumed Lussa	frequent duck feathers					
							3	17			GJ	20	-	5	landed Tangy Loch brief calls							
					17:54		1	14			G	30										
								1046							Movement period = c 34 mins							
															Total estimate G flighting of which GWF c. (100% of Machrihanish flock)							
VISIT 19																						
06-11-2003	S F0 -1	optimum	v. good	07:36																		
	80% cloud				07:22		1	3			GJ	15	-	100	calls audible;	Tangy	12 Whooper Swan on Tangy feeding to 11.00am					
	half moon	telescope			07:31		2	200			GWF	80	-	150	calls	Assumed Lussa	A:	0	0	0	0	0
		binoculars			07:34		2	100			GWF	80			calls	Assumed Lussa						
		image intensifier			07:37	07:39	2	574	-	594	GWF	120			calls, slow flight drawn out skeins	Assumed Lussa						
					07:42		2	50			GWF	80	-	100	calls	Assumed Lussa						
					07:43		3	20			G	150			silent	Assumed Lussa	frequent duck feathers					
					07:47		2	400			GJ & GWF	100	-	120	calls	Assumed Lussa						
							4	10			GJ	150			calls	Assumed Lussa						
							5	34			GJ	150			calls	Assumed Lussa						
						07:50	2	80			G	100	-	120		Assumed Lussa						
					07:51		2	380			GWF	50	-	150	calls	Assumed Lussa						
							2	16			G	100										
						07:53	2	32			G	100										
								1899		**1919**					Movement period = c 31 mins							
															Total estimate G flighting of which GWF c. (100% of Machrihanish flock)							
VISIT 20																						
26-11-2003	W F6	limited 4km	poor	16:01	15:50	18:15									no geese flighting	Laggan flooded						
	100% cloud																					
	rain	telescope																				
	half moon	binoculars																				
		image intensifier																				
VISIT 21																						
06-12-2003	ESE F2	optimum	good	15:52													old swan feathers					
	0% cloud				16:39		1	140			GWF		>	120	calls audible;	Assumed Lussa	A	5	2	5	1	1
	full moon	telescope			16:42		1	1			G	200				Assumed Lussa	B	1	3	0	0	0
	risen to E	binoculars					1	14			G	80	-	100		Assumed Lussa	C	0	0	1	1	0
		image intensifier				16:44	1	1			G	100				Assumed Lussa	D	0	0	0	0	
					16:47		1	120	-	140	GWF		>	100	calls	Assumed Lussa						
							1	170			GWF	100			calls	Assumed Lussa						
					16:49		1	80			GWF		>	150	calls	Assumed Lussa						
							1	40			GWF		>	150	calls	Assumed Lussa						
					16:50		1	440			GWF		>	150	calls	Assumed Lussa						
					16:52		1	340			GWF		>	200	calls	Assumed Lussa						
					16:55		1	60	-	80	GWF	120			calls	Assumed Lussa						
					17:04		2	4			GJ	20			calls	Tangy						
								1410	-	**1450**					Movement period = c 25 mins							
VISIT 22																						
13-12-2003	F 6 NW	poor	poor	15:49																		
	100% cloud rain				16:23		1	40			G		<	30	low, zig-zag, behind & east of Cruach	Assumed Lussa						
	moon not visible				16:25		1	70			G		<	30		Assumed Lussa						
		telescope			16:27		1	120			G		<	30		Assumed Lussa						
		binoculars																				
		image intensifier																				
								230							Period of movement 4min.							
															proportion of daytime field count=c. <15%							
VISIT 23																						
27-12-2003	SW F3-4	variable poor	poor	15:54																		
	100% cloud				16:37		1	3			G	100			N, no calls audible;	Assumed Lussa						
	1st Quarter Moon	telescope			16:44		2	46			G	50			N, long drawn out skein, no call audible; wind F0	Assumed Lussa						
	not visible	binoculars			16:45		2	160			G	60			N,	Assumed Lussa						
		image intensifier			16:46		2	360			G	50	-	100	N, in seven skeins	Assumed Lussa						
					16:48		2	260	-	290	G	20	-	100	N, more compact V skein	Assumed Lussa						
															snow shower to 17:02 visibility not possible	no geese on Tangy						
								829	-	**859**					Movement period = c 11 mins min. interrupted?							
VISIT 24																	A:	0	0	0	0	0
16-01-2004	NW F1-2	good	good	16:21													B:	0	0	2	1	0
	0% cloud				17:18		1	22			G	80			N, no calls audible;	Assumed Lussa	C:	1	0	1	0	0
	new moon	telescope			17:19		1	160			G	80	-	100	N,	Assumed Lussa	D:	0	1	0		
	not visible	binoculars			17:21		1	700	-	800	G		>	150	N, long drawn out skein, no call audible, slow flight	Assumed Lussa						
		image intensifier																				
								882	-	**982**					Movement period = c 3 min.							
VISIT 25																	A:	0	2	5	12	0
22-01-2004	W F1-2	<100m	good	16:33													B:	1	1	17	5	10
	100% low cloud				17:07		1				GWF				variable direction ? N, calls audible;	Assumed Lussa	C:	16	3	3	2	5
	new moon	telescope			17:10	17:14	2		?	50	GWF & GJ		c.	50	NE, meander, calls receeding	Assumed Lussa	D:	4	4	10	1	
	not visible	binoculars			17:19	17:21	1		?	30	GWF		c.	40	W, meander calls audible, slow flight circle over Tanngy? Land	Tangy?						
		image intensifier					1		?		GWF				above group joined by 2nd flock	Tangy?						
					17:23	17:25	3		?		GWF		c.	20	NW then circle to land on NE corner Tangy	Tangy?						
					17:25	17:26	1		?		GWF & GJ		c.	20	E variable landed NE part Tangy Loch	Tangy?						
							1		?		GJ				joined above flock	Tangy?						
					17:45		1		?		GWF				calls from Tangy surface or in fight?	Tangy?						
					17:50		1		?		GWF				calls from Tangy surface or in fight?	Tangy?						
									?						Movement period = c 43 min.							
VISIT 26																	A:	4	2	3	1	1
27-01-2004	NNW F3-2	good	good	16:43													B:	4	5	17	9	10
	20% cloud				17:23		1	8			G	40	-	60	N, no calls audible;	Lussa	C:	7	1	0	2	9
	1/3 moon	telescope			17:27	17:29	1	256			G	20	-	30	N, in four skeins, rapid height & course changes- cross wind	Lussa	D:	11				
	visible	binoculars			17:32	17:34	1	680			G	20	-	30	N, in three main waves;	Lussa						
		image intensifier			17:36		1	60			G		<	20	N	Lussa						
					17:39	17:41	2	48			G	40			in two skeins	Lussa						
					17:43	17:44	2	100			G	30	-	40	N in two skeins	Lussa						
					17:47	17:48	2	50			G	20	-	30	N, two skeins no calls audible;	Lussa						
								1202							Movement period = c 25 min.							
VISIT 27																	A:	7	3	0	2	2
17-02-2004	N F0-1	good	good	17:28													B:	15	16	0	3	0
	0% cloud				18:06		1	180			G	80			N, no calls audible;	Lussa	C:	11	0	1	0	4
		telescope			18:09		1	80			G	80			N	Lussa		1				
		binoculars			18:10		1	600			GWF	120			N, long drawn out skeins	Lussa						
		image intensifier			18:12		1	200			GWF	120			N	Lussa						
					18:14		1	530			GWF	120			N in two movements	Lussa						
						18:15	3	3			WS	30			E to far end landed (Whooper Swan)	Tangy Loch						
					18:31		2	250	-	300	G	100			N,	Lussa						
						18:32			<	6	GJ				calls only, landed	Tangy Loch						
								1840		**1890**					Movement period = c 26 min.							
VISIT 28																	A:	4	2	3	4	2
23-02-2004	W F2-3	good	good	17:41													B:	4	4	5	2	1
	100% cloud				17:52		1	3			G	60			N, no calls audible;	Lussa	C:	4	4	7		
	at 800m	telescope			18:04	18:06	2	660	+		G	60	-	200	N	Lussa						
	new moon	binoculars			18:07		3	250			G	70	-	150	N, cross wind V skeins; others linear	Lussa						
		image intensifier			18:08		2	100			G	70	-	150	N	Lussa						
					18:11		2	90			G	70	-	150	N	Lussa						
					18:23	18:25	2	310			G	70	-	150	N	Lussa						
					18:33		2	34			G	60	-	80	N,	Lussa						
								1447							Movement period = c 41 min.							
VISIT 29																	A:	0	0	2	0	0
25-02-2004	NW F0-1	good	good	07:25													B:	2	2	3	0	0
	50% cloud				06:58		1	2			GJ	20	-	40	W then SW	Tangy Loch	C:	0	0	0	0	
	occ. snow shower	telescope			07:03		2	40			G	80	-	100	S	Lussa						
	new moon	binoculars			07:10		2	40			GWF	80	-	100	S	Lussa						
		image intensifier			07:16		2	30			GWF	80			S	Lussa						
					07:19		2	360	-	390	GWF & GJ	60	-	120	S	Lussa						
					07:21		2	40			GWF		>	100	S	Lussa						
					07:28		2	30			G	100			S	Lussa						
					07:31		2	18			G	100			S	Lussa						
					07:36		2	110			GWF	100			S	Lussa						
					07:39		2	160			GWF	100			S	Lussa						
					07:40		2	27			GWF	100			S	Lussa						
					07:43		3	12			GWF	40			S	Lussa						
					07:44		2	40			GWF	80	-	100	S	Lussa						
					07:43		3	12			GWF	40			S	Lussa						
					07:44		2	40			GWF	80	-	100	S	Lussa						
						07:45	2	85	-	100	GWF & GJ	80	-	100	S	Lussa						
					07:48		2	160	-	170	GWF & GJ	80			S	Lussa						
					07:59		2	60			GWF	80			S	Lussa						
					08:04		2	120			G	40	-	70	S	Lussa						
					08:06		2	4			G	60			S	Lussa						
								1390		**1445**					Movement period = c 68 min.							
VISIT 30																	A: similar frequency of old goose feathers	2	7	3	1	1
10-03-2004	E F2-4	good	moderate	18:16													B:	1	2	1	0	0
	100% cloud				18:06		1	10			G	50			N, no calls audible;	Lussa	C:	0	0			
		telescope			18:07		1	120			G	50			N	Lussa						
	new moon	binoculars			18:11		1	90			G	50			N	Lussa						
	not visible				18:16		1	10			G	100			N	Lussa						
					18:29		1	80			GWF	75			N feint calls	Lussa						
					18:31		1	24			G	75			N	Lussa						
					18:44	18:48	1	570			GWF	50	-	100	N, in five groups	Lussa						
								904							Movement period = c 42 min.							
VISIT 31																						
11-03-2004	E F4-6	moderate	poor	06:48																		
	50% cloud				06:52		1	50			G	50			S not audible	Lussa						
	occ. snow shower	telescope			06:53		1	20			G	100			S	Lussa						
	new moon	binoculars			06:55		1	280			G	50	-	100	S	Lussa						
	not visible	image intensifier			06:58		1	280			G	50	-	100	S	Lussa						
					07:02		1	610			G	50	-	250	S	Lussa						
					07:03		1	24			G	50			S	Lussa						
					07:05		1	5			G	50			S	Lussa						
					07:06		1	18			G	50			S	Lussa						
					07:07	07:08	1	102			G	20	-	100	S	Lussa						
					07:12		1	18			G	10			S	Lussa						
					07:14		1	90			G	10	-	30	S	Lussa						
					07:15		1	30			G	50			S	Lussa						
					07:18		1	140			G		<	10	S	Lussa						
					07:20		1	30			G	30			S	Lussa						
					07:30		2	1			GJ				SW landed	Tangy						
								1698							Movement period = c 38 min.							
VISIT 32																	A: old goose feathers between 1-2/100m	0	0	0	0	0
17-03-2004	V F0	good	good	18:29											Tangy Loch RH pr. 4 CG 17:10- 17:48		B:	0	0	0	0	0
	20% cloud				18:54		1	10			G	50			N, no calls audible;	Lussa	C: evidence of grazing west end, droppings =Canada Geese?	2	0			
		telescope			18:55		1	8			G	5			N, V low	Lussa						
	new moon	binoculars			18:57	18:00	1	1000	c.		G	5	-	30	N; one continuous movement	Lussa						
	not visible																					
								1018							Movement period = >6 min.							

No. Geese and flight height (m) subdivided into min. - max. estimates
GJ= Greylag goose; GWF= Greenland White-fronted goose
G= unidentified goose

Bank shoreline activity: f/100 = number of goose feathers per 100m; with replicates

Fig. 1 Accumulated flight lines of Greenland White-fronted Geese. Tangy wind farm

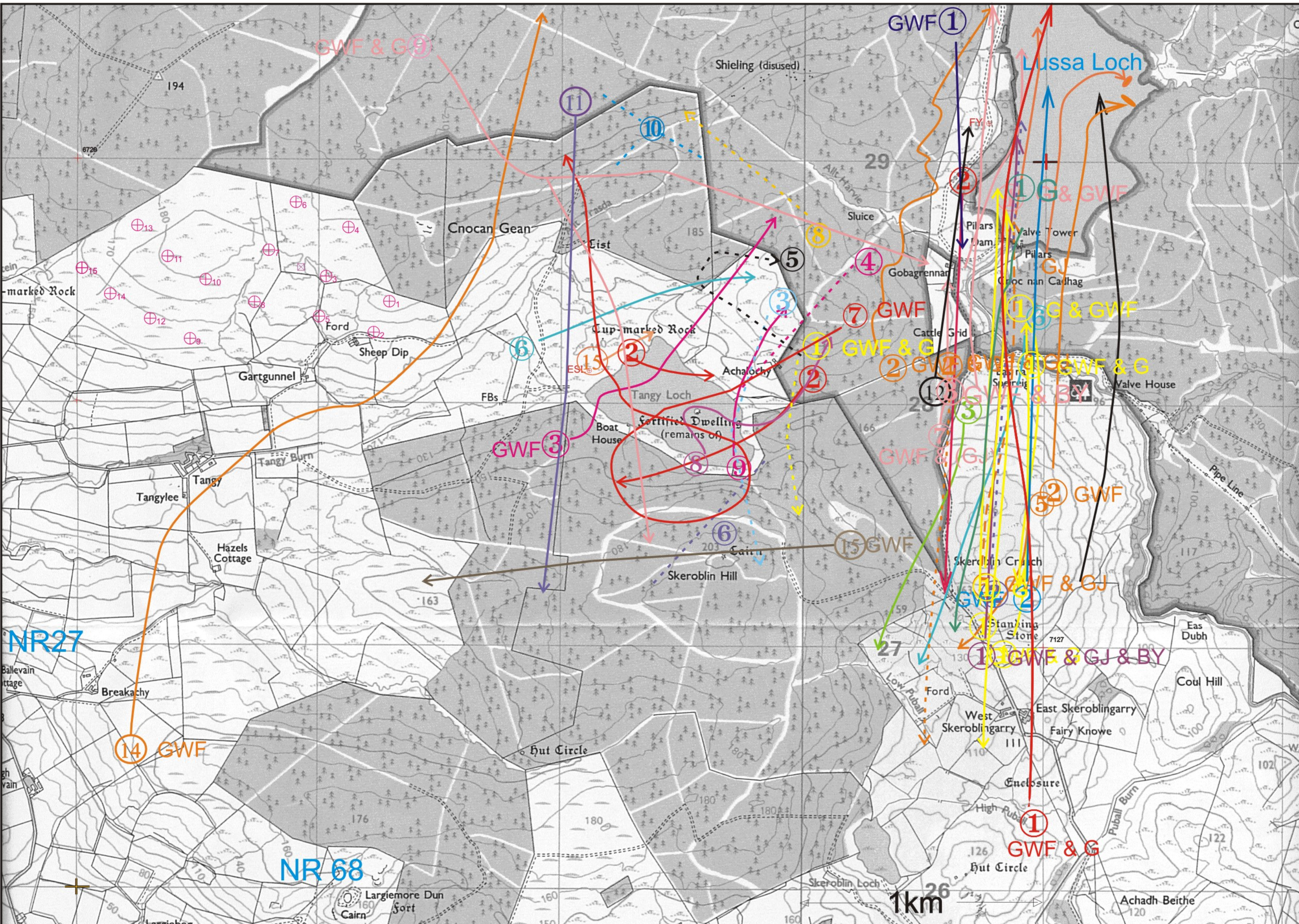


Pre-construction 2001/02 winter

17,327 GWF or G

KEY: Flight lines include Greenland White-fronted Geese and routes of unidentified geese species over 17 surveys
Line colour based on individual surveys and unrelated to numbers of geese.
Total accumulated geese movements shown in three sectors denoted by:

Fig. 2. Accumulated geese flight lines. Tangy wind farm, Kintyre 2002/03 winter



Operation 2002/03

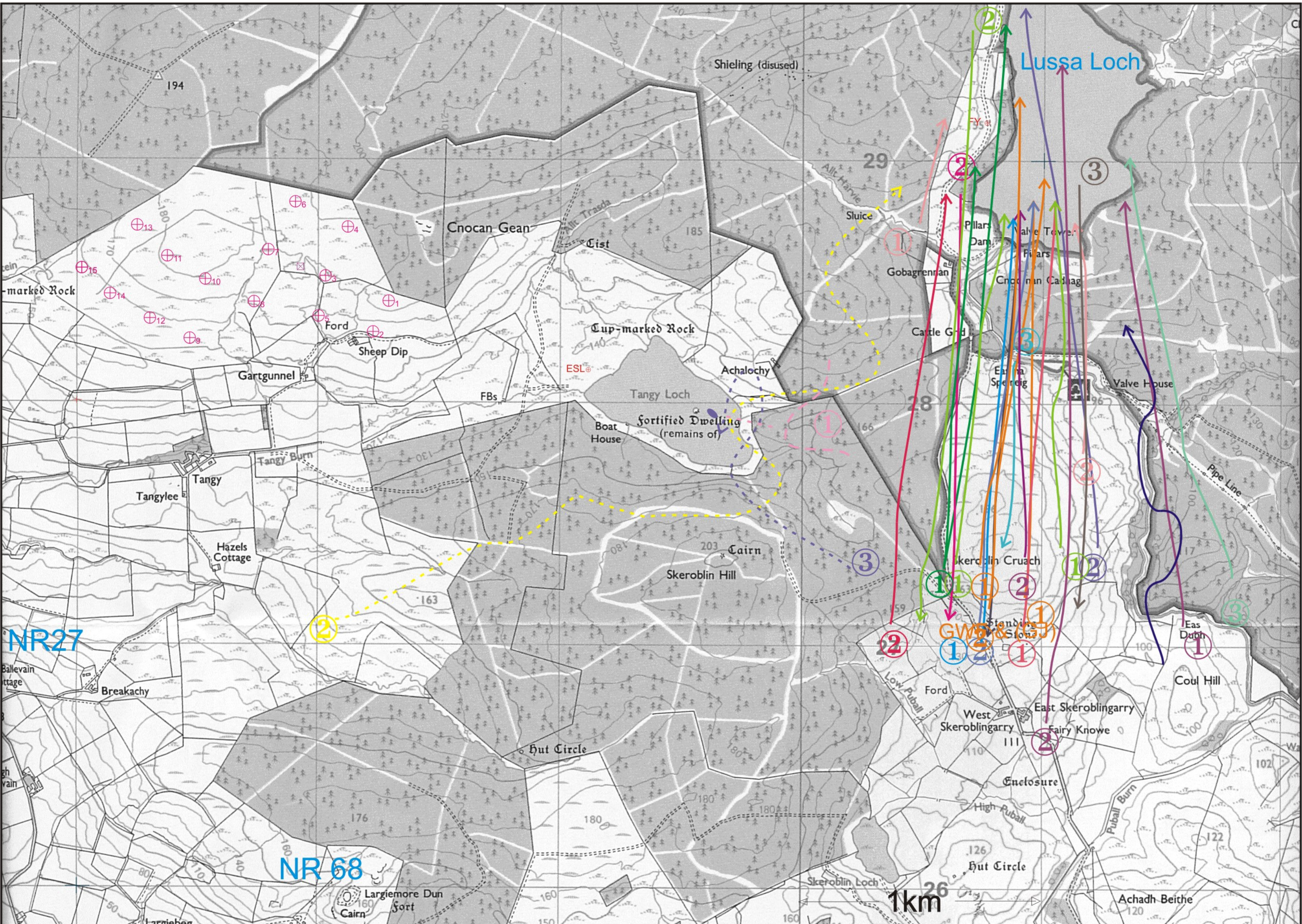
KEY: ⊕ = flight line observation points

- - - - denotes assumed route- auditory cues alone

GWF= Greenland White-fronted Goose

GJ= Greylag Geese not depicted

Fig. 3. Accumulated geese flight lines. Tangy wind farm, Kintyre 2003/04 winter



Operation 2003/04

KEY: ⊕ = flight line observation points

- - - - denotes assumed route- auditory cues alone

GWF= Greenland White-fronted Goose

GJ= Greylag Geese not depicted

Appendix A

Red-throated Diver sightings at Tangy Loch, Kintyre from the geese survey sheets.

12.03.02 pair
03.04.02 single
08.04.02 single
25.03.03 single
17.03.04 pair
06.04.04 pair

From the sample of geese surveys earlier in March, they don't appear until after c. 12th March.

Lawrence Environmental Consultants 09.11.04