



## **Appendix 8F**

### **CRM Report October 17-September 18**





Lewis Wind Power

wood.

Stornoway Wind Farm Ltd

## Stornoway Wind Farm

Appendix 8F. Collision Risk Modelling Report

October 2017-September 2018



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# Executive summary

## Purpose of this report

Stornoway Wind Farm Limited (the Applicant) is proposing to construct and operate a wind farm currently anticipated to comprise up to 35 turbines with a generating capacity in excess of 50MW on the site of the existing consented (but not yet built) Stornoway Wind Farm. The Consented Stornoway Wind Farm gained section 36 consent and planning permission in September 2012 (Stornoway Wind Farm 2012) and in 2015 an application was made to amend this consent with regard to the layout, output and size of the wind turbines, this being granted in spring 2016 (Stornoway Wind Farm Variation 2016). The site of the consented Stornoway Wind Farm 2017 is located to the south west of the town of Stornoway on the Isle of Lewis and centred on National Grid Reference (NGR) E137149, N933373.

The current application (Proposed Development) would comprise a revised layout, with turbine tip heights of approximately 156 m and 180 m and turbine rotor diameters of 136 m and 150 m respectively. Changes to the consented wind farm layout and / or turbine specifications will have implications on the existing assessed ornithological impacts of the wind farm. Furthermore, the status of the baseline bird populations and flight activity patterns will have potentially changed since the original application. Therefore a comprehensive suite of survey work was initiated in October 2017 and is continuing through to September 2019.

This report has been produced for the purpose of presenting the methods used and results produced from Collision Risk Modelling of flight data collected from October 2017 to September 2018 in support of the Ecological Impact Assessment (EIA) for the Proposed Development.





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# 1. Introduction

- 1.1.1 This Appendix documents the methodology and results of collision risk modelling based on data collected from Vantage Point (VP) surveys undertaken from October 2017 to September 2018 for a thirty five turbine wind farm site at the proposed Stornoway wind farm (the Proposed Development).
- 1.1.2 Data obtained during VP surveys was used to determine the theoretical collision risk for a range of species by incorporation into a collision risk model (CRM) (Band et al. 2007) and herein referred to as 'the Band model'.
- 1.1.3 **Annex A** presents figures of flight activity of non-sensitive species included in the CRM, whilst figures for sensitive species are contained within the **Confidential Technical Appendix 8D**. **Annex B** contains the flight data used in the CRM, whilst **Annex C** presents CRM calculations.



## 2. CRM Methodology

### 2.1 Introduction

- 2.1.1 The risk of birds colliding with the turbine rotors has been assessed using a model developed by Band, which estimates the number of bird collisions with the turbine rotors during a specified time period (Band et al. 2007; SNH 2000). The model requires input data based on species biometrics and flight characteristics, turbine specification and data on flights observed at the site. The amount of time that a species may be active within the survey area in any given season is also required for the model and must therefore be estimated.
- 2.1.2 The 'Band model' uses a two-stage approach, whereby the number of birds or flights passing through the air space swept by the rotors is determined at Stage 1 and the probability of a bird strike occurring is calculated at Stage 2. The product of Stage 1 and Stage 2 gives a theoretical annual collision mortality rate on the assumption that birds make no attempt to avoid collision.
- 2.1.3 However, it is widely accepted that many species are able to avoid turbine blades in a number of ways. Birds may exercise avoidance by detecting the wind farm or turbine and modifying their flight lines to avoid the structures or at close proximity, birds may see an oncoming blade and emergency avoidance action can be taken (SNH, 2000). As such, species specific avoidance rates were applied to the model to estimate the collision risk (SNH, 2017a).
- 2.1.4 The results of the model provides an estimate of the number of collisions that can be expected over a specific season, year, or for the lifetime of the wind farm.

### 2.2 Choice of Random or Regular Model

- 2.2.1 The Stage 1 calculation varies depending on whether flight activity follows a regular predictable pattern, or is random. The second stage is identical for both methods.
- 2.2.2 The modelling method for birds with predictable (regular) flight activity, such as geese following a regular migration route or travelling from a winter roost to a regular feeding area, or divers travelling from breeding lochans to feed at sea or on larger water bodies requires the calculation of the number of birds flying through the turbine rotor swept area each year.
- 2.2.3 The modelling method with irregular (or random) flight activity, such as raptors and waders, or divers at breeding lochans, requires the calculation of the amount of time birds were observed flying per unit of area surveyed. This level of flight activity is then applied to the Proposed Development in subsequent calculations of the collision risk.

### 2.3 Model Parameters

#### Turbines

- 2.3.1 The turbine models proposed for the Proposed Development are the Vestas V150 and the Vestas V136 (**Table 8F.2.1**). The Vestas V136 will have a hub height of 88 m and rotor diameter of 68 m, with the potential collision risk height (PCH) of 20 – 156 m. The Vestas V150 will have a hub height of 105 m and rotor diameter of 75 m, with the potential collision risk height (PCH) being 30 – 180 m.



- 2.3.2 As a precautionary approach, the assumed PCH used in models will cover the lowest and highest tip heights from the two turbine models used, thus the PCH used was 20 – 180 m.
- 2.3.3 For the purposes of CRM, it has been assumed that turbines will be non-operational for 15 % of the time as per the original CRM (e.g. during periods when wind speed is too low or too high to operate, or during maintenance).

Table 8F.2.1 Turbine Technical Parameters

Parameter	Specification 156m Tip Height	Specification 180m Tip Height	Unit
<b>Number of turbines</b>	10	25	
<b>Number of blades</b>	3	3	
<b>Approximate hub height</b>	88	105	m
<b>Approximate rotor diameter</b>	68	75	m
<b>Maximum height to blade tip</b>	156	180	m
<b>Minimum height to blade tip</b>	20	30	
<b>PCH</b>	20-156	30-180	m
<b>Pitch</b>	12	12	Degrees
<b>Chord</b>	4.2	4.2	m
<b>Rotation period</b>	4.7	4.7	rpm

### Survey Effort, Available Hours Per Season and Observation Time

- 2.3.4 VP surveys commenced in October 2017 and continued through until the end of September 2018 at eight VP locations. A summary of survey effort is shown in **Table 8F.2.2**.

Table 8F.2.2 VP survey Effort

VP	Oct 17	Nov 17	Dec 17	Jan 18	Feb 18	Mar 18	Apr 18	May 18	Jun 18	Jul 18	Aug 18	Sep 18
<b>1</b>	9	9	-	15	12	9	9	9	9	9	9	9
<b>2</b>	9	9	3	12	12	9	9	9	9	9	9	9
<b>3</b>	9	9	-	15	12	9	9	9	9	6	12	9
<b>4</b>	9	9	6	12	9	9	9	9	6	12	9	9
<b>5</b>	12	6	6	12	9	9	9	9	6	12	9	9
<b>6</b>	9	9	6	9	12	9	9	9	9	9	9	9
<b>7</b>	9	9	9	9	9	9	9	9	9	9	9	9



VP	Oct 17	Nov 17	Dec 17	Jan 18	Feb 18	Mar 18	Apr 18	May 18	Jun 18	Jul 18	Aug 18	Sep 18
<b>8</b>	9	9	6	12	9	9	9	9	9	9	9	9

- 2.3.5 Available active hours was defined as the number of hours that a bird species may be potentially active in any given season (SNH, 2017b) (**Table 8F.2.3**). Available hours for flight activity were calculated to include daylight, one hour before sunrise and one hour after sunset (dusk) and 25% of the night for waders, geese and swans. Available hours for flight activity were calculated to include daylight, one hour before sunrise and one hour after sunset (dusk) for all other species.
- 2.3.6 Observation effort relates to the total number of survey hours undertaken at VP locations within the seasons in question.

Table 8F.2.3 Available Hours and Observation Effort

Species Group	Season	Available Hours	Total Observation Effort (Hours)
<b>Merlin</b>	Non-breeding (August 2017 – March 2018)	3,415.85	432 (54 hours at each VP)
	Breeding (April 2018 – July 2018)	2,280.73	285 (36 hours at 7 VP's; 33 hours at 1 VP)
<b>Golden eagle / White-tailed eagle</b>	Non-breeding (September 2017 – January 2018)	1,671.41	276 (36 hours at 4 VP's; 33 hours at 4 VP's)
	Breeding (February 2018 – August 2018)	3,565.18	516 (66 hours at 4 VP's; 63 hours at 4 VP's)
<b>Peregrine</b>	Non-breeding (September 2017– February 2018)	1,990.15	360 (45 hours at each VP)
	Breeding (March 2018 – August 2018)	3,246.44	432 (54 hours at each VP)
<b>Geese and swans</b>	Non-breeding (September 2017– March 2018)	3,086.73	432 (54 hours at each VP)
	Breeding (April – August 2018)	3,030.69	360 (45 hours at each VP)
<b>Waders</b>	Non-breeding (September 2017– February 2018)	2,578.60	360 (45 hours at 7 VP's; 42 hours at 1 VP))
	Breeding (March 2018 – July 2018)	2,950.66	357 (45 hours at 7 VP's; 42 Hours at 1 VP)
<b>All other species</b>	Non-breeding (September 2017 – March 2018)	2,419.66	432 (54 hours at each VP)
	Breeding (April 2018 – August 2018)	2,816.94	360 (45 hours at each VP)



## 2.4 Random Model

### Definition of Terms

- 2.4.1 The **collision risk zone (CRZ)** is defined as the wind farm polygon (WFP). This was taken as the perimeter of the Proposed Development Site Boundary plus a 500 m buffer, as per previous CRM iterations used in the 2012 Addendum relating to the 2012 consent and the FEI relating to the amended scheme consented in 2016. SNH guidance currently recommends a 500 m buffer to allow for observer inaccuracies when mapping flights during surveys (SNH, 2017b).
- 2.4.2 The **Vantage Point View-Shed** is the survey area associated with each VP, calculated as a 180 degree arc of a 2km-radius applied around each VP location.
- 2.4.3 The **Flight risk area (FRA)** is defined as the **area of visibility** of each viewshed at minimum collision-risk height, in this instance at 20 m, that falls within the CRZ, and was calculated using GIS (**Annex A, Figure 8F.2.1**).
- 2.4.4 **FRAw** is an adjustment calculation that accounts for the difference between the height bands used for recording collision risk height flights and the length of the turbine blades. The flight activity surveys were carried out prior to turbine model selection, and used four height bands that are not identical to the PCH of the final turbine dimensions. Height bands B and C covers a greater area (180 m) than the rotor swept volume area (150 m), and therefore the overall bird activity is weighted to reflect that the swept area is smaller than the recording area, decreasing the overall bird activity.
- 2.4.5 The **collision risk volume** is defined as the volume of the airspace between the minimum and maximum risk height band (13.9 m – 149.9 m) and is used in random models (SNH 2000).
- 2.4.6 The **rotor-swept volume** is defined as the volume of air that would be swept by all of the rotors in the wind farm. For an individual rotor this is determined by the area swept ( $\pi r^2$ ) multiplied by the thickness of the rotor blades plus the length of the focal species (SNH 2000).

### Selection of Flights

- 2.4.7 The approach taken on the selection of flights for inclusion in CRM was the same as that used in the 2012 Addendum relating to the 2012 consent and the FEI relating to the amended scheme consented in 2016. All flights that were observed at PCH (height bands B and C) falling within the CRZ were included. Those flights that extended beyond the CRZ were clipped to the CRZ boundary (i.e. only the time spent within the CRZ was included in the collision risk model). Where flights at PCH originated or ended outside of the CRZ, the amount of time for the clipped flight at PCH within CRZ was calculated as a proportion of the clipped flight length to the total flight length at PCH. Where a flight represented the activity of more than one bird, total flight time was calculated based on number of birds multiplied by the time at PCH within the CRZ.
- 2.4.8 Flights were apportioned to the breeding or non-breeding season identified in **Table 8F.2.3. Table 8F.2.4** shows the total flight times for all species where flight data indicated that the random CRM approach should be used.
- 2.4.9 Those highlighted in bold were included in CRM, whilst those not in bold were considered to have insufficient flight activity levels to make the CRM results meaningful, or were scoped out from assessment purposes in **Appendix 8C Table 1**, and so were excluded from CRM.
- 2.4.10 The clipped flights at PCH within the CRZ included in the modelling are shown in **Annex A, figure 8F.2.2a-e**. Figures for sensitive species are shown in **Appendix D**. **Annex B** provides details of all flights included in the random CRM.



Table 8D.2.4 Random Model: Species Flight Time in Seconds

	<b>Season</b>	<b>Total Number Flights</b>	<b>Total Seconds Below PCH</b>	<b>Total Seconds at PCH</b>	<b>Total Seconds Above PCH</b>
Arctic skua	Breeding	1	0	45	0
Black-tailed godwit	Breeding	1	0	200	0
<b>Black-throated diver</b>	<b>Breeding</b>	<b>23</b>	<b>586</b>	<b>1,394</b>	<b>0</b>
Dunlin	Breeding	3	75	26	0
<b>Golden eagle</b>	<b>Non-breeding</b>	<b>12</b>	<b>90</b>	<b>959</b>	<b>0</b>
	<b>Breeding</b>	<b>33</b>	<b>732</b>	<b>2,456</b>	<b>789</b>
Golden plover	Non-breeding	5	1,009	0	0
	<b>Breeding</b>	<b>11</b>	<b>272</b>	<b>382</b>	<b>0</b>
<b>Great skua</b>	<b>Breeding</b>	<b>272</b>	<b>10,911</b>	<b>14,926</b>	<b>3,282</b>
<b>Greenshank</b>	<b>Breeding</b>	<b>9</b>	<b>30</b>	<b>509</b>	<b>0</b>
<b>Greylag goose</b>	<b>Breeding</b>	<b>50</b>	<b>5,200</b>	<b>1,830</b>	<b>0</b>
<b>Hen harrier</b>	<b>Non-breeding</b>	<b>35</b>	<b>2,468</b>	<b>915</b>	<b>0</b>
	<b>Breeding</b>	<b>108</b>	<b>9,682</b>	<b>3,628</b>	<b>120</b>
<b>Merlin</b>	Non-breeding	2	52	30	0
	<b>Breeding</b>	<b>14</b>	<b>398</b>	<b>282</b>	<b>0</b>
<b>Red-throated diver</b>	<b>Breeding</b>	<b>119</b>	<b>1,605</b>	<b>12,033</b>	<b>15</b>
Short-eared owl	Non-breeding	1	195	0	0
	Breeding	5	675	15	0
Teal	Breeding	2	30	45	0
<b>White-tailed eagle</b>	<b>Non-breeding</b>	<b>12</b>	<b>148</b>	<b>1,029</b>	<b>0</b>
	<b>Breeding</b>	<b>19</b>	<b>342</b>	<b>1,675</b>	<b>1,740</b>
<b>Whooper swan</b>	<b>Non-breeding</b>	<b>9</b>	<b>0</b>	<b>3,687</b>	<b>0</b>
	Breeding	1	30	0	0

2.4.11 The following species were taken forward for random CRM:

- Breeding season: black-throated diver; golden eagle; great skua; greenshank; greylag goose; hen harrier; merlin; red-throated diver; white-tailed eagle, and
- Non-breeding season: golden eagle; greylag goose; hen harrier; white-tailed eagle and whooper swan.



## Bird Parameters

2.4.12 Morphometric measurements for bird species were taken from the BTO (<https://www.bto.org/about-birds/birdfacts>) with flight speeds from Alerstam et al. (2007) or alternatively from Bruderer and Boldt (2001) (**Table 8F.2.5**). Avoidance rates were taken from current guidance (SNH, 2017a).

Table 8F.2.5 Bird Biometric Parameters

Species	Avoidance Rate %	Length (m)	Wing Span (m)	Flight Speed (m/s)	Flight Style
<b>Black-throated diver</b>	99.5	0.66	1.20	19.3	Flapping
<b>Golden eagle</b>	99	0.82	2.03	11.9	Gliding
<b>Golden plover</b>	98	0.28	0.72	13.7	Flapping
<b>Great skua</b>	99.5	0.56	1.36	14.9	Flapping
<b>Greenshank</b>	98	0.32	0.69	12.3	Flapping
<b>Greylag goose</b>	99.8	0.82	1.64	17	Flapping
<b>Hen harrier</b>	99	0.48	1.1	9.1	Flapping
<b>Merlin</b>	98	0.28	0.56	13.4	Flapping
<b>Red-throated diver</b>	99.5	0.69	1.16	17.89	Flapping
<b>White-tailed eagle</b>	95	0.80	2.30	10.20	Gliding
<b>Whooper swan</b>	99.5	1.52	2.30	17.3	Flapping

## 2.5 Regular Model

### Definition of Terms

- 2.5.1 The **risk window** was defined as a window of width equal to the width of the windfarm (including blade length) perpendicular to the general flight direction of the bird species being modelled plus a 500m buffer either side to allow for inaccuracies in mapping flights (SNH, 2017b), and of a height equal to the maximum height of the highest turbine.
- 2.5.2 The **area occupied by the rotors** was determined by multiplying the number of turbines by  $\pi r^2$ . Where rotors overlapped when viewed in cross-section, the full cross sectional area of all rotors was included as the risk to birds is doubled if passing through two successive rotors.
- 2.5.3 The **proportion of the risk window occupied by rotors** was expressed as a proportion of the area occupied by rotors / risk window.

### Selection of Flights

- 2.5.4 The modelling method for birds with predictable flight activity, such as geese following a regular migration route or travelling from a winter roost to a regular feeding area, or divers travelling from



breeding lochans to feed at sea or on larger water bodies requires the calculation of the number of birds flying through the turbine rotor swept area each year.

2.5.5 The first step was to identify the risk window relevant for each species. This is defined as 'a window of width equal to the width of the wind farm perpendicular to the general flight direction of the birds' (SNH, 2000), and will be different for each species modelled, depending on their predominant direction of flight. The length of the risk windows also allows for a 50 m micro-siting allowance plus an additional 75 m either side to allow for the radius of the rotor blade. **Table 8F.2.6** presents the risk windows selected for each species included in regular CRM, and the number of turbines within that risk window whilst the relevant risk windows are illustrated in **Figures 8F.2.3a –b, Annex A**.

2.5.6 Calculations of available active time were based on the appropriate season (**Table 8F.2.4**), and survey effort included all VP locations within the appropriate season. As a precautionary measure, the total number of birds recorded at PCH within a 500m buffer of the wind farm polygon for each species was included for analysis, regardless of whether it actually crossed the risk window or not.

2.5.7 Full details of all flights included in the random CRM models are shown in **Annex B** and details of CRM calculations are presented in **Annex C**.

**Table 8F.2.6 Number of Birds Observed Passing Through Risk Window**

Season	Risk window (m)	Number of turbines	Total number flights	Total number birds	Total number birds at PCH
<b>Common tern</b>	Breeding	3502	12	60	145
<b>Greylag goose</b>	Non-breeding	2011	8	38	322

2.5.8 The following species were taken forward CRM for regular flights:

- Breeding season: common tern;
- Non-breeding season: greylag goose.

### Bird Parameters

2.5.9 Morphometric measurements for bird species were taken from the BTO (<https://www.bto.org/about-birds/birdfacts>) with flight speeds from Alerstam et al. (2007) or alternatively from Bruderer and Boldt (2001). Avoidance rates were taken from current guidance (SNH, 2017a). (**Table 8F.2.7**)

**Table 8F.2.7 Bird Biometric Parameters**

Species	Avoidance Rate %	Length (m)	Wing Span (m)	Flight Speed (m/s)	Flight Style
<b>Common tern</b>	98	0.34	0.8	10.9	Flapping
<b>Greylag goose</b>	99.8	0.82	1.64	17	Flapping





### 3. Results

3.1.1 A summary of the CRM results are shown in **Table 8F.3.1** below, whilst details of model calculations are presented in **Annex C**.

Table 8F.3.1 Collision Rates

Species	Avoidance Rate %	Season	Potential Collisions	No Avoidance	Avoidance
<b>Black-throated diver</b>	99.5	Breeding (April 2018 – August 2018)	Per year 1 bird every X years Over 25 years	8.37 0.12 209.3	0.042 23.9 1.05
<b>Common tern</b>	98	Breeding (April 2018 – August 2018)	Per year 1 bird every X years Over 25 years	8.7 0.11 217.6	0.174 5.74 4.35
<b>Golden eagle</b>	99	Non-breeding (Sep 2017 – January 2018)	Per year 1 bird every X years Over 25 years	4.63 0.22 115.7	0.046 21.6 1.16
<b>Golden eagle</b>	99	Breeding (February 2018 – August 2018)	Per year 1 bird every X years Over 25 years	11.42 0.09 285.5	0.114 8.8 2.85
<b>Golden plover</b>	98	Breeding (March 2018 – July 2018)	Per year 1 bird every X years Over 25 years	1.49 0.67 37.3	0.03 33.5 0.75
<b>Great skua</b>	99.5	Breeding (April 2018 – August 2018)	Per year 1 bird every X years Over 25 years	73.66 0.01 1841.5	0.368 2.7 9.21
<b>Greenshank</b>	98	Breeding (March 2018 – July 2018)	Per year 1 bird every X years Over 25 years	1.94 0.52 48.4	0.039 25.8 0.97
<b>Greylag goose</b>	99.8	Non-breeding (September 2018 – March 2018)	Per year 1 bird every X years Over 25 years	30.60 0.033 764.99	0.061 16.34 1.53
<b>Greylag goose</b>	99.8	Breeding (April 2018 – August 2018)	Per year 1 bird every X years Over 25 years	12.38 0.08 309.4	0.025 40.4 0.62
<b>Hen harrier</b>	99	Non-breeding (September 2017 – March 2018)	Per year 1 bird every X years Over 25 years	2.48 0.40 62.1	0.025 40.3 0.62
<b>Hen harrier</b>	99	Breeding (April 2018 – August 2018)	Per year 1 bird every X years Over 25 years	13.75 0.07 343.8	0.138 7.3 3.44
<b>Merlin</b>	98	Breeding (April 2018 – July 2018)	Per year 1 bird every X years Over 25 years	1.38 0.73 34.4	0.028 36.3 0.69



<b>Species</b>	<b>Avoidance Rate %</b>	<b>Season</b>	<b>Potential Collisions</b>	<b>No Avoidance</b>	<b>Avoidance</b>
<b>Red-throated diver</b>	99.5	Breeding (April 2018 – August 2018)	Per year 1 bird every X years Over 25 years	69.94 0.01 1748.5	0.350 2.9 8.74
<b>White-tailed eagle</b>	95	Non-breeding (Sep 2017 – January 2018)	Per year 1 bird every X years Over 25 years	4.72 0.21 118	0.236 4.2 5.9
<b>White-tailed eagle</b>	95	Breeding (February 2018 – August 2018)	Per year 1 bird every X years Over 25 years	7.4 0.14 184.9	0.370 2.7 9.24
<b>Whooper swan</b>	99.5	Non-breeding (Sep 2017 – March 2018)	Per year 1 bird every X years Over 25 years	29.24 0.03 731.1	0.146 6.8 3.66

## 4. References

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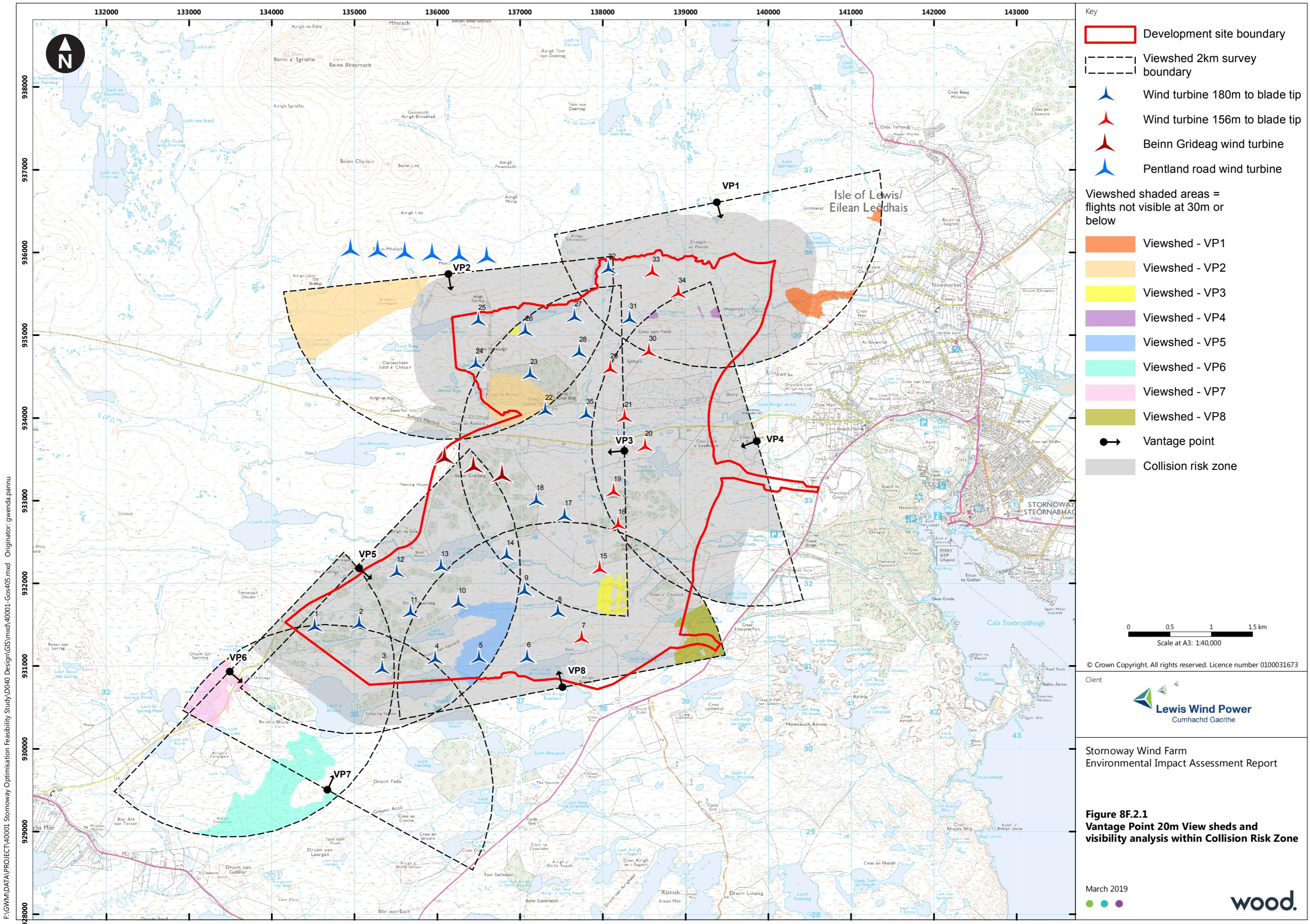


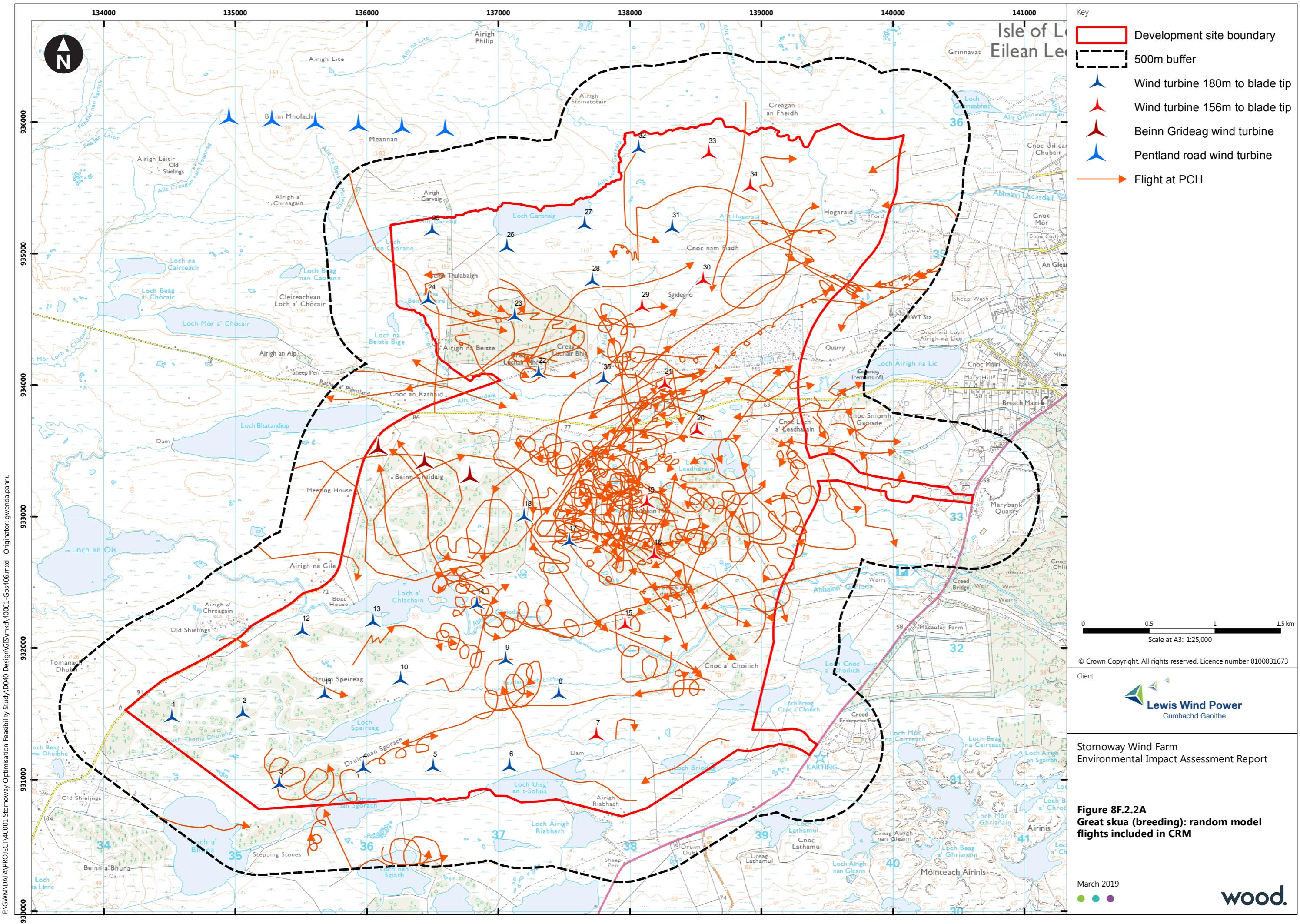


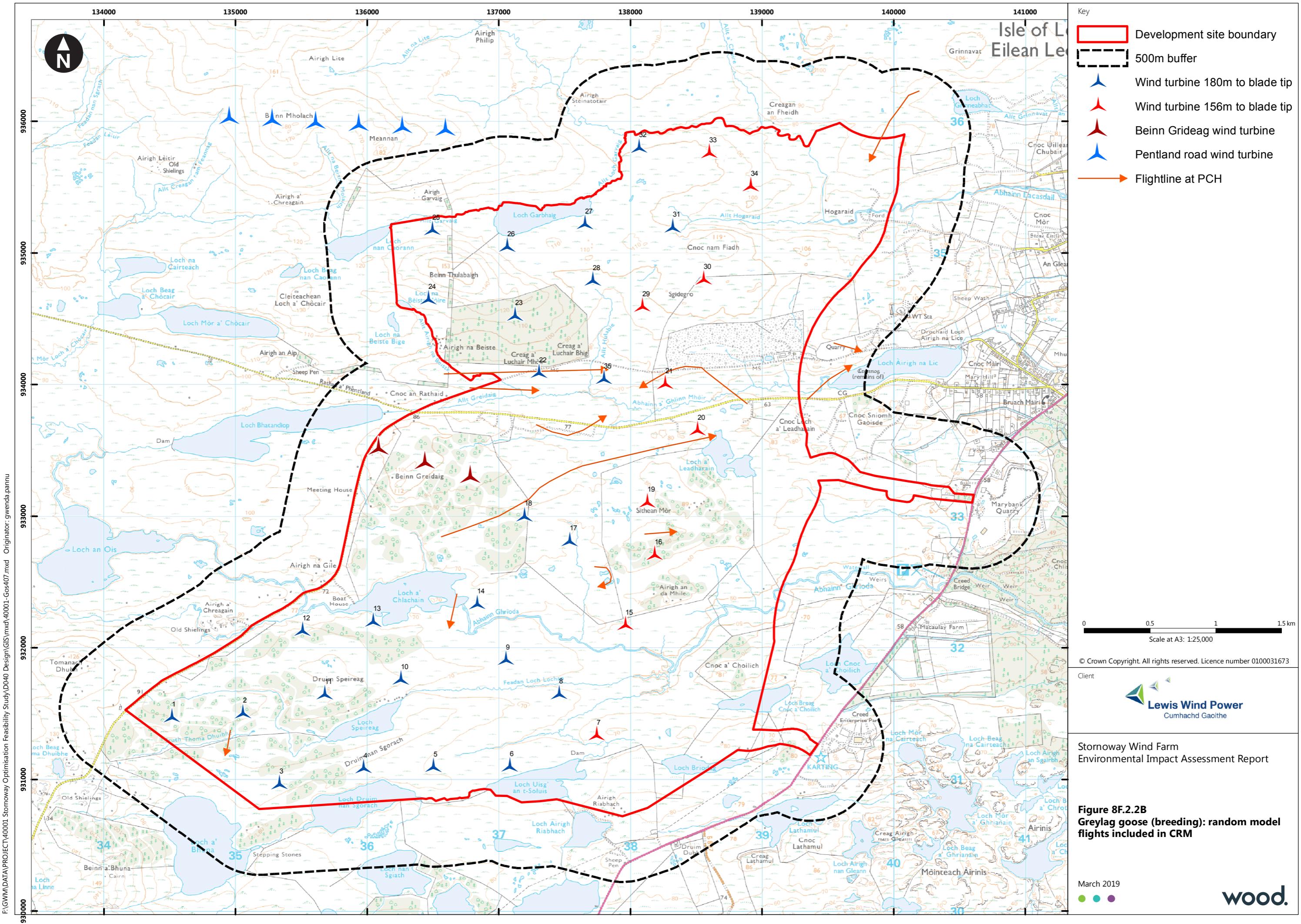
## Annex A

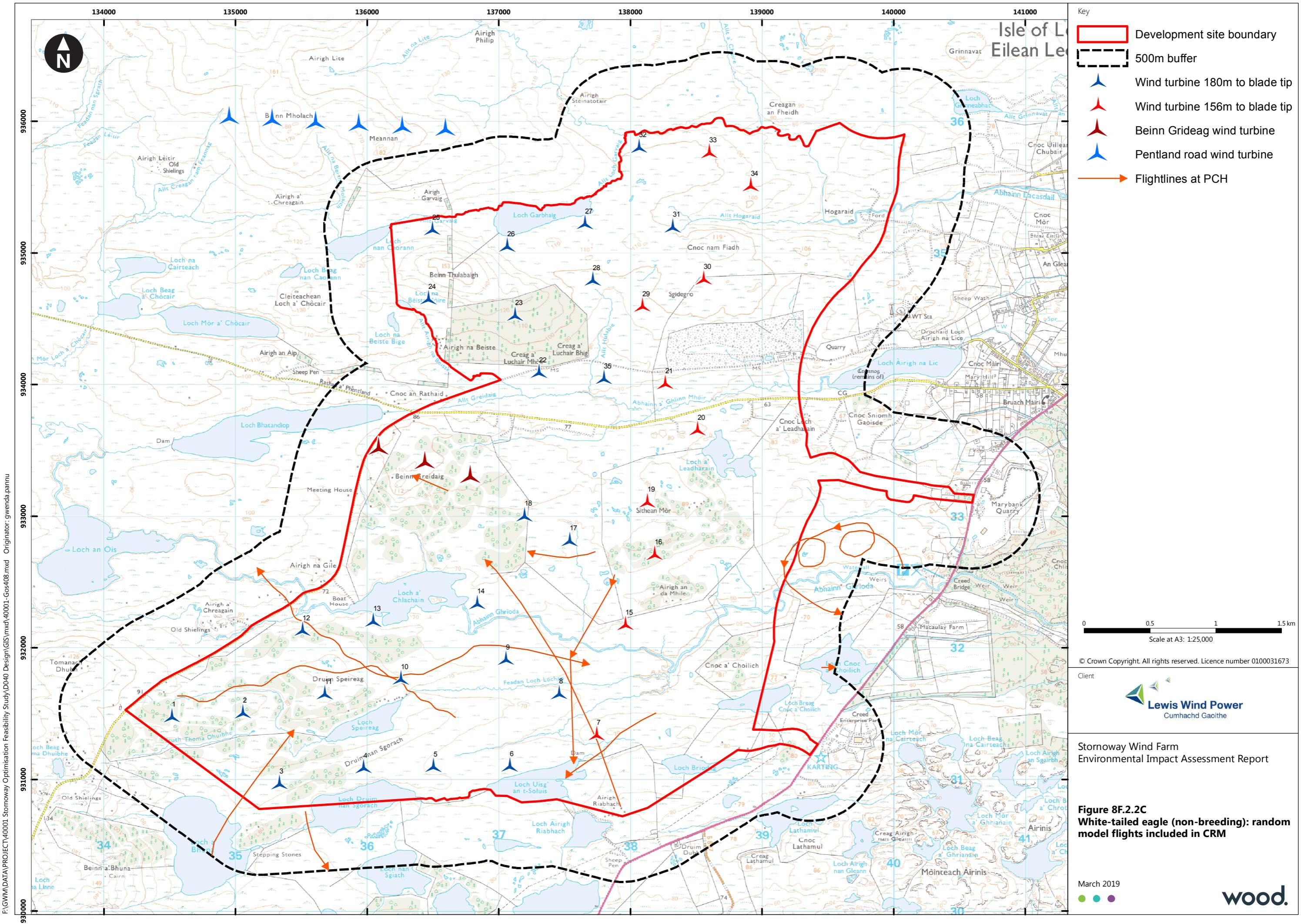
## Figures

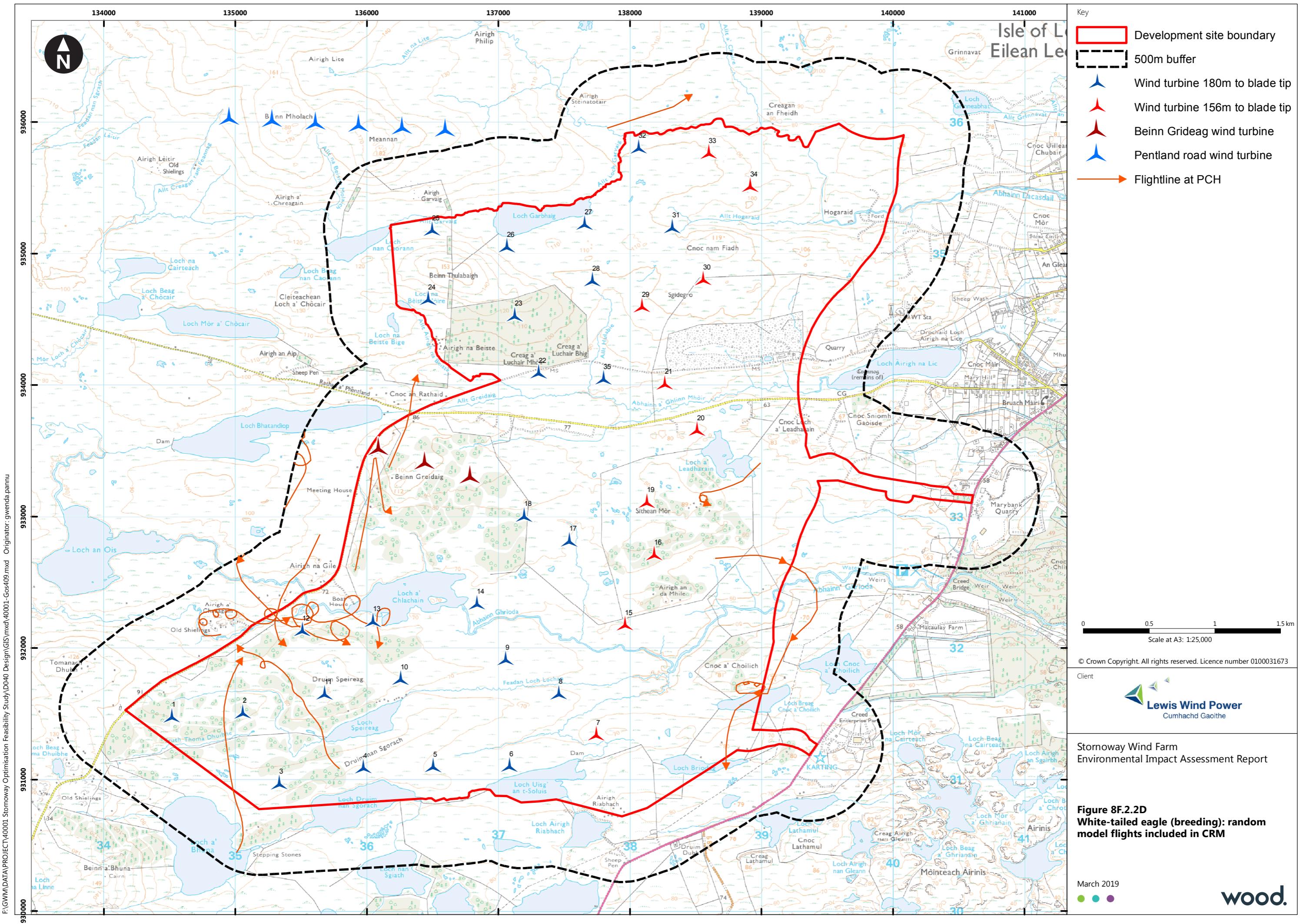


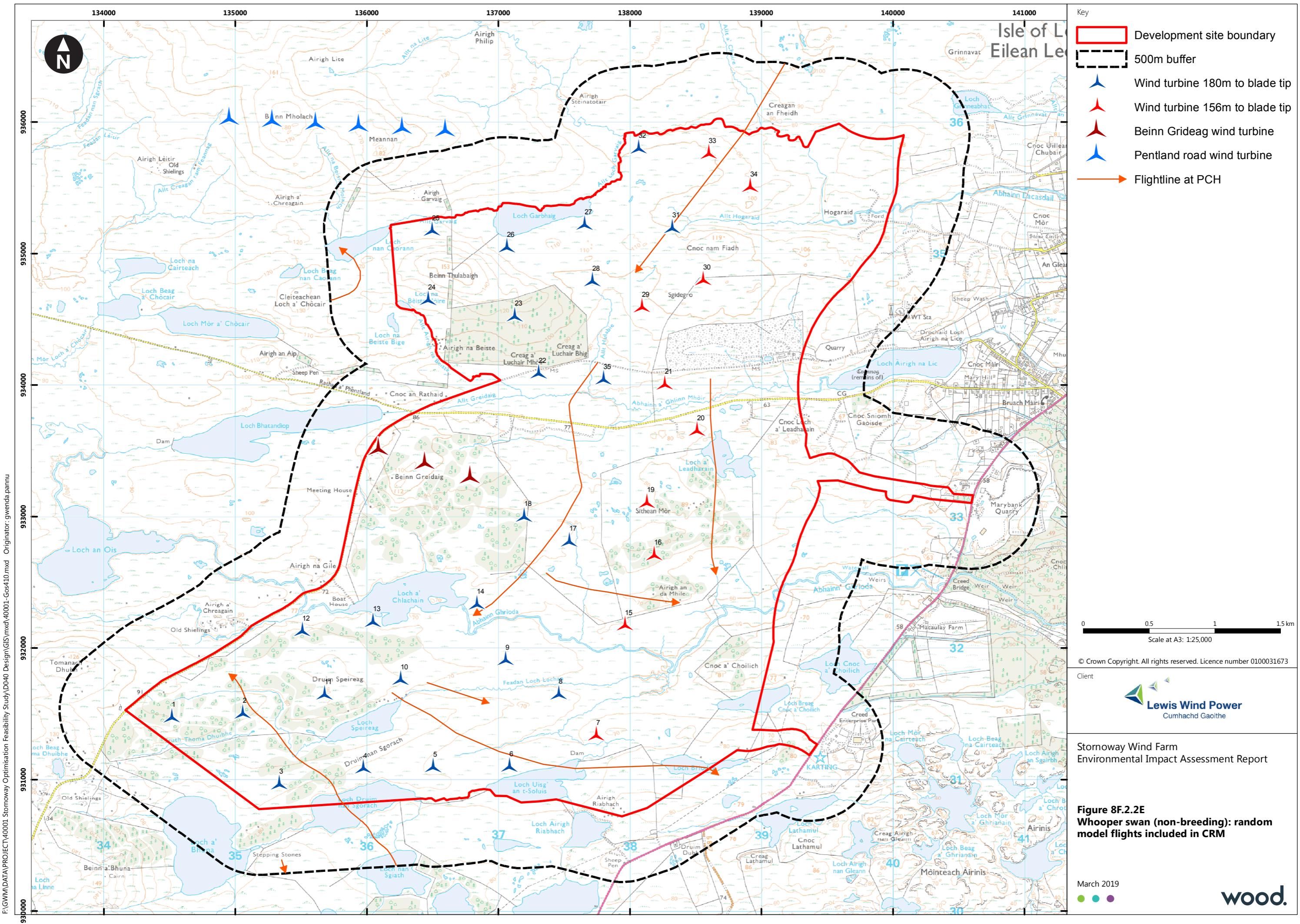


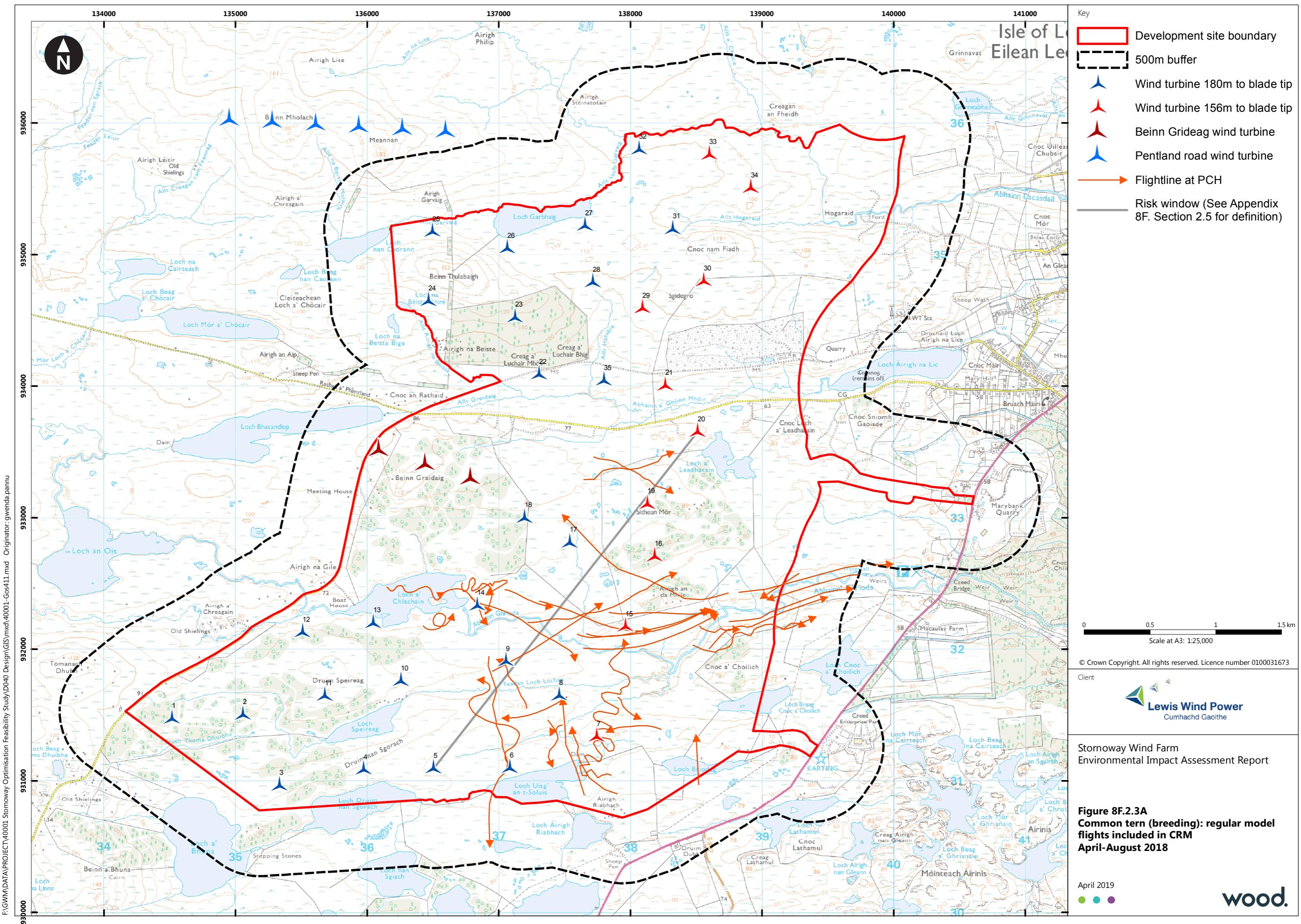


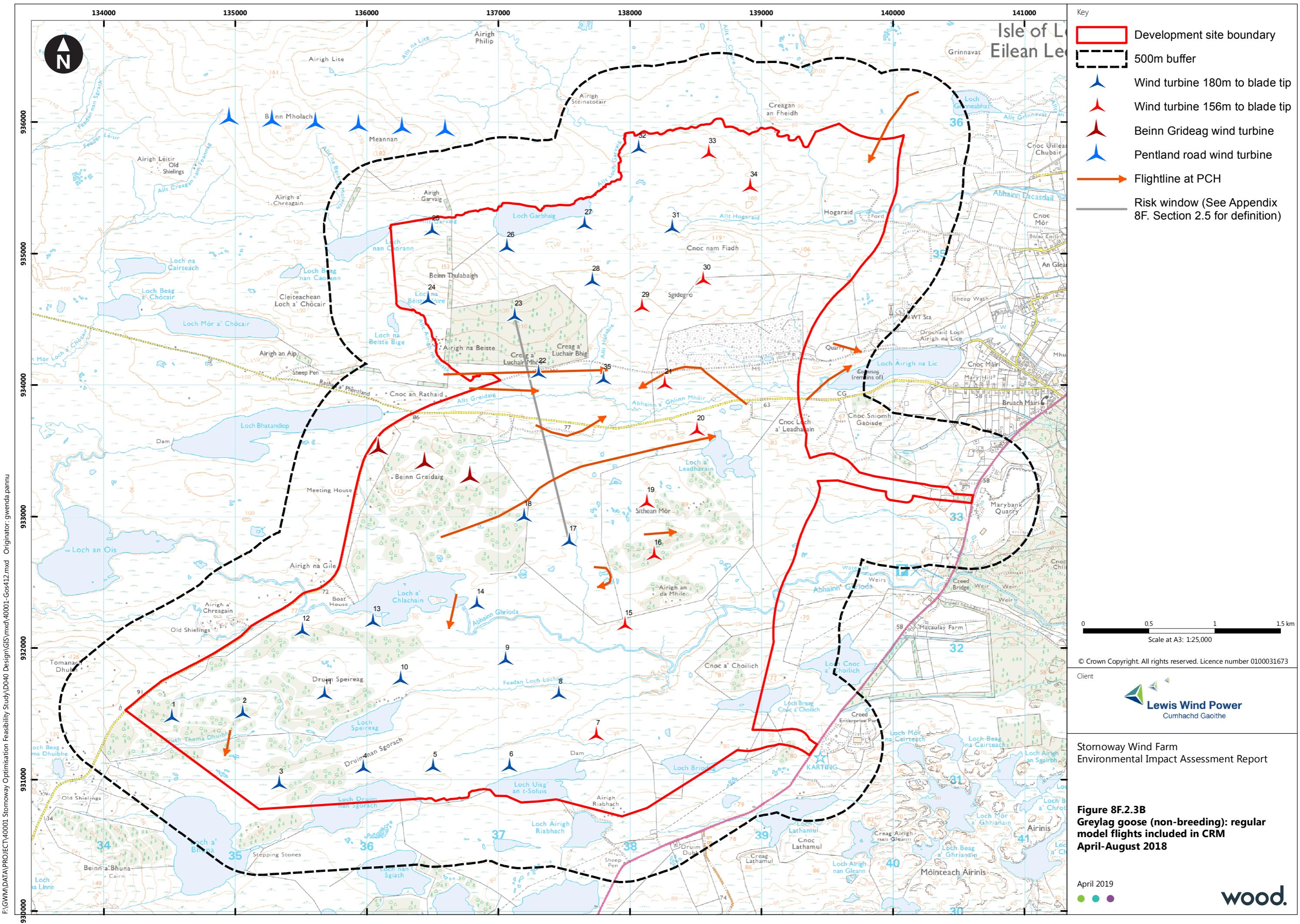












## Annex B

# Flight Data used for CRM



**Table B.1** Black-throated Diver Breeding (April – August 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in Height Band	Original Length (m)	Clipped Length (m)	Clip %	Length	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0057_a</b>	8	BV	26/04/2018	15:09	60	1471.11	1471.11	100.0	1	B	60	
<b>BS_SW_0076_a</b>	7	BV	28/04/2018	07:04	60	1822.08	919.40	50.5	2	B	61	
<b>BS_SW_0187</b>	3	BV	24/05/2018	05:37	60	2856.63	2856.63	100.0	1	B	60	
<b>BS_SW_0214</b>	1	BV	24/05/2018	20:37	45	2326.56	1339.14	57.6	1	C	26	
<b>BS_SW_0275_a</b>	5	BV	21/06/2018	12:40	90	2939.11	2939.11	100.0	1	B	90	
<b>BS_SW_0296_a</b>	8	BV	23/06/2018	21:38	30	888.68	888.68	100.0	1	B	30	
<b>BS_SW_0298_a</b>	8	BV	27/06/2018	05:20	15	492.84	492.84	100.0	1	B	15	
<b>BS_SW_0390_a</b>	3	BV	27/06/2018	18:02	15	322.18	322.18	100.0	1	B	15	
<b>BS_SW_0390_b</b>	3	BV	27/06/2018	18:02	90	3079.18	3079.18	100.0	1	C	90	
<b>BS_SW_0390_c</b>	3	BV	27/06/2018	18:02	45	1461.42	1461.42	100.0	1	B	45	
<b>BS_SW_0469</b>	8	BV	16/07/2018	10:05	15	363.32	363.32	100.0	1	B	15	
<b>BS_SW_0671_a</b>	6	BV	07/08/2018	16:27	45	723.52	168.20	23.2	1	B	10	
<b>BS_SW_0681</b>	8	BV	08/08/2018	13:36	60	1202.77	1122.65	93.3	2	B	112	
<b>BS_SW_0802_a</b>	8	BV	15/08/2018	11:25	45	723.91	723.91	100.0	2	B	90	
<b>BS_SW_0806_b</b>	8	BV	15/08/2018	12:02	45	1051.23	1051.23	100.0	4	B	180	
<b>BS_SW_0806_c</b>	8	BV	15/08/2018	12:02	90	2174.17	2174.17	100.0	4	C	360	

Flight_Ref	VP	Species	Date	Time	Seconds in Height Band	Original Length (m)	Clipped Length (m)	Clip %	Length	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0808_a	8	BV	15/08/2018	12:13	45	836.68	836.68	100.0		2	B	90
BS_SW_0849	5	BV	24/08/2018	18:05	45	1122.45	1122.45	100.0		1	B	45

**Table B.2 Common Tern Breeding (April – August 2018)**

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip %	Length	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0173_b	8	CN	10/06/2018	12:39	105	987.11	987.11	100.0		21	B	2205
BS_SW_0281_a	8	CN	23/06/2018	18:48	15	254.04	254.04	100.0		1	B	15
BS_SW_0282_a	8	CN	23/06/2018	18:49	30	432.77	432.77	100.0		1	B	30
BS_SW_0282_c	8	CN	23/06/2018	18:49	150	1100.70	1100.70	100.0		1	B	150
BS_SW_0290_a	8	CN	23/06/2018	21:18	45	532.52	532.52	100.0		1	B	45
BS_SW_0291	8	CN	23/06/2018	21:19	75	1222.25	1222.25	100.0		1	B	75
BS_SW_0294	8	CN	23/06/2018	21:33	60	1082.09	1082.09	100.0		1	B	60
BS_SW_0300_a	8	CN	27/06/2018	05:45	15	133.76	133.76	100.0		1	B	15
BS_SW_0320	3	CN	30/06/2018	08:31	30	681.20	681.20	100.0		1	C	30
BS_SW_0433	5	CN	09/07/2018	14:33	30	709.76	709.76	100.0		1	B	30
BS_SW_0435_b	5	CN	09/07/2018	14:56	30	586.46	586.46	100.0		1	B	30

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0435_c</b>	5	CN	09/07/2018	14:56	15	486.11	486.11	100.0	1	C	15
<b>BS_SW_0443_b</b>	5	CN	09/07/2018	18:30	30	958.50	958.50	100.0	1	B	30
<b>BS_SW_0461_b</b>	8	CN	16/07/2018	09:15	45	885.35	885.35	100.0	1	B	45
<b>BS_SW_0464_b</b>	8	CN	16/07/2018	09:30	105	1037.95	1037.95	100.0	3	B	315
<b>BS_SW_0465</b>	8	CN	16/07/2018	09:39	90	829.14	829.14	100.0	1	B	90
<b>BS_SW_0473_b</b>	8	CN	16/07/2018	10:42	90	989.60	989.60	100.0	3	B	270
<b>BS_SW_0478_a</b>	8	CN	16/07/2018	11:20	15	458.87	458.87	100.0	1	B	15
<b>BS_SW_0479_a</b>	8	CN	16/07/2018	11:23	15	605.35	605.35	100.0	1	B	15
<b>BS_SW_0480_b</b>	8	CN	16/07/2018	11:54	30	393.85	393.85	100.0	1	B	30
<b>BS_SW_0560_a</b>	8	CN	25/07/2018	13:30	30	385.48	385.48	100.0	1	B	30
<b>BS_SW_0563</b>	8	CN	25/07/2018	14:04	45	1490.03	1490.03	100.0	1	B	45
<b>BS_SW_0568_b</b>	8	CN	25/07/2018	14:44	15	413.30	413.30	100.0	1	B	15
<b>BS_SW_0570_a</b>	8	CN	25/07/2018	15:03	30	673.56	673.56	100.0	1	B	30
<b>BS_SW_0571</b>	8	CN	25/07/2018	15:15	60	1524.07	1524.07	100.0	2	B	120
<b>BS_SW_0573_a</b>	8	CN	25/07/2018	15:48	45	767.55	767.55	100.0	1	B	45
<b>BS_SW_0574</b>	8	CN	25/07/2018	16:14	60	2734.18	2734.18	100.0	1	B	60

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0585	3	CN	25/07/2018	19:36	45	755.84	755.84	100.0	4	B	180
BS_SW_0552_a	4	CN	26/07/2018	09:24	15	298.11	298.11	100.0	1	B	15
BS_SW_0552_c	4	CN	26/07/2018	09:24	15	210.54	210.54	100.0	1	B	15
BS_SW_0592	4	CN	27/07/2018	13:28	45	1201.04	1099.53	91.5	2	B	82
BS_SW_0593	4	CN	27/07/2018	13:28	60	872.41	728.62	83.5	2	B	100
BS_SW_0595_a	4	CN	27/07/2018	13:35	15	356.36	356.36	100.0	2	B	30
BS_SW_0598	4	CN	27/07/2018	14:16	45	1095.79	1095.79	100.0	1	B	45
BS_SW_0600	4	CN	27/07/2018	14:45	60	1016.14	994.04	97.8	2	B	117
BS_SW_0601	4	CN	27/07/2018	14:47	45	1054.42	1054.42	100.0	1	B	45
BS_SW_0734	8	CN	13/08/2018	18:06	30	497.76	497.76	100.0	1	B	30

**Table B.3** Golden Eagle Non-breeding (September 2017-January 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_048</b>	3	EA	14/10/2017	12:04	90	917.54	917.54	100.00	1	B	90
<b>SW_050</b>	2	EA	16/10/2017	12:15	210	2003.72	1394.00	69.57	1	B	146
<b>SW_059</b>	1	EA	21/10/2017	13:10	375	2437.25	2437.25	100.00	1	C	375
<b>SW_001</b>	5	EA	30/10/2017	11:18	36	983.76	983.76	100.00	1	B	36
<b>SW_021_b</b>	2	EA	02/11/2017	13:22	225	1920.99	594.91	30.97	1	B	70
<b>SW_074</b>	2	EA	25/11/2017	13:45	45	637.54	237.08	37.19	1	B	17
<b>SW_075_a</b>	2	EA	25/11/2017	13:52	165	37.16	37.16	100.00	1	B	165
<b>SW_124</b>	5	EA	14/01/2018	11:41	45	1248.29	1248.29	100.00	1	B	45
<b>SW_108</b>	5	EA	15/01/2018	13:15	15	263.96	263.96	100.00	1	B	15

**Table B.4** Golden Eagle Breeding (February-August 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_128</b>	6	EA	12/02/2018	09:25	88	2145.80	1617.54	75.38	1	B	66
<b>SW_187</b>	3	EA	28/03/2018	12:36	75	1531.02	1531.02	100.00	1	B	75
<b>BS_SW_0420_a</b>	1	EA	03/04/2018	09:50	30	827.18	827.18	100.0	1	B	30

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0420_b	1	EA	03/04/2018	09:50	45	1140.15	1140.15	100.0	1	C	45
BS_SW_0018_b	5	EA	10/04/2018	17:40	105	895.80	57.14	6.4	3	B	20
BS_SW_0020_a	5	EA	10/04/2018	18:25	75	690.23	215.05	31.2	1	B	23
BS_SW_0055_b	8	EA	26/04/2018	12:38	135	1500.53	1500.53	100.0	1	B	135
BS_SW_0055_c	8	EA	26/04/2018	12:38	120	2029.36	2019.46	99.5	1	C	119
BS_SW_0056_a	8	EA	26/04/2018	14:40	135	3063.66	3063.66	100.0	1	B	135
BS_SW_0110_b	2	EA	01/05/2018	07:55	60	583.21	583.21	100.0	1	B	60
BS_SW_0127_b	2	EA	02/05/2018	11:30	180	3297.91	3297.91	100.0	1	B	180
BS_SW_0128_b	2	EA	02/05/2018	12:54	90	2075.07	1398.09	67.4	1	C	61
BS_SW_0513_b	8	EA	07/05/2018	17:46	195	2191.67	2191.67	100.0	1	B	195
BS_SW_0513_c	8	EA	07/05/2018	17:46	75	1783.99	1783.99	100.0	1	C	75
BS_SW_0518_a	1	EA	11/05/2018	12:09	75	2880.36	2880.36	100.0	1	C	75
BS_SW_0518_b	1	EA	11/05/2018	12:09	15	610.29	514.94	84.4	1	B	13
BS_SW_0159	3	EA	12/05/2018	19:13	120	1346.56	1346.56	100.0	1	B	120
BS_SW_0161_a	7	EA	15/05/2018	16:48	180	3164.07	3164.07	100.0	1	B	180
BS_SW_0210	1	EA	24/05/2018	19:43	60	817.56	817.56	100.0	1	B	60

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0171_b	8	EA	10/06/2018	11:03	90	2922.10	2922.10	100.0	1	B	90
BS_SW_0171_c	8	EA	10/06/2018	11:03	150	2670.31	2670.31	100.0	1	C	150
BS_SW_0304_a	1	EA	11/06/2018	11:55	30	418.04	418.04	100.0	1	B	30
BS_SW_0305_b	1	EA	11/06/2018	11:56	120	1051.55	1051.55	100.0	1	B	120
BS_SW_0687_a	8	EA	08/08/2018	15:39	90	1060.49	1060.49	100.0	1	C	90
BS_SW_0696_b	3	EA	10/08/2018	16:55	30	574.60	574.60	100.0	1	C	30
BS_SW_0696_c	3	EA	10/08/2018	16:55	15	199.07	199.07	100.0	1	B	15
BS_SW_0842_a	3	EA	24/08/2018	11:20	180	1898.17	1898.17	100.0	1	C	180
BS_SW_0842_c	3	EA	24/08/2018	11:20	90	2131.84	1986.15	93.2	1	C	84

**Table B.5** Greylag Goose Non-breeding (September 2017-March 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
SW_049_a	5	GJ	14/10/2017	16:55	60	911.33	911.33	100.00	8	C	480
SW_049_b	5	GJ	14/10/2017	16:55	45	860.82	515.34	59.87	8	B	216
SW_064	3	GJ	26/10/2017	15:37	90	1280.30	1280.30	100.00	8	B	720
SW_066	3	GJ	26/10/2017	16:43	105	1270.20	1270.20	100.00	3	C	315

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_009_b</b>	4	GJ	01/11/2017	08:17	12	162.59	162.59	100.00	9	B	108
<b>SW_010_a</b>	4	GJ	01/11/2017	08:18	30	583.05	583.05	100.00	7	B	210
<b>SW_019</b>	8	GJ	02/11/2017	10:51	46	1085.72	1085.72	100.00	1	B	46
<b>SW_023_b</b>	3	GJ	03/11/2017	11:23	54	1436.15	1436.15	100.00	39	B	2106
<b>SW_028_b</b>	5	GJ	14/11/2017	08:46	14	309.85	309.85	100.00	62	B	868
<b>SW_029_a</b>	8	GJ	14/11/2017	14:20	10	89.05	89.05	100.00	8	B	80
<b>SW_033</b>	4	GJ	16/11/2017	10:30	45	1523.46	1523.46	100.00	2	B	90
<b>SW_034</b>	3	GJ	16/11/2017	13:55	85	1735.75	1735.75	100.00	3	B	255
<b>SW_096_a</b>	4	GJ	13/12/2017	15:51	45	1036.78	1036.78	100.00	4	B	180
<b>SW_097</b>	4	GJ	15/12/2017	11:27	45	1136.00	1136.00	100.00	4	B	180
<b>SW_176_b</b>	4	GJ	26/02/2018	16:08	30	286.01	286.01	100.00	2	B	60
<b>SW_151</b>	3	GJ	13/03/2018	09:25	60	1703.17	1703.17	100.00	15	B	900
<b>SW_159_b</b>	1	GJ	14/03/2018	11:12	60	848.37	848.37	100.00	2	B	120
<b>SW_181</b>	4	GJ	19/03/2018	16:34	45	1686.01	1686.01	100.00	5	B	225
<b>SW_185</b>	4	GJ	25/03/2018	08:02	75	1114.60	1114.60	100.00	7	B	525
<b>SW_188_b</b>	3	GJ	28/03/2018	18:14	30	1074.27	1074.27	100.00	3	B	90

**Table B.6** Greylag Goose Breeding (April-August 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0045_b</b>	3	GJ	25/04/2018	20:11	30	589.85	589.85	100.0	4	B	120
<b>BS_SW_0067_b</b>	5	GJ	27/04/2018	09:00	30	201.73	201.73	100.0	1	B	30
<b>BS_SW_0088_a</b>	3	GJ	30/04/2018	07:03	30	529.00	529.00	100.0	1	B	30
<b>BS_SW_0093</b>	3	GJ	30/04/2018	08:09	60	1249.16	1249.16	100.0	3	B	180
<b>BS_SW_0114_a</b>	5	GJ	02/05/2018	06:06	30	271.54	271.54	100.0	1	B	30
<b>BS_SW_0516</b>	1	GJ	11/05/2018	09:36	30	677.85	677.85	100.0	4	B	120
<b>BS_SW_0146</b>	3	GJ	12/05/2018	17:50	15	248.38	248.38	100.0	4	B	60
<b>BS_SW_0155</b>	3	GJ	12/05/2018	18:46	15	315.85	315.85	100.0	1	B	15
<b>BS_SW_0581</b>	3	GJ	25/07/2018	19:09	120	2256.16	2256.16	100.0	7	B	840
<b>BS_SW_0608_b</b>	4	GJ	28/07/2018	15:10	45	958.30	958.30	100.0	7	B	315
<b>BS_SW_0788_b</b>	4	GJ	14/08/2018	12:04	15	226.06	226.06	100.0	2	B	30
<b>BS_SW_0799</b>	4	GJ	14/08/2018	12:59	15	433.76	433.76	100.0	4	B	60

**Table B.7** Greenshank Breeding (March-July 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_162</b>	8	GK	15/03/2018	08:20	45	1086.44	1086.44	100.00	1	B	45
<b>BS_SW_0066_b</b>	5	GK	27/04/2018	08:58	45	1236.65	1236.65	100.0	1	B	45
<b>BS_SW_0068</b>	5	GK	27/04/2018	09:11	45	541.72	541.72	100.0	1	B	45
<b>BS_SW_0082</b>	2	GK	28/04/2018	17:34	90	2523.20	2519.80	99.9	1	B	90
<b>BS_SW_0119_a</b>	5	GK	02/05/2018	07:23	60	295.63	295.63	100.0	1	B	60
<b>BS_SW_0123</b>	5	GK	02/05/2018	08:18	45	819.91	819.91	100.0	2	B	90
<b>BS_SW_0208</b>	1	GK	24/05/2018	19:35	30	893.74	695.13	77.8	2	B	47
<b>BS_SW_0166</b>	2	GK	07/06/2018	15:04	75	2120.83	2023.93	95.4	1	C	72
<b>BS_SW_0431</b>	5	GK	09/07/2018	14:26	15	399.27	399.27	100.0	1	B	15

**Table B.8** Hen Harrier Non-breeding (September 2017-March 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_042_a</b>	4	HH	11/10/2017	10:26	60	469.60	469.60	100.00	1	B	60
<b>SW_067_b</b>	3	HH	26/10/2017	17:06	45	252.68	252.68	100.00	1	B	45
<b>SW_003</b>	5	HH	30/10/2017	11:38	50	1339.46	1339.46	100.00	1	B	50

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_004_b</b>	8	HH	30/10/2017	15:19	61	1832.53	1832.53	100.00	1	B	61
<b>SW_017_a</b>	8	HH	02/11/2017	10:05	45	471.37	471.37	100.00	1	B	45
<b>SW_022</b>	2	HH	02/11/2017	14:00	75	1331.87	1266.97	95.13	1	B	71
<b>SW_026_a</b>	3	HH	03/11/2017	14:03	75	1325.15	1325.15	100.00	1	B	75
<b>SW_080_b</b>	8	HH	20/12/2017	10:10	40	1028.24	1028.24	100.00	1	B	40
<b>SW_082_b</b>	8	HH	20/12/2017	11:40	30	782.07	782.07	100.00	1	B	30
<b>SW_089_a</b>	7	HH	21/12/2017	15:25	60	1499.30	702.47	46.85	1	B	28
<b>SW_098_b</b>	5	HH	23/12/2017	15:32	15	112.01	112.01	100.00	1	B	15
<b>SW_109</b>	8	HH	16/01/2018	09:40	79	1458.28	1458.28	100.00	1	B	79
<b>SW_112</b>	8	HH	16/01/2018	11:57	38	631.97	631.97	100.00	1	B	38
<b>SW_113</b>	8	HH	16/01/2018	13:08	23	696.23	696.23	100.00	1	B	23
<b>SW_115_a</b>	8	HH	16/01/2018	15:09	45	841.27	841.27	100.00	1	B	45
<b>SW_146</b>	8	HH	16/02/2018	13:41	90	989.36	989.36	100.00	1	B	90
<b>SW_160_b</b>	5	HH	14/03/2018	16:55	60	511.34	511.34	100.00	1	B	60
<b>SW_161_b</b>	5	HH	14/03/2018	16:59	30	323.34	323.34	100.00	1	B	30
<b>SW_182_a</b>	4	HH	19/03/2018	17:21	30	371.96	371.96	100.00	1	B	30

**Table B.9** Hen Harrier Breeding (April-August 2018)

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0417_b</b>	4	HH	04/04/2018	07:33	15	139.88	139.88	100.0	1	B	15
<b>BS_SW_0417_d</b>	4	HH	04/04/2018	07:33	30	504.89	504.89	100.0	1	B	30
<b>BS_SW_0428_a</b>	5	HH	04/04/2018	14:41	30	1326.64	1326.64	100.0	1	B	30
<b>BS_SW_0002_b</b>	3	HH	10/04/2018	13:03	30	121.98	121.98	100.0	1	B	30
<b>BS_SW_0003_b</b>	3	HH	10/04/2018	13:10	165	575.29	575.29	100.0	2	B	330
<b>BS_SW_0003_c</b>	3	HH	10/04/2018	13:10	45	157.80	157.80	100.0	2	C	90
<b>BS_SW_0003_d</b>	3	HH	10/04/2018	13:10	45	566.97	566.97	100.0	2	B	90
<b>BS_SW_0005_b</b>	3	HH	10/04/2018	13:35	90	1126.69	1126.69	100.0	1	B	90
<b>BS_SW_0008_b</b>	3	HH	10/04/2018	14:00	30	106.66	106.66	100.0	2	B	60
<b>BS_SW_0009</b>	3	HH	10/04/2018	14:15	165	1922.42	1922.42	100.0	1	B	165
<b>BS_SW_0011_a</b>	3	HH	10/04/2018	14:55	45	214.89	214.89	100.0	1	C	45
<b>BS_SW_0011_b</b>	3	HH	10/04/2018	14:55	45	698.70	698.70	100.0	1	B	45
<b>BS_SW_0011_c</b>	3	HH	10/04/2018	14:55	15	127.99	127.99	100.0	1	C	15
<b>BS_SW_0011_d</b>	3	HH	10/04/2018	14:55	90	3028.75	3028.75	100.0	1	B	90
<b>BS_SW_0012_b</b>	3	HH	10/04/2018	15:40	90	1541.18	1541.18	100.0	1	B	90
<b>BS_SW_0013_b</b>	3	HH	10/04/2018	15:42	45	465.72	465.72	100.0	1	B	45

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0014_b	3	HH	10/04/2018	15:45	45	830.43	830.43	100.0	1	B	45
BS_SW_0033_b	3	HH	25/04/2018	18:40	45	265.51	265.51	100.0	1	B	45
BS_SW_0040_b	3	HH	25/04/2018	19:16	115	1410.10	1410.10	100.0	2	B	230
BS_SW_0050_b	6	HH	26/04/2018	08:29	60	908.87	123.36	13.6	1	B	8
BS_SW_0059_b	5	HH	27/04/2018	07:28	45	561.03	561.03	100.0	1	B	45
BS_SW_0059_c	5	HH	27/04/2018	07:28	30	270.33	270.33	100.0	1	C	30
BS_SW_0060_b	5	HH	27/04/2018	07:44	30	296.46	296.46	100.0	1	B	30
BS_SW_0060_c	5	HH	27/04/2018	07:44	15	247.66	247.66	100.0	1	C	15
BS_SW_0061_b	5	HH	27/04/2018	08:04	15	585.05	585.05	100.0	1	B	15
BS_SW_0062_b	5	HH	27/04/2018	08:15	30	120.23	120.23	100.0	1	B	30
BS_SW_0069_b	5	HH	27/04/2018	08:04	15	239.62	239.62	100.0	1	B	15
BS_SW_0094_a	3	HH	30/04/2018	08:25	120	2238.50	2238.50	100.0	1	B	120
BS_SW_0095	3	HH	30/04/2018	08:25	210	2887.15	2887.15	100.0	1	B	210
BS_SW_0096	3	HH	30/04/2018	08:45	120	1504.34	1504.34	100.0	1	B	120
BS_SW_0097_a	3	HH	30/04/2018	08:49	30	501.54	501.54	100.0	1	B	30
BS_SW_0124_b	5	HH	02/05/2018	08:30	180	3535.83	3535.83	100.0	1	B	180

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0139_a	3	HH	12/05/2018	16:32	45	476.15	476.15	100.0	1	B	45
BS_SW_0139_b	3	HH	12/05/2018	16:32	60	255.62	255.62	100.0	1	C	60
BS_SW_0176_a	8	HH	10/06/2018	13:30	135	4267.33	4267.33	100.0	1	C	135
BS_SW_0177_a	8	HH	10/06/2018	13:34	75	534.85	534.85	100.0	1	B	75
BS_SW_0177_b	8	HH	10/06/2018	13:34	180	3579.57	3579.57	100.0	1	C	180
BS_SW_0359_a	3	HH	18/06/2018	15:09	45	966.73	966.73	100.0	1	B	45
BS_SW_0272_a	5	HH	21/06/2018	10:42	30	470.68	470.68	100.0	1	B	30
BS_SW_0288_b	8	HH	23/06/2018	20:00	30	217.26	217.26	100.0	1	B	30
BS_SW_0292_a	8	HH	23/06/2018	21:28	45	1262.33	1262.33	100.0	1	B	45
BS_SW_0302_a	8	HH	27/06/2018	06:30	45	1613.78	1613.78	100.0	1	B	45
BS_SW_0384	3	HH	27/06/2018	16:42	45	1623.85	1623.85	100.0	1	C	45
BS_SW_0393_a	3	HH	27/06/2018	18:23	45	1776.06	1776.06	100.0	1	C	45
BS_SW_0393_b	3	HH	27/06/2018	18:23	15	308.10	308.10	100.0	1	B	15
BS_SW_0344_b	7	HH	28/06/2018	19:57	45	486.61	486.61	100.0	1	B	45
BS_SW_0432_a	5	HH	09/07/2018	14:28	105	1329.29	1329.29	100.0	1	C	105
BS_SW_0432_b	5	HH	09/07/2018	14:28	15	216.19	216.19	100.0	1	B	15

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0436_a	5	HH	09/07/2018	15:37	45	1426.40	1426.40	100.0	1	C	45
BS_SW_0436_b	5	HH	09/07/2018	15:37	30	820.98	820.98	100.0	1	B	30
BS_SW_0489_a	4	HH	17/07/2018	11:10	105	1852.50	1852.50	100.0	1	B	105
BS_SW_0747_b	8	HH	13/08/2018	20:23	30	421.60	421.60	100.0	1	B	30
BS_SW_0831_a	2	HH	23/08/2018	07:27	30	499.44	499.44	100.0	1	B	30

**Table B.10 Merlin Breeding (April-July 2018)**

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0031_a	3	ML	25/04/2018	18:08	60	1145.23	1145.23	100.0	1	B	60
BS_SW_0279_b	8	ML	23/06/2018	18:46	15	431.17	431.17	100.0	1	B	15
BS_SW_0280_b	8	ML	23/06/2018	18:46	45	794.93	794.93	100.0	1	B	45
BS_SW_0368	6	ML	27/06/2018	07:04	90	2851.76	1881.01	66.0	1	B	59
BS_SW_0439_b	5	ML	09/07/2018	16:27	15	223.60	223.60	100.0	1	B	15
BS_SW_0452_a	6	ML	13/07/2018	11:24	75	2141.86	1231.40	57.5	1	B	43
BS_SW_0455_a	5	ML	15/07/2018	10:10	15	239.73	239.73	100.0	1	B	15
BS_SW_0631_b	8	ML	30/07/2018	18:06	30	207.45	207.45	100.0	1	B	30

**Table B.11 Great Skua Breeding (April-August 2018)**

<b>Flight_Ref</b>	<b>VP</b>	<b>Species</b>	<b>Date</b>	<b>Time</b>	<b>Seconds in height Band</b>	<b>Original Length (m)</b>	<b>Clipped Length (m)</b>	<b>Clip Length %</b>	<b>Count</b>	<b>Height Band</b>	<b>Total Flight Time (Seconds)</b>
<b>BS_SW_0007_a</b>	3	NX	10/04/2018	13:45	135	2051.91	2051.91	100.0	1	B	135
<b>BS_SW_0007_b</b>	3	NX	10/04/2018	13:45	45	533.31	533.31	100.0	1	C	45
<b>BS_SW_0027_b</b>	3	NX	25/04/2018	17:37	105	1195.36	1195.36	100.0	1	B	105
<b>BS_SW_0030_b</b>	3	NX	25/04/2018	18:02	45	744.10	744.10	100.0	1	B	45
<b>BS_SW_0036_b</b>	3	NX	25/04/2018	19:03	105	229.60	229.60	100.0	1	B	105
<b>BS_SW_0036_c</b>	3	NX	25/04/2018	19:03	30	526.84	526.84	100.0	1	C	30
<b>BS_SW_0043_b</b>	3	NX	25/04/2018	19:25	45	205.81	205.81	100.0	1	B	45
<b>BS_SW_0064_b</b>	5	NX	27/04/2018	08:45	60	1200.29	1200.29	100.0	1	B	60
<b>BS_SW_0065</b>	5	NX	27/04/2018	08:46	45	621.54	621.54	100.0	1	B	45
<b>BS_SW_0070_a</b>	4	NX	27/04/2018	12:25	105	970.59	970.59	100.0	1	B	105
<b>BS_SW_0072_a</b>	4	NX	27/04/2018	13:15	135	1511.82	1511.82	100.0	2	B	270
<b>BS_SW_0072_b</b>	4	NX	27/04/2018	13:15	90	1164.84	1164.84	100.0	2	C	180
<b>BS_SW_0073</b>	4	NX	27/04/2018	14:55	75	1240.95	1240.95	100.0	1	B	75
<b>BS_SW_0080_a</b>	7	NX	28/04/2018	08:48	45	1424.33	499.24	35.1	1	B	16
<b>BS_SW_0104_b</b>	4	NX	30/04/2018	17:50	60	1792.92	1792.92	100.0	2	B	120
<b>BS_SW_0105_b</b>	4	NX	30/04/2018	18:16	60	221.04	221.04	100.0	2	B	120

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0132_b</b>	8	NX	03/05/2018	14:25	15	352.12	352.12	100.0	1	B	15
<b>BS_SW_0525</b>	4	NX	05/05/2018	18:51	45	1185.71	1185.71	100.0	1	B	45
<b>BS_SW_0533</b>	3	NX	06/05/2018	18:54	30	944.60	944.60	100.0	2	B	60
<b>BS_SW_0142</b>	3	NX	12/05/2018	16:52	30	415.09	415.09	100.0	1	B	30
<b>BS_SW_0144_a</b>	3	NX	12/05/2018	17:32	75	1540.27	1540.27	100.0	1	B	75
<b>BS_SW_0144_b</b>	3	NX	12/05/2018	17:32	15	310.52	310.52	100.0	1	C	15
<b>BS_SW_0157</b>	3	NX	12/05/2018	18:51	30	593.98	593.98	100.0	1	B	30
<b>BS_SW_0509</b>	4	NX	22/05/2018	07:39	30	1001.51	1001.51	100.0	1	B	30
<b>BS_SW_0180_a</b>	3	NX	24/05/2018	05:25	90	2358.80	2358.80	100.0	1	B	90
<b>BS_SW_0181_b</b>	3	NX	24/05/2018	05:25	30	1860.51	1860.51	100.0	1	B	30
<b>BS_SW_0182_b</b>	3	NX	24/05/2018	05:26	15	469.14	469.14	100.0	1	B	15
<b>BS_SW_0188_b</b>	3	NX	24/05/2018	05:40	15	512.57	512.57	100.0	1	B	15
<b>BS_SW_0190</b>	3	NX	24/05/2018	05:43	15	732.48	732.48	100.0	1	B	15
<b>BS_SW_0204_a</b>	3	NX	24/05/2018	07:31	30	868.51	868.51	100.0	1	B	30
<b>BS_SW_0206_b</b>	3	NX	24/05/2018	08:04	15	582.59	582.59	100.0	1	B	15
<b>BS_SW_0207</b>	1	NX	24/05/2018	19:32	30	657.08	619.84	94.3	1	B	28

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0212_b	1	NX	24/05/2018	20:21	30	326.26	326.26	100.0	1	B	30
BS_SW_0167	2	NX	07/06/2018	16:10	60	2132.52	1199.25	56.2	1	C	34
BS_SW_0170_a	2	NX	07/06/2018	17:10	120	3570.45	3570.45	100.0	3	C	360
BS_SW_0174_a	8	NX	10/06/2018	13:15	135	2365.03	2365.03	100.0	1	B	135
BS_SW_0178_a	8	NX	10/06/2018	13:42	135	2054.95	2054.95	100.0	1	B	135
BS_SW_0309	1	NX	11/06/2018	08:02	60	1478.83	1478.83	100.0	1	B	60
BS_SW_0356_b	3	NX	18/06/2018	12:59	30	479.18	479.18	100.0	1	B	30
BS_SW_0276_a	5	NX	21/06/2018	12:44	45	997.51	997.51	100.0	1	C	45
BS_SW_0276_b	5	NX	21/06/2018	12:44	15	193.52	193.52	100.0	1	B	15
BS_SW_0283_a	8	NX	23/06/2018	19:10	60	1390.57	1390.57	100.0	5	B	300
BS_SW_0381_a	3	NX	27/06/2018	16:09	15	613.99	613.99	100.0	1	B	15
BS_SW_0382_b	3	NX	27/06/2018	16:37	30	492.83	492.83	100.0	3	B	90
BS_SW_0383_b	3	NX	27/06/2018	16:41	45	1524.64	1524.64	100.0	1	B	45
BS_SW_0383_c	3	NX	27/06/2018	16:41	90	2215.13	2215.13	100.0	1	C	90
BS_SW_0387_b	3	NX	27/06/2018	17:17	30	403.48	403.48	100.0	1	B	30
BS_SW_0388_a	3	NX	27/06/2018	17:36	15	544.06	544.06	100.0	1	C	15

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0388_b	3	NX	27/06/2018	17:36	45	1827.74	1827.74	100.0	1	B	45
BS_SW_0392_b	3	NX	27/06/2018	18:13	30	693.13	693.13	100.0	2	B	60
BS_SW_0392_c	3	NX	27/06/2018	18:13	15	555.66	555.66	100.0	2	C	30
BS_SW_0392_d	3	NX	27/06/2018	18:13	15	61.69	61.69	100.0	2	B	30
BS_SW_0341_b	7	NX	28/06/2018	18:52	30	604.39	604.39	100.0	1	B	30
BS_SW_0396	4	NX	29/06/2018	12:49	45	1960.22	1960.22	100.0	1	B	45
BS_SW_0397	4	NX	29/06/2018	13:08	30	881.29	881.29	100.0	1	C	30
BS_SW_0398_a	4	NX	29/06/2018	13:12	15	620.04	620.04	100.0	1	B	15
BS_SW_0399	4	NX	29/06/2018	13:42	45	2236.60	2236.60	100.0	1	B	45
BS_SW_0400_a	4	NX	29/06/2018	14:16	45	584.88	584.88	100.0	1	B	45
BS_SW_0402	4	NX	29/06/2018	14:32	90	2016.07	2016.07	100.0	1	B	90
BS_SW_0403_a	4	NX	29/06/2018	14:43	15	190.97	190.97	100.0	2	B	30
BS_SW_0403_c	4	NX	29/06/2018	14:43	15	181.85	181.85	100.0	2	B	30
BS_SW_0403_d	4	NX	29/06/2018	14:43	60	1216.42	1216.42	100.0	2	C	120
BS_SW_0403_f	4	NX	29/06/2018	14:43	120	418.69	418.69	100.0	2	C	240
BS_SW_0406_b	4	NX	29/06/2018	15:33	45	444.20	444.20	100.0	1	B	45

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0321_a</b>	3	NX	30/06/2018	08:32	75	1004.20	1004.20	100.0	1	B	75
<b>BS_SW_0321_b</b>	3	NX	30/06/2018	08:32	105	682.23	682.23	100.0	1	C	105
<b>BS_SW_0323_b</b>	3	NX	30/06/2018	08:52	60	689.28	689.28	100.0	1	B	60
<b>BS_SW_0327_b</b>	3	NX	30/06/2018	09:48	30	215.34	215.34	100.0	1	B	30
<b>BS_SW_0329</b>	3	NX	30/06/2018	09:54	135	1635.98	1635.98	100.0	1	B	135
<b>BS_SW_0330_a</b>	3	NX	30/06/2018	09:59	30	226.78	226.78	100.0	3	B	90
<b>BS_SW_0408</b>	3	NX	05/07/2018	14:18	45	1418.47	1418.47	100.0	1	B	45
<b>BS_SW_0411_a</b>	3	NX	05/07/2018	14:48	45	1190.31	1190.31	100.0	2	C	90
<b>BS_SW_0411_b</b>	3	NX	05/07/2018	14:48	30	580.66	580.66	100.0	2	B	60
<b>BS_SW_0411_c</b>	3	NX	05/07/2018	14:48	45	813.41	813.41	100.0	2	C	90
<b>BS_SW_0412</b>	3	NX	05/07/2018	14:49	45	631.52	631.52	100.0	1	B	45
<b>BS_SW_0413_b</b>	3	NX	05/07/2018	15:17	45	655.25	655.25	100.0	2	B	90
<b>BS_SW_0414_b</b>	3	NX	05/07/2018	15:22	60	2370.30	2370.30	100.0	1	B	60
<b>BS_SW_0415_b</b>	3	NX	05/07/2018	15:41	15	1175.17	1175.17	100.0	1	B	15
<b>BS_SW_0416</b>	3	NX	05/07/2018	16:28	90	1299.12	1299.12	100.0	1	B	90
<b>BS_SW_0430</b>	5	NX	09/07/2018	14:18	45	916.73	916.73	100.0	1	B	45

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0460_a	5	NX	15/07/2018	11:43	30	245.03	245.03	100.0	3	B	90
BS_SW_0460_c	5	NX	15/07/2018	11:43	30	626.67	626.67	100.0	3	B	90
BS_SW_0471_a	8	NX	16/07/2018	10:32	30	576.71	576.71	100.0	1	C	30
BS_SW_0488	4	NX	17/07/2018	10:15	60	1335.94	1335.94	100.0	1	B	60
BS_SW_0491_a	4	NX	17/07/2018	11:34	90	972.67	972.67	100.0	1	C	90
BS_SW_0491_b	4	NX	17/07/2018	11:34	15	312.11	312.11	100.0	1	B	15
BS_SW_0494_b	4	NX	17/07/2018	12:18	15	334.37	334.37	100.0	1	B	15
BS_SW_0494_d	4	NX	17/07/2018	12:18	15	652.69	652.69	100.0	1	B	15
BS_SW_0542	7	NX	23/07/2018	16:15	195	3599.23	1565.13	43.5	1	B	85
BS_SW_0562_a	8	NX	25/07/2018	14:03	15	173.99	173.99	100.0	3	B	45
BS_SW_0569_a	8	NX	25/07/2018	14:58	30	773.24	773.24	100.0	1	B	30
BS_SW_0575	8	NX	25/07/2018	16:24	60	1500.07	1500.07	100.0	1	B	60
BS_SW_0576_a	3	NX	25/07/2018	17:58	60	592.20	592.20	100.0	1	B	60
BS_SW_0577_a	3	NX	25/07/2018	18:28	60	328.80	328.80	100.0	2	B	120
BS_SW_0580	3	NX	25/07/2018	18:55	45	1395.93	1395.93	100.0	1	B	45
BS_SW_0582_b	3	NX	25/07/2018	19:13	30	1005.23	1005.23	100.0	1	B	30

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0549_a	5	NX	26/07/2018	10:19	75	2242.53	2242.53	100.0	2	B	150
BS_SW_0553	4	NX	26/07/2018	09:34	45	1302.04	1302.04	100.0	1	B	45
BS_SW_0557_a	4	NX	26/07/2018	10:33	45	1008.85	1008.85	100.0	1	B	45
BS_SW_0558	4	NX	26/07/2018	10:57	45	857.08	857.08	100.0	1	B	45
BS_SW_0559_b	4	NX	26/07/2018	11:38	15	322.91	322.91	100.0	1	B	15
BS_SW_0590_a	7	NX	27/07/2018	15:21	120	2639.92	2639.92	100.0	1	B	120
BS_SW_0591_b	4	NX	27/07/2018	13:24	45	1038.18	1038.18	100.0	1	B	45
BS_SW_0594_a	4	NX	27/07/2018	13:34	30	952.46	952.46	100.0	1	B	30
BS_SW_0594_c	4	NX	27/07/2018	13:34	15	346.32	346.32	100.0	1	B	15
BS_SW_0596_b	4	NX	27/07/2018	13:36	15	176.75	176.75	100.0	1	B	15
BS_SW_0596_d	4	NX	27/07/2018	13:36	15	192.74	192.74	100.0	1	B	15
BS_SW_0597_a	4	NX	27/07/2018	13:44	15	321.71	321.71	100.0	1	B	15
BS_SW_0597_b	4	NX	27/07/2018	13:44	60	1473.27	1473.27	100.0	1	C	60
BS_SW_0599_a	4	NX	27/07/2018	14:38	30	372.96	372.96	100.0	1	B	30
BS_SW_0602_a	4	NX	27/07/2018	15:02	75	1202.64	1202.64	100.0	1	B	75
BS_SW_0604_a	4	NX	27/07/2018	15:43	15	363.19	363.19	100.0	4	B	60

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0604_c	4	NX	27/07/2018	15:43	15	247.03	247.03	100.0	4	B	60
BS_SW_0604_e	4	NX	27/07/2018	15:43	15	62.24	62.24	100.0	4	B	60
BS_SW_0604_g	4	NX	27/07/2018	15:43	15	60.45	60.45	100.0	4	B	60
BS_SW_0604_i	4	NX	27/07/2018	15:43	15	555.12	555.12	100.0	4	B	60
BS_SW_0605_a	4	NX	28/07/2018	14:50	60	1056.39	1056.39	100.0	1	B	60
BS_SW_0606_a	4	NX	28/07/2018	15:06	60	631.25	631.25	100.0	1	B	60
BS_SW_0610	4	NX	28/07/2018	15:56	30	574.81	574.81	100.0	4	B	120
BS_SW_0613_a	4	NX	28/07/2018	16:33	30	965.85	965.85	100.0	1	B	30
BS_SW_0614_b	4	NX	28/07/2018	16:50	45	1831.22	1831.22	100.0	4	B	180
BS_SW_0615_b	4	NX	28/07/2018	16:52	15	492.23	492.23	100.0	1	B	15
BS_SW_0617_a	4	NX	28/07/2018	17:15	60	1585.52	1585.52	100.0	1	B	60
BS_SW_0618_b	4	NX	28/07/2018	17:20	60	509.93	509.93	100.0	3	B	180
BS_SW_0619_a	4	NX	28/07/2018	17:23	30	336.46	336.46	100.0	1	B	30
BS_SW_0624_a	8	NX	30/07/2018	16:05	60	1332.08	1332.08	100.0	2	B	120
BS_SW_0627_a	8	NX	30/07/2018	16:50	60	1249.83	1249.83	100.0	1	B	60
BS_SW_0630_a	8	NX	30/07/2018	17:55	60	1112.57	1112.57	100.0	1	B	60

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0632_b</b>	8	NX	30/07/2018	18:10	45	807.28	807.28	100.0	2	B	90
<b>BS_SW_0634_b</b>	8	NX	30/07/2018	18:29	30	302.31	302.31	100.0	1	B	30
<b>BS_SW_0657_a</b>	3	NX	01/08/2018	09:31	60	1757.97	1757.97	100.0	3	B	180
<b>BS_SW_0674</b>	2	NX	08/08/2018	14:14	75	889.20	889.20	100.0	1	B	75
<b>BS_SW_0675</b>	2	NX	08/08/2018	14:43	45	1868.86	1852.25	99.1	1	B	45
<b>BS_SW_0677</b>	2	NX	08/08/2018	16:01	15	265.91	265.91	100.0	1	B	15
<b>BS_SW_0688_a</b>	3	NX	10/08/2018	14:46	15	272.67	272.67	100.0	2	C	30
<b>BS_SW_0688_b</b>	3	NX	10/08/2018	14:46	120	1908.44	1908.44	100.0	2	B	240
<b>BS_SW_0689_a</b>	3	NX	10/08/2018	15:03	240	4609.27	4609.27	100.0	1	B	240
<b>BS_SW_0698_b</b>	3	NX	10/08/2018	17:11	30	1045.22	1045.22	100.0	1	B	30
<b>BS_SW_0700_a</b>	3	NX	10/08/2018	17:16	150	1645.43	1645.43	100.0	2	B	300
<b>BS_SW_0703_b</b>	7	NX	12/08/2018	15:28	60	860.64	736.93	85.6	1	B	51
<b>BS_SW_0718_a</b>	1	NX	12/08/2018	11:37	15	305.95	198.16	64.8	1	C	10
<b>BS_SW_0718_b</b>	1	NX	12/08/2018	11:37	45	648.22	648.22	100.0	1	B	45
<b>BS_SW_0719_a</b>	1	NX	12/08/2018	11:46	75	2003.63	2003.63	100.0	1	B	75
<b>BS_SW_0722_a</b>	1	NX	12/08/2018	13:29	90	1723.12	1723.12	100.0	1	C	90

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0722_b</b>	1	NX	12/08/2018	13:29	45	560.48	560.48	100.0	1	B	45
<b>BS_SW_0723_a</b>	1	NX	12/08/2018	13:49	45	766.91	757.21	98.7	1	B	44
<b>BS_SW_0724_a</b>	1	NX	12/08/2018	13:50	30	423.78	423.78	100.0	1	B	30
<b>BS_SW_0728</b>	1	NX	12/08/2018	14:53	105	2506.59	2506.59	100.0	1	B	105
<b>BS_SW_0729_a</b>	1	NX	12/08/2018	14:53	15	262.73	262.73	100.0	1	B	15
<b>BS_SW_0731_a</b>	1	NX	12/08/2018	15:13	30	486.85	380.25	78.1	1	B	23
<b>BS_SW_0731_b</b>	1	NX	12/08/2018	15:13	75	1118.02	1118.02	100.0	1	C	75
<b>BS_SW_0736_b</b>	8	NX	13/08/2018	18:11	30	321.69	321.69	100.0	1	B	30
<b>BS_SW_0738_a</b>	8	NX	13/08/2018	18:20	60	601.18	601.18	100.0	1	C	60
<b>BS_SW_0738_b</b>	8	NX	13/08/2018	18:20	30	505.87	505.87	100.0	1	B	30
<b>BS_SW_0740_a</b>	8	NX	13/08/2018	18:45	60	767.07	767.07	100.0	1	B	60
<b>BS_SW_0752_a</b>	4	NX	13/08/2018	14:05	45	780.54	780.54	100.0	1	B	45
<b>BS_SW_0753_b</b>	4	NX	13/08/2018	14:10	30	697.99	697.99	100.0	2	B	60
<b>BS_SW_0755</b>	4	NX	13/08/2018	14:22	225	3527.35	3527.35	100.0	4	B	900
<b>BS_SW_0761_b</b>	4	NX	13/08/2018	14:56	45	799.68	799.68	100.0	1	B	45
<b>BS_SW_0763_a</b>	4	NX	13/08/2018	15:10	45	880.46	880.46	100.0	1	B	45

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0763_c	4	NX	13/08/2018	15:10	60	944.47	944.47	100.0	1	B	60
BS_SW_0763_d	4	NX	13/08/2018	15:10	90	2009.18	2009.18	100.0	1	C	90
BS_SW_0764	4	NX	13/08/2018	15:30	30	562.61	562.61	100.0	1	B	30
BS_SW_0771	4	NX	13/08/2018	16:40	30	409.44	409.44	100.0	1	B	30
BS_SW_0779	4	NX	14/08/2018	10:47	30	1097.89	1097.89	100.0	1	B	30
BS_SW_0780_a	4	NX	14/08/2018	11:19	30	430.11	430.11	100.0	1	B	30
BS_SW_0780_c	4	NX	14/08/2018	11:19	30	546.02	546.02	100.0	1	B	30
BS_SW_0781	4	NX	14/08/2018	11:21	45	1293.28	1293.28	100.0	3	B	135
BS_SW_0782_a	4	NX	14/08/2018	11:27	15	387.89	387.89	100.0	2	B	30
BS_SW_0783	4	NX	14/08/2018	11:38	210	2745.28	2745.28	100.0	2	B	420
BS_SW_0795_a	4	NX	14/08/2018	12:44	15	375.52	375.52	100.0	1	B	15
BS_SW_0796	4	NX	14/08/2018	12:48	105	2005.96	2005.96	100.0	2	B	210
BS_SW_0798_b	4	NX	14/08/2018	12:57	15	620.47	620.47	100.0	1	B	15
BS_SW_0810_a	2	NX	15/08/2018	10:22	60	978.74	978.74	100.0	1	C	60
BS_SW_0810_b	2	NX	15/08/2018	10:22	30	337.28	337.28	100.0	1	B	30
BS_SW_0810_d	2	NX	15/08/2018	10:22	30	521.57	521.57	100.0	1	B	30

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0810_e	2	NX	15/08/2018	10:22	90	1318.41	1318.41	100.0	1	C	90
BS_SW_0810_f	2	NX	15/08/2018	10:22	45	691.79	610.76	88.3	1	B	40
BS_SW_0811_a	2	NX	15/08/2018	11:26	30	769.42	769.42	100.0	2	C	60
BS_SW_0811_b	2	NX	15/08/2018	11:26	15	573.14	573.14	100.0	2	B	30
BS_SW_0811_c	2	NX	15/08/2018	11:26	30	917.56	917.56	100.0	2	C	60
BS_SW_0811_d	2	NX	15/08/2018	11:26	15	775.41	775.41	100.0	2	B	30
BS_SW_0813	2	NX	15/08/2018	12:06	45	902.76	902.76	100.0	2	B	90
BS_SW_0822_a	3	NX	17/08/2018	09:04	60	1045.79	1045.79	100.0	2	C	120
BS_SW_0822_b	3	NX	17/08/2018	09:04	45	769.69	769.69	100.0	2	B	90
BS_SW_0825_a	5	NX	22/08/2018	14:20	135	1779.58	1779.58	100.0	2	B	270
BS_SW_0826_a	5	NX	22/08/2018	14:28	120	1790.86	1790.86	100.0	4	B	480
BS_SW_0826_b	5	NX	22/08/2018	14:28	75	2349.63	2349.63	100.0	4	C	300
BS_SW_0827_a	5	NX	22/08/2018	14:32	30	352.21	352.21	100.0	2	B	60
BS_SW_0828_a	5	NX	22/08/2018	14:45	60	903.10	903.10	100.0	2	B	120
BS_SW_0845_b	3	NX	24/08/2018	12:14	30	464.15	464.15	100.0	2	B	60
BS_SW_0846_b	3	NX	24/08/2018	12:48	120	998.08	998.08	100.0	1	B	120

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0847_b	3	NX	24/08/2018	12:57	30	490.01	490.01	100.0	1	B	30
BS_SW_0850_b	4	NX	25/08/2018	19:15	30	603.46	603.46	100.0	1	B	30
BS_SW_1175	4	NX	09/09/2018	11:53	45	1200.52	1200.52	100.0	1	C	45
BS_SW_0400_c	4	NX	0218-06-29	14:16	45	617.25	617.25	100.0	1	B	45

**Table B.12 Red-throated Diver Breeding (April-August 2018)**

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0048_a	6	RH	26/04/2018	07:26	45	950.95	855.52	90.0	1	B	40
BS_SW_0529_a	6	RH	05/05/2018	07:11	90	1730.48	553.93	32.0	2	C	58
BS_SW_0534_a	3	RH	06/05/2018	19:17	15	435.85	435.85	100.0	1	C	15
BS_SW_0534_b	3	RH	06/05/2018	19:17	15	584.95	584.95	100.0	1	B	15
BS_SW_0535	3	RH	06/05/2018	19:35	75	2936.46	2936.46	100.0	1	B	75
BS_SW_0538	4	RH	06/05/2018	16:41	120	2591.70	2591.70	100.0	2	C	240
BS_SW_0515	1	RH	11/05/2018	08:14	105	2334.31	2334.31	100.0	2	B	210
BS_SW_0517	1	RH	11/05/2018	10:24	30	957.88	823.17	85.9	1	B	26
BS_SW_0154_a	3	RH	12/05/2018	18:41	90	2615.52	2615.52	100.0	2	C	180

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0154_b	3	RH	12/05/2018	18:41	30	1226.20	1226.20	100.0	2	B	60
BS_SW_0522	7	RH	12/05/2018	08:07	45	1535.69	1512.93	98.5	2	B	89
BS_SW_0506	6	RH	13/05/2018	19:41	60	2146.22	23.09	1.1	1	B	1
BS_SW_0498	5	RH	22/05/2018	20:57	90	2273.79	2273.79	100.0	2	C	180
BS_SW_0179	3	RH	24/05/2018	05:14	30	2269.59	2269.59	100.0	1	B	30
BS_SW_0213	1	RH	24/05/2018	20:22	45	2140.56	910.99	42.6	1	B	19
BS_SW_0215_b	1	RH	24/05/2018	21:28	15	234.39	234.39	100.0	1	B	15
BS_SW_0303_a	1	RH	11/06/2018	09:26	45	706.07	84.35	11.9	1	B	5
BS_SW_0303_b	1	RH	11/06/2018	09:26	90	1388.42	103.73	7.5	1	C	7
BS_SW_0307	1	RH	11/06/2018	06:43	105	1481.68	1479.94	99.9	1	B	105
BS_SW_0365	7	RH	16/06/2018	07:00	150	3106.36	633.03	20.4	2	B	61
BS_SW_0366_b	7	RH	16/06/2018	07:34	75	2063.66	1300.48	63.0	1	B	47
BS_SW_0360	3	RH	18/06/2018	15:34	30	1315.50	1315.50	100.0	2	B	60
BS_SW_0362	4	RH	18/06/2018	18:39	150	1419.24	1419.24	100.0	2	C	300
BS_SW_0285	8	RH	23/06/2018	19:21	120	2569.42	2431.35	94.6	1	C	114
BS_SW_0371	1	RH	26/06/2018	18:04	105	2087.84	2087.84	100.0	1	B	105

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0378_a	1	RH	26/06/2018	20:36	30	620.76	620.76	100.0	2	B	60
BS_SW_0385_a	3	RH	27/06/2018	16:42	15	545.42	545.42	100.0	1	C	15
BS_SW_0385_b	3	RH	27/06/2018	16:42	30	389.35	389.35	100.0	1	B	30
BS_SW_0337_a	5	RH	29/06/2018	19:04	30	910.11	910.11	100.0	2	B	60
BS_SW_0339	5	RH	29/06/2018	19:40	45	1001.32	1001.32	100.0	1	B	45
BS_SW_0401	4	RH	29/06/2018	14:27	75	1150.35	1068.28	92.9	1	C	70
BS_SW_0322	3	RH	30/06/2018	08:40	60	1043.61	1043.61	100.0	1	C	60
BS_SW_0326	3	RH	30/06/2018	09:25	75	1537.82	1537.82	100.0	1	C	75
BS_SW_0332	1	RH	09/07/2018	17:48	135	3756.09	3697.69	98.4	1	B	133
BS_SW_0333	1	RH	09/07/2018	18:00	90	1684.15	1646.26	97.8	1	B	88
BS_SW_0334	1	RH	09/07/2018	18:43	180	2950.32	2740.09	92.9	2	C	334
BS_SW_0441	5	RH	09/07/2018	17:50	60	1500.31	1500.31	100.0	1	B	60
BS_SW_0444_a	5	RH	09/07/2018	18:50	45	1235.81	1072.28	86.8	1	B	39
BS_SW_0445_b	5	RH	09/07/2018	19:06	75	1827.42	1807.13	98.9	1	B	74
BS_SW_0445_c	5	RH	09/07/2018	19:06	75	2240.60	2240.60	100.0	1	C	75
BS_SW_0446_b	5	RH	09/07/2018	19:26	30	1122.22	1122.22	100.0	2	B	60

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0448_a	5	RH	09/07/2018	19:47	45	1384.72	1384.72	100.0	1	B	45
BS_SW_0448_b	5	RH	09/07/2018	19:47	30	960.62	794.24	82.7	1	C	25
BS_SW_0453_b	5	RH	13/07/2018	08:46	75	1585.71	1585.71	100.0	1	B	75
BS_SW_0459_b	5	RH	15/07/2018	11:22	90	2044.83	2044.83	100.0	2	B	180
BS_SW_0459_c	5	RH	15/07/2018	11:22	75	979.55	979.55	100.0	2	C	150
BS_SW_0482_b	7	RH	17/07/2018	10:24	30	1542.40	1331.18	86.3	2	C	52
BS_SW_0482_c	7	RH	17/07/2018	10:24	15	393.27	393.27	100.0	2	B	30
BS_SW_0495_b	2	RH	18/07/2018	07:40	75	1749.97	1749.97	100.0	1	B	75
BS_SW_0495_c	2	RH	18/07/2018	07:40	15	229.36	229.36	100.0	1	C	15
BS_SW_0496_a	2	RH	18/07/2018	08:28	30	424.68	424.68	100.0	1	C	30
BS_SW_0496_b	2	RH	18/07/2018	08:28	45	1350.75	434.55	32.2	1	B	14
BS_SW_0544_b	2	RH	23/07/2018	15:40	30	983.32	983.32	100.0	1	B	30
BS_SW_0583	3	RH	25/07/2018	19:15	30	894.88	894.88	100.0	1	B	30
BS_SW_0586_a	3	RH	25/07/2018	20:07	15	360.47	360.47	100.0	1	B	15
BS_SW_0547	5	RH	26/07/2018	09:15	75	2364.13	2364.13	100.0	1	B	75
BS_SW_0550	4	RH	26/07/2018	09:04	45	1894.21	981.14	51.8	1	B	23

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0551_a</b>	4	RH	26/07/2018	09:23	15	326.47	326.47	100.0	1	B	15
<b>BS_SW_0609</b>	4	RH	28/07/2018	15:12	105	2701.94	1648.81	61.0	2	C	128
<b>BS_SW_0611_a</b>	4	RH	28/07/2018	16:23	75	1932.46	1100.29	56.9	1	C	43
<b>BS_SW_0611_b</b>	4	RH	28/07/2018	16:23	30	630.86	630.86	100.0	1	B	30
<b>BS_SW_0621</b>	4	RH	28/07/2018	17:33	105	2328.14	1491.77	64.1	2	B	135
<b>BS_SW_0633</b>	1	RH	31/07/2018	07:05	135	8951.94	7113.29	79.5	1	B	107
<b>BS_SW_0635_a</b>	1	RH	31/07/2018	08:00	75	1809.77	1516.31	83.8	1	B	63
<b>BS_SW_0635_b</b>	1	RH	31/07/2018	08:00	45	554.65	554.65	100.0	1	C	45
<b>BS_SW_0637</b>	1	RH	31/07/2018	08:20	45	1571.36	1413.08	89.9	2	B	81
<b>BS_SW_0638_b</b>	1	RH	31/07/2018	08:21	30	1541.64	1349.83	87.6	1	B	26
<b>BS_SW_0639</b>	1	RH	31/07/2018	08:22	30	2132.93	2030.47	95.2	2	B	57
<b>BS_SW_0640_a</b>	1	RH	31/07/2018	08:28	60	1658.82	1658.82	100.0	4	B	240
<b>BS_SW_0640_b</b>	1	RH	31/07/2018	08:28	60	1104.05	882.69	80.0	4	C	192
<b>BS_SW_0642_a</b>	1	RH	31/07/2018	08:37	60	2532.65	2208.21	87.2	3	B	157
<b>BS_SW_0643</b>	1	RH	31/07/2018	08:40	90	3743.71	2229.94	59.6	3	B	161
<b>BS_SW_0647_b</b>	1	RH	31/07/2018	09:10	135	6849.05	6220.50	90.8	2	B	245

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>BS_SW_0648_b</b>	1	RH	31/07/2018	09:11	150	6070.57	6070.57	100.0	2	B	300
<b>BS_SW_0648_c</b>	1	RH	31/07/2018	09:11	180	3854.48	3854.48	100.0	2	C	360
<b>BS_SW_0648_d</b>	1	RH	31/07/2018	09:11	45	1737.55	964.99	55.5	2	B	50
<b>BS_SW_0649_a</b>	1	RH	31/07/2018	09:43	135	2793.17	2422.44	86.7	2	B	234
<b>BS_SW_0990</b>	1	RH	31/07/2018	07:05	165	9499.01	7058.20	74.3	1	B	123
<b>BS_SW_0993_a</b>	1	RH	31/07/2018	07:05	135	9416.09	8063.28	85.6	1	B	116
<b>BS_SW_0651_a</b>	3	RH	01/08/2018	08:25	90	3781.64	3781.64	100.0	2	B	180
<b>BS_SW_0655_a</b>	3	RH	01/08/2018	09:02	120	3425.75	3425.75	100.0	2	B	240
<b>BS_SW_0656</b>	3	RH	01/08/2018	09:08	30	969.93	969.93	100.0	1	B	30
<b>BS_SW_0662</b>	3	RH	01/08/2018	09:58	105	2835.47	2835.47	100.0	1	B	105
<b>BS_SW_0676_a</b>	2	RH	08/08/2018	14:52	15	562.51	562.51	100.0	1	C	15
<b>BS_SW_0676_b</b>	2	RH	08/08/2018	14:52	15	409.30	409.30	100.0	1	B	15
<b>BS_SW_0690_a</b>	3	RH	10/08/2018	15:22	90	2098.07	2098.07	100.0	3	B	270
<b>BS_SW_0690_b</b>	3	RH	10/08/2018	15:22	45	1515.86	1515.86	100.0	3	C	135
<b>BS_SW_0710</b>	1	RH	12/08/2018	10:20	30	1168.87	866.23	74.1	1	B	22
<b>BS_SW_0711_a</b>	1	RH	12/08/2018	10:43	75	1901.41	1653.57	87.0	1	B	65

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0713_a	1	RH	12/08/2018	10:58	30	744.59	715.51	96.1	1	B	29
BS_SW_0713_b	1	RH	12/08/2018	10:58	150	3112.35	1551.42	49.8	1	C	75
BS_SW_0730_b	1	RH	12/08/2018	15:08	45	1311.29	857.76	65.4	1	B	29
BS_SW_0735	8	RH	13/08/2018	18:08	135	3538.84	3538.84	100.0	2	B	270
BS_SW_0737_a	8	RH	13/08/2018	18:13	30	1134.42	1134.42	100.0	1	B	30
BS_SW_0739_b	8	RH	13/08/2018	18:24	30	1216.01	1216.01	100.0	1	B	30
BS_SW_0739_c	8	RH	13/08/2018	18:24	45	659.09	659.09	100.0	1	C	45
BS_SW_0741_a	8	RH	13/08/2018	18:53	45	1001.04	1001.04	100.0	1	B	45
BS_SW_0743	8	RH	13/08/2018	20:00	75	1866.04	1866.04	100.0	1	B	75
BS_SW_0746	8	RH	13/08/2018	20:20	90	2697.43	2387.32	88.5	1	B	80
BS_SW_0748_a	8	RH	13/08/2018	20:30	75	1508.93	1508.93	100.0	1	B	75
BS_SW_0749	8	RH	13/08/2018	20:34	45	1401.06	1401.06	100.0	2	B	90
BS_SW_0750_a	4	RH	13/08/2018	13:57	90	4025.70	4025.70	100.0	2	B	180
BS_SW_0750_b	4	RH	13/08/2018	13:57	45	941.92	941.92	100.0	2	C	90
BS_SW_0751	4	RH	13/08/2018	14:02	45	2185.08	2185.08	100.0	2	B	90
BS_SW_0754_b	4	RH	13/08/2018	14:12	165	7933.19	7657.38	96.5	1	B	159

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0756	4	RH	13/08/2018	14:26	30	1431.41	1431.41	100.0	2	B	60
BS_SW_0758	4	RH	13/08/2018	14:32	255	13959.44	13959.44	100.0	2	C	510
BS_SW_0766	4	RH	13/08/2018	15:54	60	2035.63	1767.49	86.8	1	B	52
BS_SW_0768	4	RH	13/08/2018	16:18	75	2553.56	2553.56	100.0	1	B	75
BS_SW_0770	4	RH	13/08/2018	16:30	135	2573.58	2117.98	82.3	1	B	111
BS_SW_0775	4	RH	14/08/2018	10:39	30	1268.09	1268.09	100.0	2	B	60
BS_SW_0776	4	RH	14/08/2018	10:40	30	1981.20	1981.20	100.0	2	B	60
BS_SW_0784	4	RH	14/08/2018	11:43	75	2577.64	1753.30	68.0	1	B	51
BS_SW_0792_a	4	RH	14/08/2018	12:16	30	681.38	681.38	100.0	2	B	60
BS_SW_0792_b	4	RH	14/08/2018	12:16	45	1017.51	1017.51	100.0	2	C	90
BS_SW_0794_a	4	RH	14/08/2018	12:27	60	1308.48	1113.65	85.1	1	C	51
BS_SW_0794_b	4	RH	14/08/2018	12:27	60	951.71	951.71	100.0	1	B	60
BS_SW_0797_a	4	RH	14/08/2018	12:55	45	990.64	990.64	100.0	1	C	45
BS_SW_0797_b	4	RH	14/08/2018	12:55	30	838.87	838.87	100.0	1	B	30
BS_SW_0803_a	8	RH	15/08/2018	11:34	30	528.14	528.14	100.0	1	B	30
BS_SW_0807_a	8	RH	15/08/2018	12:07	45	1122.97	1122.97	100.0	1	B	45

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0816_a	1	RH	17/08/2018	19:14	30	610.17	610.17	100.0	1	B	30
BS_SW_0816_b	1	RH	17/08/2018	19:14	120	2493.36	1059.75	42.5	1	C	51
BS_SW_0824_b	3	RH	17/08/2018	10:10	75	931.05	931.05	100.0	1	C	75
BS_SW_0824_c	3	RH	17/08/2018	10:10	15	261.21	261.21	100.0	1	B	15
BS_SW_0836	2	RH	23/08/2018	08:32	120	5395.24	2429.06	45.0	1	B	54
BS_SW_0837_b	2	RH	23/08/2018	08:55	75	2138.28	2138.28	100.0	2	B	150
BS_SW_0839	3	RH	24/08/2018	10:30	90	4268.49	4268.49	100.0	1	B	90
BS_SW_0843	3	RH	24/08/2018	11:34	165	5338.53	5338.53	100.0	2	C	330
BS_SW_0851	4	RH	25/08/2018	19:25	135	6580.92	6580.92	100.0	1	B	135
BS_SW_0852	4	RH	25/08/2018	19:25	135	6509.77	6509.77	100.0	1	B	135

**Table B.13 White-tailed Eagle Non-breeding (September 2017-January 2018)**

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
SW_043_a	4	WE	11/10/2017	12:19	210	1813.80	1446.65	79.76	1	C	167
SW_043_b	4	WE	11/10/2017	12:19	75	1204.03	1204.03	100.00	1	B	75
SW_043_c	4	WE	11/10/2017	12:19	90	1220.79	610.59	50.02	1	C	45

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
SW_016	8	WE	02/11/2017	10:04	30	526.79	526.79	100.00	1	B	30
SW_020	8	WE	02/11/2017	11:32	36	557.63	334.13	59.92	1	B	22
SW_069	5	WE	12/11/2017	14:13	225	3335.32	3335.32	100.00	1	C	225
SW_027_a	5	WE	14/11/2017	08:45	15	299.82	299.82	100.00	1	B	15
SW_030_a	8	WE	14/11/2017	15:05	10	96.31	96.31	100.00	1	B	10
SW_030_b	8	WE	14/11/2017	15:05	55	625.18	625.18	100.00	1	C	55
SW_030_c	8	WE	14/11/2017	15:05	60	804.11	804.11	100.00	1	B	60
SW_032	4	WE	16/11/2017	09:50	40	916.15	167.42	18.27	1	C	7
SW_088	7	WE	21/12/2017	12:00	105	2000.31	1081.74	54.08	1	B	57
SW_110	8	WE	16/01/2018	09:52	53	857.07	857.07	100.00	1	B	53
SW_114	8	WE	16/01/2018	13:12	133	2161.20	2161.20	100.00	1	B	133
SW_125	5	WE	25/01/2018	14:11	75	1966.63	1966.63	100.00	1	C	75

**Table B.14 White-tailed Eagle Breeding (February-August 2018)**

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
<b>SW_129</b>	6	WE	12/02/2018	11:08	30	804.05	804.05	100.00	3	B	90
<b>SW_143</b>	8	WE	16/02/2018	09:22	30	286.21	286.21	100.00	1	B	30
<b>SW_177</b>	8	WE	19/02/2018	15:09	120	2049.66	2049.66	100.00	1	B	120
<b>SW_156_b</b>	2	WE	13/03/2018	14:45	60	1594.22	1594.22	100.00	1	B	60
<b>SW_156_c</b>	2	WE	13/03/2018	14:45	60	387.35	387.35	100.00	1	C	60
<b>BS_SW_0352_b</b>	7	WE	16/06/2018	11:23	120	1541.09	1541.09	100.0	1	B	120
<b>BS_SW_0429_a</b>	5	WE	09/07/2018	13:47	90	1444.29	1444.29	100.0	1	B	90
<b>BS_SW_0429_c</b>	5	WE	09/07/2018	13:47	120	1877.32	1877.32	100.0	1	B	120
<b>BS_SW_0429_d</b>	5	WE	09/07/2018	13:47	120	2006.47	2006.47	100.0	1	C	120
<b>BS_SW_0548_a</b>	5	WE	26/07/2018	09:18	90	977.98	977.98	100.0	1	B	90
<b>BS_SW_0646_a</b>	1	WE	31/07/2018	09:07	60	702.47	702.47	100.0	2	B	120
<b>BS_SW_0660_a</b>	3	WE	01/08/2018	09:50	45	745.58	745.58	100.0	1	B	45
<b>BS_SW_0691_a</b>	3	WE	10/08/2018	15:30	420	5961.41	996.69	16.7	1	B	70
<b>BS_SW_0691_b</b>	3	WE	10/08/2018	15:30	180	2103.83	2103.83	100.0	1	C	180
<b>BS_SW_0699_a</b>	3	WE	10/08/2018	17:13	105	1373.07	1373.07	100.0	1	B	105
<b>BS_SW_0765_a</b>	4	WE	13/08/2018	15:30	60	854.13	854.13	100.0	1	B	60

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
BS_SW_0767_a	4	WE	13/08/2018	16:01	45	556.75	556.75	100.0	1	B	45
BS_SW_0767_b	4	WE	13/08/2018	16:01	45	779.90	779.90	100.0	1	C	45
BS_SW_0767_c	4	WE	13/08/2018	16:01	45	543.35	543.35	100.0	1	B	45
BS_SW_0767_d	4	WE	13/08/2018	16:01	60	1388.40	1388.40	100.0	1	C	60

**Table B.15 Whooper Swan Non-breeding (September 2017-March 2018)**

Flight_Ref	VP	Species	Date	Time	Seconds in height Band	Original Length (m)	Clipped Length (m)	Clip Length %	Count	Height Band	Total Flight Time (Seconds)
SW_051	2	WS	16/10/2017	13:56	90	1749.38	603.79	34.51	2	B	62
SW_053	7	WS	16/10/2017	17:11	120	2308.25	6.87	0.30	4	C	1
SW_055	4	WS	20/10/2017	16:36	120	1497.08	1497.08	100.00	3	C	360
SW_057	1	WS	21/10/2017	09:21	120	2244.20	1960.31	87.35	4	C	419
SW_065	3	WS	26/10/2017	16:10	165	2323.25	2323.25	100.00	7	C	1155
SW_002	5	WS	30/10/2017	11:28	15	499.51	499.51	100.00	12	C	180
SW_015	8	WS	02/11/2017	08:48	180	2639.13	2639.13	100.00	6	B	1080
SW_024	3	WS	03/11/2017	11:29	46	1051.98	1051.98	100.00	6	C	276
SW_175	7	WS	22/02/2018	16:21	45	2039.32	1736.92	85.17	4	B	153



## Annex C

# CRM Calculations



**Table C.1a. Stage 1: Black-throated Diver Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Black-throated diver</b>								
<b>Season: Breeding season 2018 (April - August)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.66					
Number turbines	35	wingspan (m)	1.2					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	19.3					
Max chord (m)	4.2	Number daylight hours available	2816.94					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99.5%	0.005							
Rotor radius <sup>2</sup>	5625.00	<b>Survey Data</b>						
Combined rotor swept area	618500.93	VP	1	2	3	4	5	6
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000	FRA (ha)	433.00	348.00	556	548	482	208
Rotor swept volume 'Vr' (m <sup>3</sup> )	3,005,914	Observation Time (hours)	45	45	45	45	45	45
		Time at height band A	0	0	30	0	15	25
		Time at height band B	0	0	120	0	135	10
		Time at height band C	26	0	90	0	0	0
		Time at height band D	0	0	0	0	0	0
		Total Time at PCH	26	0	210	0	135	10
							61	952
<b>Flight activity per unit time and area</b>								
		1	2	3	4	5	6	7
Observation effort	Obsevation time (seconds) * hectare	70146000	56376000	90072000	88776000	78084000	33696000	33048000
Flying time at risk height	Effort at each VP / FRA	3.71E-07	0.00E+00	2.33E-06	0.00E+00	1.73E-06	2.97E-07	1.85E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.29E-01	1.04E-01	1.66E-01	1.63E-01	1.43E-01	6.19E-02	6.07E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	4.78E-08	0.00E+00	3.86E-07	0.00E+00	2.48E-07	1.84E-08	1.12E-07
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000002562						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	12.27						
FRAw	Estimated bird time*(rotor diameter/recording height band)	10.22						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	43.38						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.25						
Number of transits 'ntr'	'n'/'t'	172.28						
<b>Stage 2</b>								
Probability of collision (Band model)		0.057						
<b>Calculation of number collisions</b>							<b>No avoidance</b>	<b>Avoidance 99.5%</b>
Collisions per year							8.37	0.042
Equivalent to 1 bird every x (years)							0.12	23.9
Over 25 years							209.3	1.05

**Table C.1b. Stage 2: Black-throated Diver Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution from radius r	collide	contribution from radius r
Pitch (degrees)	12	radius	chord	alpha		p(collision)			p(collision)	
BirdLength	0.66	m	0.025	0.575	7.70	27.93	0.92	0.00115	26.93	0.89
Wingspan	1.2	m	0.075	0.575	2.57	9.64	0.32	0.00239	8.64	0.29
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.54	6.90	0.23	0.00285	5.67	0.19
			0.175	0.860	1.10	5.96	0.20	0.00345	4.46	0.15
Bird speed	19.3	m/sec	0.225	0.994	0.86	5.39	0.18	0.00401	3.65	0.12
RotorDiam	150	m	0.275	0.947	0.70	4.39	0.15	0.00399	2.74	0.09
RotationPeriod	4.70	sec	0.325	0.899	0.59	3.68	0.12	0.00396	2.11	0.07
			0.375	0.851	0.51	3.20	0.11	0.00397	1.71	0.06
			0.425	0.804	0.45	2.86	0.09	0.00402	1.45	0.05
			0.475	0.756	0.41	2.58	0.09	0.00405	1.26	0.04
Bird aspect ratioo: β	0.55		0.525	0.708	0.37	2.35	0.08	0.00407	1.11	0.04
			0.575	0.660	0.33	2.15	0.07	0.00408	0.99	0.03
			0.625	0.613	0.31	1.97	0.07	0.00407	0.90	0.03
			0.675	0.565	0.29	1.82	0.06	0.00405	0.83	0.03
			0.725	0.517	0.27	1.68	0.06	0.00402	0.77	0.03
			0.775	0.470	0.25	1.55	0.05	0.00397	0.73	0.02
			0.825	0.422	0.23	1.43	0.05	0.00391	0.70	0.02
			0.875	0.374	0.22	1.33	0.04	0.00383	0.67	0.02
			0.925	0.327	0.21	1.22	0.04	0.00375	0.67	0.02
			0.975	0.279	0.20	1.13	0.04	0.00364	0.68	0.02
Overall p(collision) =						Upwind	7.3%		Downwind	4.1%
						Average	5.7%			



**Table C.2a. Stage 1: Common Tern Breeding**

<b>Band Model - Regular Flights (All flights that clipped risk window from all VP and FW effort)</b>		
<b>Species: Common tern</b>		
<b>Season: Breeding season 2018 (April - August)</b>		
<b>Bird Parameters</b>		
length (m)		0.34
wingspan (m)		0.8
flapping (0) or gliding (1)		0
Assumed flight speed (m/s)		10.9
Available hours active		2816.94
Survey effort (hours)		360
No birds observed in risk window		66
Avoidance Rate 98%		0.02
<b>Wind Farm Parameters</b>		
Max height of turbines (m)		180
Number turbines		12
Rotor diameter (m)		150
Hub height (m)		105
Max chord (m)		4.2
Pitch (degrees)		12
Rotation period (secs)		4.7
Turbine operation time 85%		0.85
Risk window width (m)		3502
<b>Calculations</b>		
Risk window area (m <sup>2</sup> )		630360
Area occupied by rotors		212058
Rotor area as a proportion of risk window area		0.336
No of birds per hour of observation		0.183
Potential number birds crossing windfarm area		516
Number birds through rotors		173.73
Stage 2 Probability of collision		0.059
<b>Calculation of number collisions</b>		<b>No avoidance</b>
Collisions per year		8.71
Years per collision		0.115
Over 25 years		217.64
		<b>Avoidance 99.5%</b>
		0.174
		5.74
		4.35



**Table C.2b. Stage 2: Common Tern Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	length
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	contribution	length	p(collision)
BirdLength	0.34	m	0.025	0.575	4.35	14.25	0.83	0.00104	13.25	0.78
Wingspan	0.8	m	0.075	0.575	1.45	5.09	0.30	0.00223	4.08	0.24
F: Flapping (0) or gliding (+1)	0		0.125	0.702	0.87	3.81	0.22	0.00279	2.59	0.15
			0.175	0.860	0.62	3.44	0.20	0.00353	1.94	0.11
Bird speed	10.9	m/sec	0.225	0.994	0.48	3.23	0.19	0.00425	1.49	0.09
RotorDiam	150	m	0.275	0.947	0.40	2.70	0.16	0.00435	1.05	0.06
RotationPeriod	4.70	sec	0.325	0.899	0.33	2.36	0.14	0.00449	0.79	0.05
			0.375	0.851	0.29	2.10	0.12	0.00461	0.61	0.04
			0.425	0.804	0.26	1.89	0.11	0.00469	0.48	0.03
			0.475	0.756	0.23	1.71	0.10	0.00476	0.39	0.02
Bird aspect ratioo: β	0.43		0.525	0.708	0.21	1.56	0.09	0.00480	0.36	0.02
			0.575	0.660	0.19	1.43	0.08	0.00481	0.40	0.02
			0.625	0.613	0.17	1.31	0.08	0.00481	0.44	0.03
			0.675	0.565	0.16	1.21	0.07	0.00477	0.46	0.03
			0.725	0.517	0.15	1.11	0.07	0.00471	0.47	0.03
			0.775	0.470	0.14	1.02	0.06	0.00463	0.48	0.03
			0.825	0.422	0.13	0.94	0.05	0.00453	0.48	0.03
			0.875	0.374	0.12	0.86	0.05	0.00440	0.48	0.03
			0.925	0.327	0.12	0.78	0.05	0.00424	0.47	0.03
			0.975	0.279	0.11	0.71	0.04	0.00406	0.46	0.03
Overall p(collision) =					Upw ind	8.3%	Down nw ind		3.5%	
					Average	5.9%				

**Table C.3a. Stage 1: Golden Eagle Non-breeding**

<b>Band Model - Random flights</b>								
<b>Species: Golden eagle</b>								
<b>Season: Non-breeding season (September 2017 - January 2018)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.82					
Number turbines	35	wingspan (m)	2.03					
Rotor diameter	150	flapping (0) or gliding (1)	1					
Hub height (m)	105	Assumed flight speed (m/s)	11.9					
Max chord (m)	4.2	Number daylight hours available	1990.15					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99%	0.01							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,104,875							
		<b>Survey Data</b>						
		VP	1	2	3	4	5	6
		FRA (ha)	433.00	348.00	556	548	482	208
		Observation Time (hours)	33	33	33	36	36	33
		Time at height band A	0	30	30	0	0	30
		Time at height band B	0	398	90	0	96	0
		Time at height band C	375	0	0	0	0	0
		Time at height band D	0	0	0	0	0	0
		Total Time at PCH	375	398	90	0	96	0
<b>Flight activity per unit time and area</b>		1	2	3	4	5	6	7
Observation effort	Obsevation time (seconds) * hectare	51440400	41342400	66052800	71020800	62467200	24710400	26438400
Flying time at risk height	Effort at each VP / FRA	7.29E-06	9.63E-06	1.36E-06	0.00E+00	1.54E-06	0.00E+00	0.00E+00
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.23E-01	9.88E-02	1.58E-01	1.70E-01	1.49E-01	5.90E-02	6.32E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	8.96E-07	9.51E-07	2.15E-07	0.00E+00	2.29E-07	0.00E+00	0.00E+00
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000002291						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	7.75						
FRAw	Estimated bird time*(rotor diameter/recording height band)	6.46						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	28.31						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.42						
Number of transits 'ntr'	'n'/'t'	67.11						
E								
Probability of collision (Band model)		0.081						
<b>Calculation of number collisions</b>								
<b>No avoidance</b>			<b>Avoidance 99%</b>					
Collisions per year			4.63					0.046
Equivalent to 1 bird every x (years)			0.22					21.6
Over 25 years			115.7					1.16

**Table C.3b. Stage 1: Golden Eagle Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Golden eagle</b>								
<b>Season: Breeding season 2018 (February - August)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.82					
Number turbines	35	wingspan (m)	2.03					
Rotor diameter	150	flapping (0) or gliding (1)	1					
Hub height (m)	105	Assumed flight speed (m/s)	11.9					
Max chord (m)	4.2	Number daylight hours available	3565.18					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99%	0.01							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,104,875							
<b>Survey Data</b>								
	VP	1	2	3	4	5	6	7
FRA (ha)		433.00	348.00	556	548	482	208	204
Observation Time (hours)		66	66	66	63	63	66	63
Time at height band A		60	222	0	0	48	0	90
Time at height band B		253	240	210	0	43	66	180
Time at height band C		120	61	294	0	0	0	434
Time at height band D		0	239	250	0	0	0	300
Total Time at PCH		373	301	504	0	43	66	180
								989
<b>Flight activity per unit time and area</b>								
		1	2	3	4	5	6	7
Observation effort	Obsevation time (seconds) * hectare	102880800	82684800	132105600	124286400	109317600	49420800	46267200
Flying time at risk height	Effort at each VP / FRA	3.63E-06	3.64E-06	3.82E-06	0.00E+00	3.93E-07	1.34E-06	3.89E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.32E-01	1.06E-01	1.70E-01	1.60E-01	1.40E-01	6.35E-02	5.94E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	4.79E-07	3.87E-07	6.47E-07	0.00E+00	5.52E-08	8.48E-08	2.31E-07
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000003155						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	19.12						
FRAw	Estimated bird time*(rotor diameter/recording height band)	15.93						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	69.84						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.42						
Number of transits 'ntr'	'n'/'t'	165.56						
E								
Probability of collision (Band model)		0.081						
<b>Calculation of number collisions</b>				<b>No avoidance</b>		<b>Avoidance 99%</b>		
Collisions per year						11.42		0.114
Equivalent to 1 bird every x (years)						0.09		8.8
Over 25 years						285.5		2.85

**Table C.3c. Stage 2: Golden Eagle Non-breeding & Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	$\alpha$	collide	length	contribution from radius r	collide	length
Pitch (degrees)	12	radius	chord	alpha		p(collision)			p(collision)	from radius r
BirdLength	0.82	m	0.025	0.575	4.75	17.85	0.96	0.00120	16.85	0.90
Wingspan	2.03	m	0.075	0.575	1.58	6.29	0.34	0.00253	5.28	0.28
F: Flapping (0) or gliding (+1)	1		0.125	0.702	0.95	4.58	0.25	0.00307	3.35	0.18
			0.175	0.860	0.68	4.02	0.22	0.00378	2.52	0.14
Bird speed	11.9	m/sec	0.225	0.994	0.53	3.70	0.20	0.00447	1.97	0.11
RotorDiam	150	m	0.275	0.947	0.43	3.06	0.16	0.00452	1.41	0.08
RotationPeriod	4.70	sec	0.325	0.899	0.37	2.95	0.16	0.00515	1.38	0.07
			0.375	0.851	0.32	2.67	0.14	0.00537	1.18	0.06
			0.425	0.804	0.28	2.44	0.13	0.00557	1.04	0.06
			0.475	0.756	0.25	2.26	0.12	0.00575	0.94	0.05
Bird aspect ratioo: $\beta$	0.40		0.525	0.708	0.23	2.10	0.11	0.00590	0.86	0.05
			0.575	0.660	0.21	1.96	0.10	0.00604	0.84	0.04
			0.625	0.613	0.19	1.83	0.10	0.00615	0.88	0.05
			0.675	0.565	0.18	1.72	0.09	0.00623	0.91	0.05
			0.725	0.517	0.16	1.62	0.09	0.00630	0.92	0.05
			0.775	0.470	0.15	1.53	0.08	0.00634	0.93	0.05
			0.825	0.422	0.14	1.44	0.08	0.00636	0.94	0.05
			0.875	0.374	0.14	1.36	0.07	0.00636	0.94	0.05
			0.925	0.327	0.13	1.28	0.07	0.00634	0.93	0.05
			0.975	0.279	0.12	1.20	0.06	0.00629	0.92	0.05
Overall p(collision) =						Upwind	10.4%	Dow nw ind	5.9%	
						Average	8.1%			

**Table C4.a. Stage 1: Golden Plover Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Golden plover</b>								
<b>Season: Breeding season 2018 (March - July)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.28					
Number turbines	35	wingspan (m)	0.72					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	13.7					
Max chord (m)	4.2	Number daylight hours available	2950.66					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 98%	0.02							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	2,770,884							
<b>Survey Data</b>								
	VP	1	2	3	4	5	6	7
FRA (ha)		433.00	348.00	556	548	482	208	204
Observation Time (hours)		45	45	42	45	45	45	45
Time at height band A		122	90				60	
Time at height band B		72	101					120
Time at height band C			90					
Time at height band D								
Total Time at PCH		72	191	0	0	0	0	120
<b>Flight activity per unit time and area</b>								
		1	2	3	4	5	6	7
Observation effort	Observeation time (seconds) * hectare	70146000	56376000	84067200	88776000	78084000	33696000	33048000
Flying time at risk height	Effort at each VP / FRA	1.03E-06	3.39E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.30E-01	1.05E-01	1.56E-01	1.65E-01	1.45E-01	6.26E-02	6.14E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	1.34E-07	3.55E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000000712						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	3.57						
FRAw	Estimated bird time*(rotor diameter/recording height band)	2.97						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	11.64						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.33						
Number of transits 'ntr'	'n'/'t'	35.59						
E								
Probability of collision (Band model)		0.049						
<b>Calculation of number collisions</b>					<b>No avoidance</b>		<b>Avoidance 98%</b>	
Collisions per year					1.49		0.030	
Equivalent to 1 bird every x (years)					0.67		33.5	
Over 25 years					37.3		0.75	

**Table C4b. Stage 2: Golden Plover**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	length
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	contribution	from radius r	p(collision)
BirdLength	0.28	m	0.025	0.575	5.47	17.35	0.81	0.00101	16.34	0.76
Wingspan	0.72	m	0.075	0.575	1.82	6.12	0.29	0.00214	5.11	0.24
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.09	4.55	0.21	0.00265	3.32	0.15
			0.175	0.860	0.78	4.07	0.19	0.00332	2.57	0.12
Bird speed	13.7	m/sec	0.225	0.994	0.61	3.79	0.18	0.00397	2.05	0.10
RotorDiam	150	m	0.275	0.947	0.50	3.12	0.15	0.00399	1.46	0.07
RotationPeriod	4.70	sec	0.325	0.899	0.42	2.64	0.12	0.00400	1.07	0.05
			0.375	0.851	0.36	2.30	0.11	0.00401	0.81	0.04
			0.425	0.804	0.32	2.04	0.10	0.00405	0.64	0.03
			0.475	0.756	0.29	1.83	0.09	0.00406	0.51	0.02
Bird aspect ratioo: β	0.39		0.525	0.708	0.26	1.66	0.08	0.00405	0.42	0.02
			0.575	0.660	0.24	1.50	0.07	0.00402	0.35	0.02
			0.625	0.613	0.22	1.37	0.06	0.00398	0.30	0.01
			0.675	0.565	0.20	1.24	0.06	0.00391	0.30	0.01
			0.725	0.517	0.19	1.13	0.05	0.00382	0.33	0.02
			0.775	0.470	0.18	1.03	0.05	0.00372	0.35	0.02
			0.825	0.422	0.17	0.94	0.04	0.00360	0.36	0.02
			0.875	0.374	0.16	0.85	0.04	0.00345	0.37	0.02
			0.925	0.327	0.15	0.76	0.04	0.00329	0.37	0.02
			0.975	0.279	0.14	0.68	0.03	0.00311	0.36	0.02
			Overall p(collision) =			Upwind	7.0%	Downwind	2.9%	
						Average	4.9%			

**Table C.5a. Stage 1: Great Skua Breeding**

Band Model - Random flights								
Species: Great skua								
Season: Breeding season 2018 (April - August)								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.56					
Number turbines	35	wingspan (m)	1.36					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	14.9					
Max chord (m)	4.2	Number daylight hours available	2816.94					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99.5%	0.005							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	2,944,064							
<b>Survey Data</b>								
VP								
FRA (ha)	433.00	1	2	3	4	5	6	7
Observation Time (hours)	45	45	45	45	45	45	45	45
Time at height band A	305	66	5875	2565	540	0	150	1410
Time at height band B	501	384	3525	4845	1425	0	302	1200
Time at height band C	175	664	660	810	345	0	0	90
Time at height band D	0	642	210	2325	0	0	0	105
Total Time at PCH	676	1048	4185	5655	1770	0	302	1290
<b>Flight activity per unit time and area</b>								
1								
Observation effort	Obsevation time (seconds) * hectare	70146000	56376000	90072000	88776000	78084000	33696000	33048000
Flying time at risk height	Effort at each VP / FRA	9.64E-06	1.86E-05	4.65E-05	6.37E-05	2.27E-05	0.00E+00	9.14E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.29E-01	1.04E-01	1.66E-01	1.63E-01	1.43E-01	6.19E-02	6.07E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	1.24E-06	1.93E-06	7.69E-06	1.04E-05	3.25E-06	0.00E+00	5.55E-07
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000027430						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	131.35						
FRAw	Estimated bird time*(rotor diameter/recording height band)	109.46						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	454.96						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.32						
Number of transits 'ntr'	'n'/'t'	1424.14						
<b>Stage 2</b>								
Probability of collision (Band model)		0.061						
<b>Calculation of number collisions</b>							<b>No avoidance</b>	<b>Avoidance 99.5%</b>
Collisions per year							73.66	0.368
Equivalent to 1 bird every x (years)							0.01	2.7
Over 25 years							1841.5	9.21

**Table C.5b. Stage 2: Great Skua Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA											
Only enter input parameters in green cells											
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius									
NoBlades	3	Upw ind:									
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	contribution	
Pitch (degrees)	12	radius	chord	alpha		p(collision)	from radius r	length	p(collision)	from radius r	
BirdLength	0.56	m	0.025	0.575	5.94	22.63	0.97	0.00121	21.62	0.93	0.00116
Wingspan	1.36	m	0.075	0.575	1.98	7.88	0.34	0.00253	6.87	0.29	0.00221
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.19	5.66	0.24	0.00303	4.43	0.19	0.00237
			0.175	0.860	0.85	4.91	0.21	0.00368	3.40	0.15	0.00255
Bird speed	14.9	m/sec	0.225	0.994	0.66	4.46	0.19	0.00430	2.73	0.12	0.00263
RotorDiam	150	m	0.275	0.947	0.54	3.66	0.16	0.00432	2.01	0.09	0.00237
RotationPeriod	4.70	sec	0.325	0.899	0.46	3.10	0.13	0.00431	1.53	0.07	0.00212
			0.375	0.851	0.40	2.69	0.12	0.00432	1.20	0.05	0.00193
			0.425	0.804	0.35	2.42	0.10	0.00440	1.01	0.04	0.00184
			0.475	0.756	0.31	2.19	0.09	0.00446	0.87	0.04	0.00177
Bird aspect ratioo: β	0.41		0.525	0.708	0.28	2.00	0.09	0.00450	0.77	0.03	0.00172
			0.575	0.660	0.26	1.84	0.08	0.00453	0.68	0.03	0.00169
			0.625	0.613	0.24	1.69	0.07	0.00453	0.62	0.03	0.00167
			0.675	0.565	0.22	1.56	0.07	0.00452	0.58	0.02	0.00167
			0.725	0.517	0.20	1.45	0.06	0.00450	0.58	0.02	0.00179
			0.775	0.470	0.19	1.34	0.06	0.00445	0.60	0.03	0.00199
			0.825	0.422	0.18	1.24	0.05	0.00438	0.62	0.03	0.00218
			0.875	0.374	0.17	1.15	0.05	0.00430	0.63	0.03	0.00235
			0.925	0.327	0.16	1.06	0.05	0.00420	0.63	0.03	0.00249
			0.975	0.279	0.15	0.98	0.04	0.00409	0.63	0.03	0.00263
			Overall p(collision) =			Upwind	8.1%		Downwind	4.1%	
						Average	6.1%				

**Table C.6a. Stage 1: Greenshank Breeding**

<b>Band Model - Random flights</b>															
<b>Species: Greenshank</b>															
<b>Season: Breeding season 2018 (March - July)</b>															
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>													
WFP (ha)	1700	length (m)	0.32												
Number turbines	35	wingspan (m)	0.69												
Rotor diameter	150	flapping (0) or gliding (1)	0												
Hub height (m)	105	Assumed flight speed (m/s)	12.3												
Max chord (m)	4.2	Number daylight hours available	2950.66												
Rotor depth	4.2	Maximum recording height (m)	200												
Pitch (degrees)	12	Minimum recording height (m)	20												
Rotation period (secs)	4.7														
Turbine operation time 85%	0.85														
Avoidance Rate 98%	0.02														
Rotor radius <sup>2</sup>	5625.00														
Combined rotor swept area	618500.93														
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000														
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	2,795,624														
<b>Survey Data</b>															
		VP	1	2	3	4	5	6							
FRA (ha)		433.00	348.00	556	548	482	208	204							
Observation Time (hours)		45	45	42	45	45	45	45							
Time at height band A		0	0	0	0	30	0	0							
Time at height band B		47	90	0	0	255	0	0							
Time at height band C		0	72	0	0	0	0	0							
Time at height band D		0	0	0	0	0	0	0							
Total Time at PCH		47	162	0	0	255	0	0							
								45							
<b>Flight activity per unit time and area</b>															
		1	2	3	4	5	6	7							
Observation effort		70146000	56376000	84067200	88776000	78084000	33696000	33048000							
Flying time at risk height		6.70E-07	2.87E-06	0.00E+00	0.00E+00	3.27E-06	0.00E+00	0.00E+00							
<b>Weighted by observation effort</b>															
Weighted obs effort		Effort at each VP / sum of all effort at all VP's	1.30E-01	1.05E-01	1.56E-01	1.65E-01	1.45E-01	6.26E-02							
Adjusted time at risk height		Weighted obs effort * flying time at risk height	8.73E-08	3.01E-07	0.00E+00	0.00E+00	4.74E-07	0.00E+00							
<b>Occupancy Rate</b>															
Summed Occupancy rate		Sum of weighted average flight activity per visible ha	0.000000946												
Estimated bird time 'b' in risk area		Summed Occupancy rate*windfarm polygon*hours active	4.74												
FRAw		Estimated bird time*(rotor diameter/recording height band)	3.95												
<b>Rotor Transits</b>															
Bird occupancy of rotor swept volume ('b')		Estimated bird time * (rotor swept volume / collision risk volume)*	15.60												
Bird transit time (t)		(rotor depth+bird length)/flight speed(m/s)	0.37												
Number of transits 'ntr'		'n'/'t'	42.46												
<b>E</b>															
Probability of collision (Band model)			0.054												
<b>Calculation of number collisions</b>															
		<b>No avoidance</b>		<b>Avoidance 98%</b>											
Collisions per year				1.94											
Equivalent to 1 bird every x (years)				0.52											
Over 25 years				48.4											
0.039															
25.8															
0.97															

**Table C.6b. Stage 2: Greenshank Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	length
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	contribution	length	p(collision)
BirdLength	0.32	m	0.025	0.575	4.91	15.48	0.80	0.00100	14.48	0.75
Wingspan	0.69	m	0.075	0.575	1.64	5.49	0.29	0.00214	4.49	0.23
F: Flapping (0) or gliding (+1)	0		0.125	0.702	0.98	4.12	0.21	0.00267	2.89	0.15
			0.175	0.860	0.70	3.71	0.19	0.00337	2.21	0.11
Bird speed	12.3	m/sec	0.225	0.994	0.55	3.47	0.18	0.00405	1.74	0.09
RotorDiam	150	m	0.275	0.947	0.45	2.88	0.15	0.00411	1.23	0.06
RotationPeriod	4.70	sec	0.325	0.899	0.38	2.50	0.13	0.00421	0.93	0.05
			0.375	0.851	0.33	2.21	0.11	0.00430	0.72	0.04
			0.425	0.804	0.29	1.97	0.10	0.00435	0.57	0.03
			0.475	0.756	0.26	1.78	0.09	0.00439	0.46	0.02
Bird aspect ratioo: β	0.46		0.525	0.708	0.23	1.62	0.08	0.00441	0.38	0.02
			0.575	0.660	0.21	1.48	0.08	0.00440	0.32	0.02
			0.625	0.613	0.20	1.35	0.07	0.00438	0.36	0.02
			0.675	0.565	0.18	1.24	0.06	0.00433	0.39	0.02
			0.725	0.517	0.17	1.13	0.06	0.00426	0.41	0.02
			0.775	0.470	0.16	1.04	0.05	0.00416	0.42	0.02
			0.825	0.422	0.15	0.95	0.05	0.00405	0.43	0.02
			0.875	0.374	0.14	0.86	0.04	0.00392	0.43	0.02
			0.925	0.327	0.13	0.78	0.04	0.00376	0.43	0.02
			0.975	0.279	0.13	0.71	0.04	0.00358	0.42	0.02
			Overall p(collision) =			Upwind	7.6%	Downwind	3.1%	
						Average	5.4%			

**Table C.7a. Stage 1: Greylag Goose Non-breeding**

<b>Band Model - Regular Flights (All flights that clipped risk window from all VP and FW effort)</b>		
<b>Species: Greylag goose</b>		
<b>Season: Non breeding season 2018 (September 2017 - March 2018)</b>		
<b>Bird Parameters</b>		
length (m)	0.82	
wingspan (m)	1.64	
flapping (0 )or gliding (1)	0	
Assumed flight speed (m/s)	17	
Available hours active	3086.73	
Survey effort (hours)	432	
No birds observed in risk window	192	
Avoidance Rate 99.8%	0.002	
<b>Wind Farm Parameters</b>		
Max height of turbines (m)	180	
Number turbines	8	
Rotor diameter (m)	150	
Hub height (m)	105	
Max chord (m)	4.2	
Pitch (degrees)	12	
Rotation period (secs)	4.7	
Turbine operation time 85%	0.85	
Risk window width (m)	2011	
<b>Calculations</b>		
Risk window area (m <sup>2</sup> )	361980	
Area occupied by rotors	141372	
Rotor area as a proportion of risk window area	0.391	
No of birds per hour of observation	0.444	
Potential number birds crossing windfarm area	1372	
Number birds through rotors	535.79	
Stage 2 Probability of collision	0.067	
<b>Calculation of number collisions</b>		<b>No avoidance</b>
Collisions per year	30.60	
Years per collision	0.033	
Over 25 years	764.99	
		<b>Avoidance 99.5%</b>
Collisions per year	0.061	
Years per collision	16.34	
Over 25 years	1.53	



**Table C.7b. Stage 1: Greylag Goose Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Greylag goose</b>								
<b>Season: Breeding season 2018 (April - August)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.82					
Number turbines	35	wingspan (m)	1.64					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	17					
Max chord (m)	4.2	Number daylight hours available	3030.69					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99.8%	0.002							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,104,875							
<b>Survey Data</b>								
	VP	1	2	3	4	5	6	7
FRA (ha)		433.00	348.00	556	548	482	208	204
Observation Time (hours)		45	45	42	45	45	45	45
Time at height band A		40	1800	0	5580	1695	0	295
Time at height band B		120	1245	0	405	60	0	0
Time at height band C		0	0	0	0	0	0	0
Time at height band D		0	0	0	0	0	0	0
Total Time at PCH		120	1245	0	405	60	0	0
<b>Flight activity per unit time and area</b>								
		1	2	3	4	5	6	7
Observation effort	Observeation time (seconds) * hectare	70146000	56376000	84067200	88776000	78084000	33696000	33048000
Flying time at risk height	Effort at each VP / FRA	1.71E-06	2.21E-05	0.00E+00	4.56E-06	7.68E-07	0.00E+00	0.00E+00
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.30E-01	1.05E-01	1.56E-01	1.65E-01	1.45E-01	6.26E-02	6.14E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	2.23E-07	2.31E-06	0.00E+00	7.53E-07	1.11E-07	0.00E+00	0.00E+00
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000003401						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	17.52						
FRAw	Estimated bird time*(rotor diameter/recording height band)	14.60						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	64.00						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.30						
Number of transits 'ntr'	'n'/'t'	216.72						
E								
Probability of collision (Band model)		0.067						
<b>Calculation of number collisions</b>								
							<b>No avoidance</b>	<b>Avoidance 99.8%</b>
Collisions per year							12.38	0.025
Equivalent to 1 bird every x (years)							0.08	40.4
Over 25 years							309.4	0.62

**Table C.7c. Stage 2: Greylag Goose Non-breeding & Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA											
Only enter input parameters in green cells											
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius									
NoBlades	3	Upw ind:									
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	contribution	
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r	
BirdLength	0.82	m	0.025	0.575	6.78	27.65	1.00	0.00125	26.64	1.00	0.00125
Wingspan	1.64	m	0.075	0.575	2.26	9.55	0.36	0.00269	8.55	0.32	0.00241
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.36	6.75	0.25	0.00317	5.52	0.21	0.00259
			0.175	0.860	0.97	5.76	0.22	0.00379	4.26	0.16	0.00280
Bird speed	17	m/sec	0.225	0.994	0.75	5.18	0.19	0.00438	3.45	0.13	0.00291
RotorDiam	150	m	0.275	0.947	0.62	4.24	0.16	0.00437	2.58	0.10	0.00267
RotationPeriod	4.70	sec	0.325	0.899	0.52	3.57	0.13	0.00435	2.00	0.07	0.00244
			0.375	0.851	0.45	3.14	0.12	0.00443	1.66	0.06	0.00233
			0.425	0.804	0.40	2.84	0.11	0.00453	1.44	0.05	0.00229
			0.475	0.756	0.36	2.59	0.10	0.00462	1.27	0.05	0.00226
Bird aspect ratioo: β	0.50		0.525	0.708	0.32	2.38	0.09	0.00469	1.14	0.04	0.00225
			0.575	0.660	0.29	2.20	0.08	0.00474	1.04	0.04	0.00225
			0.625	0.613	0.27	2.04	0.08	0.00478	0.97	0.04	0.00227
			0.675	0.565	0.25	1.90	0.07	0.00481	0.91	0.03	0.00231
			0.725	0.517	0.23	1.77	0.07	0.00482	0.87	0.03	0.00236
			0.775	0.470	0.22	1.65	0.06	0.00481	0.83	0.03	0.00242
			0.825	0.422	0.21	1.54	0.06	0.00478	0.83	0.03	0.00258
			0.875	0.374	0.19	1.44	0.05	0.00475	0.85	0.03	0.00279
			0.925	0.327	0.18	1.35	0.05	0.00469	0.86	0.03	0.00298
			0.975	0.279	0.17	1.26	0.05	0.00462	0.86	0.03	0.00316
			Overall p(collision) =			Upw ind	8.5%		Down nw ind	4.9%	
							Average	6.7%			

**Table C.8a. Stage 1: Hen Harrier Non-breeding**

<b>Band Model - Random flights</b>								
<b>Species: Hen harrier</b>								
<b>Season: Non-breeding season 2017-2018 (Sept - March)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.48					
Number turbines	35	wingspan (m)	1.1					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	9.1					
Max chord (m)	4.2	Number daylight hours available	2419.66					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99%	0.01	<b>Survey Data</b>						
Rotor radius <sup>2</sup>	5625.00	VP	1	2	3	4	5	6
Combined rotor swept area	618500.93	FRA (ha)	433.00	348.00	556	548	482	208
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000	Observation Time (hours)	54	54	54	54	54	54
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	2,894,584	Time at height band A	0	90	425	333	645	60
		Time at height band B	0	71	120	90	155	0
		Time at height band C	0	0	0	0	0	0
		Time at height band D	0	0	0	0	0	0
		Total Time at PCH	0	71	120	90	155	0
								28
								451
<b>Flight activity per unit time and area</b>		1	2	3	4	5	6	7
Observation effort	Obsevation time (seconds) * hectare	84175200	67651200	108086400	106531200	93700800	40435200	39657600
Flying time at risk height	Effort at each VP / FRA	0.00E+00	1.05E-06	1.11E-06	8.45E-07	1.65E-06	0.00E+00	7.06E-07
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.29E-01	1.04E-01	1.66E-01	1.63E-01	1.43E-01	6.19E-02	6.07E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	0.00E+00	1.09E-07	1.84E-07	1.38E-07	2.37E-07	0.00E+00	4.29E-08
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000001401						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	5.76						
FRAw	Estimated bird time*(rotor diameter/recording height band)	4.80						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume) <sup>1</sup>	19.63						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.51						
Number of transits 'ntr'	'n'/'t'	38.17						
E								
Probability of collision (Band model)		0.077						
		<b>Calculation of number collisions</b>			<b>No avoidance</b>		<b>Avoidance 99%</b>	
		Collisions per year			2.48		0.025	
		Equivalent to 1 bird every x (years)			0.40		40.3	
		Over 25 years			62.1		0.62	

**Table C.8b. Stage 2: Hen Harrier Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Hen harrier</b>								
<b>Season: Breeding season 2018 (April - August)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.48					
Number turbines	35	wingspan (m)	1.1					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	9.1					
Max chord (m)	4.2	Number daylight hours available	2816.94					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99%	0.01							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	2,894,584							
		<b>Survey Data</b>						
		VP	1	2	3	4	5	6
		FRA (ha)	433	348	556	548	482	208
		Observation Time (hours)	45	45	45	45	45	45
		Time at height band A	0	1267	3240	1065	1080	780
		Time at height band B	0	30	1940	150	420	8
		Time at height band C	0	0	300	0	195	0
		Time at height band D	0	0	0	0	0	0
		Total Time at PCH	0	30	2240	150	615	8
								45
								540
<b>Flight activity per unit time and area</b>		1	2	3	4	5	6	7
Observation effort	Observeation time (seconds) * hectare	70146000	56376000	90072000	88776000	78084000	33696000	33048000
Flying time at risk height	Effort at each VP / FRA	0.00E+00	5.32E-07	2.49E-05	1.69E-06	7.88E-06	2.37E-07	1.36E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.29E-01	1.04E-01	1.66E-01	1.63E-01	1.43E-01	6.19E-02	6.07E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	0.00E+00	5.51E-08	4.12E-06	2.76E-07	1.13E-06	1.47E-08	8.27E-08
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000006667						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	31.93						
FRAw	Estimated bird time*(rotor diameter/recording height band)	26.61						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	108.73						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.51						
Number of transits 'ntr'	'n'/'t'	211.41						
E								
Probability of collision (Band model)		0.077						
<b>Calculation of number collisions</b>					<b>No avoidance</b>	<b>Avoidance 99%</b>		
Collisions per year					13.75	0.138		
Equivalent to 1 bird every x (years)					0.07	7.3		
Over 25 years					343.8	3.44		

**Table C.8c. Stage 2: Hen Harrier Non-breeding & Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	$\alpha$	collide	length	contribution	collide	length
Pitch (degrees)	12	radius	chord	alpha		p(collision)	from radius r	contribution	p(collision)	from radius r
BirdLength	0.48	m	0.025	0.575	3.63	13.07	0.92	0.00115	12.07	0.85
Wingspan	1.1	m	0.075	0.575	1.21	4.69	0.33	0.00247	3.69	0.26
F: Flapping (0) or gliding (+1)	0		0.125	0.702	0.73	3.50	0.25	0.00307	2.28	0.16
			0.175	0.860	0.52	3.15	0.22	0.00387	1.65	0.12
Bird speed	9.1	m/sec	0.225	0.994	0.40	3.00	0.21	0.00473	1.26	0.09
RotorDiam	150	m	0.275	0.947	0.33	2.59	0.18	0.00500	0.94	0.07
RotationPeriod	4.70	sec	0.325	0.899	0.28	2.30	0.16	0.00523	0.73	0.05
			0.375	0.851	0.24	2.07	0.15	0.00544	0.58	0.04
			0.425	0.804	0.21	1.89	0.13	0.00562	0.48	0.03
			0.475	0.756	0.19	1.73	0.12	0.00578	0.55	0.04
Bird aspect ratioo: $\beta$	0.44		0.525	0.708	0.17	1.60	0.11	0.00590	0.60	0.04
			0.575	0.660	0.16	1.49	0.10	0.00599	0.63	0.04
			0.625	0.613	0.15	1.38	0.10	0.00605	0.65	0.05
			0.675	0.565	0.13	1.29	0.09	0.00609	0.66	0.05
			0.725	0.517	0.13	1.20	0.08	0.00609	0.67	0.05
			0.775	0.470	0.12	1.12	0.08	0.00607	0.66	0.05
			0.825	0.422	0.11	1.04	0.07	0.00601	0.66	0.05
			0.875	0.374	0.10	0.97	0.07	0.00593	0.65	0.05
			0.925	0.327	0.10	0.90	0.06	0.00582	0.63	0.04
			0.975	0.279	0.09	0.83	0.06	0.00568	0.62	0.04
			Overall p(collision) =			Upwind	10.2%		Downwind	5.1%
							Average	7.7%		

**Table C.9a. Stage 1: Merlin Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Merlin</b>								
<b>Season: Breeding season 2018 (April - July)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.28					
Number turbines	35	wingspan (m)	0.72					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	13.7					
Max chord (m)	4.2	Number daylight hours available	2950.66					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 98%	0.02							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	2,770,884							
<b>Survey Data</b>								
	VP	1	2	3	4	5	6	7
FRA (ha)		433.00	348.00	556	548	482	208	204
Observation Time (hours)		36	36	33	36	36	36	36
Time at height band A		15	38	15	0	240	15	0
Time at height band B		0	0	60	0	30	102	0
Time at height band C		0	0	0	0	0	0	0
Time at height band D		0	0	0	0	0	0	0
Total Time at PCH		0	0	60	0	30	102	0
								90
<b>Flight activity per unit time and area</b>								
		1	2	3	4	5	6	7
Observation effort	Observeation time (seconds) * hectare	56116800	45100800	66052800	71020800	62467200	26956800	26438400
Flying time at risk height	Effort at each VP / FRA	0.00E+00	0.00E+00	9.08E-07	0.00E+00	4.80E-07	3.78E-06	0.00E+00
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.31E-01	1.05E-01	1.54E-01	1.65E-01	1.46E-01	6.28E-02	6.16E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	0.00E+00	0.00E+00	1.40E-07	0.00E+00	6.99E-08	2.38E-07	0.00E+00
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000000657						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	3.29						
FRAw	Estimated bird time*(rotor diameter/recording height band)	2.75						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	10.74						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.33						
Number of transits 'ntr'	'n'/'t'	32.85						
E								
Probability of collision (Band model)		0.049						
<b>Calculation of number collisions</b>					<b>No avoidance</b>		<b>Avoidance 98%</b>	
Collisions per year						1.38		0.028
Equivalent to 1 bird every x (years)						0.73		36.3
Over 25 years						34.4		0.69

**Table C.9b. Stage 2: Merlin Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	length
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	contribution	length	p(collision)
BirdLength	0.28	m	0.025	0.575	5.47	17.35	0.81	0.00101	16.34	0.76
Wingspan	0.72	m	0.075	0.575	1.82	6.12	0.29	0.00214	5.11	0.24
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.09	4.55	0.21	0.00265	3.32	0.15
			0.175	0.860	0.78	4.07	0.19	0.00332	2.57	0.12
Bird speed	13.7	m/sec	0.225	0.994	0.61	3.79	0.18	0.00397	2.05	0.10
RotorDiam	150	m	0.275	0.947	0.50	3.12	0.15	0.00399	1.46	0.07
RotationPeriod	4.70	sec	0.325	0.899	0.42	2.64	0.12	0.00400	1.07	0.05
			0.375	0.851	0.36	2.30	0.11	0.00401	0.81	0.04
			0.425	0.804	0.32	2.04	0.10	0.00405	0.64	0.03
			0.475	0.756	0.29	1.83	0.09	0.00406	0.51	0.02
Bird aspect ratioo: β	0.39		0.525	0.708	0.26	1.66	0.08	0.00405	0.42	0.02
			0.575	0.660	0.24	1.50	0.07	0.00402	0.35	0.02
			0.625	0.613	0.22	1.37	0.06	0.00398	0.30	0.01
			0.675	0.565	0.20	1.24	0.06	0.00391	0.30	0.01
			0.725	0.517	0.19	1.13	0.05	0.00382	0.33	0.02
			0.775	0.470	0.18	1.03	0.05	0.00372	0.35	0.02
			0.825	0.422	0.17	0.94	0.04	0.00360	0.36	0.02
			0.875	0.374	0.16	0.85	0.04	0.00345	0.37	0.02
			0.925	0.327	0.15	0.76	0.04	0.00329	0.37	0.02
			0.975	0.279	0.14	0.68	0.03	0.00311	0.36	0.02
Overall p(collision) =					Upwind	7.0%	Downwind	2.9%		
					Average	4.9%				

**Table C.10a. Stage 1: Red-throated Diver Breeding**

<b>Band Model - Random flights</b>								
<b>Species: Red-throated diver</b>								
<b>Season: Breeding season 2018 (April - August)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.69					
Number turbines	35	wingspan (m)	1.16					
Rotor diameter	150	flapping (0) or gliding (1)	0					
Hub height (m)	105	Assumed flight speed (m/s)	17.89					
Max chord (m)	4.2	Number daylight hours available	2816.94					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 99.5%	0.005							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,024,470							
<b>Survey Data</b>								
	VP	1	2	3	4	5	6	7
FRA (ha)		433.00	348.00	556	548	482	208	204
Observation Time (hours)		45	45	45	45	45	45	45
Time at height band A		219	223	105	60	672	0	56
Time at height band B		2902	339	1245	1521	713	41	227
Time at height band C		1064	60	885	1567	430	58	52
Time at height band D		0	0	15	0	0	0	0
Total Time at PCH		3966	399	2130	3088	1143	99	279
								929
<b>Flight activity per unit time and area</b>								
		1	2	3	4	5	6	7
Observation effort	Observeation time (seconds) * hectare	70146000	56376000	90072000	88776000	78084000	33696000	33048000
Flying time at risk height	Effort at each VP / FRA	5.65E-05	7.08E-06	2.36E-05	3.48E-05	1.46E-05	2.94E-06	8.44E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.29E-01	1.04E-01	1.66E-01	1.63E-01	1.43E-01	6.19E-02	6.07E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	7.29E-06	7.33E-07	3.91E-06	5.67E-06	2.10E-06	1.82E-07	5.13E-07
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000022113						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	105.89						
FRAw	Estimated bird time*(rotor diameter/recording height band)	88.25						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	376.80						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.27						
Number of transits 'ntr'	'n'/'t'	1378.50						
E		0.060						
Probability of collision (Band model)								
<b>Calculation of number collisions</b>								
<b>No avoidance</b>		<b>Avoidance 99.5%</b>						
Collisions per year								
Equivalent to 1 bird every x (years)								
Over 25 years								

**Table C.10b. Stage 2: Red-throated Diver Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA											
Only enter input parameters in green cells											
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius									
NoBlades	3	Upw ind:									
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	contribution	
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r	
BirdLength	0.69	m	0.025	0.575	7.14	25.64	0.91	0.00114	24.64	0.88	0.00110
Wingspan	1.16	m	0.075	0.575	2.38	8.88	0.32	0.00238	7.88	0.28	0.00211
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.43	6.38	0.23	0.00285	5.16	0.18	0.00230
			0.175	0.860	1.02	5.54	0.20	0.00346	4.03	0.14	0.00252
Bird speed	17.89	m/sec	0.225	0.994	0.79	5.03	0.18	0.00404	3.29	0.12	0.00264
RotorDiam	150	m	0.275	0.947	0.65	4.10	0.15	0.00403	2.45	0.09	0.00240
RotationPeriod	4.70	sec	0.325	0.899	0.55	3.50	0.12	0.00406	1.93	0.07	0.00224
			0.375	0.851	0.48	3.10	0.11	0.00414	1.61	0.06	0.00215
			0.425	0.804	0.42	2.78	0.10	0.00421	1.37	0.05	0.00208
			0.475	0.756	0.38	2.52	0.09	0.00426	1.20	0.04	0.00203
Bird aspect ratioo: β	0.59		0.525	0.708	0.34	2.30	0.08	0.00430	1.06	0.04	0.00199
			0.575	0.660	0.31	2.11	0.08	0.00433	0.96	0.03	0.00196
			0.625	0.613	0.29	1.94	0.07	0.00433	0.87	0.03	0.00195
			0.675	0.565	0.26	1.80	0.06	0.00433	0.81	0.03	0.00195
			0.725	0.517	0.25	1.66	0.06	0.00431	0.76	0.03	0.00197
			0.775	0.470	0.23	1.54	0.06	0.00427	0.72	0.03	0.00200
			0.825	0.422	0.22	1.43	0.05	0.00422	0.70	0.02	0.00205
			0.875	0.374	0.20	1.33	0.05	0.00415	0.70	0.03	0.00220
			0.925	0.327	0.19	1.23	0.04	0.00407	0.72	0.03	0.00236
			0.975	0.279	0.18	1.14	0.04	0.00398	0.72	0.03	0.00252
			Overall p(collision) =			Upw ind	7.7%		Down nw ind	4.3%	
							Average	6.0%			

**Table C.11a. Stage 1: White-tailed Eagle Non-breeding**

<b>Band Model - Random flights</b>								
<b>Species: White-tailed eagle</b>								
<b>Season: Non-breeding season (September 2017 - January 2018)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.8					
Number turbines	35	wingspan (m)	2.3					
Rotor diameter	150	flapping (0) or gliding (1)	1					
Hub height (m)	105	Assumed flight speed (m/s)	10.2					
Max chord (m)	4.2	Number daylight hours available	1990.15					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 95%	0.05							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,092,505							
		<b>Survey Data</b>						
		VP	1	2	3	4	5	6
		FRA (ha)	433.00	348.00	556	548	482	208
		Observation Time (hours)	33	33	33	36	36	33
		Time at height band A	0	0	0	0	15	0
		Time at height band B	0	0	0	75	15	0
		Time at height band C	0	0	0	220	300	0
		Time at height band D	0	0	0	0	0	0
		Total Time at PCH	0	0	0	295	315	57
								363
<b>Flight activity per unit time and area</b>		1	2	3	4	5	6	7
Observation effort	Obsevation time (seconds) * hectare	51440400	41342400	66052800	71020800	62467200	24710400	26438400
Flying time at risk height	Effort at each VP / FRA	0.00E+00	0.00E+00	0.00E+00	4.15E-06	5.04E-06	0.00E+00	2.16E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.23E-01	9.88E-02	1.58E-01	1.70E-01	1.49E-01	5.90E-02	6.32E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	0.00E+00	0.00E+00	0.00E+00	7.05E-07	7.52E-07	0.00E+00	1.36E-07
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000002460						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	8.32						
FRAw	Estimated bird time*(rotor diameter/recording height band)	6.94						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	30.28						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.49						
Number of transits 'ntr'	'n'/'t'	61.78						
E								
Probability of collision (Band model)		0.090						
<b>Calculation of number collisions</b>			<b>No avoidance</b>			<b>Avoidance 95%</b>		
Collisions per year			4.72			0.236		
Equivalent to 1 bird every x (years)			0.21			4.2		
Over 25 years			118.0			5.90		

**Table C.11b. Stage 1: White-tailed Eagle Breeding**

<b>Band Model - Random flights</b>								
<b>Species: White-tailed eagle</b>								
<b>Season: Breeding season 2018 (February - August)</b>								
<b>Wind Farm Parameters</b>		<b>Bird Parameters</b>						
WFP (ha)	1700	length (m)	0.8					
Number turbines	35	wingspan (m)	2.3					
Rotor diameter	150	flapping (0) or gliding (1)	1					
Hub height (m)	105	Assumed flight speed (m/s)	10.2					
Max chord (m)	4.2	Number daylight hours available	3565.18					
Rotor depth	4.2	Maximum recording height (m)	200					
Pitch (degrees)	12	Minimum recording height (m)	20					
Rotation period (secs)	4.7							
Turbine operation time 85%	0.85							
Avoidance Rate 95%	0.05							
Rotor radius <sup>2</sup>	5625.00							
Combined rotor swept area	618500.93							
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000							
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,092,505							
		<b>Survey Data</b>						
		VP	1	2	3	4	5	6
		FRA (ha)	433.00	348.00	556	548	482	208
		Observation Time (hours)	66	66	66	63	63	66
		Time at height band A	86	14	45	75	60	0
		Time at height band B	120	60	220	150	300	90
		Time at height band C	0	60	180	105	120	0
		Time at height band D	0	157	1240	0	343	0
		Total Time at PCH	120	120	400	255	420	90
<b>Flight activity per unit time and area</b>		1	2	3	4	5	6	7
Observation effort	Obsevation time (seconds) * hectare	102880800	82684800	132105600	124286400	109317600	49420800	46267200
Flying time at risk height	Effort at each VP / FRA	1.17E-06	1.45E-06	3.03E-06	2.05E-06	3.84E-06	1.82E-06	2.59E-06
<b>Weighted by observation effort</b>								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.32E-01	1.06E-01	1.70E-01	1.60E-01	1.40E-01	6.35E-02	5.94E-02
Adjusted time at risk height	Weighted obs effort * flying time at risk height	1.54E-07	1.54E-07	5.14E-07	3.28E-07	5.39E-07	1.16E-07	1.54E-07
<b>Occupancy Rate</b>								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000002152						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	13.04						
FRAw	Estimated bird time*(rotor diameter/recording height band)	10.87						
<b>Rotor Transits</b>								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	47.44						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.49						
Number of transits 'ntr'	'n'/'t'	96.78						
E								
Probability of collision (Band model)		0.090						
<b>Calculation of number collisions</b>								
		<b>No avoidance</b>			<b>Avoidance 95%</b>			
Collisions per year					7.40			
Equivalent to 1 bird every x (years)					0.14			
Over 25 years					184.9			
					9.24			

**Table C.11c. Stage 2: White-tailed Eagle Non-breeding & Breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA											
Only enter input parameters in green cells											
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius									
NoBlades	3	Upw ind:									
MaxChord	4.2	m	r/R	c/C	α	collide	length	contribution	collide	contribution	
Pitch (degrees)	12	radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r	
BirdLength	0.8	m	0.025	0.575	4.07	16.07	1.00	0.00125	15.07	0.94	0.00118
Wingspan	2.3	m	0.075	0.575	1.36	5.69	0.36	0.00267	4.69	0.29	0.00220
F: Flapping (0) or gliding (+1)	1		0.125	0.702	0.81	4.15	0.26	0.00325	2.92	0.18	0.00229
			0.175	0.860	0.58	3.66	0.23	0.00400	2.15	0.13	0.00236
Bird speed	10.2	m/sec	0.225	0.994	0.45	3.38	0.21	0.00476	1.64	0.10	0.00231
RotorDiam	150	m	0.275	0.947	0.37	2.81	0.18	0.00483	1.15	0.07	0.00199
RotationPeriod	4.70	sec	0.325	0.899	0.31	2.74	0.17	0.00557	1.17	0.07	0.00238
			0.375	0.851	0.27	2.49	0.16	0.00585	1.01	0.06	0.00236
			0.425	0.804	0.24	2.29	0.14	0.00610	0.89	0.06	0.00236
			0.475	0.756	0.21	2.13	0.13	0.00632	0.81	0.05	0.00239
Bird aspect ratioo: β	0.35		0.525	0.708	0.19	1.98	0.12	0.00651	0.85	0.05	0.00281
			0.575	0.660	0.18	1.86	0.12	0.00668	0.90	0.06	0.00323
			0.625	0.613	0.16	1.74	0.11	0.00682	0.93	0.06	0.00362
			0.675	0.565	0.15	1.64	0.10	0.00694	0.94	0.06	0.00399
			0.725	0.517	0.14	1.55	0.10	0.00703	0.95	0.06	0.00433
			0.775	0.470	0.13	1.46	0.09	0.00710	0.96	0.06	0.00464
			0.825	0.422	0.12	1.38	0.09	0.00714	0.95	0.06	0.00493
			0.875	0.374	0.12	1.31	0.08	0.00715	0.95	0.06	0.00519
			0.925	0.327	0.11	1.23	0.08	0.00714	0.94	0.06	0.00543
			0.975	0.279	0.10	1.16	0.07	0.00710	0.92	0.06	0.00564
			Overall p(collision) =			Upwind	11.4%		Downwind	6.6%	
						Average	9.0%				

**Table C.12a. Stage 1: Whooper Swan Non-breeding**

<b>Band Model - Random flights</b>									
<b>Species: Whooper swan</b>									
<b>Season: Non-breeding season 2017-18 (September - March)</b>									
<b>Wind Farm Parameters</b>									
WFP (ha)	1700								
Number turbines	35								
Rotor diameter	150								
Hub height (m)	105								
Max chord (m)	4.2								
Rotor depth	4.2								
Pitch (degrees)	12								
Rotation period (secs)	4.7								
Turbine operation time 85%	0.85								
Avoidance Rate 99.5%	0.005								
Rotor radius <sup>2</sup>	5625.00								
Combined rotor swept area	618500.93								
Collision Risk volume 'Vw' (m <sup>3</sup> )	2,550,000,000								
Rotor swept volume 'V <sub>r</sub> ' (m <sup>3</sup> )	3,537,825								
<b>Bird Parameters</b>									
length (m)	1.52								
wingspan (m)	2.3								
flapping (0) or gliding (1)	0								
Assumed flight speed (m/s)	17.3								
Number daylight hours available	3086.73								
Maximum recording height (m)	200								
Minimum recording height (m)	20								
<b>Survey Data</b>									
VP	1	2	3	4	5	6	7	8	
FRA (ha)	433.00	348.00	556	548	482	208	204	580	
Observation Time (hours)	54	54	54	54	54	54	54	54	
Time at height band A	0	0	0	0	0	0	0	0	
Time at height band B	0	62	0	0	0	0	153	1080	
Time at height band C	419	0	1431	360	180	0	1	0	
Time at height band D	0	0	0	0	0	0	0	0	
Total Time at PCH	419	62	1431	360	180	0	154	1080	
<b>Flight activity per unit time and area</b>									
Observation effort	Observeation time (seconds) * hectare	84175200	67651200	108086400	106531200	93700800	40435200	39657600	112752000 #####
Flying time at risk height	Effort at each VP / FRA	4.98E-06	9.16E-07	1.32E-05	3.38E-06	1.92E-06	0.00E+00	3.88E-06	9.58E-06 3.79E-05
<b>Weighted by observation effort</b>									
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	1.29E-01	1.04E-01	1.66E-01	1.63E-01	1.43E-01	6.19E-02	6.07E-02	1.73E-01 1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	6.42E-07	9.49E-08	2.19E-06	5.51E-07	2.76E-07	0.00E+00	2.36E-07	1.65E-06 5.64E-06
<b>Occupancy Rate</b>									
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000005645							
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	29.62							
FRAw	Estimated bird time*(rotor diameter/recording height band)	24.68							
<b>Rotor Transits</b>									
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*	123.29							
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.33							
Number of transits 'ntr'	'n'/t'	372.88							
E									
Probability of collision (Band model)		0.092							
<b>Calculation of number collisions</b>				<b>No avoidance</b>					
Collisions per year					29.24				
Equivalent to 1 bird every x (years)					0.03				
Over 25 years					731.1				
					3.66				

**Table C.12b. Stage 1: Whooper Swan Non-breeding**

CALCULATION OF COLLISION RISK FOR BIRD PASSING THROUGH ROTOR AREA										
Only enter input parameters in green cells										
K: [1D or [3D] (0 or 1)	1	Calculation of alpha and p(collision) as a function of radius								
NoBlades	3	Upw ind:								
MaxChord	4.2	m	r/R	c/C	$\alpha$	collide	length	contribution	collide	length
Pitch (degrees)	12	radius	chord	alpha		p(collision)	from radius r	contribution	p(collision)	from radius r
BirdLength	1.52	m	0.025	0.575	6.90	32.68	1.00	0.00125	31.68	1.00
Wingspan	2.3	m	0.075	0.575	2.30	11.23	0.41	0.00311	10.22	0.38
F: Flapping (0) or gliding (+1)	0		0.125	0.702	1.38	7.77	0.29	0.00358	6.54	0.24
			0.175	0.860	0.99	6.50	0.24	0.00420	5.00	0.18
Bird speed	17.3	m/sec	0.225	0.994	0.77	5.76	0.21	0.00479	4.03	0.15
RotorDiam	150	m	0.275	0.947	0.63	4.79	0.18	0.00486	3.13	0.12
RotationPeriod	4.70	sec	0.325	0.899	0.53	4.27	0.16	0.00512	2.70	0.10
			0.375	0.851	0.46	3.87	0.14	0.00536	2.39	0.09
			0.425	0.804	0.41	3.56	0.13	0.00559	2.16	0.08
			0.475	0.756	0.36	3.31	0.12	0.00580	1.99	0.07
Bird aspect ratioo: $\beta$	0.66		0.525	0.708	0.33	3.09	0.11	0.00599	1.86	0.07
			0.575	0.660	0.30	2.91	0.11	0.00618	1.76	0.06
			0.625	0.613	0.28	2.75	0.10	0.00634	1.68	0.06
			0.675	0.565	0.26	2.61	0.10	0.00649	1.62	0.06
			0.725	0.517	0.24	2.48	0.09	0.00663	1.57	0.06
			0.775	0.470	0.22	2.36	0.09	0.00675	1.54	0.06
			0.825	0.422	0.21	2.25	0.08	0.00685	1.53	0.06
			0.875	0.374	0.20	2.15	0.08	0.00694	1.54	0.06
			0.925	0.327	0.19	2.06	0.08	0.00701	1.55	0.06
			0.975	0.279	0.18	1.97	0.07	0.00707	1.56	0.06
			Overall p(collision) =			Upw ind	11.0%	Dow nw ind	7.5%	
						Average	9.2%			

**wood.**

