



Pennant Walters Ltd

Mynydd y Glyn wind Farm

Draft Environmental Statement

Appendix 9B Collision Risk Modelling Report



Report for

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Document revisions

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1. Introduction

- 1.1.1 This Appendix documents the methodology and results of collision risk modelling (CRM) based on flight activity data collected from Vantage Point (VP) surveys undertaken from March 2020 to February 2022. Data obtained during VP surveys was used to determine the theoretical collision risk for a range of species by incorporation into a CRM (Band et al. 2007)¹ and herein referred to as ‘the Band model’.
- 1.1.2 From March 2020 to February/March 2022, two VP locations (VP 1-2) (**Figure 1.1, Annex A**) were used for the Proposed Development.
- 1.1.3 **Annex A** presents figures of flight activity of species included in the CRM.
- 1.1.4 **Annex B** contains tables presenting the clipped flight data recorded from VPs 1 and 2 used for the CRM analysis.
- 1.1.5 **Annex C** presents the CRM calculations for year 1 and year 2 for the Proposed Development, based on data collected from VP 1 and 2.

¹ Band, W., Madders, M. & Whitfield, D.P. 2007. Developing field and analytical methods to assess avian collision risk at wind farms. In *Birds and Wind Farms: Risk Assessment and Mitigation*. de Lucas, M., Janss, G., and Ferrer, M. (eds). Lynx Edicions, Barcelona.

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. 2007¹; SNH 2000²). 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, 2000²). As such, species specific avoidance rates were applied to the model to estimate the collision risk (SNH, 2017a³).
- 2.1.4 The results of the model provide 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.
- 2.2.4 Species that have been identified as requiring CRM (i.e. those recorded regularly during VP surveys) is limited to golden plover, goshawk and red kite, therefore the Random Flight Model has been selected.

² Scottish Natural Heritage. (2000). Windfarms and Birds: Calculating a theoretical collision risk assuming no avoiding action. SNH Guidance Note. Scottish Natural Heritage

³ Scottish Natural Heritage. (2017a). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. SNH guidance. July 2017

2.3 Model Parameters

Turbines

- 2.3.1 The preferred turbine model selected for the Proposed Development have not been finalised at this stage, however the applicant has identified likely models and provided anticipated design parameters for use at this stage. It is assumed that the chosen turbine model will have a hub height of 97.5m and rotor diameter of 136m, with the potential collision risk height (PCH) of 29.5 – 155m.
- 2.3.2 For the purposes of CRM, it has been assumed that turbines will be non-operational for 15% of the time, e.g. during periods when wind speed is too low or too high to operate, or during maintenance.

Table 2.1 Turbine Technical Parameters

Parameter	Proposed Specification 155m Tip Height
Number of turbines	7
Number of blades	3
Approximate hub height (m)	97.5
Approximate rotor radius (m)	68
Maximum height to blade tip (m)	155
Minimum height to blade tip (m)	29.5
PCH (m)	29.5-155
Pitch (Degrees)	11
Chord (m)	4.1
Rotation period (rpm)	5.2

Available Active Hours Per Season, Survey Effort and Observation Time

- 2.3.3 Available active hours are defined as the number of hours that a bird species may be potentially active in any given season, these seasons being defined by SNH (2017b⁴), and those seasons and hours for the periods March 2020 – August 2020, September 2020 – February 2021, March 2021 – August 2021 and September 2021 – February 2022, are presented in **Table 2.2**. These are adapted, taking into account the different seasons for individual bird species and also the observed activity for the birds involved. For example, the breeding season for
- 2.3.4 Available hours for flight activity were calculated to include daylight, one hour before sunrise and one hour after sunset.

⁴ Scottish Natural Heritage. (2017b). Recommended bird survey methods to inform impact assessment of onshore wind farms Version 2. SNH guidance. July 2017

- 2.3.5 Waders, including golden plover, are likely to be nocturnally active. Following SNH 2017b, the available hours for golden plover is therefore calculated as including 25% of the nocturnal period, in addition to the hours around sunrise and sunset.

Table 2.2 Available Active Hours April 2020 – August 2021

Species Group	Season	Available Hours
Goshawk and Red Kite	Breeding 2020 (March 2020 – August 2020)	3,080.12
	Non-Breeding 2020-2021 (September 2020 – February 2021)	2,114.6
	Breeding 2021 (March 2021 – August 2021)	3,079.45
	Non-Breeding 2021-2022 (September 2021 – February 2022)	2,115.25
Golden Plover	Non-Breeding 2020-2021 (September 2020 – March 2021)	3,180.65
	Non-Breeding 2021-2022 (September 2021 – March 2022)	3,180.78

- 2.3.6 Based on VP survey effort presented in **Appendix 9A** for the period March 2020 to February 2022 **Table 2.3** presents the total observation effort from VPs 1 and 2. Observation effort relates to the total number of survey hours undertaken at VP locations within the seasons in question.

Table 2.3 Observation Time

Season	Period	1	2
Breeding (2020)	March 2020 – August 2020	54	54
Non-Breeding (2020-21)	September 2020 – February 2021	51	51
Non-Breeding (2020-2021) – Golden Plover only	September 2020 – March 2021	57	57
Breeding (2021)	March 2021 – August 2021	36	33
Non-Breeding (2021-22)	September 2021 – February 2022	42	36
Non-Breeding (2020-2021) – Golden Plover only	September 2020 – March 2021	42	36

- 2.3.7 Guidance (SNH 2017b) requires a minimum of 36 hours per season at each individual VP location, with the exception of VP2 in the breeding season 2021 this was met or exceeded.

- 2.3.8 A period of poor weather during June and July coincided with planned survey dates. Despite efforts to complete additional effort later in the season, the full allocation for VP2 was not possible and additional surveys late in September were not considered appropriate to compensate for missed surveys earlier in the breeding season.

2.4 Random Model

Definition of Terms

- 2.4.1 The **CRZ** is defined as the wind farm polygon (WFP). This was taken as the perimeter of the location of each turbine location (allowing for 50m limits of deviation) plus a 500m buffer. SNH guidance currently recommends a 500m 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° arc of a 2km-radius applied around each VP location.
- 2.4.3 The **area of visibility** of each viewshed at minimum collision-risk height, in this instance at 29.5m, was calculated in QGIS.
- 2.4.4 The **Flight risk area (FRA)** is defined as the **area of visibility** that falls within the CRZ, and was also calculated using GIS (**Annex A, Figure 2.1**).
- 2.4.5 **FRA** is an adjustment calculation that accounts for the difference between the height bands used for recording collision risk height flights and the PCH of the turbine blades. The flight activity surveys were carried out prior to turbine model selection and used four height bands:
- A: <10m;
 - B: 10-50m;
 - C: 50-150m;
 - D: 150 - 200m
- 2.4.6 The PCH of the turbines fall within height bands B, C and D, which collectively cover a greater height range (190m) than the rotor swept range (136m), 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.
- 2.4.7 The **collision risk volume** is defined as the volume of the airspace between the minimum and maximum risk height band (200m) and is used in random models (SNH 2000).
- 2.4.8 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 (πr^2) multiplied by the thickness of the rotor blades plus the length of the focal species (SNH 2000).

Selection of Flights

- 2.4.9 All flights that were observed at PCH (within height bands B, C and D for the Proposed Development) 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 CRM). 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.

- 2.4.10 **Table 2.4** summarises the flight times at PCH from VPs 1 and 2 for April 2020 – February 2022 within the CRZ devised for the Proposed Development.
- 2.4.11 Only those species listed below were included in CRM, additional target species recorded on site (including hen harrier, merlin, hobby and peregrine) were considered to have insufficient flight activity levels to make the CRM results meaningful or were scoped out for assessment purposes in the draft environmental statement, and so were excluded from CRM.
- 2.4.12 **Annex A Figures 2.2 – A2.9** shows the flights at PCH within the CRZ included in the modelling for goshawk, red kite and golden plover.
- 2.4.13 **Annex B** provides details of flights included in the CRM calculations.

Table 2.4 Species Flight Time in Seconds

	Season	Year	Total Number Flights	CRZ Total Seconds at PCH (Number of birds X flight length (seconds))
Red Kite	Breeding	2020	16	1,180
	Non-Breeding	2020-2021	18	2,584
	Breeding	2021	8	552
	Non-Breeding	2021-2022	15	1,035
Goshawk	Non-Breeding	2020-2021	5	352
	Non-Breeding	2021-2022	7	1,002
Golden Plover	Non-Breeding	2020-2021	94	1,942,246
	Non-Breeding	2021-2022	81	1,335,114

Bird Parameters

2.4.14 Morphometric measurements for bird species were taken from the BTO⁵ with flight speeds from Alerstam et al. (2007)⁶ or alternatively from Bruderer and Boldt (2001)⁷ (**Table 2.5**). Avoidance rates were taken from current guidance (SNH, 2017a).

Table 2.5 Bird Biometric Parameters

Species	Avoidance Rate %	Length (m)	Wing Span (m)	Flight Speed (m/s)	Flight Style
Red Kite	99	0.63	1.85	12	Flapping
Goshawk	98	0.55	1.10	13.9	Flapping
Golden Plover	98	0.28	0.72	13.7	Flapping

⁵ British Trust for Ornithology (2022). Birdfacts. (Online) Available at: <https://www.bto.org/about-birds/birdfacts> (Accessed April 2022).

⁶ Alerstam T., Rosén M., Bäckman J., Ericson P.G.P., Hellgren, O. (2007). Flight Speeds among Bird Species: Allometric and Phylogenetic Effects. PLoS Biol 5(8): e197. DOI:10.1371/journal.pbio.0050197.

⁷ Bruderer, B. & Boldt, A. 2001. Flight characteristics of birds 1: radar measurement of speeds. Ibis 143 (2): 178 – 204.

3. Results

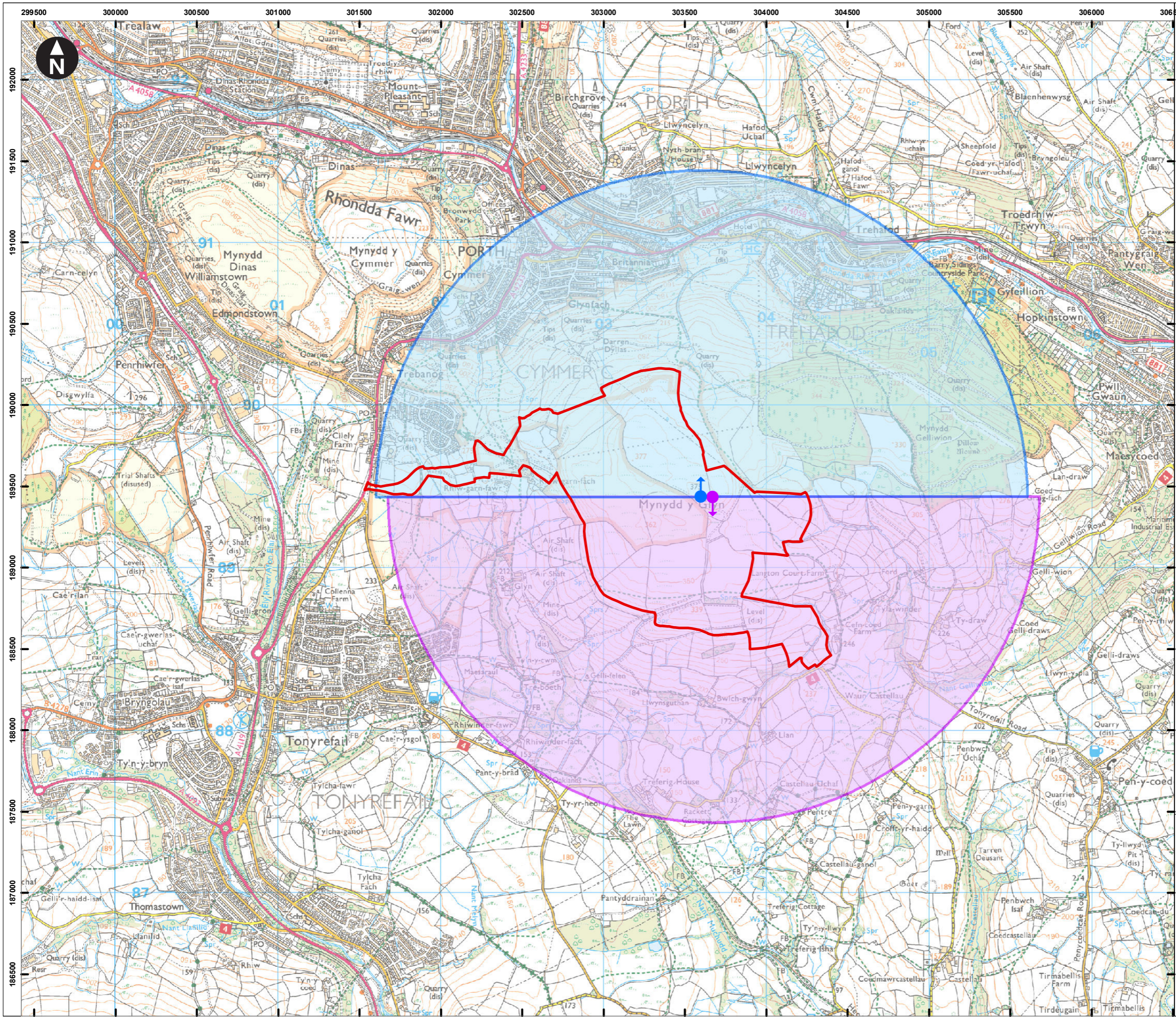
3.1.1 A summary of the CRM results for year one and year two are shown in **Table 3.1** below, whilst details of model calculations are presented in **Annex C**.

Table 3.1 Predicted collision rates

Species	Season	Predicted Potential collisions	Year 1	Year 2	Average
Red Kite (99% Avoidance)	Breeding	Per year	0.135	0.099	0.1145
		Over 30 years	4.06	2.97	3.515
	Non-Breeding	Per year	0.215	0.113	0.164
		Over 30 years	6.46	3.39	4.925
Annual Total		Per year	0.35	0.212	0.281
		Over 30 years	10.52	6.36	8.44
Goshawk (98% Avoidance)	Non-Breeding	Per year	0.058	0.216	0.137
		Over 30 years	1.74	6.47	4.105
Golden Plover (98% Avoidance)	Non-Breeding	Per year	345	346	345
		Over 30 years	10,351	10,381	10,366

Annex A Figures

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Key

- Site boundary
- ↑ Viewpoint 1
- ↓ Viewpoint 2
- Viewshed 1
- Viewshed 2

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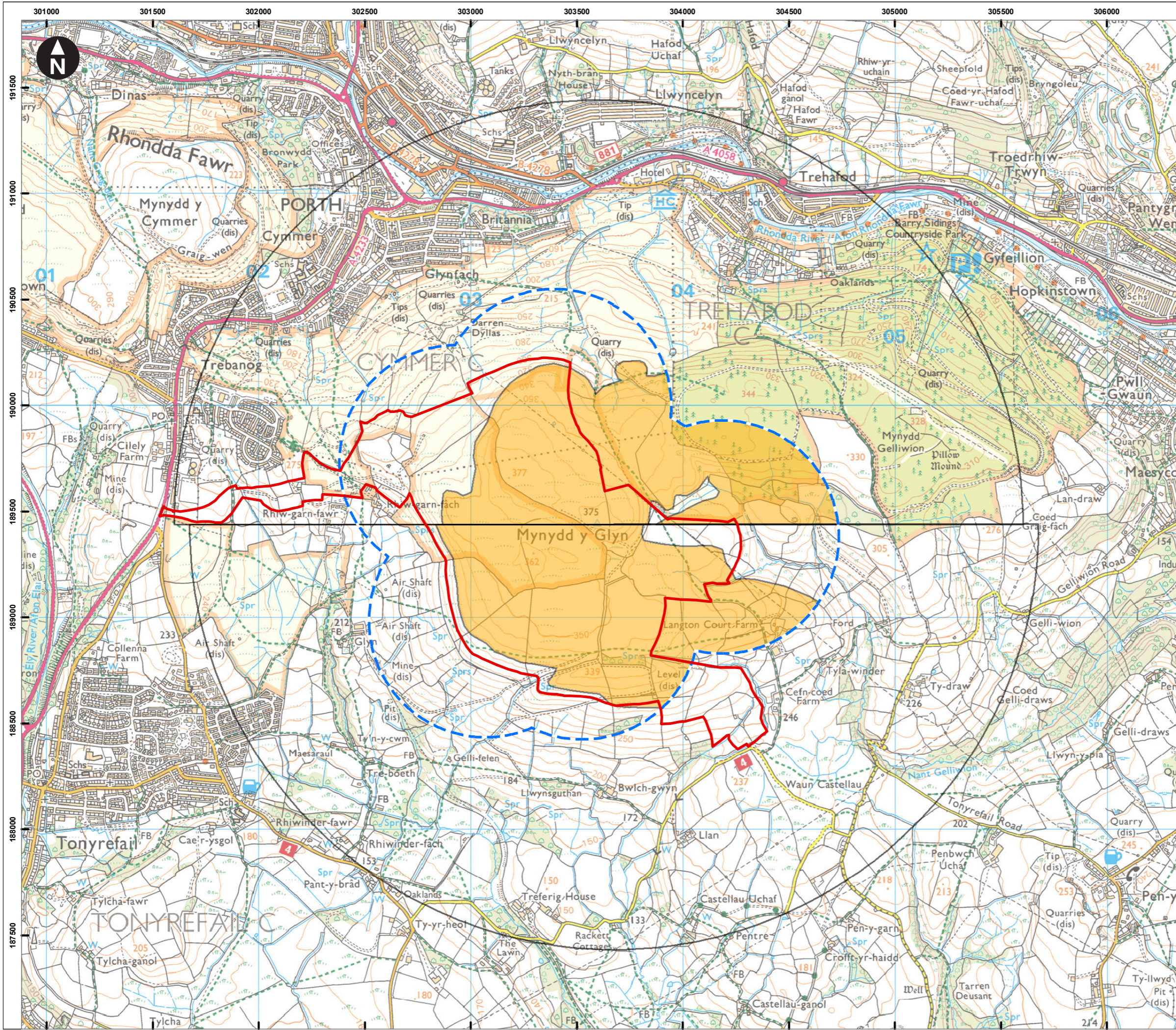
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Figure 1.1
Vantage point survey viewshed locations

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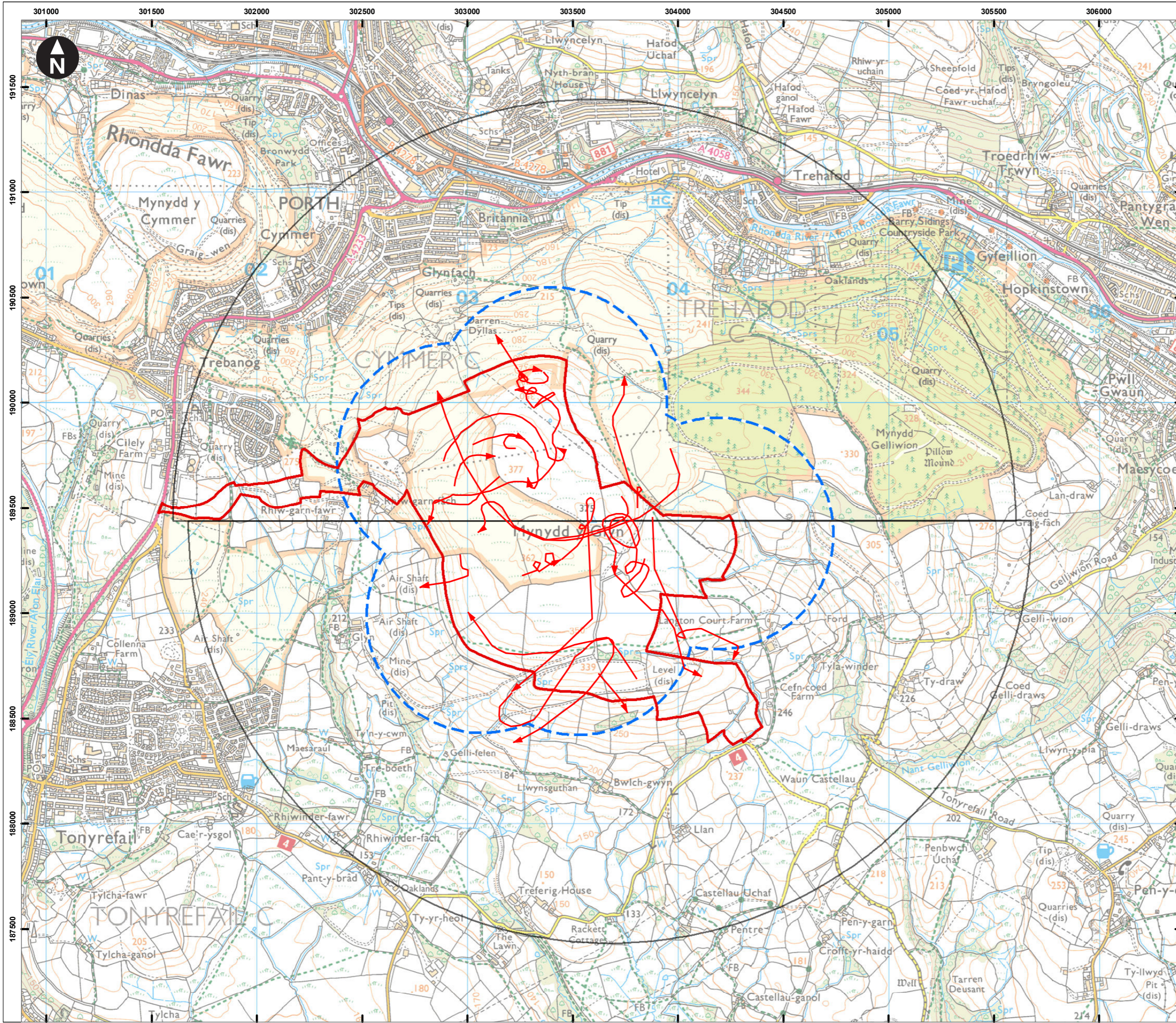
- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewed
 - Flight risk area - visible at minimum blade height

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 Scale at A3: 1:17,500
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Figure 2.1
 Map showing area of visibility that falls within the CRZ

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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewedshed
 - Red kite flightlines

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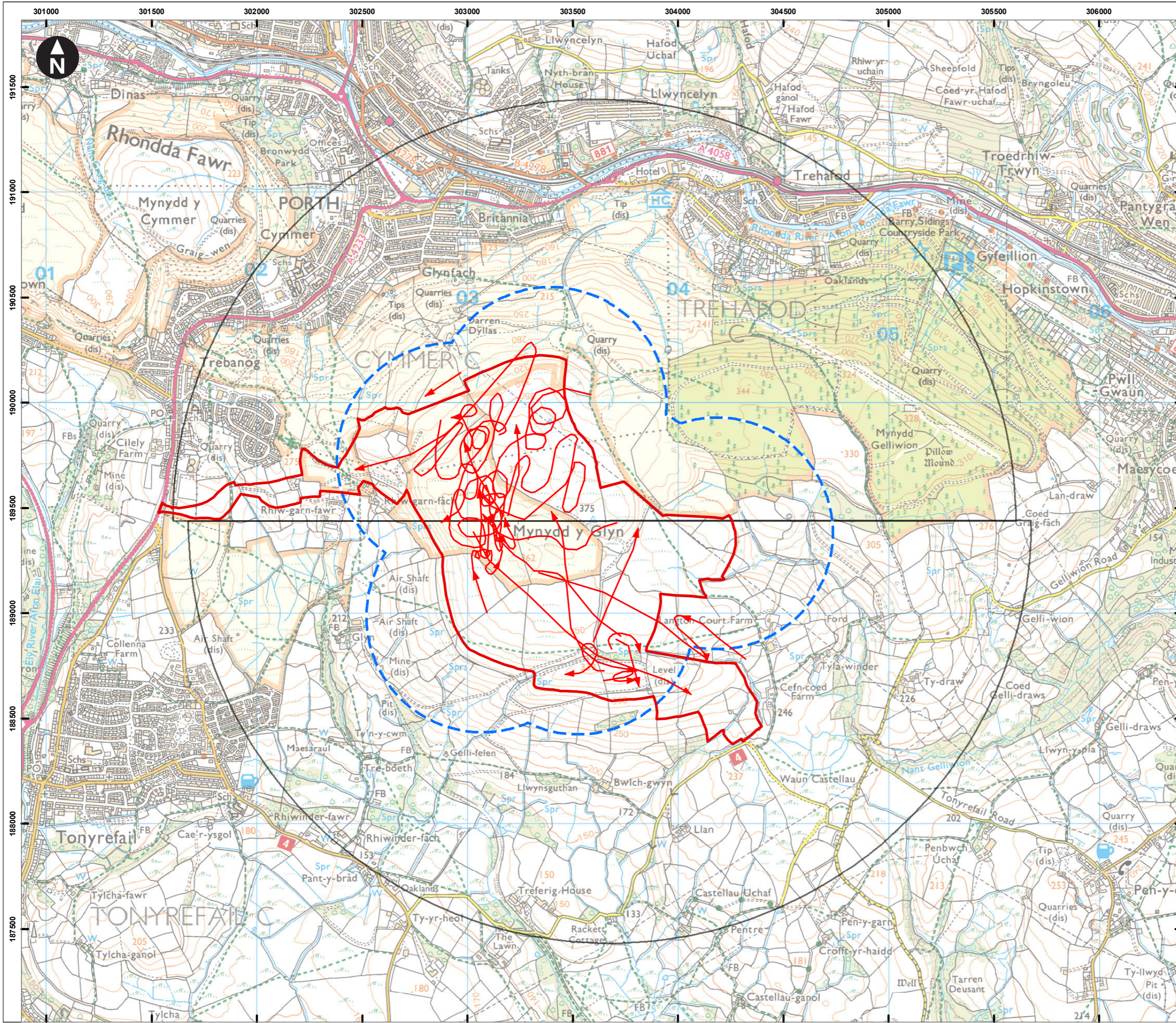
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Figure 2.2
 Map showing red kite flights at potential collision risk height (PCH) - breeding season 2020

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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewed
 - Red kite flightlines

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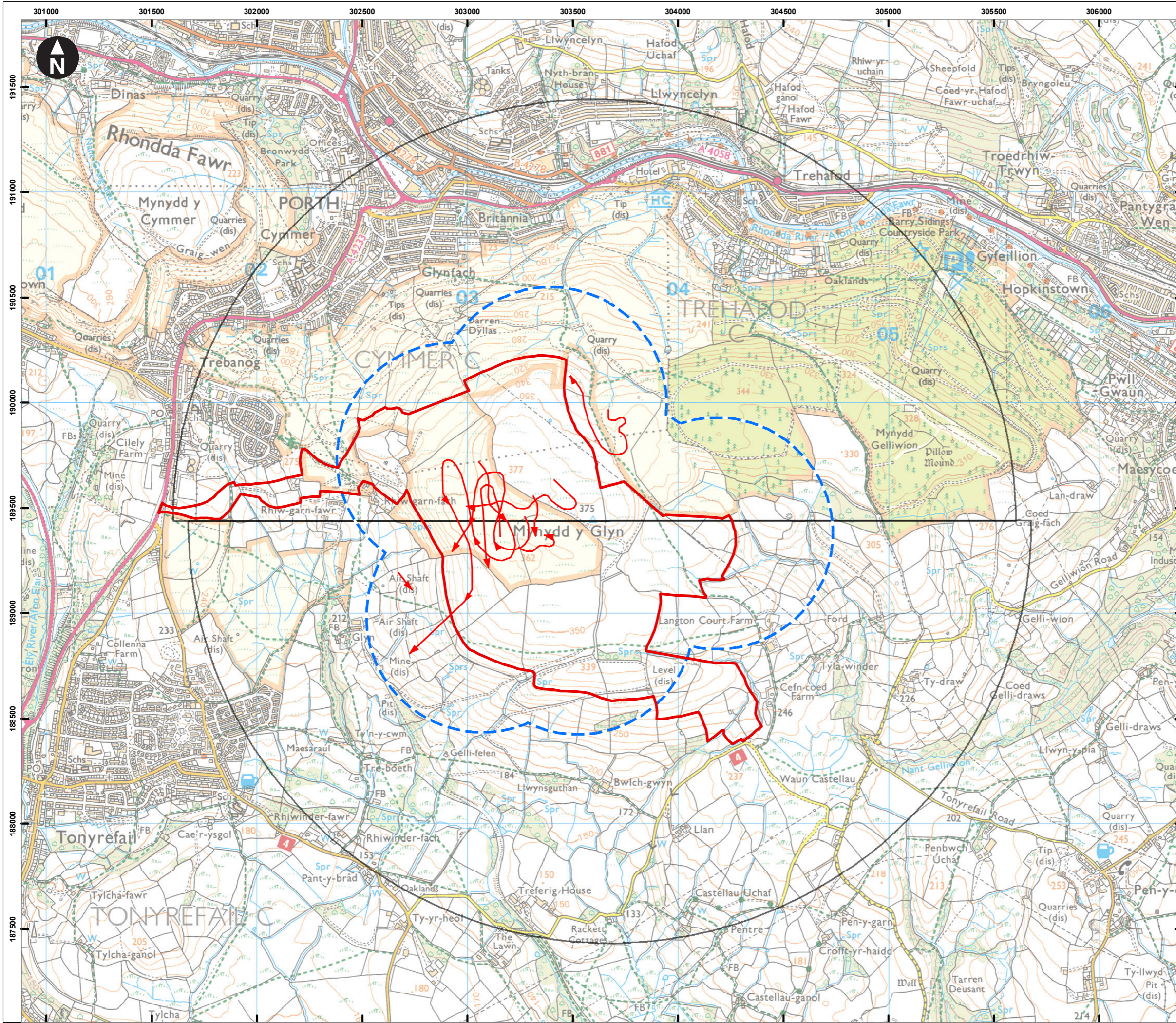
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Figure 2.3
 Map showing red kite flights at potential collision risk height (PCH) - non-breeding season 2020-2021



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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewedshed
 - Red kite flightlines

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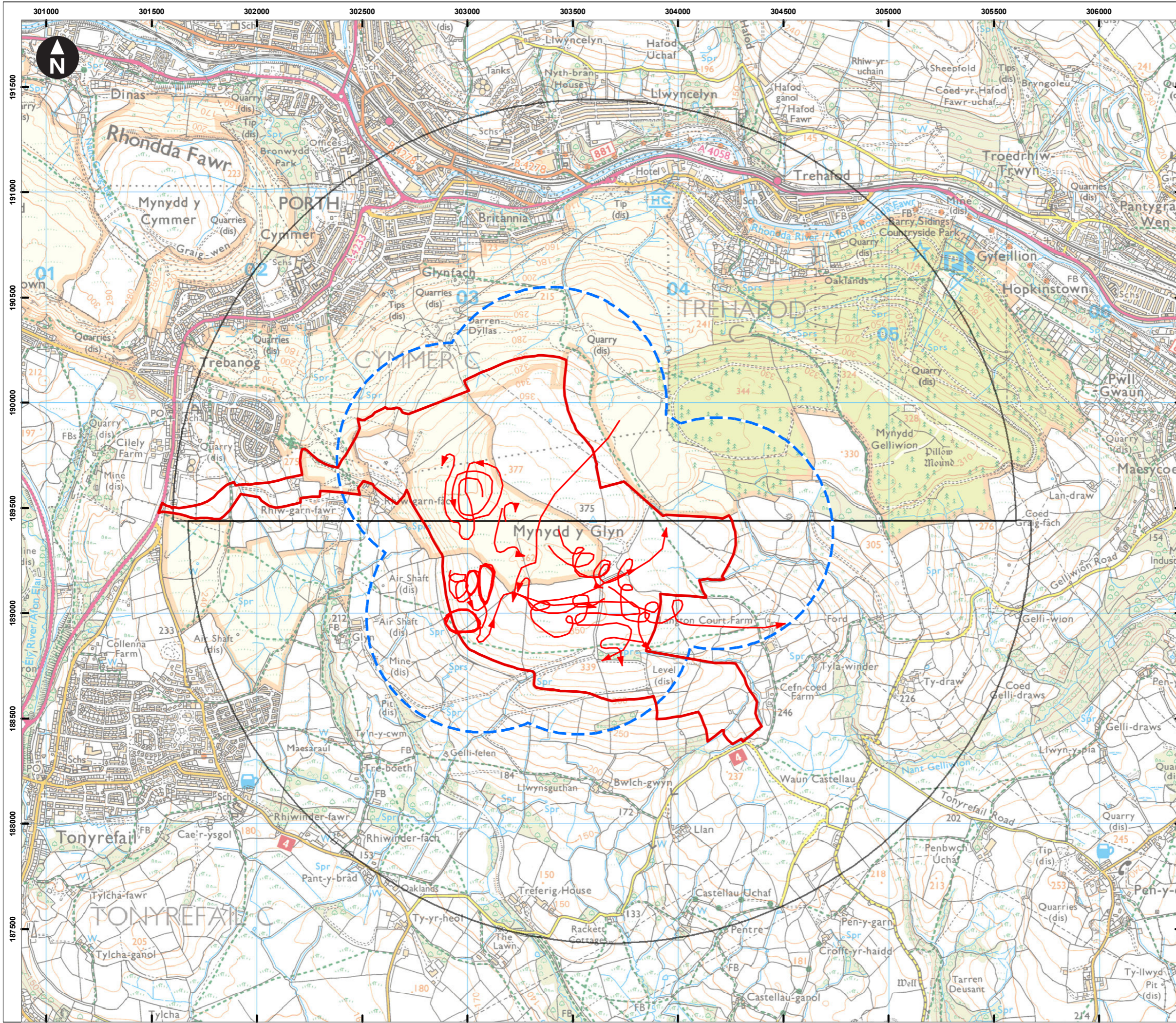
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Figure 2.4
 Map showing red kite flights at potential collision risk height (PCH) - breeding season 2021



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- Key
- Site boundary
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 - Vantage point viewedshed
 - Red kite flightlines

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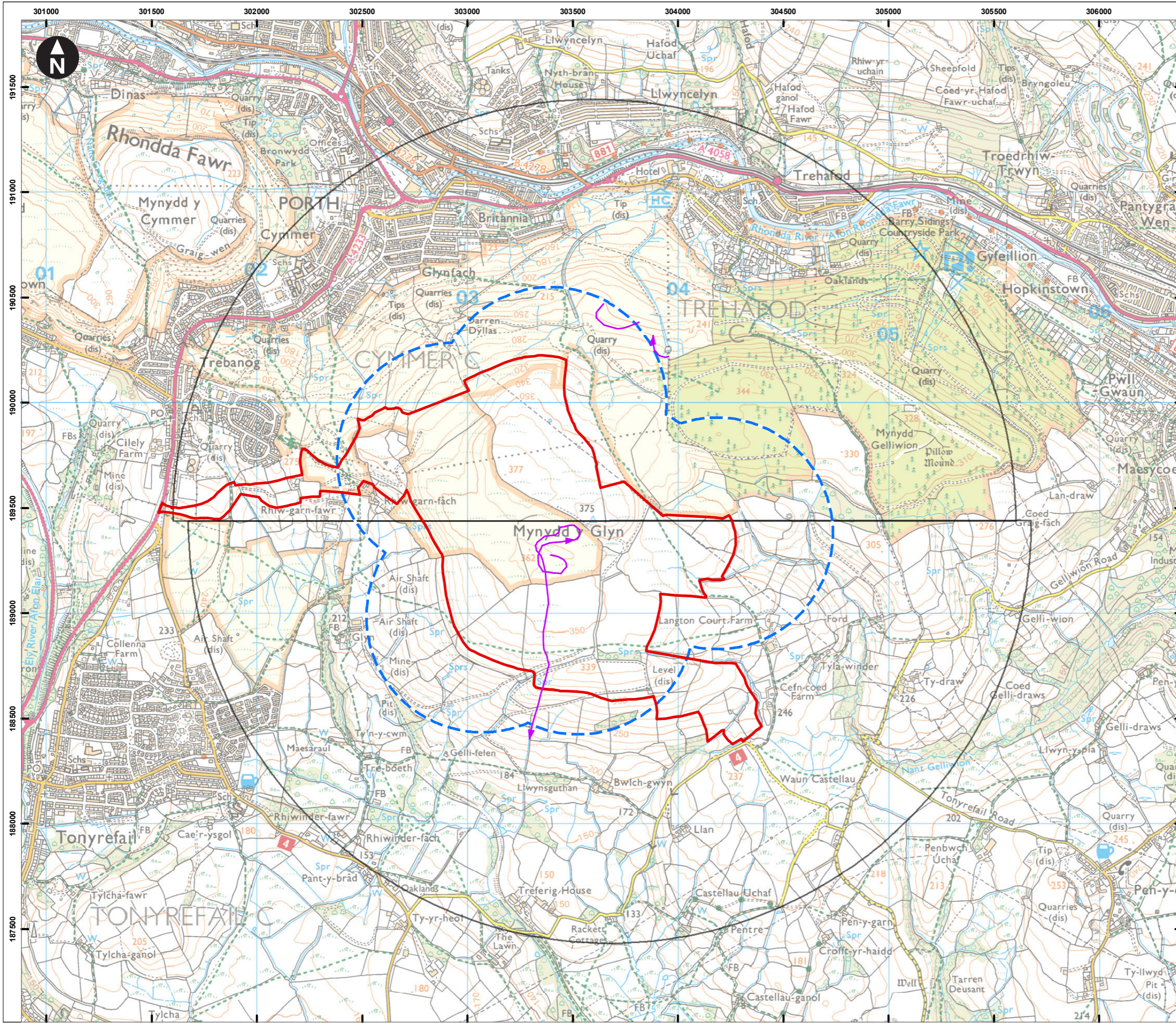
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Figure 2.5
 Map showing red kite flights at potential collision risk height (PCH) - non-breeding season 2021-2022

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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewed
 - Goshawk flightlines

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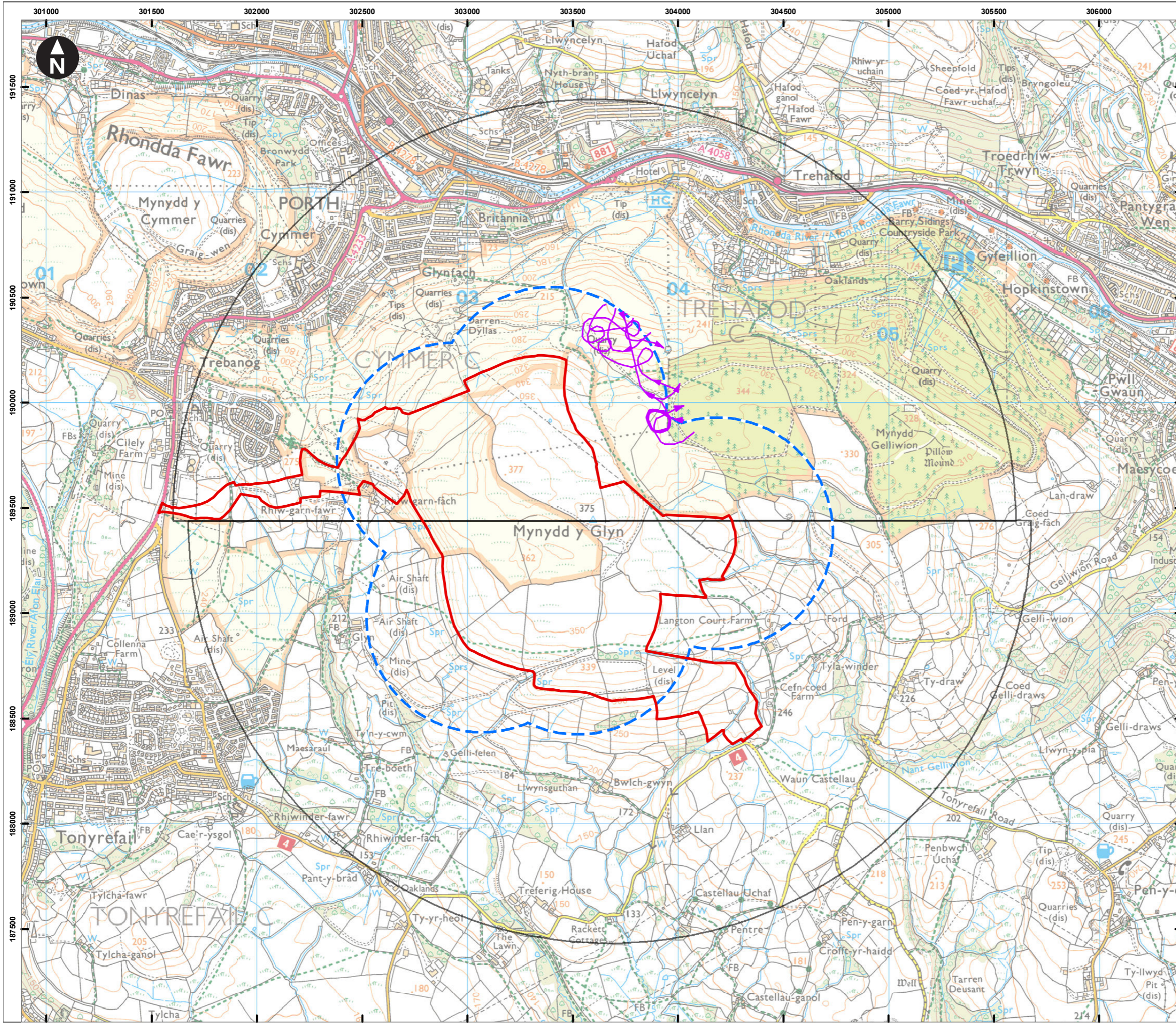
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Figure 2.6
 Map showing goshawk flights at potential collision risk height (PCH) - non-breeding season 2020-2021

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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewed
 - Goshawk flightlines

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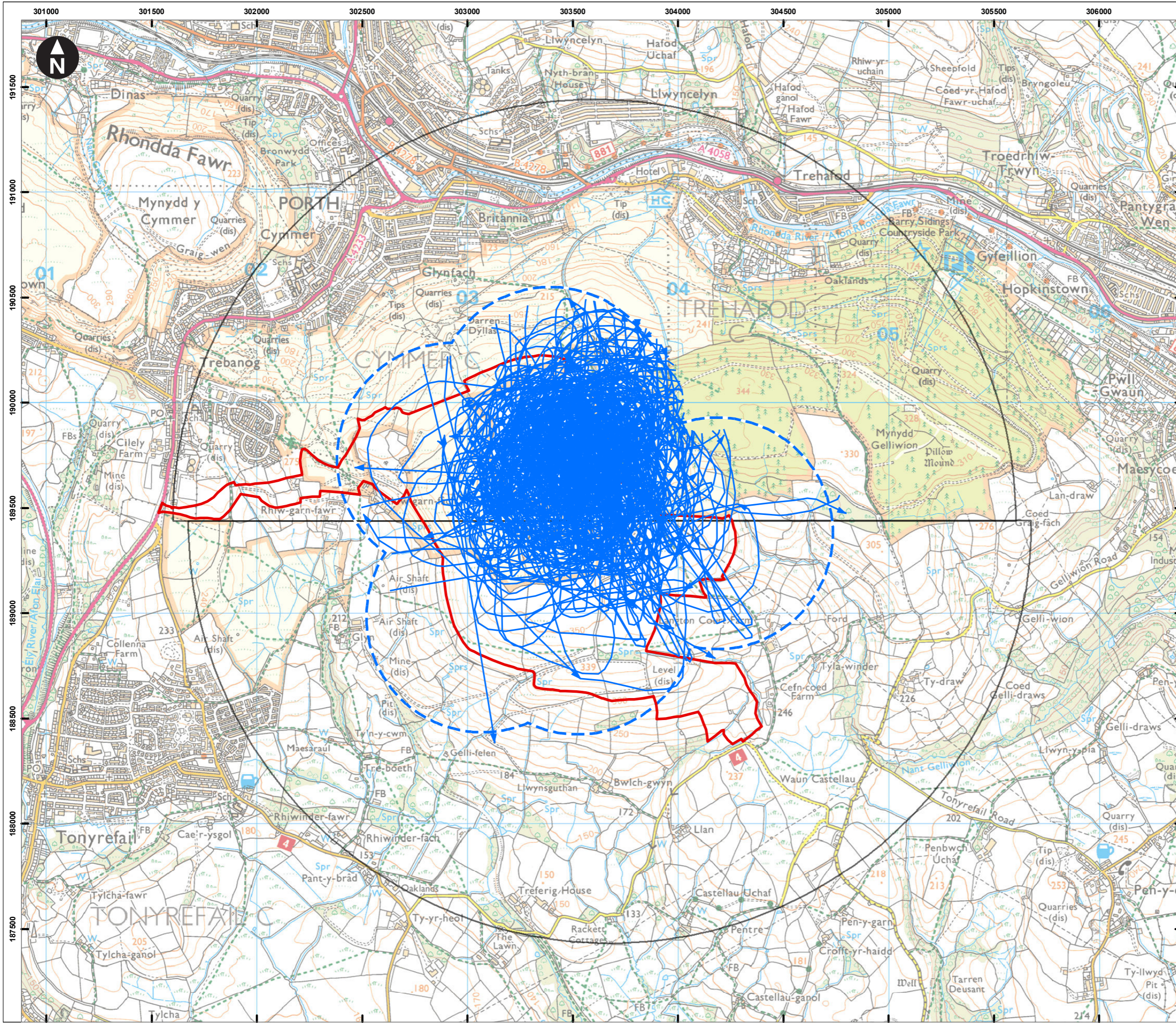
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Figure 2.7
 Map showing goshawk flights at potential collision risk height (PCH) - non-breeding season 2021-2022



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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewed
 - Golden plover flightlines

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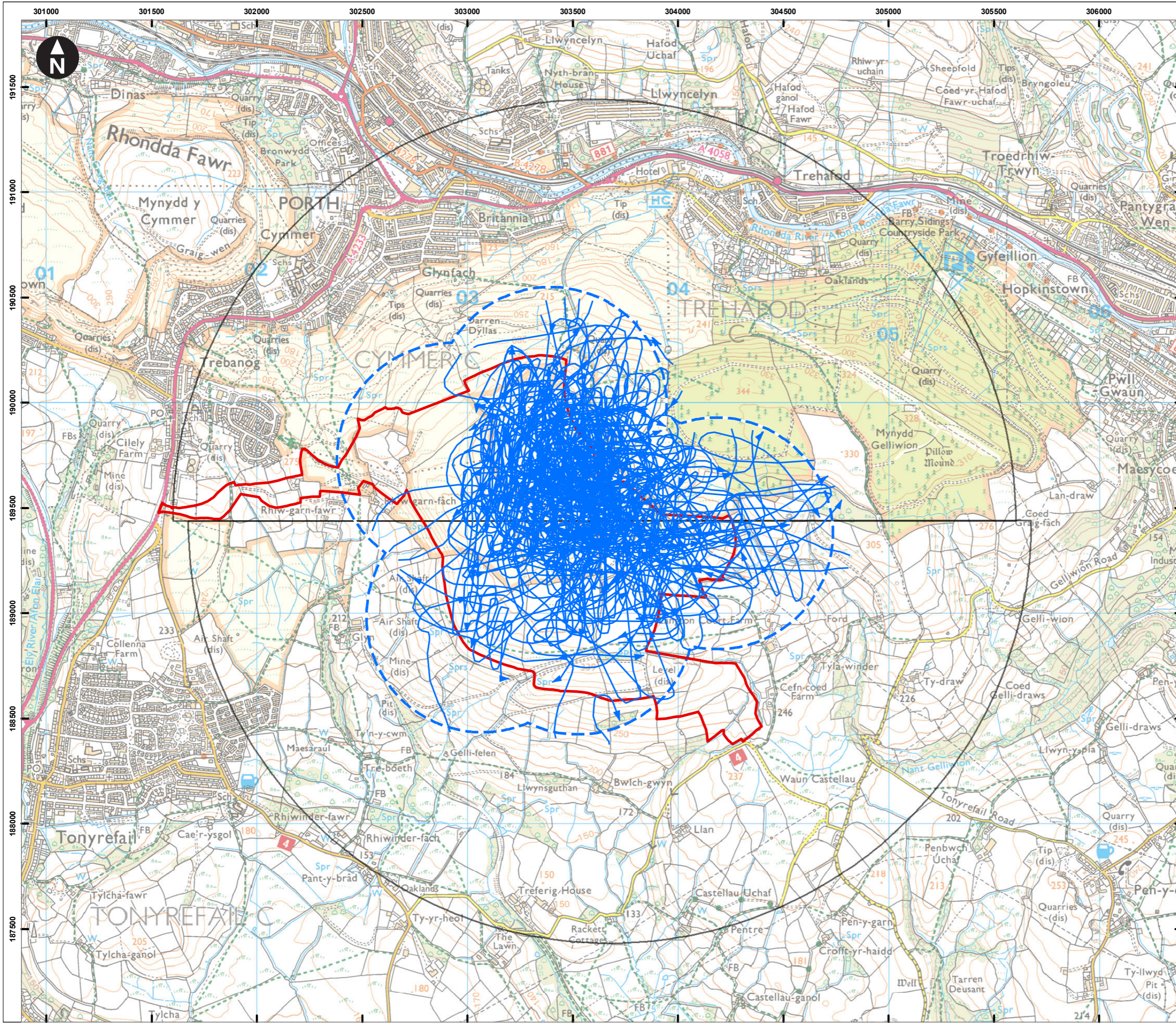
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Figure 2.8
Map showing golden plover flights at potential collision risk height (PCH) - non-breeding season 2020-2021

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- Key
- Site boundary
 - Collision risk zone
 - Vantage point viewedshed
 - Golden plover flightlines

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Figure 2.9
 Map showing golden plover flights at potential collision risk height (PCH) - non-breeding season 2021-2022

October 2022



Annex B

Flight Data used for CRM

Table B1 Raw flight data used in CRM modelling for red kite– March 2020 – August 2020

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_04_L_001A	KT	03/04/2020	18:15	2	1	B	45	45	45
VP2_04_L_001B	KT	03/04/2020	18:15	2	1	C	75	75	75
VP2_04_L_001C	KT	03/04/2020	18:17	2	1	D	40	40	40
VP2_05_M_011A	KT	19/05/2020	11:19	2	1	A	45	0	0
VP2_05_M_011B	KT	19/05/2020	11:19	2	1	B	15	15	15
VP1_06_M_012A	KT	04/06/2020	15:41	1	1	B	45	45	45
VP1_06_M_012B	KT	04/06/2020	15:41	1	1	A	255	0	0
VP1_06_M_013A	KT	04/06/2020	16:07	1	1	B	45	45	45
VP1_06_M_013B	KT	04/06/2020	16:07	1	1	A	30	0	0
VP1_06_M_013C	KT	04/06/2020	16:08	1	1	B	165	165	165
VP1_06_M_013D	KT	04/06/2020	16:11	1	1	A	75	0	0
VP2_06_E_016A	KT	16/06/2020	07:46	2	1	B	75	75	75
VP2_06_E_016B	KT	16/06/2020	07:47	2	1	A	15	0	0
VP1_06_E_017A	KT	19/06/2020	09:05	1	1	B	45	45	45

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_06_E_017B	KT	19/06/2020	09:05	1	1	A	60	0	0
VP1_06_E_017C	KT	19/06/2020	09:06	1	1	B	105	105	105
VP1_04_E_003	KT	14/04/2020	07:35	1	1	B	90	90	90
VP1_05_E_004	KT	06/05/2020	08:50	1	1	A	15	0	0
VP1_05_E_005A	KT	06/05/2020	08:55	1	1	B	15	15	15
VP1_05_E_005B	KT	06/05/2020	08:55	1	1	A	15	0	0
VP1_05_E_006A	KT	06/05/2020	09:36	1	1	A	30	0	0
VP1_05_E_006B	KT	06/05/2020	09:36	1	1	B	15	15	15
VP1_05_E_006C	KT	06/05/2020	09:36	1	1	C	15	15	15
VP1_05_E_006D	KT	06/05/2020	09:37	1	1	B	15	15	15
VP2_05_M_007A	KT	06/05/2020	10:44	2	1	B	26	45	45
VP2_05_M_008A	KT	06/05/2020	11:02	2	1	A	15	0	0
VP2_05_M_008B	KT	06/05/2020	11:02	2	1	B	30	30	30
VP2_05_M_008C	KT	06/05/2020	11:02	2	1	C	7	15	15
VP1_07_M_021B	KT	01/07/2020	15:16	1	1	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_07_M_021A	KT	01/07/2020	15:14	1	1	B	120	120	120
VP2_07_E_022B	KT	21/07/2020	12:58	2	1	A	45	0	0
VP2_07_E_022A	KT	21/07/2020	12:57	2	1	B	105	105	105
VP1_08_M_023	KT	12/08/2020	10:54	1	1	A	120	0	0
VP1_08_L_024B	KT	26/08/2020	16:08	1	1	B	60	60	60
VP1_08_L_024A	KT	26/08/2020	16:06	1	1	A	135	0	0

Table B2 Raw flight data used in CRM modelling for red kite, goshawk and golden plover – September 2020 – February 2020

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_09_L_025	GP	15/09/2020	16:29	1	1	D	72	72	72
VP1_09_M_026A	GP	29/09/2020	11:39	1	48	B	45	45	2160
VP1_09_M_026D	GP	29/09/2020	11:45	1	48	C	67	67	3216
VP1_09_M_026C	GP	29/09/2020	11:44	1	48	B	76	76	3648
VP1_09_M_026B	GP	29/09/2020	11:39	1	48	A	250	0	0
VP1_09_M_027	GP	29/09/2020	12:18	1	2	A	15	0	0
VP1_09_M_028	GP	29/09/2020	12:20	1	3	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_09_M_067B	KT	09/09/2020	17:44	2	1	B	45	45	45
VP2_09_M_067A	KT	09/09/2020	17:43	2	1	A	60	0	0
VP2_09_E_068	GP	29/09/2020	10:58	2	48	C	43	43	2064
VP1_10_E_029C	GP	14/10/2020	07:40	1	57	B	210	210	11970
VP1_10_E_029B	GP	14/10/2020	07:38	1	57	C	75	75	4275
VP1_10_E_030	GP	14/10/2020	09:53	1	6	B	135	135	810
VP1_10_M_031C	GP	12/10/2020	12:33	1	57	B	30	30	1710
VP1_10_M_031B	GP	12/10/2020	12:32	1	57	C	90	90	5130
VP1_10_M_031A	GP	12/10/2020	12:31	1	57	B	60	60	3420
VP1_10_L_032B	GP	04/11/2020	13:53	1	16	C	125	125	2000
VP1_10_L_032A	GP	04/11/2020	13:53	1	16	B	30	30	480
VP1_10_L_033A	GP	04/11/2020	13:58	1	53	B	45	45	2385
VP1_10_L_033D	GP	04/11/2020	14:06	1	53	A	15	0	0
VP1_10_L_033C	GP	04/11/2020	13:59	1	53	B	420	420	22260
VP1_10_L_033B	GP	04/11/2020	13:59	1	53	C	60	60	3180

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_10_L_034	GP	04/11/2020	14:09	1	11	A	15	0	0
VP1_10_L_035B	GI	04/11/2020	14:14	1	1	D	41	41	41
VP1_10_L_036	GP	04/11/2020	14:17	1	10	B	15	15	150
VP1_10_L_037	GP	04/11/2020	14:39	1	10	D	30	30	300
VP1_10_L_038	GP	04/11/2020	14:45	1	10	D	30	30	300
VP1_10_L_039	GP	04/11/2020	15:22	1	16	A	15	0	0
VP1_10_L_040D	GP	04/11/2020	15:35	1	1	C	75	75	75
VP1_10_L_040C	GP	04/11/2020	15:32	1	1	B	150	150	150
VP1_10_L_040B	GP	04/11/2020	15:31	1	1	A	60	0	0
VP1_10_L_040A	GP	04/11/2020	15:28	1	1	B	210	210	210
VP1_10_L_041A	GP	04/11/2020	16:06	1	74	B	45	45	3330
VP1_10_L_041C	GP	04/11/2020	16:10	1	74	D	165	165	12210
VP1_10_L_041B	GP	04/11/2020	16:06	1	74	C	255	255	18870
VP1_11_E_042	GP	10/11/2020	07:58	1	18	A	30	0	0
VP1_11_E_043C	GP	10/11/2020	09:59	1	213	C	15	15	3195

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_11_E_043B	GP	10/11/2020	09:58	1	213	B	30	30	6390
VP1_11_E_043A	GP	10/11/2020	09:48	1	213	C	562	562	119706
VP1_11_E_044B	GP	10/11/2020	10:03	1	110	C	88	88	9680
VP1_11_E_044A	GP	10/11/2020	10:03	1	110	B	30	30	3300
VP1_11_E_044D	GP	10/11/2020	10:12	1	110	A	30	0	0
VP1_11_E_044C	GP	10/11/2020	10:05	1	110	B	405	405	44550
VP1_11_E_045E	GP	10/11/2020	10:25	1	104	C	75	75	7800
VP1_11_E_045D	GP	10/11/2020	10:23	1	104	B	120	120	12480
VP1_11_E_045C	GP	10/11/2020	10:22	1	104	C	45	45	4680
VP1_11_E_045B	GP	10/11/2020	10:16	1	104	B	301	301	31304
VP1_11_E_045A	GP	10/11/2020	10:16	1	104	A	30	0	0
VP1_11_E_045K	GP	10/11/2020	10:38	1	141	C	99	99	13959
VP1_11_E_045J	GP	10/11/2020	10:37	1	141	B	60	60	8460
VP1_11_E_045I	GP	10/11/2020	10:30	1	141	C	266	266	37506
VP1_11_E_045G	Gp	10/11/2020	10:28	1	141	A	45	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_11_E_045F	GP	10/11/2020	10:26	1	141	B	135	135	19035
VP1_11_E_046	GP	10/11/2020	10:22	1	3	A	30	0	0
VP1_11_M_047B	GP	18/11/2020	10:47	1	226	B	15	15	3390
VP1_11_M_047A	GP	18/11/2020	10:47	1	226	A	15	0	0
VP1_11_M_048	GP	18/11/2020	10:58	1	280	B	315	315	88200
VP1_11_M_049	GP	18/11/2020	11:03	1	280	A	60	0	0
VP1_11_M_050	GP	18/11/2020	11:36	1	29	B	15	15	435
VP1_11_M_051	GP	18/11/2020	13:07	1	260	B	75	75	19500
VP1_11_M_052D	GP	19/11/2020	11:40	1	12	B	75	75	900
VP1_11_M_052C	GP	19/11/2020	11:40	1	12	A	15	0	0
VP1_11_M_052B	GP	19/11/2020	11:39	1	12	B	30	30	360
VP1_11_M_052A	GP	19/11/2020	11:36	1	12	C	210	210	2520
VP1_11_M_052G	GP	19/11/2020	11:42	1	12	C	30	30	360
VP1_11_M_052F	GP	19/11/2020	11:42	1	12	B	45	45	540
VP1_11_M_052E	GP	19/11/2020	11:41	1	12	A	30	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_11_M_053C	GP	19/11/2020	12:56	1	26	C	300	300	7800
VP1_11_M_053B	GP	19/11/2020	12:55	1	26	B	75	75	1950
VP1_11_M_053A	GP	19/11/2020	12:55	1	26	A	15	0	0
VP1_12_E_054B	GP	01/12/2020	08:49	1	9	C	195	195	1755
VP1_12_E_054A	GP	01/12/2020	08:48	1	9	B	105	105	945
VP1_12_E_055B	GP	01/12/2020	08:55	1	89	D	60	60	5340
VP1_12_E_055A	GP	01/12/2020	08:53	1	89	C	120	120	10680
VP1_12_E_056C	GP	01/12/2020	09:01	1	114	D	50	50	5700
VP1_12_E_056B	GP	01/12/2020	08:59	1	114	C	120	120	13680
VP1_12_E_056A	GP	01/12/2020	08:56	1	114	D	210	210	23940
VP1_12_E_057	GP	01/12/2020	09:09	1	96	B	849	849	81504
VP1_12_E_058B	GP	01/12/2020	09:24	1	30	B	30	30	900
VP1_12_E_058A	GP	01/12/2020	09:24	1	30	A	45	0	0
VP1_12_E_059D	GP	01/12/2020	09:38	1	126	A	90	0	0
VP1_12_E_059C	GP	01/12/2020	09:37	1	126	B	90	90	11340

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_12_E_059B	GP	01/12/2020	09:36	1	126	A	60	0	0
VP1_12_E_059A	GP	01/12/2020	09:25	1	126	B	657	657	82782
VP1_12_E_060B	GP	01/12/2020	10:13	1	63	A	45	0	0
VP1_12_E_060A	GP	01/12/2020	10:12	1	63	B	60	60	3780
VP1_12_E_061	GP	02/12/2020	08:22	1	31	B	405	405	12555
VP1_12_E_062D	GP	02/12/2020	09:44	1	26	C	60	60	1560
VP1_12_E_062C	GP	02/12/2020	09:36	1	26	B	480	480	12480
VP1_12_E_062B	GP	02/12/2020	09:34	1	26	C	75	75	1950
VP1_12_E_062A	GP	02/12/2020	09:24	1	26	B	645	645	16770
VP1_12_M_063B	GP	07/12/2020	11:42	1	14	A	30	0	0
VP1_12_M_063A	GP	07/12/2020	11:42	1	14	B	30	30	420
VP1_12_M_064C	GP	07/12/2020	12:49	1	255	C	613	613	156315
VP1_12_M_064B	GP	07/12/2020	12:49	1	255	B	30	30	7650
VP1_12_M_064A	GP	07/12/2020	12:49	1	255	A	15	0	0
VP1_12_M_065A	GP	07/12/2020	13:03	1	17	B	240	240	4080

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_12_M_065B	GP	07/12/2020	13:07	1	17	A	60	0	0
VP1_12_M_066B	GP	07/12/2020	14:02	1	158	B	465	465	73470
VP1_12_M_066A	GP	07/12/2020	13:56	1	158	C	375	375	59250
VP2_10_E_069E	GP	12/10/2021	07:38	2	34	B	105	105	3570
VP2_10_E_069D	GP	12/10/2021	07:37	2	34	A	30	0	0
VP2_10_E_069B	GP	12/10/2021	07:35	2	34	C	135	135	4590
VP2_10_E_069C	GP	12/10/2021	07:35	2	34	B	15	15	510
VP2_10_E_069A	GP	12/10/2021	07:33	2	34	B	135	135	4590
VP2_10_E_070	GP	12/10/2020	07:46	2	34	B	60	60	2040
VP2_10_E_071B	GP	12/10/2020	07:56	2	57	C	46	46	2622
VP2_10_E_071A	GP	12/10/2020	07:55	2	57	B	60	60	3420
VP2_10_E_072C	GP	12/10/2020	08:19	2	2	B	120	120	240
VP2_10_E_072B	GP	12/10/2020	08:18	2	2	C	60	60	120
VP2_10_E_072A	GP	12/10/2020	08:18	2	2	B	30	30	60
VP2_11_M_073C	GP	04/11/2020	11:26	2	88	D	41	41	3608

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_11_M_073B	GP	04/11/2020	11:25	2	88	C	60	60	5280
VP2_11_M_073A	GP	04/11/2020	11:25	2	88	B	15	15	1320
VP2_11_M_074	GP	04/11/2020	11:48	2	78	D	389	389	30342
VP2_11_M_075F	GP	04/11/2020	13:14	2	25	B	135	135	3375
VP2_11_M_075E	GP	04/11/2020	13:11	2	25	C	180	180	4500
VP2_11_M_075D	GP	04/11/2020	13:10	2	25	B	75	75	1875
VP2_11_M_075C	GP	04/11/2020	13:09	2	25	A	30	0	0
VP2_11_M_075B	GP	04/11/2020	13:09	2	25	B	45	45	1125
VP2_11_M_075A	GP	04/11/2020	13:08	2	25	C	60	60	1500
VP2_11_M_076B	GP	04/11/2020	13:26	2	32	D	55	55	1760
VP2_11_M_076A	GP	04/11/2020	13:26	2	32	C	30	30	960
VP2_11_M_077C	GP	10/11/2020	12:40	2	322	D	30	30	9660
VP2_11_M_077B	GP	10/11/2020	12:36	2	322	C	240	240	77280
VP2_11_M_077A	GP	10/11/2020	12:36	2	322	B	45	45	14490
VP2_11_M_078	GP	10/11/2020	12:43	2	15	B	30	30	450

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_11_M_079	KT	10/11/2020	12:48	2	1	B	60	60	60
VP2_11_L_080B	Gp	18/11/2020	14:50	2	243	B	60	60	14580
VP2_11_L_080A	GP	18/11/2020	14:50	2	243	A	15	0	0
VP2_11_L_081	GP	18/11/2020	15:54	2	114	C	630	630	71820
VP2_11_E_082B	GP	19/11/2020	08:24	2	43	A	30	0	0
VP2_11_E_082A	GP	19/11/2020	08:24	2	43	B	45	45	1935
VP2_11_E_083B	GP	19/11/2020	08:26	2	20	A	15	0	0
VP2_11_E_083A	Gp	19/11/2020	08:26	2	20	B	30	30	600
VP2_11_E_084	GP	19/11/2020	08:45	2	63	A	30	0	0
VP2_11_E_085B	GP	19/11/2020	08:59	2	110	A	30	0	0
VP2_11_E_085A	GP	19/11/2020	08:58	2	110	B	60	60	6600
VP2_12_M_086B	GP	01/12/2020	12:06	2	18	B	120	120	2160
VP2_12_M_086A	GP	01/12/2020	12:06	2	18	C	15	15	270
VP2_12_M_087B	GP	01/12/2020	12:17	2	126	B	45	45	5670
VP2_12_M_087A	GP	01/12/2020	12:08	2	126	C	570	570	71820

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_12_M_088B	KT	01/12/2020	13:37	2	1	B	63	63	63
VP2_12_M_088A	KT	01/12/2020	13:35	2	1	C	111	111	111
VP2_12_M_089	GP	02/12/2020	12:46	2	304	B	765	765	232560
VP2_12_E_090	GP	07/12/2020	08:36	2	27	C	510	510	13770
VP2_12_E_091	GP	07/12/2020	08:37	2	93	D	314	314	29202
VP2_12_E_092B	KT	07/12/2020	09:09	2	1	A	60	0	0
VP2_12_E_092A	KT	07/12/2021	09:09	2	1	B	45	45	45
VP1_11_E_045H	GP	10/11/2020	10:29	1	141	B	75	75	10575
VP1_10_E_029A	GP	14/10/2020	07:36	1	57	B	165	165	9405
VP1_01_E_093C	GP	12/01/2021	10:29	1	79	D	30	30	2370
VP1_01_E_093B	GP	12/01/2021	10:29	1	79	C	47	47	3713
VP1_01_E_093A	GP	12/01/2021	10:28	1	79	B	30	30	2370
VP1_01_E_094B	GP	12/01/2021	10:35	1	6	A	60	0	0
VP1_01_E_094A	GP	12/01/2021	10:35	1	6	B	30	30	180

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_01_E_095D	GP	12/01/2021	11:46	1	19	C	15	15	285
VP1_01_E_095C	GP	12/01/2021	11:44	1	19	B	120	120	2280
VP1_01_E_095B	GP	12/01/2021	11:43	1	19	A	30	0	0
VP1_01_E_095A	GP	12/01/2021	11:43	1	19	B	45	45	855
VP1_01_M_096A	KT	13/01/2021	12:24	1	2	A	151	0	0
VP1_01_M_096B	KT	13/01/2021	12:24	1	2	B	75	75	150
VP1_01_M_097	KT	13/01/2021	12:25	1	1	B	270	270	270
VP1_01_M_098D	GP	13/01/2021	13:49	1	14	A	15	0	0
VP1_01_M_098C	GP	13/01/2021	13:47	1	14	B	120	120	1680
VP1_01_M_098B	GP	13/01/2021	13:46	1	14	A	75	0	0
VP1_01_M_098A	GP	13/01/2021	13:46	1	14	B	30	30	420
VP1_01_M_099B	GP	13/01/2021	14:11	1	29	C	30	30	870
VP1_01_M_099A	GP	13/01/2021	14:11	1	29	B	30	30	870
VP1_01_M_100	GP	13/01/2021	14:13	1	29	B	135	135	3915
VP1_01_M_101B	GP	13/01/2021	14:34	1	29	A	45	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_01_M_101A	GP	13/01/2021	14:34	1	29	B	15	15	435
VP1_01_M_102C	GP	13/01/2021	14:40	1	97	A	30	0	0
VP1_01_M_102B	GP	13/01/2021	14:39	1	97	B	45	45	4365
VP1_01_M_102A	GP	13/01/2021	14:39	1	97	A	15	0	0
VP1_01_E_103B	GP	22/01/2021	09:10	1	12	B	315	315	3780
VP1_01_E_103A	GP	22/01/2021	09:10	1	12	A	15	0	0
VP1_01_E_103C	GP	22/01/2021	09:15	1	12	A	15	0	0
VP1_01_E_104B	GP	22/01/2021	10:19	1	31	A	15	0	0
VP1_01_E_104A	GP	22/01/2021	10:16	1	31	B	215	215	6665
VP1_01_E_105C	GP	22/01/2021	10:30	1	43	A	30	0	0
VP1_01_E_105B	GP	22/01/2021	10:21	1	43	B	551	551	23693
VP1_01_E_105A	GP	22/01/2021	10:21	1	43	A	15	0	0
VP1_01_E_106G	GP	22/01/2021	11:15	1	32	C	75	75	2400
VP1_01_E_106F	GP	22/01/2021	11:14	1	32	B	60	60	1920
VP1_01_E_106E	GP	22/01/2021	11:14	1	32	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_01_E_106D	GP	22/01/2021	11:13	1	32	B	60	60	1920
VP1_01_E_106C	GP	22/01/2021	11:12	1	32	C	45	45	1440
VP1_01_E_106B	GP	22/01/2021	11:11	1	32	B	75	75	2400
VP1_01_E_106A	GP	22/01/2021	11:11	1	32	A	15	0	0
VP1_01_E_107	GP	22/01/2021	11:32	1	49	C	210	210	10290
VP2_01_M_109	KT	12/01/2021	14:23	2	1	B	90	90	90
VP2_01_M_110B	GP	12/01/2021	14:26	2	66	D	135	135	8910
VP2_01_M_110A	GP	12/01/2021	14:24	2	66	C	120	120	7920
VP2_01_M_111B	GP	12/01/2021	14:36	2	41	D	135	135	5535
VP2_01_M_111A	GP	12/01/2021	14:33	2	41	C	225	225	9225
VP2_01_M_112A	KT	12/01/2021	14:43	2	1	B	175	175	175
VP2_01_M_113B	GP	12/01/2021	14:55	2	9	A	30	0	0
VP2_01_M_113A	GP	12/01/2021	14:55	2	9	B	45	45	405
VP2_01_E_114B	GP	13/01/2021	09:51	2	109	B	120	120	13080
VP2_01_E_114A	GP	13/01/2021	09:51	2	109	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_01_E_115B	GP	13/01/2021	10:00	2	19	B	30	30	570
VP2_01_E_115A	GP	13/01/2021	10:00	2	19	A	15	0	0
VP2_01_E_116	GP	13/01/2021	11:34	2	28	B	405	405	11340
VP2_01_E_117A	KT	22/01/2021	11:55	2	1	A	45	0	0
VP2_01_E_117D	KT	22/01/2021	11:56	2	1	B	45	45	45
VP2_01_E_117C	KT	22/01/2021	11:56	2	1	A	30	0	0
VP2_01_E_117B	KT	22/01/2021	11:55	2	1	B	30	30	30
VP2_01_E_118	KT	22/01/2021	12:10	2	1	B	60	60	60
VP2_01_E_119C	GP	22/01/2021	13:37	2	6	B	150	150	900
VP2_01_E_119B	GP	22/01/2021	13:36	2	6	A	30	0	0
VP2_01_E_119A	GP	22/01/2021	13:36	2	6	B	45	45	270
VP1_01_E_120C	GP	12/01/2021	11:51	1	9	A	15	0	0
VP1_01_E_120B	GP	12/01/2021	11:51	1	9	B	15	15	135
VP1_01_E_120A	GP	12/01/2021	11:51	1	9	A	30	0	0
VP1_02_E_121G	GP	17/02/2021	08:35	1	2	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_02_E_121F	GP	17/02/2021	08:35	1	2	B	30	30	60
VP1_02_E_121E	GP	17/02/2021	08:34	1	2	C	90	90	180
VP1_02_E_121D	GP	17/02/2021	08:33	1	2	B	75	75	150
VP1_02_E_121C	GP	17/02/2021	08:32	1	2	A	30	0	0
VP1_02_E_121B	GP	17/02/2021	08:32	1	2	B	15	15	30
VP1_02_E_121A	GP	17/02/2021	08:32	1	2	C	15	15	30
VP1_02_E_122B	GP	17/02/2021	09:05	1	1	A	30	0	0
VP1_02_E_122A	GP	17/02/2021	09:04	1	1	B	105	105	105
VP1_02_E_122D	GP	17/02/2021	09:07	1	1	A	15	0	0
VP1_02_E_122C	GP	17/02/2021	09:06	1	1	B	90	90	90
VP1_02_E_124	GP	17/02/2021	09:55	1	2	A	30	0	0
VP2_02_M_126	GI	17/02/2021	13:02	2	1	A	75	0	0
VP1_02_M_127	KT	22/02/2021	11:07	1	1	B	15	15	15
VP1_02_M_136	GI	22/02/2021	12:09	1	1	A	15	0	15
VP1_02_M_137B	GP	22/02/2021	12:11	1	1	A	30	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP1_02_M_137A	GP	22/02/2021	12:11	1	1	B	45	45	45
VP1_02_M_138B	KT	22/02/2021	12:16	1	2	C	75	75	150
VP1_02_M_138A	KT	22/02/2021	12:15	1	2	B	90	90	180
VP1_02_M_141C	KT	22/02/2021	13:25	1	1	A	15	0	0
VP1_02_M_141B	KT	22/02/2021	13:23	1	1	B	75	75	75
VP1_02_M_141A	KT	22/02/2021	13:23	1	1	A	60	0	0
VP1_02_M_142	KT	22/02/2021	13:42	1	1	A	15	0	0
VP2_02_E_143A	GP	22/02/2021	10:25	2	15	B	480	480	7200
VP2_02_E_143C	GP	22/02/2021	10:35	2	15	B	30	30	450
VP2_02_E_143B	GP	22/02/2021	10:33	2	15	C	150	150	2250
VP1_02_M_144	GP	25/02/2021	14:15	1	121	A	15	0	0
VP2_02_E_145D	KT	25/02/2021	10:06	2	2	C	45	45	90
VP2_02_E_145C	KT	25/02/2021	10:05	2	2	D	60	60	120
VP2_02_E_145B	KT	25/02/2021	10:01	2	2	C	255	255	510
VP2_02_E_145A	KT	25/02/2021	10:00	2	2	B	60	60	120

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
VP2_02_E_146	KT	25/02/2021	10:07	2	1	C	60	60	60
VP2_02_E_147	KT	25/02/2021	10:07	2	1	C	60	60	60
VP2_02_E_149B	GI	25/02/2021	11:05	2	1	C	221	221	221
VP2_02_E_149A	GI	25/02/2021	11:04	2	1	B	75	75	75
VP2_02_E_150	KT	25/02/2021	11:06	2	1	C	60	60	60
GL_VP2_0114A	GP	17/03/2021	16:25	2	13	B	135	135	1215
GL_VP2_0114B	GP	17/03/2021	16:25	2	13	C	75	75	975
GL_VP2_0114C	GP	17/03/2021	16:25	2	13	B	15	15	195
GL_VP2_0114D	GP	17/03/2021	16:25	2	13	A	75	0	0
GL_VP2_0114E	GP	17/03/2021	16:25	2	13	B	30	30	390
GL_VP2_0114F	GP	17/03/2021	16:25	2	13	A	15	0	0

Table B3 Raw flight data used in CRM modelling for red kite – March 2021 – August 2021

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0001	KT	16/06/2021	07:50	1	1	B	60	60	60
GL_VP1_0002	KT	16/06/2021	08:00	1	1	B	30	30	30

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0003A	KT	16/06/2021	09:35	1	1	B	15	60	60
GL_VP1_0003B	KT	16/06/2021	09:35	1	1	C	30	60	60
GL_VP1_0003C	KT	16/06/2021	09:35	1	1	B	15	60	60
GL_VP1_0004A	KT	16/06/2021	11:01	1	1	B	15	15	15
GL_VP1_0004B	KT	16/06/2021	11:01	1	1	C	30	30	30
GL_VP1_0004C	KT	16/06/2021	11:01	1	1	D	30	0	0
GL_VP1_0004D	KT	16/06/2021	11:02	1	1	B	15	15	15
GL_VP1_0004E	KT	16/06/2021	11:02	1	1	C	15	15	15
GL_VP1_0005	KT	16/06/2021	11:20	1	1	B	30	30	30
GL_VP2_0006A	KT	10/08/2021	10:03	2	1	B	30	30	30
GL_VP2_0006B	KT	10/08/2021	10:03	2	1	A	30	0	0
GL_VP1_0007	GI	17/08/2021	09:05	1	1	A	15	0	0
GL_VP1_0008C	KT	15/07/2021	12:58	1	1	B	12	12	12
GL_VP1_0113	KT	17/03/2021	12:05	1	1	B	135	135	135
GL_VP2_0114A	GP	17/03/2021	16:25	2	13	B	135	135	1215

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0114B	GP	17/03/2021	16:27	2	13	C	75	75	975
GL_VP2_0114C	GP	17/03/2021	16:28	2	13	B	15	15	195
GL_VP2_0114D	GP	17/03/2021	16:28	2	13	A	75	0	0
GL_VP2_0114E	GP	17/03/2021	16:30	2	13	B	30	30	390
GL_VP2_0114F	GP	17/03/2021	16:30	2	13	A	15	0	0
GL_VP1_0115	KT	24/05/2021	16:36	1	2	A	30	0	0

Table B4 Raw flight data used in CRM modelling for red kite, goshawk and golden plover – September 2021 – February 2022

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0010	GP	14/09/2021	1013	2	1	B	37	37	37
GL_VP1_0011	GP	14/09/2021	1241	1	1	B	45	45	45
GL_VP2_0012A	GP	05/10/2021	1021	2	85	B	210	210	17850
GL_VP2_0012B	GP	05/10/2021	1024	2	85	A	15	0	0
GL_VP2_0013A	KT	05/10/2021	1212	2	1	B	75	75	75
GL_VP2_0013B	KT	05/10/2021	1213	2	1	A	30	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0014A	GP	05/10/2021	1608	2	34	B	180	180	6120
GL_VP2_0014B	GP	05/10/2021	1611	2	34	A	45	0	0
GL_VP1_0015A	KT	06/10/2021	1124	1	1	B	60	60	60
GL_VP1_0015B	KT	06/10/2021	1125	1	1	C	45	45	45
GL_VP1_0015C	KT	06/10/2021	1125	1	1	B	30	30	30
GL_VP1_0015D	KT	06/10/2021	1126	1	1	A	15	0	0
GL_VP1_0016A	GP	06/10/2021	1139	1	2	B	30	30	60
GL_VP1_0016B	GP	06/10/2021	1139	1	2	A	15	0	0
GL_VP1_0017A	GP	06/10/2021	1204	1	41	B	45	45	1845
GL_VP1_0017B	GP	06/10/2021	1204	1	41	C	75	75	3075
GL_VP1_0017C	GP	06/10/2021	1206	1	41	B	30	30	1230
GL_VP1_0017D	GP	06/10/2021	1207	1	41	C	60	60	2460
GL_VP1_0017E	GP	06/10/2021	1208	1	41	D	29	29	1189
GL_VP1_0018	GP	06/10/2021	1212	1	16	D	105	105	1680
GL_VP1_0019	GP	06/10/2021	1213	1	19	D	60	60	1140

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0020A	GP	06/10/2021	1220	1	17	B	45	45	765
GL_VP1_0020B	GP	06/10/2021	1220	1	17	A	15	0	0
GL_VP1_0021A	GI	06/10/2021	1239	1	1	C	30	30	30
GL_VP1_0021B	GI	06/10/2021	1239	1	1	D	75	75	75
GL_VP1_0022A	GI	06/10/2021	1239	1	1	C	21	21	21
GL_VP1_0022B	GI	06/10/2021	1239	1	1	D	30	30	30
GL_VP2_0025A	GP	03/11/2021	934	2	8	A	45	0	0
GL_VP2_0025B	GP	03/11/2021	934	2	8	B	45	45	360
GL_VP2_0025C	GP	03/11/2021	935	2	8	A	15	0	0
GL_VP2_0026A	GP	03/11/2021	954	2	60	C	15	15	900
GL_VP2_0026B	GP	03/11/2021	954	2	60	D	15	15	900
GL_VP2_0027A	GP	03/11/2021	954	2	1	A	15	0	0
GL_VP2_0027B	GP	03/11/2021	954	2	1	B	45	45	45
GL_VP2_0027C	GP	03/11/2021	955	2	1	C	15	15	15
GL_VP2_0027D	GP	03/11/2021	955	2	1	D	15	15	15

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0028A	GP	03/11/2021	1028	2	24	D	30	30	720
GL_VP2_0028B	GP	03/11/2021	1028	2	24	C	120	120	2880
GL_VP2_0028C	GP	03/11/2021	1030	2	24	B	45	45	1080
GL_VP2_0028D	GP	03/11/2021	1031	2	24	A	15	0	0
GL_VP2_0029A	GP	03/11/2021	1035	2	210	B	30	30	6300
GL_VP2_0029B	GP	03/11/2021	1035	2	210	C	225	225	47250
GL_VP2_0029C	GP	03/11/2021	1039	2	210	B	30	30	6300
GL_VP2_0030	GP	03/11/2021	1040	2	140	A	15	0	0
GL_VP2_0029D	GP	03/11/2021	1039	2	210	A	15	0	0
GL_VP2_0031A	GP	03/11/2021	1041	2	73	B	165	165	12045
GL_VP2_0031B	GP	03/11/2021	1043	2	73	A	15	0	0
GL_VP2_0032A	GP	03/11/2021	1045	2	310	A	15	0	0
GL_VP2_0032B	GP	03/11/2021	1045	2	310	B	15	15	4650
GL_VP2_0032C	GP	03/11/2021	1045	2	310	C	15	15	4650
GL_VP2_0032D	GP	03/11/2021	1045	2	310	D	45	45	13950

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0032E	GP	03/11/2021	1046	2	310	C	543	543	168330
GL_VP2_0033A	GP	03/11/2021	1109	2	180	C	45	45	8100
GL_VP2_0033B	GP	03/11/2021	1109	2	180	D	195	195	35100
GL_VP2_0033C	GP	03/11/2021	1113	2	180	C	75	75	13500
GL_VP2_0033D	GP	03/11/2021	1114	2	180	D	60	60	10800
GL_VP2_0033E	GP	03/11/2021	1115	2	180	C	210	210	37800
GL_VP2_0033F	GP	03/11/2021	1118	2	180	D	217	217	39060
GL_VP2_0034A	GP	03/11/2021	1124	2	240	D	36	36	8640
GL_VP2_0034B	GP	03/11/2021	1126	2	240	C	45	45	10800
GL_VP2_0034C	GP	03/11/2021	1127	2	240	B	105	105	25200
GL_VP2_0034D	GP	03/11/2021	1128	2	240	C	30	30	7200
GL_VP2_0034E	GP	03/11/2021	1129	2	240	D	75	75	18000
GL_VP2_0034F	GP	03/11/2021	1130	2	240	C	30	30	7200
GL_VP2_0034G	GP	03/11/2021	1131	2	240	B	90	90	21600
GL_VP2_0034H	GP	03/11/2021	1132	2	240	C	30	30	7200

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0034I	GP	03/11/2021	1132	2	240	D	378	378	90720
GL_VP1_0035A	GP	03/11/2021	1141	1	187	C	165	165	30855
GL_VP1_0035B	GP	03/11/2021	1143	1	187	B	15	15	2805
GL_VP1_0035C	GP	03/11/2021	1143	1	187	A	15	0	0
GL_VP1_0035D	GP	03/11/2021	1144	1	187	B	30	30	5610
GL_VP1_0035E	GP	03/11/2021	1144	1	187	C	90	90	16830
GL_VP1_0035F	GP	03/11/2021	1146	1	187	D	150	150	28050
GL_VP1_0035G	GP	03/11/2021	1148	1	187	C	165	165	30855
GL_VP1_0035H	GP	03/11/2021	1151	1	187	D	105	105	19635
GL_VP1_0036A	GP	03/11/2021	1157	1	145	C	120	120	17400
GL_VP1_0036B	GP	03/11/2021	1159	1	145	B	30	30	4350
GL_VP1_0036C	GP	03/11/2021	1159	1	145	C	45	45	6525
GL_VP1_0036D	GP	03/11/2021	1200	1	145	D	75	75	10875
GL_VP1_0037A	GP	03/11/2021	1200	1	41	B	75	75	3075
GL_VP1_0037B	GP	03/11/2021	1201	1	41	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0038A	GP	03/11/2021	1211	1	4	C	15	15	60
GL_VP1_0038B	GP	03/11/2021	1211	1	4	B	15	15	60
GL_VP1_0038C	GP	03/11/2021	1211	1	4	C	15	15	60
GL_VP1_0039A	GP	03/11/2021	1212	1	130	D	30	30	3900
GL_VP1_0039B	GP	03/11/2021	1212	1	130	C	15	15	1950
GL_VP1_0039C	GP	03/11/2021	1212	1	130	D	90	90	11700
GL_VP1_0039D	GP	03/11/2021	1214	1	130	C	75	75	9750
GL_VP1_0039E	GP	03/11/2021	1215	1	130	B	75	75	9750
GL_VP1_0039F	GP	03/11/2021	1216	1	130	C	45	45	5850
GL_VP1_0039G	GP	03/11/2021	1217	1	130	B	60	60	7800
GL_VP1_0039H	GP	03/11/2021	1218	1	130	C	45	45	5850
GL_VP1_0039I	GP	03/11/2021	1219	1	130	D	315	315	40950
GL_VP1_0040A	GP	03/11/2021	1226	1	129	C	30	30	3870
GL_VP1_0040B	GP	03/11/2021	1226	1	129	B	45	45	5805
GL_VP1_0040C	GP	03/11/2021	1227	1	129	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0040D	GP	03/11/2021	1227	1	129	B	30	30	3870
GL_VP1_0040E	GP	03/11/2021	1228	1	129	C	30	30	3870
GL_VP1_0040F	GP	03/11/2021	1228	1	129	B	75	75	9675
GL_VP1_0040G	GP	03/11/2021	1229	1	129	C	45	45	5805
GL_VP1_0040H	GP	03/11/2021	1230	1	129	B	15	15	1935
GL_VP1_0041	GP	03/11/2021	1232	1	30	A	30	0	0
GL_VP1_0042A	GP	03/11/2021	1232	1	159	B	45	45	7155
GL_VP1_0042B	GP	03/11/2021	1232	1	159	A	15	0	0
GL_VP1_0043A	GP	03/11/2021	1241	1	3	C	30	30	90
GL_VP1_0043B	GP	03/11/2021	1241	1	3	B	30	30	90
GL_VP1_0043C	GP	03/11/2021	1242	1	3	A	15	0	0
GL_VP1_0044A	GP	03/11/2021	1243	1	176	B	75	75	13200
GL_VP1_0044B	GP	03/11/2021	1244	1	176	A	15	0	0
GL_VP1_0044C	GP	03/11/2021	1244	1	176	B	30	30	5280
GL_VP1_0044D	GP	03/11/2021	1245	1	176	C	45	45	7920

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0044E	GP	03/11/2021	1245	1	176	B	75	75	13200
GL_VP1_0044F	GP	03/11/2021	1247	1	176	A	45	0	0
GL_VP1_0045A	GP	03/11/2021	1336	1	2	C	75	75	150
GL_VP1_0045B	GP	03/11/2021	1337	1	2	D	11	11	22
GL_VP1_0046A	GP	03/11/2021	1343	1	4	B	75	75	300
GL_VP1_0046B	GP	03/11/2021	1344	1	4	A	15	0	0
GL_VP1_0047A	GP	03/11/2021	1423	1	24	B	105	105	2520
GL_VP1_0047B	GP	03/11/2021	1424	1	24	A	15	0	0
GL_VP1_0048A	GP	16/11/2021	939	1	43	C	30	30	1290
GL_VP1_0048B	GP	16/11/2021	939	1	43	D	15	15	645
GL_VP1_0049	GP	16/11/2021	1007	1	24	B	225	225	5400
GL_VP1_0050	GP	16/11/2021	1009	1	8	B	45	45	360
GL_VP1_0051	GP	16/11/2021	1010	1	32	B	30	30	960
GL_VP1_0052A	GP	16/11/2021	1013	1	32	C	13	13	416
GL_VP1_0052B	GP	16/11/2021	1013	1	32	D	105	105	3360

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0052C	GP	16/11/2021	1015	1	32	C	30	30	960
GL_VP1_0052D	GP	16/11/2021	1015	1	32	D	29	29	928
GL_VP1_0052E	GP	16/11/2021	1016	1	32	C	4	4	128
GL_VP1_0052F	GP	16/11/2021	1016	1	32	B	105	105	3360
GL_VP1_0052G	GP	16/11/2021	1018	1	32	C	45	45	1440
GL_VP1_0052H	GP	16/11/2021	1018	1	32	D	15	15	480
GL_VP1_0052I	GP	16/11/2021	1019	1	32	C	15	15	480
GL_VP1_0053A	GP	16/11/2021	1024	1	17	B	105	105	1785
GL_VP1_0053B	GP	16/11/2021	1025	1	17	A	45	0	0
GL_VP1_0053C	GP	16/11/2021	1026	1	17	B	15	15	255
GL_VP1_0053D	GP	16/11/2021	1026	1	17	C	30	30	510
GL_VP1_0053E	GP	16/11/2021	1027	1	17	B	15	15	255
GL_VP1_0053F	GP	16/11/2021	1027	1	17	C	15	15	255
GL_VP1_0054	GP	16/11/2021	1027	1	32	C	45	45	1440
GL_VP1_0055B	GP	16/11/2021	1031	1	49	B	45	45	2205

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0055C	GP	16/11/2021	1032	1	49	A	15	0	0
GL_VP1_0055A	GP	16/11/2021	1028	1	49	C	225	225	11025
GL_VP1_0056A	GP	16/11/2021	1032	1	51	A	15	0	0
GL_VP1_0056B	GP	16/11/2021	1032	1	51	B	90	90	4590
GL_VP1_0056C	GP	16/11/2021	1033	1	51	C	193	193	9843
GL_VP1_0056D	GP	16/11/2021	1036	1	51	D	30	30	1530
GL_VP1_0057	GP	16/11/2021	1106	1	2	A	45	0	0
GL_VP1_0058A	GP	16/11/2021	1112	1	3	B	60	60	180
GL_VP1_0058B	GP	16/11/2021	1113	1	3	A	15	0	0
GL_VP1_0059	GP	16/11/2021	1132	1	25	C	45	45	1125
GL_VP1_0060	GP	16/11/2021	1135	1	29	C	105	105	3045
GL_VP1_0061A	GP	16/11/2021	1152	1	31	B	45	45	1395
GL_VP1_0061B	GP	16/11/2021	1152	1	31	C	105	105	3255
GL_VP1_0061C	GP	16/11/2021	1154	1	31	D	30	30	930
GL_VP1_0061D	GP	16/11/2021	1555	1	31	C	60	60	1860

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0061E	GP	16/11/2021	1156	1	31	D	30	30	930
GL_VP1_0062A	GP	16/11/2021	1157	1	54	C	45	45	2430
GL_VP1_0062B	GP	16/11/2021	1157	1	54	B	15	15	810
GL_VP1_0062C	GP	16/11/2021	1158	1	54	C	210	210	11340
GL_VP1_0062D	GP	16/11/2021	1201	1	54	D	15	15	810
GL_VP2_0063	GP	16/11/2021	1212	2	13	B	45	45	585
GL_VP2_0064	GP	16/11/2021	1237	2	15	A	75	0	0
GL_VP2_0065	GP	16/11/2021	1319	2	2	A	30	0	0
GL_VP1_0066	KT	05/01/2022	1117	1	1	A	150	0	0
GL_VP1_0067A	GP	05/01/2022	1258	1	50	C	210	210	10500
GL_VP1_0067B	GP	05/01/2022	1301	1	50	D	60	60	3000
GL_VP2_0068A	GP	05/01/2022	1333	2	87	C	90	90	7830
GL_VP2_0068B	GP	05/01/2022	1334	2	87	D	90	90	7830
GL_VP2_0068C	GP	05/01/2022	1336	2	87	C	30	30	2610
GL_VP2_0068D	GP	05/01/2022	1336	2	87	D	30	30	2610

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0068E	GP	05/01/2022	1337	2	87	C	30	30	2610
GL_VP2_0068F	GP	05/01/2022	1337	2	87	B	45	45	3915
GL_VP2_0068G	GP	05/01/2022	13:38	2	87	A	45	45	0
GL_VP2_0069A	KT	25/01/2022	1033	2	1	B	90	90	90
GL_VP2_0069B	KT	25/01/2022	1034	2	1	C	120	120	120
GL_VP2_0069C	KT	25/01/2022	1036	2	1	B	105	105	105
GL_VP2_0070	GP	25/01/2022	1048	2	39	C	45	45	1755
GL_VP2_0071A	GP	25/01/2022	1052	2	49	B	105	105	5145
GL_VP2_0071B	GP	25/01/2022	1053	2	49	C	75	75	3675
GL_VP2_0071C	GP	25/01/2022	1055	2	49	B	90	90	4410
GL_VP2_0071D	GP	25/01/2022	1056	2	49	C	60	60	2940
GL_VP2_0071E	GP	25/01/2022	1057	2	49	B	105	105	5145
GL_VP2_0071F	GP	25/01/2022	1059	2	49	C	30	30	1470
GL_VP2_0072A	GP	25/01/2022	1108	2	44	B	30	30	1320
GL_VP2_0072B	GP	25/01/2022	1108	2	44	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0072C	GP	25/01/2022	1108	2	44	B	30	30	1320
GL_VP2_0072F	GP	25/01/2022	1110	2	44	C	75	75	3300
GL_VP2_0072G	GP	25/01/2022	1111	2	44	B	60	60	2640
GL_VP2_0072H	GP	25/01/2022	11112	2	44	A	15	0	0
GL_VP2_0072D	GP	25/01/2022	1109	2	44	A	15	0	0
GL_VP2_0072E	GP	25/01/2022	1109	2	44	B	60	60	2640
GL_VP2_0073A	GP	25/01/2022	1142	2	37	B	120	120	4440
GL_VP2_0073B	GP	25/01/2022	1144	2	37	A	60	0	0
GL_VP2_0073C	GP	25/01/2022	1144	2	37	B	45	45	1665
GL_VP2_0073D	GP	25/01/2022	1145	2	37	C	15	15	555
GL_VP1_0075A	GP	25/01/2022	1304	1	24	B	105	105	2520
GL_VP1_0075B	GP	25/01/2022	1305	1	24	A	15	0	0
GL_VP1_0074A	GP	25/01/2022	1246	1	28	B	120	120	3360
GL_VP1_0074B	GP	25/01/2022	1248	1	28	C	75	75	2100
GL_VP1_0074C	GP	25/01/2022	1249	1	28	B	45	45	1260

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0074D	GP	25/01/2022	1250	1	28	C	45	45	1260
GL_VP1_0074E	GP	25/01/2022	1250	1	28	B	15	15	420
GL_VP1_0074F	GP	25/01/2022	1251	1	28	C	60	60	1680
GL_VP1_0074G	GP	25/01/2022	1252	1	28	B	75	75	2100
GL_VP1_0074H	GP	25/01/2022	1253	1	28	C	105	105	2940
GL_VP1_0074I	GP	25/01/2022	1255	1	28	B	120	120	3360
GL_VP1_0074J	GP	25/01/2022	1257	1	28	A	30	0	0
GL_VP1_0076A	GP	25/01/2022	1340	1	59	B	180	180	10620
GL_VP1_0076B	GP	25/01/2022	1343	1	59	C	30	30	1770
GL_VP1_0076C	GP	25/01/2022	1343	1	59	B	60	60	3540
GL_VP1_0077A	GP	25/01/2022	1417	1	65	D	180	180	11700
GL_VP1_0077B	GP	25/01/2022	1420	1	65	C	105	105	6825
GL_VP1_0077C	GP	25/01/2022	1421	1	65	D	110	110	7150
GL_VP1_0078A	GP	26/01/2022	956	1	7	C	30	30	210
GL_VP1_0078B	GP	26/01/2022	956	1	7	D	15	15	105

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0078C	GP	26/01/2022	956	1	7	C	15	15	105
GL_VP1_0078D	GP	26/01/2022	957	1	7	B	15	15	105
GL_VP1_0078E	GP	26/01/2022	957	1	7	A	15	0	0
GL_VP1_0078F	GP	26/01/2022	957	1	7	B	45	45	315
GL_VP1_0078G	GP	26/01/2022	958	1	7	A	15	0	0
GL_VP1_0079	GP	26/01/2022	1001	1	7	A	60	0	0
GL_VP1_0080A	GP	26/01/2022	1020	1	48	B	75	75	3600
GL_VP1_0080B	GP	26/01/2022	1021	1	48	C	39	39	1872
GL_VP1_0080C	GP	26/01/2022	1022	1	48	B	30	30	1440
GL_VP1_0080D	GP	26/01/2022	1023	1	48	C	88	88	4224
GL_VP1_0080E	GP	26/01/2022	1024	1	48	D	129	129	6192
GL_VP1_0082A	GP	26/01/2022	1045	1	18	B	75	75	1350
GL_VP1_0082B	GP	26/01/2022	1046	1	18	C	60	60	1080
GL_VP1_0082C	GP	26/01/2022	1047	1	18	B	60	60	1080
GL_VP1_0082D	GP	26/01/2022	1048	1	18	A	30	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP1_0083	KT	26/01/2022	1116	1	1	A	30	0	0
GL_VP1_0084A	GP	26/01/2022	1121	1	37	A	30	0	0
GL_VP1_0084B	GP	26/01/2022	1121	1	37	B	45	45	1665
GL_VP1_0084C	GP	26/01/2022	1122	1	37	C	90	90	3330
GL_VP1_0084D	GP	26/01/2022	1123	1	37	D	67	67	2479
GL_VP2_0085A	GP	26/01/2022	1134	2	76	D	270	270	20520
GL_VP2_0085B	GP	26/01/2022	1138	2	76	C	60	60	4560
GL_VP2_0085C	GP	26/01/2022	1139	2	76	B	45	45	3420
GL_VP2_0085D	GP	26/01/2022	1140	2	76	C	30	30	2280
GL_VP2_0086A	GP	26/01/2022	1146	2	53	B	75	75	3975
GL_VP2_0086B	GP	26/01/2022	1147	2	53	C	90	90	4770
GL_VP2_0086C	GP	26/01/2022	1148	2	53	B	15	15	795
GL_VP2_0087	GP	26/01/2022	1148	2	9	B	15	15	135
GL_VP2_0088A	GP	26/01/2022	1148	2	62	B	90	90	5580
GL_VP2_0088B	GP	26/01/2022	1149	2	62	C	105	105	6510

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0089A	KT	26/01/2022	1157	2	1	B	30	30	30
GL_VP2_0089B	KT	26/01/2022	1157	2	1	A	15	0	0
GL_VP2_0090A	GP	27/01/2022	921	2	16	B	60	60	960
GL_VP2_0090B	GP	27/01/2022	922	2	16	C	45	45	720
GL_VP2_0090C	GP	27/01/2022	922	2	16	B	45	45	720
GL_VP2_0090D	GP	27/01/2022	923	2	16	C	15	15	240
GL_VP2_0091A	GP	27/01/2022	944	2	1	B	45	45	45
GL_VP2_0091B	GP	27/01/2022	944	2	1	A	45	0	0
GL_VP2_0092	GP	27/01/2022	1041	2	6	C	45	45	270
GL_VP2_0093	GP	27/01/2022	1049	2	17	C	60	60	1020
GL_VP2_0094	KT	27/01/2022	1105	2	2	B	45	45	90
GL_VP2_0095A	KT	27/01/2022	1106	2	1	B	60	60	60
GL_VP2_0095B	KT	27/01/2022	1107	2	1	A	15	0	0
GL_VP2_0096A	KT	27/01/2022	1106	2	1	B	75	75	75
GL_VP2_0096B	KT	27/01/2022	1107	2	1	A	15	0	0

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0097A	KT	27/01/2022	1111	2	1	B	45	45	45
GL_VP2_0097B	KT	27/01/2022	1111	2	1	A	15	0	0
GL_VP2_0098A	GP	27/01/2022	1153	2	7	B	60	60	420
GL_VP2_0098B	GP	27/01/2022	1154	2	7	C	15	15	105
GL_VP2_0099A	KT	15/02/2022	1445	2	1	B	30	30	30
GL_VP2_0099B	KT	15/02/2022	1445	2	1	A	30	0	0
GL_VP1_0100A	GP	15/02/2022	1424	1	2	B	15	15	30
GL_VP1_0100B	GP	15/02/2022	1424	1	2	A	15	0	0
GL_VP1_0101A	KT	15/02/2022	1445	1	1	B	30	30	30
GL_VP1_0101B	KT	15/02/2022	1445	1	1	A	30	0	0
GL_VP2_0102	GP	09/03/2022	1207	2	34	C	56	56	1904
GL_VP2_0103	GP	09/03/2022	1311	2	43	C	45	45	1935
GL_VP2_0104A	GP	09/03/2022	1406	2	27	B	30	30	810
GL_VP2_0104B	GP	09/03/2022	1406	2	27	C	60	60	1620
GL_VP2_0105	GP	09/03/2022	1409	2	27	B	105	105	2835

Flight ID	Species	Date	Time	VP	No. Birds	Height Band	Flight Time	Time at PCH	No. Birds X Time at PCH
GL_VP2_0106A	KT	15/03/2022	1142	2	1	C	45	45	45
GL_VP2_0106B	KT	15/03/2022	1142	2	1	B	30	30	30
GL_VP2_0106C	KT	15/03/2022	1143	2	1	A	30	0	0
GL_VP1_0108A	GP	15/03/2022	1557	1	5	B	30	30	150
GL_VP1_0108B	GP	15/03/2022	1557	1	5	C	30	30	150
GL_VP1_0108C	GP	15/03/2022	1558	1	5	D	15	15	75
GL_VP1_0109	GI	18/03/2022	1152	1	1	A	69	69	0
GL_VP1_0110A	GI	18/03/2022	1155	1	2	B	34	34	68
GL_VP1_0110B	GI	18/03/2022	1155	1	2	C	66	66	132
GL_VP1_0110C	GI	18/03/2022	1157	1	2	D	316	316	632
GL_VP1_0111B	GI	18/03/2022	1205	1	1	B	14	14	14
GL_VP1_0112	KT	18/03/2022	1218	1	1	B	75	75	75

Annex C

CRM Calculations

Band Model - Random Flights Proposed Development Year 1								
Species: Red Kite								
Season: Breeding season 2020								
Wind Farm Parameters		Bird Parameters						
WFP (ha)	349.92	length (m)	0.63					
Number turbines	7	wingspan (m)	1.85					
Rotor diameter	136	flapping (0) or gliding (1)	0					
Hub height (m)	97.5	Assumed flight speed (m/s)	12					
Max chord (m)	4.1	Number daylight hours available	3080.12					
Rotor depth	4.1	Maximum recording height (m)	200					
Pitch (degrees)	11	Minimum recording height (m)	10					
Rotation period (secs)	5.2	Survey Data						
Turbine operation time 85%	0.85	VP	1	2				
Avoidance Rate 98%	0.01	FRA (ha)	96	98				
Rotor radius ²	4624.00	Observation Time (hours)	54	54				
Combined rotor swept area	101687.05	Time at height band A	750	120				
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	720	315				
Rotor swept volume 'Vr' (m ³)	480,980	Time at height band C	15	90				
		Time at height band D	0	40				
		Total Time at PCH	735	445	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8 Total
Observation effort	Observation time (seconds) * hectare	18670176	19051200	0	0	0	0	37721376.0
Flying time at risk height	Effort at each VP / FRA	3.94E-05	2.34E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-05
Weighted by observation effort								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	4.95E-01	5.05E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	1.95E-05	1.18E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E-05
Occupancy Rate								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000031282						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	33.72						
FRAw	Estimated bird time*(rotor diameter/recording height band)	24.13						
Rotor Transits								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600	87.81						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.39						
Number of transits 'ntr'	'n'/t'	222.77						
E								
Probability of collision (Band model)		0.071						
		Calculation of number collisions		No avoidance		Avoidance 99%		
		Collisions per year		13.52		0.135		
		Equivalent to 1 bird every x (years)		0.07		7.4		
		Over 30 years		338.0		4.06		

Band Model - Random Flights Proposed Development Year 1									
Species: Red Kite									
Season: Non- Breeding season 2020-21									
Wind Farm Parameters		Bird Parameters							
WFP (ha)	349.92	length (m)	0.63						
Number turbines	7	wingspan (m)	1.85						
Rotor diameter	136	flapping (0) or gliding (1)	0						
Hub height (m)	97.5	Assumed flight speed (m/s)	12						
Max chord (m)	4.1	Number daylight hours available	2114.6						
Rotor depth	4.1	Maximum recording height (m)	200						
Pitch (degrees)	11	Minimum recording height (m)	10						
Rotation period (secs)	5.2	Survey Data							
Turbine operation time 85%	0.85	VP	1	2					
Avoidance Rate 98%	0.01	FRA (ha)	96	98					
Rotor radius ²	4624.00	Observation Time (hours)	51	51					
Combined rotor swept area	101687.05	Time at height band A	241	195					
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	690	733					
Rotor swept volume 'Vr' (m ³)	480,980	Time at height band C	150	891					
		Time at height band D	0	120					
		Total Time at PCH	840	1744	0	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8	Total
Observation effort	Observation time (seconds) * hectare		17632944	17992800	0	0	0	0	35625744.0
Flying time at risk height	Effort at each VP / FRA		4.76E-05	9.69E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-04
Weighted by observation effort									
Weighted obs effort	Effort at each VP / sum of all effort at all VP's		4.95E-01	5.05E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height		2.36E-05	4.90E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.25E-05
Occupancy Rate									
Summed Occupancy rate	Sum of weighted average flight activity per visible ha		0.000072532						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active		53.67						
FRAw	Estimated bird time*(rotor diameter/recording height band)		38.42						
Rotor Transits									
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600		139.78						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)		0.39						
Number of transits 'ntr'	'n'/t'		354.61						
E									
Probability of collision (Band model)			0.071						
			Calculation of number collisions			No avoidance		Avoidance 99%	
			Collisions per year			21.52		0.215	
			Equivalent to 1 bird every x (years)			0.05		4.6	
			Over 30 years			538.0		6.46	

Band Model - Random Flights Proposed Development Year 2									
Species: Red Kite									
Season: Breeding season 2021									
Wind Farm Parameters		Bird Parameters							
WFP (ha)	349.92	length (m)	0.63						
Number turbines	7	wingspan (m)	1.85						
Rotor diameter	136	flapping (0) or gliding (1)	0						
Hub height (m)	97.5	Assumed flight speed (m/s)	12						
Max chord (m)	4.1	Number daylight hours available	3079.45						
Rotor depth	4.1	Maximum recording height (m)	200						
Pitch (degrees)	11	Minimum recording height (m)	10						
Rotation period (secs)	5.2	Survey Data							
Turbine operation time 85%	0.85	VP	1	2					
Avoidance Rate 98%	0.01	FRA (ha)	96	98					
Rotor radius ²	4624.00	Observation Time (hours)	36	33					
Combined rotor swept area	101687.05	Time at height band A	30	30					
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	417	30					
Rotor swept volume 'Vr' (m ³)	480,980	Time at height band C	105	0					
		Time at height band D	0	0					
		Total Time at PCH	522	30	0	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8	Total
Observation effort	Observation time (seconds) * hectare		12446784	11642400	0	0	0	0	24089184.0
Flying time at risk height	Effort at each VP / FRA		4.19E-05	2.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.45E-05
Weighted by observation effort									
Weighted obs effort	Effort at each VP / sum of all effort at all VP's		5.17E-01	4.83E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height		2.17E-05	1.25E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-05
Occupancy Rate									
Summed Occupancy rate	Sum of weighted average flight activity per visible ha		0.000022915						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active		24.69						
FRAw	Estimated bird time*(rotor diameter/recording height band)		17.67						
Rotor Transits									
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600		64.31						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)		0.39						
Number of transits 'ntr'	'n'/t'		163.15						
E									
Probability of collision (Band model)			0.071						
			Calculation of number collisions			No avoidance		Avoidance 99%	
			Collisions per year			9.90		0.099	
			Equivalent to 1 bird every x (years)			0.10		10.1	
			Over 30 years			247.5		2.97	

Band Model - Random Flights Proposed Development Year 2								
Species: Red Kite								
Season: Non- Breeding season 2021-22								
Wind Farm Parameters		Bird Parameters						
WFP (ha)	349.92	length (m)	0.63					
Number turbines	7	wingspan (m)	1.85					
Rotor diameter	136	flapping (0) or gliding (1)	0					
Hub height (m)	97.5	Assumed flight speed (m/s)	12					
Max chord (m)	4.1	Number daylight hours available	2115.25					
Rotor depth	4.1	Maximum recording height (m)	200					
Pitch (degrees)	11	Minimum recording height (m)	10					
Rotation period (secs)	5.2	Survey Data						
Turbine operation time 85%	0.85	VP	1	2				
Avoidance Rate 98%	0.01	FRA (ha)	96	98				
Rotor radius ²	4624.00	Observation Time (hours)	42	36				
Combined rotor swept area	101687.05	Time at height band A	225	150				
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	195	630				
Rotor swept volume 'Vr' (m ³)	480,980	Time at height band C	45	165				
		Time at height band D	0	0				
		Total Time at PCH	240	795	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8 Total
Observation effort	Observation time (seconds) * hectare	14521248	12700800	0	0	0	0	27222048.0
Flying time at risk height	Effort at each VP / FRA	1.65E-05	6.26E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.91E-05
Weighted by observation effort								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	5.33E-01	4.67E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	8.82E-06	2.92E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.80E-05
Occupancy Rate								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000038021						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	28.14						
FRAw	Estimated bird time*(rotor diameter/recording height band)	20.14						
Rotor Transits								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600	73.29						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.39						
Number of transits 'ntr'	'n'/t'	185.94						
E								
Probability of collision (Band model)		0.071						
			Calculation of number collisions			No avoidance		Avoidance 99%
			Collisions per year			11.28		0.113
			Equivalent to 1 bird every x (years)			0.09		8.9
			Over 30 years			282.1		3.39

Band Model - Random Flights Proposed Development Year 1								
Species: Goshawk								
Season: Non- Breeding season 2020-21								
Wind Farm Parameters		Bird Parameters						
WFP (ha)	349.92	length (m)	0.55					
Number turbines	7	wingspan (m)	1.1					
Rotor diameter	136	flapping (0) or gliding (1)	0					
Hub height (m)	97.5	Assumed flight speed (m/s)	13.9					
Max chord (m)	4.1	Number daylight hours available	2114.6					
Rotor depth	4.1	Maximum recording height (m)	200					
Pitch (degrees)	11	Minimum recording height (m)	10					
Rotation period (secs)	5.2	Survey Data						
Turbine operation time 85%	0.85	VP	1	2				
Avoidance Rate 98%	0.02	FRA (ha)	96	98				
Rotor radius ²	4624.00	Observation Time (hours)	51	51				
Combined rotor swept area	101687.05	Time at height band A	15	75				
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	15	75				
Rotor swept volume 'Vr' (m ³)	472,845	Time at height band C	0	221				
		Time at height band D	41	0				
		Total Time at PCH	56	296	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8 Total
Observation effort	Observation time (seconds) * hectare	17632944	17992800	0	0	0	0	35625744.0
Flying time at risk height	Effort at each VP / FRA	3.18E-06	1.65E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E-05
Weighted by observation effort								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	4.95E-01	5.05E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	1.57E-06	8.31E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.88E-06
Occupancy Rate								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000009880						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	7.31						
FRAw	Estimated bird time*(rotor diameter/recording height band)	5.23						
Rotor Transits								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600	18.72						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.33						
Number of transits 'ntr'	'n'/t'	55.95						
E								
Probability of collision (Band model)		0.061						
		Calculation of number collisions			No avoidance		Avoidance 98%	
		Collisions per year			2.89		0.058	
		Equivalent to 1 bird every x (years)			0.35		17.3	
		Over 30 years			72.3		1.74	

Band Model - Random Flights Proposed Development Year 2								
Species: Goshawk								
Season: Non- Breeding season 2021-22								
Wind Farm Parameters		Bird Parameters						
WFP (ha)	349.92	length (m)	0.55					
Number turbines	7	wingspan (m)	1.1					
Rotor diameter	136	flapping (0) or gliding (1)	0					
Hub height (m)	97.5	Assumed flight speed (m/s)	13.9					
Max chord (m)	4.1	Number daylight hours available	2115.25					
Rotor depth	4.1	Maximum recording height (m)	200					
Pitch (degrees)	11	Minimum recording height (m)	10					
Rotation period (secs)	5.2	Survey Data						
Turbine operation time 85%	0.85	VP	1	2				
Avoidance Rate 98%	0.02	FRA (ha)	96	98				
Rotor radius ²	4624.00	Observation Time (hours)	42	36				
Combined rotor swept area	101687.05	Time at height band A	69	0				
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	82	0				
Rotor swept volume 'Vr' (m ³)	472,845	Time at height band C	183	0				
		Time at height band D	737	0				
		Total Time at PCH	1002	0	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8 Total
Observation effort	Observation time (seconds) * hectare	14521248	12700800	0	0	0	0	27222048.0
Flying time at risk height	Effort at each VP / FRA	6.90E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.90E-05
Weighted by observation effort								
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	5.33E-01	4.67E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	3.68E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.68E-05
Occupancy Rate								
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.000036808						
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	27.24						
FRAw	Estimated bird time*(rotor diameter/recording height band)	19.50						
Rotor Transits								
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600	69.76						
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.33						
Number of transits 'ntr'	'n'/t'	208.52						
E								
Probability of collision (Band model)		0.061						
			Calculation of number collisions			No avoidance		Avoidance 98%
			Collisions per year			10.78		0.216
			Equivalent to 1 bird every x (years)			0.09		4.6
			Over 30 years			269.6		6.47

Band Model - Random Flights Proposed Development Year 1									
Species: Golden Plover									
Season: Non- Breeding season 2020-21									
Wind Farm Parameters		Bird Parameters							
WFP (ha)	349.92	length (m)	0.28						
Number turbines	7	wingspan (m)	0.72						
Rotor diameter	136	flapping (0) or gliding (1)	0						
Hub height (m)	97.5	Assumed flight speed (m/s)	13.7						
Max chord (m)	4.1	Number daylight hours available	3180.65						
Rotor depth	4.1	Maximum recording height (m)	200						
Pitch (degrees)	11	Minimum recording height (m)	10						
Rotation period (secs)	5.2	Survey Data							
Turbine operation time 85%	0.85	VP	1	2					
Avoidance Rate 98%	0.02	FRA (ha)	96	98					
Rotor radius ²	4624.00	Observation Time (hours)	57	57					
Combined rotor swept area	101687.05	Time at height band A	0	0					
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	680496	338160					
Rotor swept volume 'Vr' (m ³)	445,389	Time at height band C	508350	276966					
		Time at height band D	50232	89017					
		Total Time at PCH	1239078	704143	0	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8	Total
Observation effort	Observation time (seconds) * hectare	19707408	20109600	0	0	0	0	0	39817008.0
Flying time at risk height	Effort at each VP / FRA	6.29E-02	3.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.79E-02
Weighted by observation effort									
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	4.95E-01	5.05E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	3.11E-02	1.77E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E-02
Occupancy Rate									
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.048803793							
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	54,317.31							
FRAw	Estimated bird time*(rotor diameter/recording height band)	38,879.76							
Rotor Transits									
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600	130,996.02							
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.32							
Number of transits 'ntr'	'n'/t'	409736.42							
E									
Probability of collision (Band model)		0.050							
					Calculation of number collisions		No avoidance	Avoidance 98%	
					Collisions per year		17252.21	345.044	
					Equivalent to 1 bird every x (years)		0.00	0.0	
					Over 30 years		431305.4	10351.33	

Band Model - Random Flights Proposed Development Year 2									
Species: Golden Plover									
Season: Non- Breeding season 2021-22									
Wind Farm Parameters		Bird Parameters							
WFP (ha)	349.92	length (m)	0.28						
Number turbines	7	wingspan (m)	0.72						
Rotor diameter	136	flapping (0) or gliding (1)	0						
Hub height (m)	97.5	Assumed flight speed (m/s)	13.7						
Max chord (m)	4.1	Number daylight hours available	3180.78						
Rotor depth	4.1	Maximum recording height (m)	200						
Pitch (degrees)	11	Minimum recording height (m)	10						
Rotation period (secs)	5.2	Survey Data							
Turbine operation time 85%	0.85	VP	1	2					
Avoidance Rate 98%	0.02	FRA (ha)	96	98					
Rotor radius ²	4624.00	Observation Time (hours)	42	36					
Combined rotor swept area	101687.05	Time at height band A	570	510					
Collision Risk volume 'Vw' (m ³)	475,891,200	Time at height band B	158895	154507					
Rotor swept volume 'Vr' (m ³)	445,389	Time at height band C	242113	368504					
		Time at height band D	159455	248865					
		Total Time at PCH	560463	771876	0	0	0	0	0
Flight activity per unit time and area			1	2	3	4	5	8	Total
Observation effort	Observation time (seconds) * hectare	14521248	12700800	0	0	0	0	0	27222048.0
Flying time at risk height	Effort at each VP / FRA	3.86E-02	6.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-02
Weighted by observation effort									
Weighted obs effort	Effort at each VP / sum of all effort at all VP's	5.33E-01	4.67E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.0
Adjusted time at risk height	Weighted obs effort * flying time at risk height	2.06E-02	2.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.89E-02
Occupancy Rate									
Summed Occupancy rate	Sum of weighted average flight activity per visible ha	0.048943379							
Estimated bird time 'b' in risk area	Summed Occupancy rate*windfarm polygon*hours active	54,474.89							
FRAw	Estimated bird time*(rotor diameter/recording height band)	38,992.55							
Rotor Transits									
Bird occupancy of rotor swept volume ('b')	Estimated bird time * (rotor swept volume / collision risk volume)*3600	131,376.06							
Bird transit time (t)	(rotor depth+bird length)/flight speed(m/s)	0.32							
Number of transits 'ntr'	'n'/t'	410925.12							
E									
Probability of collision (Band model)		0.050							
			Calculation of number collisions			No avoidance		Avoidance 98%	
			Collisions per year			17302.27		346.045	
			Equivalent to 1 bird every x (years)			0.00		0.0	
			Over 30 years			432556.6		10381.36	

