BSG | ecology

Llanbrynmair and Carnedd Wen

Bird Survey Report 2016/17

BLANK PAGE

BSG | ecology

Issuing office

Wyastone Business Park | Wyastone Leys | Monmouth | NP25 3SR
T: 01600 891576 | W: www.bsg-ecology.com | E: info@bsg-ecology.com

Client	RES Ltd & Innogy Renewables UK Ltd
Project	Llanbrynmair and Carnedd Wen
Report title	Bird Survey Report 2016/17
Draft version/final	FINAL
File reference	Llanbrynmair and Carnedd Wen Bird Survey Report 2016-17_public.docx

	Name	**Position**	**Date**
Originated	Gareth Lang	Senior Ecologist	27 July 2018
Reviewed	Owain Gabb	Director	30 July 2018
Approved for issue to client	Owain Gabb	Director	30 July 2018
Issued to client	Gareth Lang	Senior Ecologist	30 July 2018

Contents

1 Introduction

Background to commission

1.1 RES UK Ltd and Innogy Renewables UK have contracted BSG Ecology to provide updated baseline ornithological information for their (respective) Llanbrynmair and Carnedd Wen Wind Farm application sites, Powys. The sites lie adjacent to each other, and this collaborative approach to updating the work is aimed at ensuring consistency of approach across the combined area.

1.2 Both wind farms were refused planning permission by the Department of Energy and Climate Change following a Public Inquiry in 2015. This decision was later overturned by the High Court, and the respective planning applications are now with the Department of Business, Energy and Industrial Strategy (BEIS) for determination.

Site description

1.3 The Llanbrynmair and Carnedd Wen sites (hereafter referred to in this document for convenience as the "Site") are upland in nature, and rise to a high point of 523 m above ordnance datum (AOD) at Ordnance Survey Grid Reference (OSGR) SH9277 0997. The Site is characterised by a mixture of commercial coniferous plantation, much of which is approaching felling age, and open moorland. Within the plantation areas there is a network of well-surfaced forestry tracks[1].

1.4 Habitat survey work to support the Carnedd Wen application (the northern part of the Site) recorded over 65 % of the land as commercial forestry, with marshy grassland (12 %) and wet dwarf shrub heath (approximately 5 %) around the edges of and within the plantation being the commoner of the other habitat types.

1.5 Habitat survey and mapping completed in support of the Llanbrynmair application (the southern part of the Site) indicates that the area is predominantly a mosaic of blanket bog, heath and grassland (including improved and semi-improved pasture and acid grassland), with smaller compartments of commercial plantation (covering approximately 15 % of the area).

1.6 The topography of the Site is predominantly relatively gently rolling, but steep-sided valleys and ridges are present to the west and north and occur locally within the Site boundary. Minor watercourses are frequent, and mainly discharge to the Nant Carfan to the west and the Nant yr Eira which flows north-west across the Site to join the Afon Banwy.

1.7 There are two relatively large still freshwater bodies towards the western edge of the Site, Llyn Gwyddior and Llyn Coch-hywad; these are approximately 550 m by 350 m and 520 m by 270 m at their greatest extent.

1.8 The Site boundary is shown on **Figure 1** in **Appendix 1**. The extent of the respective Carnedd Wen and Llanbrynmair Wind Farm planning applications are also indicated on the figure. Photographs of the Site are provided in **Appendix 2**.

Aims of study

1.9 The aim of ornithological survey work at the Site between April 2016 and July 2017 inclusive has been to:

- Update survey work undertaken to support the respective Carnedd Wen and Llanbrynmair Wind Farm planning applications
- Identify any key changes in the community of bird species present (that may be subject to impacts from wind farm developments) in the area since previous work was completed.

[1] There was evidence during the course of the 2016/17 survey period that the tracks were used for motocross and enduro mountain biking events.

2 Summary of Previous Ornithological Data Relating to the Site

2.1 This section provides a summary of data collected with regard to the previous wind farm planning applications for the Site, and includes:

- The ornithology chapter of the Carnedd Wen Environmental Statement (ES), associated appendices and figures (RWE Npower Renewables, 2008)
- A revised ornithological assessment for Carnedd Wen, associated appendices and figures (RWE Npower Renewables, 2013)
- The ornithology chapter of the Llanbrynmair ES, associated appendices and figures (RES Ltd, 2008)
- Supplementary Environmental Information (SEI) submitted to inform the planning application for the Llanbrynmair Wind Farm planning application (RES Ltd, 2013). This has included review of a confidential ornithological annex relating to the scheme (Ecology Consulting in RES Ltd, 2013).

Survey Work to Support the Carnedd Wen Wind Farm Application

Overview of Survey at Carnedd Wen

2.2 Breeding bird survey to support the Carnedd Wen Wind Farm planning application was completed between 2005 and 2012 inclusive.

2.3 Desk study and reconnaissance work was undertaken in 2005. Following this, two years of detailed baseline data (including species specific work for black grouse *Lyrurus tetrix* and a variety of raptors) were collected, with grouse and hen harrier *Circus cyaneus* surveys continued into 2008 (resulting in three consecutive years of data for these species). Two years of VP work (2006 & 2007) was also completed to record baseline flight activity on the site and to establish whether there was evidence of a direct ecological linkage between the site and the nearby Berwyn SPA.

2.4 Survey work for black grouse and hen harrier was repeated in 2012 ahead of the submission of SEI to support the Wind Farm application.

2.5 A summary of baseline survey work completed in each year is presented in Table 1 below:

Table 1. Baseline Survey work at Carnedd Wen

Survey	Year
Reconnaissance Survey	2005
Black grouse	2006, 2007, 2008 & 2012
Breeding hen harrier survey	2006, 2007, 2008 & 2012
Winter hen harrier and merlin roosts survey	2006/2007
Breeding peregrine, merlin, red kite & short-eared owl surveys	2006 & 2007
Breeding honey buzzard, long-eared owl, and barn owl surveys	2006
Breeding goshawk survey	2007
Breeding wader survey	2006

Survey	Year
Nightjar survey	2005 & 2006
Surveys of raptor movements between Berwyn SPA and site	2006 & 2007
Woodland passerine survey	2006
Winter waterfowl counts	2006

VP Survey

2.6 During the breeding seasons of 2006 and 2007 VP survey was completed from 16 locations at Carnedd Wen.

2.7 No seasonal breakdown of flight activity is presented in the ornithological assessment, but it is noted that the species recorded with the greatest regularity over the VP survey period (April 2006 to July 2007 inclusive – therefore including winter 2006/07) were red kite *Milvus milvus* (531 flights), goshawk *Accipiter gentilis* (448 flights), hen harrier (417 flights) and peregrine *Falco peregrinus* (282 flights). Other species were recorded far less frequently, with merlin the next most regularly noted species (33 flights during the survey period).

Black grouse

2.8 Desk study data, supplied by RSPB Cymru prior to the commencement of survey work, had established that 8-9 pairs of black grouse were present in the Carnedd Wen / Llanbrynmair area in 2004. Prior to this, annual monitoring between 1997 and 2003 inclusive had recorded a minimum of three and a maximum of eleven lekking male grouse in the area. However, these data had not always been collected in ideal survey conditions, which potentially contributed to the range in the number of birds recorded.

2.9 Dedicated black grouse survey work was completed in support of the Carnedd Wen Wind Farm application in 2006-08 and in 2012. Work in 2006-08 recorded a total of 10, 17 and 13 displaying males respectively, and it was concluded in the ornithology ES that the Carnedd Wen population was of national (Welsh) importance at that time. Counts undertaken by RSPB Cymru during the same years were 10, 5 and 9 respectively (although the RSPB survey in 2007 was hampered by poor weather).

- In 2006 black grouse were concentrated in two general areas: around Cannon Farm in the eastern part of the Site, where land was being managed as part of the Welsh Black Grouse Recovery Project (WBGRP); and within approximately 1.5 km of Llyn Coch Hwyad in the northern part of the Site.
- In 2007, with the exception of three birds recorded incidentally (during the course of a survey relating to a proposed Nant Carfan Wind Farm), all displaying birds were recorded within approximately 1km of the area at Cannon Farm.
- In 2008 all displaying birds were recorded within approximately 1km of the area at Cannon Farm. This apparent contraction in range was considered likely to be a result of canopy closure forcing birds away from sites used previously and due to the positive effect of the RSPB habitat management measures in the vicinity of Cannon Farm (RWE Npower Renewables, 2008).

2.10 The 2012 surveys recorded no evidence of black grouse, and it was concluded (RWE, 2013) that the species had become locally extinct.

Hen Harrier, Peregrine, Merlin, Red Kite and Short-eared Owl Survey

2.11 Surveys for hen harrier, peregrine, merlin *Falco columbarius*, red kite and short-eared owl *Asio flammeus* at Carnedd Wen covered the site and a 2 km perimeter area. Methods were based on Hardey *et al*. (2006) and informed by the results of other work. Initial visits were completed to identify areas of suitable habitat and check for signs of occupancy, with further visits to identify active nests and to understand productivity.

- In 2006 the site supported three nesting hen harriers nests, with a further probable breeding pair and another possible pair within or immediately adjacent to the site boundary. A further confirmed breeding pair was located within the 2 km perimeter area to the north of the site. None of the nesting attempts was successful.
- In 2007 one confirmed nest was located within the site there was another probable breeding pair, and a further possible pair was present just to the north of the site, within the buffer zone, in April and May but not thereafter. As in 2006 breeding was unsuccessful.
- In 2008 two or three male hen harriers were noted during April around previously used sites but were not observed displaying and were not seen in subsequent months. No females were seen on site. A nest was present to the north of the site, within the Berwyn SPA and just within the 2 km perimeter area, although it is not known whether breeding was successful.
- In 2012 no hen harriers were recorded within the site or 2 km perimeter area.

2.12 One pair of peregrine nested at Carnedd Wen in 2006-08, fledging one chick in 2006 but failing in subsequent years. Two further nest sites, both within the 2 km perimeter area were also occupied in 2006-08, whilst a further two pairs were recorded regularly within the 2 km perimeter area (but were concluded to be nesting outside it).

2.13 Up to two pairs of merlin were recorded around the periphery of the site and 2 km perimeter area in 2006, but no firm evidence of breeding was found. In 2007 a pair was again recorded around the periphery of the site, but breeding was not confirmed. In 2008 there were only two records of merlin from the site (although detailed surveys for merlin were not undertaken). A pair nested just outside the 2 km perimeter area (within the Berwyn SPA) in 2007 and 2008.

2.14 No red kites were recorded breeding within the site in 2006, 2007 or 2008. Between two and five pairs of red kites were recorded breeding in the 2 km perimeter area in 2006; this declined to one pair in 2007 and 2008. All nests were located in the wooded valleys around the periphery of the site.

2.15 Single short-eared owls were recorded during reconnaissance work in 2005 and again in 2008, but not during the raptor surveys in 2006 or 2007. The species is not considered to have bred within the site or 2 km perimeter area during this period.

2.16 The raptor survey work also resulted in up to two pairs of hobby *Falco subbuteo* being recorded. These birds were present in the 2 km perimeter area in 2006 and 2007: one pair to the north and one to the south of the site in both years. Birds were present again in 2008 (although detailed surveys were not carried out). No nests were located, although records of at least one juvenile in 2006 suggest that successful breeding occurred

Goshawk Survey

2.17 A detailed survey for goshawk was undertaken in suitable habitat across the Carnedd Wen site and within the 2 km perimeter zone in February and March 2007 following a large number of records of the species in 2006. Survey methods were based on Hardey *et al*. (2006), and informed by flight lines and behaviour recorded over the preceding winter and the 2006 breeding season. The work was updated / repeated in 2008.

2.18 The goshawk surveys undertaken in early spring 2007 found two nests on site plus another nest and two further possible pairs in the 2 km perimeter area. Survey in 2008 found only two active nests (one within the site plus one in the 2 km perimeter area) and one further location in the

perimeter area where breeding may have been attempted. The population within the site and buffer zone was considered to be between three and five pairs.

Honey Buzzard Survey

2.19 Following an incidental record of the species to the north of the site during the 2005 scoping surveys, survey for breeding honey buzzard *Pernis apivorus* was undertaken in 2006 in accordance with RSPB Cymru protocols (Lindley 2006). Watches were completed from a number of locations to the north and north-west of Carnedd Wen.

2.20 The 2006 surveys resulted in one honey buzzard record: a bird was noted approximately 3 km from the site. It was concluded that the species was not breeding within the site or buffer zone. A single bird was recorded incidentally approximately 3 km from the survey area boundary in 2007 but again the species was not considered to be breeding within the site or perimeter area.

Wader Survey

2.21 A breeding wader survey, using the Brown & Shepherd (1993) method, was completed within 500 m of the Carnedd Wen site boundary in spring 2006.

2.22 No breeding waders were recorded within the site boundary or 500 m buffer during the surveys. Two pairs of lapwing *Vanellus vanellus*, five pairs of curlew *Numenius arquata* and between four and eight pairs of snipe *Gallinago gallinago* were recorded within the 2 km perimeter area.

Long-eared Owl Survey

2.23 Survey for long-eared owl *Asio otus* was carried out in March, June and July 2006 by listening for birds in suitable habitat.

2.24 One pair of long-eared owls was recorded within the forestry in 2006 (and was again present in 2007).

Barn Owl Survey

2.25 Following several sightings of barn owl *Tyto alba* during January-March 2006, vantage point watches, carried out one hour either side of dusk, were undertaken from 13 locations between April and July 2006. A total of 16 hours of survey was undertaken from each vantage point (208 hours survey in total).

2.26 No suitable nesting locations for barn owl were located within the site, although data from the Barn Owl Trust (reported in the ornithological assessment) indicated that five pairs of owls were present in the 2 km perimeter area. Barn owls were not recorded within the site during VP work, suggesting they were either not using the area for foraging or were strictly nocturnal locally.

Nightjar Survey

2.27 All suitable habitat within the survey area and 2 km perimeter area was surveyed for nightjars *Caprimulgus europaeus* in 2006 following the standard method outlined in Gilbert *et al*. (1998). The site was also surveyed for nightjar, albeit in slightly less detail, in 2005 during the scoping surveys (in conjunction with bat survey work).

2.28 No nightjars were recorded.

Surveys of Raptor Movements between the Site and Berwyn SPA

2.29 Surveys were undertaken in 2006 and 2007 to determine whether any of the qualifying species of the Berwyn SPA (see section 4.2 of this report) were using the site for foraging. These were completed from two VP locations. Surveyors used radios to communicate sightings and track birds

effectively. Surveys also included the detailed monitoring of flights from the closest hen harrier nest within the SPA. This was situated just over 2 km from the site.

2.30 Thirty-six hours of survey work was completed from (both of) the two VP locations in 2006 and a combined 61 hours of survey from two locations in 2007 (survey was discontinued following the death of the chicks and the abandonment of the nest site).

2.31 There was no evidence to suggest that breeding hen harrier moved between the SPA and the site as a result of the survey work. Occasional early season flights were recorded by males, but these were before birds were likely to have set up territory. Flights around the hen harrier nest did not go as far as the site.

2.32 Peregrine and merlin were not recorded during the work.

Woodland Passerine Survey

2.33 Point counts were undertaken within the plantation to characterise the passerine community. The work was undertaken in accordance with the recommendations of industry guidelines at that time (SNH, 2005). More recent iterations of guidance have seen the recommendation for point counts in commercial plantation withdrawn. The method and results of the work are only subject to very brief summary in this document.

2.34 The most notable findings from point counts completed in 2006 were that the Carnedd Wen site supported a range of species that are of particular conservation concern, including dunnock *Prunella modularis*, song thrush *Turdus philomelos*, bullfinch *Pyrrhula pyrrhula*, wood warbler *Phylloscopus sibilatrix* and lesser redpoll *Acanthis cabaret*. Common crossbill *Loxia curvirostra*, which is subject to protection under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended) was also noted as breeding on the site.

Winter waterfowl counts

2.35 Counts of waterfowl on Llyn Coch-hwyad and Llyn Gwyddior between January and March 2006 recorded the regular presence of a pair of whooper swan. A flight of eight whooper swan was also recorded during VP work in January 2007, and up to five birds noted on Llyn Coch-hwyad (and occasionally on Llyn Gwyddior) during the winter of 2006/2007.

2.36 Tufted duck, goldeneye, and teal were recorded on Llyn Gwyddior during counts between January and March 2006.

Survey Work to Support the Llanbrynmair Wind Farm Application

Overview of Survey at Llanbrynmair

2.37 Baseline ornithological surveys were initially undertaken in 2005 and 2006 to support the planning application for the site, and were based on industry standard methods (and informed by desk study and consultation).

2.38 The main ornithological issue at Llanbrynmair was potential impacts on breeding curlew. Further surveys of moorland waders were completed in 2011, 2012 and 2013 in order to determine if there had been a change in the baseline. The results of these were detailed in Supplementary Environmental Information.

VP Survey

2.39 Following reconnaissance work in 2005 a programme of VP surveys was carried out at Llanbrynmair during the winter period of 2005/2006 and the breeding season 2006. Seven VPs were selected. Survey methods were based on SNH (2005) guidance. Notes were made on flight behaviour and watch times were varied to ensure coverage of dawn and dusk. The assessment noted that '*approximately 36 hours of observation from each VP during each period*' was

completed (period here refers to the breeding and winter seasons) giving a total of 495 hours of observations.

2.40 The ornithological assessment for the site noted, '*No species was observed regularly over-flying in important numbers and no important regular flight lines were noted. The main species of interest seen over-flying during the vantage point surveys included red kite, hen harrier, goshawk, peregrine, merlin ……. and golden plover.*'[2]

2.41 The VP data for Llanbrynmair were not presented in the same way as for Carnedd Wen; number of flights was not provided, with birds per hour and total flight time given (for both the site and for individual VPs) instead. The data indicate that red kite (390 minutes), goshawk (139 minutes), hen harrier (101 minutes) and golden plover *Pluvialis apricaria* (139 minutes) were the focal species most commonly recorded. Peregrine and merlin were recorded for six and five minutes respectively.

2.42 The main difference from Carnedd Wen was the higher incidence of golden plover flight activity. This is likely to reflect the greater extent of open moorland and grassland habitats present at Llanbrynmair.

Black Grouse Survey

2.43 Black grouse survey was undertaken by RSPB Cymru in 2006 based on the standard survey technique detailed in Gilbert *et al*. (1998). The ornithological assessment reported, '*This survey covered all of the 1km squares in which RSPB considered this species may be present and relevant to the Proposal; SH 9507, 9509, 9510, 9607, 9608 and 9609*.'

2.44 One pair of black grouse was considered to be present in the area in both years, based on the results of the work.

Raptor Survey

2.45 The Llanbrynmair ornithological assessment notes that the desk study and the results of the preliminary surveys in 2005 indicated that the 'Study Area' (which was defined as the turbine locations and a 500 m perimeter area) was used by a range of scarce raptor species, including hen harrier, merlin, peregrine, goshawk and red kite.

2.46 A programme of species-specific surveys (following Evans (2001) for goshawk and Gilbert *et al*. (1998) for the other species) was undertaken in 2006. The following were recorded breeding:

- One red kite in 2005
- One hen harrier in 2005 and two in 2006
- One goshawk in 2005 and three in 2006
- One merlin in 2006
- Two kestrels *Falco tinnunculus* in 2005 and 2006
- Two barn owls in 2006

Wader Survey

2.47 Wader surveys of the Llanbrynmair 'Study Area' were carried out in 2005 and 2006 using the Brown & Shepherd (1993) survey technique.

- In 2005 survey visits were completed by two observers between 28 April and 2 May and 6 and 10 June 2005.

[2] Black grouse has been omitted here, as data in the ES suggests it was only recorded in flight outside the breeding season.

- Three visits were completed in 2006, the first between 17 and 20 April, the second between 30 May and 2 June and the third between 26 and 29 June 2006, with three observers present for each visit.

2.48 Further surveys were carried out during 2011, 2012 and 2013 to update the previous baseline with regard to curlew. The Brown & Shepherd (1993) survey technique was again used, but the spatial extent of the work was confined to 'the lower part of the site' in which curlew had previously been recorded. Three survey visits were completed between April and June inclusive.

2.49 These walkover surveys were supplemented by a 'mini-vantage point survey' between mid-March and June. Limited methodological details are supplied in the ornithological assessment with regard to this, but it reportedly involved a series of vantage point watches from strategic points across the curlew breeding area to observe their behaviour and habitat use. During the watch all curlews observed were mapped and notes made on behaviour and habitat use. A total observation time of 36 hours was achieved in each year.

2.50 The results of curlew surveys in 2011 and 2012 indicated that there has been a considerable decline from 2005 and 2006 (when 11 and 10 breeding pairs were recorded respectively). Only two curlew territories were identified in both years, with behavioural observations indicating that neither of these pairs bred: most records were either of feeding or roosting birds, with both members of each pair frequently being seen together rather than attending a nest/chicks (60% of records were of pairs together). This would suggest that neither pair bred successfully, if at all. Most of the birds were using the improved grassland within the survey area, with 64% of records within that habitat in 2011 and 58% in 2012. The other records were on marshy grassland (rush pasture).

2.51 There is very little information presented on the results of the curlew survey in 2013 in the ornithological assessment. However, Table 6.20 of the assessment indicates that a pair was present in excess of 800 m from the proposed turbine array.

2.52 Other waders noted breeding in the area were snipe (two in 2005 and four in 2006) and common sandpiper *Actitis hypoleucos* (one in 2006).

Autumn and winter bird surveys

2.53 Monthly visits were completed between October 2005 and March 2006 inclusive. Each visit included a number of 'instantaneous counts' of birds within 'sectors' of the study area to supplement the VP work. The results of the survey work included a peak count of 63 golden plover.

Other Bird Species

2.54 Considerable information is provided within the ornithological assessment with regard to the wider bird community at Llanbrynmair during 2005 and 2006 (when the majority of survey was completed). Although (common and widespread) raptors, passerines and near passerines are generally considered peripheral to wind farm assessments, the species present included: up to 14 buzzard *Buteo buteo* territories, five to eight cuckoos *Cuculus canorus*, up to 15 whinchat *Saxicola rubetra*, ten grasshopper warbler *Locustella naevia*, nine tree pipit *Anthus trivialis*, three spotted flycatcher *Muscicapa striata*, ten pied flycatcher *Ficedula hypoleuca* and five crossbills. The commonest species, for which the higher count over the two years is bracketed, were meadow pipit *Anthus pratensis* (636 territories) and skylark *Alauda arvensis* (209 territories)

2.55 This bird community recorded clearly demonstrates the more open nature of the Llanbrynmair area than Carnedd Wen.

3 Methods (April 2016 to June 2017 Inclusive)

Desk study

3.1 The Multi Agency Geographic Information for the Countryside (MAGIC) website[3], the Joint Nature Conservation Committee website[4], and the site search function on the Natural Resources Wales (NRW) website[5] have been used to obtain information on the position and features of statutory designated sites in relation to the Site boundary. In reflection of the fact that bird species may range away from nest sites, but are likely to concentrate their foraging activity within relatively close proximity to them, a search area of 5 km around the site boundary has been considered.

Field survey

3.2 Survey work was based on industry standard guidance relating to onshore wind farms published by SNH (2014), Hardey *et al*., 2006 (for breeding raptors) and Gilbert *et al*., 1998 (for black grouse and generic survey techniques). In the absence of their own guidance relating to bird survey at onshore wind farms, SNH (2014) guidance is generally endorsed by NRW.

3.3 Due to the size and relatively remote nature of the Site, and the network of tracks within it, four wheel drive vehicles were used to enable surveyors to reach survey locations, and a minimum of two surveyors were present on site on all days that work was undertaken. All survey was planned and co-ordinated to ensure that the work completed by the respective surveyors was compatible (e.g. so that surveyors did not survey overlapping viewsheds or walk through areas in which they could influence the bird activity recorded by each other).

Reconnaissance

3.4 A reconnaissance visit was undertaken on 29 and 30 March 2016. The work was completed by two field surveyors with previous detailed knowledge of the Carnedd Wen Wind Farm and a third surveyor with detailed knowledge of the Llanbrynmair site.

3.5 During the visit all of the vantage point (VP) locations used during baseline ornithological work to inform the respective Carnedd Wen and Llanbrynmair Wind Farm planning applications were visited, and the areas visible from them assessed and indicatively mapped.

3.6 The aim of this work was to select a suitable suite of VP locations for site survey; principally to identify VPs that needed to be altered due to plantation growth obscuring views, or which (due to overlapping coverage between VPs on the respective 'sites') were not required.

3.7 The work also aimed to establish any limitations to the scope of ornithological survey that had been proposed prior to visiting the Site.

VP Surveys

Breeding Season (April to August 2016 Inclusive)

3.8 Scottish Natural Heritage guidance (SNH, 2014) is that VPs should be chosen parsimoniously in order to achieve maximum visibility from the minimum number of survey locations, and that an arc of up to 180 degrees extending up to two kilometres from the observer can be effectively surveyed from each VP. Further, at least 36 hours of survey per VP should be conducted per 'season' to enable representative data collection.

[3] http://magic.defra.gov.uk/
[4] www.jncc.gov.uk
[5] https://naturalresources.wales/conservation-biodiversity-and-wildlife/find-protected-areas-of-land-and-seas/designated-sites-search/?lang=en

3.9 Sixteen VP locations were selected for survey of the Site (based on the reconnaissance work). The VPs were selected to obtain maximum visual coverage of the turbine locations and a 500 m perimeter area around them. The location of the VPs and their directions of view are indicated on **Figure 2**. Dates, times and weather conditions during VP surveys are recorded in **Table 1a** in **Appendix 3**.

3.10 Target species were defined as all Schedule 1[6] and Annex 1[7] raptors / owls, kestrel (a relatively rare and declining species in the area, included on Section 42 of the Natural Environment and Rural Communities (NERC) Act (2006)[8]) migratory wildfowl, curlew and passage / flocks of other waders. Black grouse and nightjar would have been considered target species if either had been seen flying over the survey area during VP work.

3.11 During VP survey the viewing arc was scanned constantly until a 'target species' was detected. The bird was then followed until it landed or was lost to view. The following information was recorded for each target species on a standardised form:

- Time of observation
- Duration of observation
- Species
- Count
- Estimated flight height (every 15 seconds)
- Direction of flight
- Estimated distance and direction of bird from the observer
- Behaviour (hunting, feeding, roosting etc.)

3.12 Records of non-target species were aggregated and summarised in five-minute intervals on the reverse of the form.

3.13 Weather data were recorded at the start of each watch, with the conditions reprised on at least an hourly basis thereafter.

Winter Season (September 2016 to March 2017 inclusive)

3.14 The VP locations used during the breeding season surveys were reused for the winter work. Methods were consistent with SNH guidance (2014) as outlined above.

3.15 Thirty-six hours of survey was completed at all sixteen VPs between September 2016 and March 2017 inclusive, resulting in a total of 512 hours of survey work. VP survey dates, times and weather conditions during the 2016/17 winter season can be found in **Table 1b** in **Appendix 3.**

Black grouse survey (April 2016)

3.16 Survey work in 2016 involved repeating work completed in 2006-08 inclusive and in 2012 to inform the Carnedd Wen ES Chapter.

3.17 The method was based on the protocol outlined in Gilbert *et al* (1998), which specifies that two survey visits should be completed between the last week of March and mid-May and between one hour before and one hour after sunrise.

3.18 A series of four transects were completed through suitable plantation and moorland habitats within 1.5 km of the proposed turbine locations. The transects followed those used for the Carnedd Wen work in 2012, and were informed by the results of the 2006-2008 work and historical data. During

[6] Of the Wildlife and Countryside Act, 1981 (as amended)
[7] Of Directive 2009/147/EC, often referred to as The Birds Directive
[8] www.legislation.gov.uk/ukpga/2006/16/contents

the course of the surveys, the bird surveyors walked slowly along the pre-determined routes, stopping to listen for lekking grouse **Table 2** in **Appendix 3** provides dates and times of the survey visits. The first visit was completed by four surveyors, and the second by two surveyors over two dates. All work was undertaken in calm, dry conditions.

3.19 Black grouse were also considered during early morning VP surveys completed at VPs 1 and 15 on 26 April and at VPs 12 and 16 on 05 May 2016.

3.20 The transect routes walked during the survey work are shown on **Figure 3**.

Breeding wader survey (April to June 2016 inclusive)

3.21 Wader surveys were completed of areas of unenclosed moorland based on the Brown & Shepherd (1993) method. Previous data with regard to the Carnedd Wen and Llanbrynmair Wind Farm schemes demonstrated that waders, particularly curlew, had occurred in an area around the eastern part of the Site, between Lluest and Ffridd Fawr. Walkover survey work concentrated on this area, albeit all areas of moorland within and around the Site were scoped for waders during the reconnaissance work, and the extent of walkover survey work was kept under constant review (i.e. the behaviour of any waders noted during VP work or incidentally was kept under review) over the season.

3.22 In the moorland areas a constant search effort was employed, with each surveyor covering between 250 and 300 ha per day, and all parts of the survey area approached to within approximately 100m. Frequent stops were made at local viewpoints in order to listen for singing and calling birds and to scan areas around the observer.

3.23 Standard British Trust for Ornithology (BTO) species and activity codes were used to record birds and their behaviour. Birds were considered to be breeding if displaying and / or singing on suitable territory, if nests, eggs or young were found, if adults repeatedly alarm called or attempted distraction displays or if territorial disputes were recorded.

3.24 The Brown & Shepherd method involves at least two survey visits, with the first being between early April and mid-May and the second between mid-May and late June. However, as recommended by SNH (2014), the survey effort at the Site was increased to four visits. **Table 3** in **Appendix 3** provides dates and times of the survey visits. Three visits were completed by four surveyors, and the final visit by two surveyors over two dates.

3.25 The area covered by the Brown & Shepherd survey is shown on **Figure 4**.

3.26 In order to gain further understanding of the nature of curlew use of the survey area, one supplementary day of survey work was completed from local VPs on 21 April 2016. Viewpoints were selected to overlook areas in which curlew had been recorded in during Brown & Shepherd surveys, and were two hours duration. **Table 4** in **Appendix 3** provides times of the targeted VP watches. The positions of survey locations are shown on **Figure 4**.

Nightjar survey (June and July 2016)

3.27 Suitable nightjar breeding habitat was identified based on the criteria detailed within Scott *et al*. (1998) during a reconnaissance visit on 06 June 2016, and was considered to include:

- Substantial areas of permanently open habitat within the forest.
- Clearfell and recently re-stocked plantation.
- Woodland less than 14 years old.

3.28 The reconnaissance survey resulted in a map of potential nightjar habitat being produced, along with a route of how to survey the areas identified most efficiently. To support the results of the

reconnaissance survey, a forestry harvesting plan was obtained from UPM Tilhill[9] to enable an assessment of the age of each block of plantation within the Site.

3.29 Targeted surveys were completed to establish the number of churring male nightjars present within the Site. Twenty-six listening stops were selected to cover all areas of suitable nightjar habitat. The area surveyed from each stop was defined by a 600 m audible range[10]. Areas of plantation not covered by the survey were considered too mature to support breeding nightjar[11].

3.30 Two survey visits were undertaken (in June and July respectively) as recommended in Gilbert *et al*. (1998). The surveyors spent 10 minutes listening for churring male nightjars at each point. Each visit was completed within 2 – 3 hours of dusk (sunset). Surveys commenced 20 minutes after dusk, and were only carried out in suitable weather conditions (i.e. wind speeds of approximately Beaufort Force 3 or lighter, and avoiding heavy rain), in accordance with Gilbert *et al*. (1998).

3.31 Due to the size of the Site and the requirement for night working, survey was completed by pairs of surveyors on 15, 27 and 28 June, and 05, 11 and 12 July 2016. A list of survey dates, times, weather conditions and surveyors is included in **Table 5** in **Appendix 3**. Nightjar listening stop locations are shown on **Figure 5**.

Breeding Raptor Surveys (April and May 2016 and March to July 2017 Inclusive)

Hen harrier survey (April and May 2016)

3.32 Surveys for breeding hen harrier concentrated on areas of moorland and adjacent plantation edge within 2 km of the proposed turbine locations. They were completed between 19 and 22 April and repeated between 09 and 12 May inclusive; they involved two surveyors undertaking 3 hour watches from each of the 11 viewpoint locations. **Table 6** in **Appendix 3** provides dates and times of the survey visits.

3.33 The survey took account of the emerging results of VP work and experience gained from previous site surveys.

3.34 The points from which survey work was completed are shown on **Figure 5**.

3.35 Species that could potentially breed on moorland or in trees along the plantation edge, such as merlin and hen harrier, typically display most actively in April before laying eggs in May (e.g. Hardey *et al*., 2006). As such the work was timed to coincide with these parts of the annual breeding cycle.

3.36 Following the May survey work, VP data was kept under constant review to identify whether there was evidence that territories could have been missed during these initial surveys.

Red Kite Survey (April – July 2017 inclusive)

3.37 A breeding raptor survey, mainly aimed at identifying active red kite territories (and non-active nests), was carried out through a combination of walking and driving on publicly accessible footpaths, tracks and roads within 2 km of the Site. Evidence of other breeding raptors, including hobby and merlin, was also considered during the survey. Nine points were used to carry out short watches over areas of suitable habitat during each visit. The locations of stopping points are shown in **Figure 6**. Stopping points were chosen so as to cover suitable breeding habitat for red kite (including broadleaved valley woodland) adding context to the results of the VP surveys.

3.38 Red kite survey visits covered the period mid-April to late-May (as kites are typically most territorial (and hence visible) in April and lay eggs in May), and June to mid-July (when young are brooded and typically fledge). There was little evidence from 2016 or previous years suggesting that red kite bred within the Site. The majority of time was therefore spent surveying the 2 km perimeter area.

[9] Provided to BSG Ecology on 22 June 2016
[10] Snow & Perrins (1998) suggest that nightjar can be heard at 600 m in good conditions
[11] Closed canopy forest is not considered to be used by breeding nightjar (Sharps *et al* 2015)

The survey was completed over a total of nine dates, spread across April to May (four dates) and June to July 2017 (five dates) to cover the display / incubation and the chick rearing / fledging periods respectively. The dates and weather conditions during these surveys are set out in **Table 7** in **Appendix 3**.

3.39 During these surveys, the species, location, number of individuals and activity observed was recorded onto survey maps by the surveyors. This information was subsequently collated and a map showing indicative territory locations compiled.

Peregrine survey (May 2016 and May to June 2017)

3.40 Four sites in the area that were known to have been occupied by peregrine during previous survey work to support the applications were visited and surveyed under licence[12] on 12 May 2016 to check for occupancy. The locations of the nest sites are provided in a confidential annex.

3.41 All four sites were visited again on 08 May 2017 and 21 June 2017 to check for occupancy and breeding success in 2017.

Goshawk Survey (March to June 2017 inclusive)

3.42 SNH (2014) guidance recommends that survey for goshawk takes in all suitable habitat within 1 km of proposed wind farms. Specific guidance on goshawk survey methods (Hardey *et al*., 2006) suggests this requires a two-stage approach involving:

- Vantage-point (VP) survey on bright, warm days between late February and mid-April, as goshawk typically display over territory at this time.
- Follow-up visits to identify central territory locations later in the spring/summer (late-April to early July).

3.43 Targeted VP survey effort (to supplement the winter period VP work) was completed between early-March and mid-April 2017, when goshawks were likely to be displaying, in addition to scheduled winter work. The resulting goshawk flight lines were collated, and the map used in conjunction with plans showing the age and species composition of forest compartments to inform the areas to be targeted during walked survey work.

3.44 The additional VP work was based on SNH (2014) guidance for upland wind farms. However, since the aim of the work was not to input to a collision risk model, the method was varied slightly. Surveyors were encouraged to scan over all suitable breeding habitat for goshawk over all 360 degrees from the VP; however, the duration of watches and method of recording flight lines remained consistent with the SNH VP methods. Flights made by other species were noted as secondary flights. The additional work was completed at 16 VP locations with watches of 3 hours in duration.

3.45 Where suitable, the additional watches were completed from the same VP locations as used for the winter period VP work. However, locations that did not provide views over suitable goshawk habitat were amended as appropriate to provide views over as much suitable habitat on the Site and a 1.25 km buffer[13] of the turbine locations as possible. The location of VPs are presented in **Figure 6**. VP survey dates, times and weather conditions can be found in **Table 8** in **Appendix 3**

3.46 Walkover surveys to locate nesting sites, regular perching areas and prey remains were completed over twelve days between mid-May and mid-June 2017.

3.47 The plantation at Carnedd Wen is dominated by sitka spruce, which results in dense (often impenetrable) cover in which it can be very difficult to locate goshawk nest sites. The survey work therefore focused on searching forest edge (walking tracks, firebreaks, areas of wind-blow and

[12] NRW licence number 71366:OTH:DBE:2016

[13] This variation from the 1 km buffer recommended by SNH (2014) was provided to allow for micro-siting at the construction stage.

patchy / poor growth), particularly targeting stands of larch within 1.25 km of the turbine locations[14]. A list of survey dates, times, weather conditions and surveyors is included in **Table 9** in **Appendix 3.** The results of the work are provided in a separate confidential annex.

Personnel

Survey Team

3.48 Ornithological survey work was completed by a team comprising Martyn Owen, Stuart Thomas, Micky Maher, Dan Brown, Gareth Thomas, and Gareth Lang.

3.49 Several of the team had previous experience surveying at either Carnedd Wen or Llanbrynmair: Dan Brown undertook much of the ornithological survey to support the Carnedd Wen planning application; Martyn Owen was responsible for co-ordinating the ornithological work to support the planning application for Carnedd Wen, and had also previously completed survey work at the Site; and Gareth Lang was familiar with the Llanbrynmair site, having previously been involved in the team that completed protected species work there in the lead up the conjoined mid-Wales public inquiry. In addition, Gareth Thomas had been involved in land management for black grouse in the area, but was not familiar with the wind farms. Further details of the skills and experience of the team are below.

3.50 Martyn Owen has worked as a professional ecologist since 2008 and has experience of working on over 20 proposed wind farms in Wales. He has completed survey for black grouse, Schedule 1 raptors and owls, holds disturbance licences for peregrine, goshawk, red kite and barn owl, co-ordinated radio-tracking studies of nightjar, and is the County Bird Recorder for Shropshire.

3.51 Stuart Thomas has worked on wind farms in mid-Wales since 2004, leading the ornithological field work at sites including Mynydd Waun Fawr, Rhyd Ddu, Hirddywel and Llanbadarn Fynydd. He has experience of all of the survey methods employed at the Site, and an excellent knowledge of the breeding and wintering birds of Powys. Stuart has also managed Special Protection Areas, of European importance for the birds they support, on behalf of Scottish Natural Heritage (SNH) and the National Trust.

3.52 Micky Maher is one of the UK's leading field ornithologists, and a member of British Birds Rarities Committee. He has worked on numerous wind farm applications in the UK (particularly in Wales and Scotland), and has experience surveying most of Britain's breeding bird species including Schedule 1 raptors, divers and owls. He provides training in ornithological survey techniques on behalf of the Joint Nature Conservation Committee, and has also worked for organisations including SNH, RSPB, The National Trust and The Wildlife Trusts.

3.53 Dan Brown has worked as an ornithological surveyor for over fifteen years, during which time he has worked on over 120 wind farms in the UK and continental Europe. He has considerable experience of all of the generic survey techniques employed at the Site, and has also surveyed for various specially protected species of raptor, diver and wader under license. In addition to freelance ornithological survey, Dan works as a tour leader for Sunbird and Heritage Expeditions, writes on mammals for the Birding Frontiers website, and is researching the mammal communities of the Sahara.

3.54 Prior to becoming a freelance surveyor in 2015, Gareth Thomas worked as a research assistant and conservation officer for RSPB Cymru, a position he held for eight years. His role was varied but included raptor nest finding, black grouse counts and wader surveys using the Brown & Shepherd method. He has also worked as a bird surveyor and conservation officer for Birdwatch Ireland and Scottish Natural Heritage, and has over 17 years of applied professional ornithological survey experience.

[14] Goshawk show a preference for larch and pine trees over spruce for nesting, and tend to favour mature forest stands with low density of trees to enable unobstructed access to the nest site (Anon, 1989).

Consultancy Team

3.55 Gareth Lang was responsible for survey co-ordination and data management and was the principal author of this report. He also undertook a small proportion of the field survey. Gareth is an experienced field ornithologist who regularly undertakes bird surveys at wind farms in Wales. He has completed monitoring of goshawk on behalf of the British Trust for Ornithology and is an active bird ringer. He regularly manages large ornithological data sets for wind farm and overhead line projects, and has particular expertise in the use of excel and GIS in managing outputs.

3.56 Owain Gabb acted as technical director for the work, planned the approach to survey and technically reviewed this report. Owain has worked as a professional ecologist since 1999, and with onshore wind projects since 2002. He has led the ornithological input to schemes throughout the UK and Ireland, and planned and co-ordinated survey work for various protected and / or rare species. Owain currently sits on the Glamorgan Rarities (rare bird adjudication) and Gower Ornithological Society Committees, and runs ornithological research at NRW's Oxwich Marsh National Nature Reserve that involves catching and taking biometric data from around 5,000 birds each year.

Limitations to methods

3.57 Full visual coverage of the Site was not possible with any arrangement of VP locations due to the extent of coniferous plantation cover. However, the VP locations used during the 2016 work sought to achieve the most complete visual coverage of the proposed turbine locations (and a 500 m perimeter around them) that was reasonably practicable.

3.58 The weather conditions throughout the VP work were representative of the geographical location of the Site. Survey work was as evenly spaced as weather allowed. However, the altitude of the Site in relation to the surrounding landscape and local weather stations meant that conditions were not always reflective of weather forecasts. Poor conditions forced the early abandonment or cancellation of some VP watches. The time missed as a result of poor weather was re-scheduled to ensure that the target threshold of hours at each VP was achieved.

4 Results (April 2016 to June 2017 Inclusive)

Desk study

Statutory Designated Sites

4.1 One Special Protection Area (SPA) and 10 Sites of Special Scientific Interest (SSSIs) are present within 5 km of the Site. One of these sites, Llanbrynmair Moors SSSI, is within the Site boundary. The positions of these designated areas in relation to the Site boundary are shown on **Figure 7** in **Appendix 1**.

4.2 The Berwyn SPA lies adjacent to the northern boundary of the Site[15]. It was classified on the basis that it regularly supports important numbers of the following species:

- Hen harrier (2.2% of the breeding population of Great Britain [based on a 5 year mean 1991-1995])
- Merlin (1.1% of the breeding population of Great Britain [based on a 5 year mean, 1991-1995])
- Peregrine (1.5% of the breeding population of Great Britain [based on a 5 year mean, 1991-1995])

4.3 Berwyn is also notified a SSSI on the basis of its breeding bird community, heather moorland and blanket mire, and due to the fact that it supports an important population of the Welsh clearwing moth *Synanthedon scoliaeformis*.

4.4 With regard to birds, the Berwyn SSSI citation states:

"Berwyn is the most important upland in Wales for breeding birds. It supports a wide range of species including internationally significant numbers of hen harrier, merlin, peregrine and red kite, as well as significant proportions of the Welsh populations of other species including short-eared owl *Asio flammeus*, golden plover, red grouse *Lagopus lagopus* and black grouse *Tetrao tetrix*."

4.5 Llanbrynmair Moors SSSI is a composite site that was notified on the basis of supporting remnant areas of blanket bog. There is no bird interest listed on the citation.

4.6 None of the other SSSIs within 5 km of the Site boundary were notified on the basis of their ornithological interest or include reference to birds on their citation: Gwaun Llan is of importance for its mesotrophic pasture; Afon Dyfi Ger Mallwyd for its geomorphology; Gweunydd Dolwen for its acid and neutral dry grassland; Bryn Coch for its lowland fen and acid grassland; Gweunydd Llechwedd Newydd for its neutral and acid grasslands; Gweunydd Pen-y-Coed for its unimproved wet pasture; Gweunydd Dyfnant for its unimproved acid pasture and, Cors Llyn Coethlyn for its valley mire system (and associated habitats).

Field survey

Reconnaissance

4.7 The reconnaissance survey established that a total of sixteen VP locations would be required to effectively survey the Site. The positions of these VPs, and their direction of view, are shown on Figure 3 in **Appendix 1**.

[15] The Natura 2000 data form for the SPA was reviewed on 08 March 2018. Note that red kite is no longer listed as a species for which the site qualifies under Article 4.1 of the Directive (79/409/EEC). The species data sheet notes that "*[Berwyn] was considered under Stage 1.1, but not selected after consideration of Stage 2 judgements since, as a site at the periphery of the species' core Welsh range, it is not the best example of a breeding site for Red Kite*"

4.8 One VP used to survey the Carnedd Wen area of the Site was found to be ineffective for survey due to plantation growth. This VP was relocated to an area of nearby clearfell, and offered a very similar viewshed to the original location.

4.9 The survey established that since the original work had been completed, some areas of plantation had been clear felled. Areas of clear fell and young plantation afford habitat to nightjar, a species of conservation concern. As a result of this, a programme of nightjar survey work was recommended.

VP Surveys

Breeding Season (April to August 2016 Inclusive)

4.10 A cumulative total of 576 hours of survey work was completed from the sixteen VPs between April and August 2016 inclusive.

4.11 It can be seen, with reference to **Table 1a** in **Appendix 3**, that a proportion of the watches at each VP location started at / just before dawn or finished at or after dusk[16].

4.12 Target species recorded during VP survey work in the 2016 breeding season were curlew, hen harrier, marsh harrier *Circus aeruginosus*, red kite, goshawk, peregrine, kestrel and osprey *Pandion haliaetus*. The number of target species flights recorded during each watch are provided in **Table 1a** in **Appendix 3**. **Tables 10a** to **10e** provide detailed data on target species flight parameters. Flight details are summarised in this section.

Curlew

4.13 Fifteen flights of curlew were recorded during the breeding season VP work. A total of 22 minutes 45 seconds of flight time was recorded, 4 minutes 45 seconds of which was at collision risk height[17]. However, only one of the 15 recorded flights during VP survey passed within 200 m of the turbine array. The flight was made by a single bird moving between foraging areas around VP 5 on 30 June. The total time in flight was 120 seconds and entirely below collision risk height.

4.14 All observations of curlew were made from the three most easterly VP locations within the Llanbrynmair site: VPs 5, 10 and 12. A maximum of six birds were noted during a watch on 07 April flying into a field and then out of view at Dol-y-Garreg Wen-Isaf. Two birds were then noted in flight on 25 April near Cannon, on 16 May over the cairn, approximately 2 km north of VP 5, and again on 23 June near Pen Coed. A displaying male and a female bird were also noted making separate flights near Neinthinion on 21 June. Both birds of each pair were observed to be foraging for prolonged periods with no indication of nesting.

4.15 Single birds were also recorded on 05 May, and 24 May. The bird on 05 May was heard calling from an area of rough grassland near Cwmderwen before flying north-east over VP 12, and the observation on 24 May was of a bird singing in flight near Neinthinion. No curlew were noted during watches in July or August.

4.16 Curlew flight lines are shown on **Figure 8**. Records of birds noted during walkover surveys are also shown in this figure and are described in the wader survey section below.

Hen harrier

4.17 Flights by hen harrier were recorded during nine of the 192 watches. Fourteen flights were noted, with a total flight time of 38 minutes and 30 seconds. Activity generally involved low, quartering flights; 4 minutes and 30 seconds of the total flight time was spent at collision risk height. Activity was concentrated around VPs 1 (4 flights), and 5 (3 flights) along the eastern boundary of the Site,

[16] A dawn survey was not completed from VP 5 and dusk surveys were not completed from VPs 12 and 16 due to poor weather conditions.

[17] The turbine dimensions for this scheme are not known, therefore the collision risk height has been based on the swept area of the turbines proposed for the Carnedd Wen and Llanbrynmair applications.

and VP 14 (3 flights) near the southern tip of the Site. Two flights were also noted near VP 2/3; one flight near VP 12 and one along plantation edge south of VP 16.

4.18 All flights were made by single birds, with adult males recorded on 04 May (two flights – one recorded at each of VPs 2 and 3, presumed to be the same bird), 30 June (one flight), 04 July (one flight), 27 July (one flight), 10 August (one flight), and 18 August (four flights noted by one (presumed) individual).

4.19 Hen harrier flight lines are shown on **Figure 9**. Records of birds noted during walkover surveys are also shown in this figure and are described in the hen harrier survey section below.

Marsh Harrier

4.20 A juvenile marsh harrier was recorded in quartering flight below collision risk height for 5 minutes and 30 seconds at Dol-y-Garreg Wen-Isaf on 10 August. No further observations of this species were made during the breeding season work.

4.21 The marsh harrier flight line is shown on **Figure 9**.

Red Kite

4.22 Red kite were the most frequently encountered species during VP survey work in the 2016 breeding season, with observations made in all surveyed months. A total of 126 flights were recorded with a duration of 5 hours, 3 minutes and 40 seconds, of which 2 hours, 12 minutes and 30 seconds was spent at collision risk height.

4.23 Flight activity was spread across the Site, with flights noted from all VP locations except VP 7 (overlooking plantation at Carnedd-y-Cylch). Concentrations of flight activity appear (from the flight line figure) to have been recorded near VPs 11 (north of Cwmderwen) and 16 (at Ffridd Ganol). However, twenty of the twenty-two recorded flights at VP 11 were noted over two survey days: 16 May and 23 June. Flights recorded on these dates were of single birds making frequent short flights from the ground.

4.24 The majority of flights were made by single red kites, with three birds observed in concurrent flight on 27 July (near Dolwen) and 11 August (near Cwmderwen); and 2 birds recorded on 18 April approximately 1 km south of the Site boundary near Cwm-Carnedd.

4.25 Red kite flight lines are shown on **Figure 10**.

Goshawk

4.26 A total of 23 goshawk flights were recorded during the VP work, equating to 23 minutes of flight time; 11 minutes and 45 seconds of which was noted at collision risk height.

4.27 Of the total flights recorded, eighteen were recorded during eight survey dates in April and early May. One flight was noted in June and four in July. No observations of goshawk were made in August.

4.28 Areas of greatest activity were associated with nest sites. Therefore, detailed flight information and goshawk flight lines are provided in a separate confidential annex.

Peregrine

4.29 Eight flights of peregrine were noted over seven dates during the breeding bird season VP work, resulting in a total of 4 minutes of flight time. A total of 2 minutes and 15 seconds was spent at collision risk height.

4.30 Two flights were noted on 07 April over Cwmderwen near the eastern boundary of the Site, and a bird was noted circling over VP 11, north of Cwmderwen on 30 June. All other observations were of

single birds in fast, direct flight, recorded on: 25 April at Carnedd-y-Clych near VP 7; 16 May at Panylau Gwynion near VP 11; 25 May at Ffridd Ganol near VP 8; 04 July at Cwm-y-Ffynnon near VP13; and 18 July approximately 200 m west of VP 7.

4.31 Peregrine flight lines are shown on **Figure 11**.

Kestrel

4.32 A total of 28 minutes and 45 seconds of flight time across 18 flights was recorded for kestrel; 18 minutes of which was at collision risk height. Flights were recorded on two dates in April, one date in May, and three dates in each of June, July and August; all flights were of single birds.

4.33 Of these flights, 7 were of an adult male making short hunting flights from a perch on a fence post near Lluest during a watch on 23 June. Single flights were noted on all other dates on which the species was recorded.

4.34 Kestrel flight lines are shown on **Figure 11**.

Osprey

4.35 Three flights were recorded for osprey; two of which, recorded from VPs 2 and 3 on 15 June, were of the same bird flying south over Esgair-y-Maes. The third bird was noted on 24 May flying south-west over plantation at Carnedd-y-Cylch.

4.36 Osprey flight lines are shown on **Figure 11**.

Activity in Non Focal Species

4.37 Two flights of lapwing were recorded during the VP work. On 07 June two adult birds were noted flying west to land in a field at Cwm-y-Ffynnon, near VP 13. Two birds were also recorded over the cairn near Esgair-y-Maes on 05 July. No further observations of lapwing were made during the breeding season work.

4.38 A common snipe was recorded on 30 June heading south over VP 5 near Lluest. No other records of snipe were made during the VP work.

4.39 Buzzard and raven were the most frequently recorded secondary species during the 2016 breeding season VP survey, with sightings of both species made from all VP locations. Buzzard was recorded in greatest number from VP 9 at the centre of the Site, with up to 8 birds noted in flight concurrently from this location during survey on 13 April.

4.40 The highest activity of raven *Corvus corax* was noted from VP 11 on 12 April, during which 12 flights were recorded by at least three birds. Eighteen birds were noted concurrently at this VP location during a watch on 27 July.

4.41 Sparrowhawk *Accipiter nisus* was recorded in low numbers during all survey months. A total of 14 flights were noted, all of single birds.

4.42 Carrion crow *Corvus corone* were recorded infrequently across the Site. The species was not noted from VPs 6, 7, 8, and 15, and no records were made from any location during surveys in May or August. The maximum count of birds was 38 recorded feeding on improved pasture north of VP 10 on 25 April.

4.43 Jackdaw *Corvus monedula* and rook *Corvus frugilegus* were noted on one date each. Four jackdaw were recorded at VP 14 on 21 June and 4 rook at VP 12 on 10 August.

4.44 Great black-backed gull *Larus marinus* was recorded from 10 of the 16 VP locations during the breeding season work. Flights were generally made by one bird, but up to three birds were noted concurrently on 06 April, 07 April, 08 June and 27 July. Lesser black-backed gull *Larus fuscus* were

recorded on 5 dates during the VP work. Up to 10 birds were noted together at VP 12 on 18 August. Herring gull was recorded at VP 12 on 10 August; no other observations were made of this species.

4.45 Twelve mallard *Anas platyrhynchos* flights were recorded over eight survey days. Flights were generally low level around Llyn Gwyddior and the associated moorland extending to the east. The largest flock recorded in flight included five birds flushed from the lake by a buzzard on 26 April. Flocks of three birds were recorded on 07 April (at Cwmderwen), 12 April (at Waun-y-Sarn), 13 April (over plantation east of the lake), 04 May (flying north over Fridd Goch) and 22 August (flying to Llyn Gwyddior from the east).

4.46 Mallard were present on Llyn Gwyddior throughout the breeding season work, and were confirmed to have bred on the lake with a family noted on 17 May.

4.47 Grey heron *Ardea cinerea* was recorded on the eastern boundary of the Site on three dates: 07 April at Cwmderwen; and 21 June and 26 July at Neinthirion. Cormorant *Phalacrocorax carbo* was noted flying into Llyn Gwyddior on 22 August. Two great crested grebe *Podiceps cristatus* were noted on the lake during VP survey on 26 April, 17 May, and 08 June. A single bird was again recorded on 25 July. A pair of tufted duck *Aythya fuligula* were recorded on the lake on 26 April and 25 July.

4.48 Great grey shrike *Lanius excubitor* was recorded from VP 9 on 13 April and on plantation edge to the north of VP 7 on 03 May. This species is a winter visitor from Fennoscandia, and generally leaves the UK in March or April (Balmer *et al*, 2013). The timing of the records suggests this was a lingering wintering bird (or birds). Common crossbills were recorded in April, May and June. Up to 10 birds were noted on 25 April from VP 4 and 9 birds on 18 May at VP 9.

4.49 Cuckoo were recorded frequently across the Site during the breeding season, along with a passerine community typical of plantation edge and open moorland. A total of eight Section 42[18] passerine and near passerine species (cuckoo, dunnock, house sparrow *Passer domesticus*, lesser redpoll, linnet *Carduelis cannabina*, reed bunting *Emberiza schoeniclus*, skylark, and song thrush *Turdus philomelos*) were recorded during VP surveys. Of the Section 42 species recorded, cuckoo, house sparrow, lesser redpoll, linnet, skylark and song thrush are red-listed species of conservation concern in the UK (Eaton *et al*, 2015). Dunnock and reed bunting are amber-listed. An additional three species are red listed (grey wagtail *Motacilla cinerea*, mistle thrush *Turdus viscivorus*, and whinchat); and four amber listed (house martin *Delichon urbicum*, redstart *Phoenicurus phoenicurus*, swift *Apus apus* and willow warbler *Phylloscopus trochilus*).

Winter Season (September 2016 to March 2017 Inclusive)

4.50 Target species recorded between September 2016 and March 2017 inclusive were curlew, golden plover, hen harrier, red kite, peregrine, hobby, kestrel, merlin, goshawk, and whooper swan. The number of target species flights recorded during each watch are provided in **Table 1b** in **Appendix 2**. **Tables 11a** to **11g** provide detailed data on target species flight parameters that can be used in collision risk analysis. Flight details are summarised in this section.

Curlew

4.51 Curlew was noted on two dates during the winter work: 08 March and 27 March 2017. The record on 08 March was of a bird calling in direct flight at collision risk height for 90 seconds. The bird flew south and passed within 300 m of VP 5. On 27 March, three birds were noted calling from pasture fields approximately 150 m east of VP 10. The birds remained in the area between 14:21 (when first noted) to 20:10 (the completion of VP survey work) and were observed foraging throughout. No further records of curlew were made during the winter work.

[18] The Natural Environment and Rural Communities Act 2006 (NERC 2006) required the Welsh Government (WG), based on advice from the Countryside Council for Wales (now part of Natural Resources Wales), to identify species and habitats of principal importance for the conservation of biodiversity in Wales. Section 42 of The NERC Act requires the WG to take steps to "further the conservation" of these species/habitats.

4.52 Curlew registrations are shown on **Figure 12**.

Golden Plover

4.53 Golden plover was recorded on 10 September (one flight of four birds) and 26 October 2016 (two flights of 27 and 15 birds respectively). The flight on the 10 September was observed for 45 seconds at collision risk height over Esgair y Maes in the north-eastern part of the Site. Both flights recorded on 26 October were of wheeling flocks over Cwn-y-ffynon in the south-western part of the Site with a total flight time of 7 minutes 15 seconds (3 minutes and 15 seconds were spent at collision risk height).

4.54 Golden plover registrations are shown on **Figure 12**.

Whooper Swan

4.55 Whooper swan flights were recorded on two dates in November and one date in December. The maximum flock size was 11 birds (10 adults and 1 juvenile) moving across Llyn Gwyddior on 16 November 2016. Flocks on 03 November and 22 December included 5 birds and 1 bird respectively.

4.56 Whooper swan registrations are shown on **Figure 12**.

Hen harrier

4.57 Hen harrier was recorded from the majority of VP locations (with the exception of VPs 2, 4 and 16) during the winter work. A total of 38 flights were noted: 6 in September, 10 in October, 3 in November, 2 in December, 1 in January, 12 in February (including 7 flights recorded on 17 February 2017), and 4 in March. Observations were of single birds, predominantly males; however, both males and females were recorded on some watches.

4.58 Activity was greatest in autumn, with birds noted on twelve dates between September and November inclusive. Flights were recorded on one date in each of December, January and March, and on four dates in February. The majority of flights were observed between mid-morning and mid-afternoon, with two of the 38 total flights recorded within an hour of dusk[19]. This does not suggest the presence of a regular roost within the Site.

4.59 A peak of seven flights was recorded on one date (on 17 February) in the south-western part of the Site near Cwmderwen: two (one male and one ringtail in low quartering flight) were noted from VP 5, and five from VP 12 (two female, two male and one 1st winter bird).

4.60 The total recorded flight time for hen harrier was 78 minutes and 45 seconds, of which 10 minutes and 45 seconds was spent at collision risk height.

4.61 Hen harrier registrations are shown on **Figure 13**.

Red Kite

4.62 Red kite was the most frequently recorded species during the winter work. A total of 109 flights were noted across the Site. A maximum of 16 flights (made by two birds) were recorded on 15 December 2016 and 12 flights on 17 February 2017, all between Cwmderwen and Neinthirion in the south-western part of the Site, and likely to have been related to the presence of carrion[20].

4.63 Red kite was recorded in flight for a total of 5 hours, 18 minutes and 5 seconds, of which 3 hours, 14 minutes and 50 seconds was spent at collision risk height. The recorded activity near Cwmderwen on 15 December and 17 February accounted for 1 hour 6 minutes and 5 seconds of this total time at collision risk height.

[19] These were 22 minutes before sunset on 13 October 2016, and 36 minutes before sunset on 25 October 2016
[20] Up to 50 raven (typically attracted to carrion) were also recorded in the same area on these dates.

4.64 Flight activity across the Site was generally more concentrated to the lower moorland and grasslands. Flights over areas of plantation were infrequent, and very little activity was noted in the higher and more exposed northern and western parts of the Site.

4.65 Red kite flight lines are shown on **Figure 14**.

Goshawk

4.66 Fifty nine goshawk flights were recorded during the VP work between September 2016 and March 2017 inclusive. A total flight time of 1 hour, 38 minutes and 45 seconds was recorded, of which 51 minutes of flight activity was at collision risk height.

4.67 All flights involved single birds. Of the 59 flights recorded, 27 were noted during survey in February (12 flights were recorded on one date: 24 February), and 16 in March.

4.68 The VP work was supplemented by additional targeted VP survey for territorial goshawk in March and April 2017. The results of the work are presented in detail in a separate confidential annex. An overview of goshawk activity is provided in the *Breeding Raptor Survey* section below.

Peregrine

4.69 Peregrine was recorded on 4 dates: 19 October (1 flight), 08 November (2 flights), 07 February (2 flights) and 24 February (2 flights). A total of 10 minutes of flight time was recorded for peregrine; 4 minutes and 30 seconds of which was spent at collision risk height.

4.70 The two flights recorded on 07 February were made by a male and female bird respectively (observed together) near Clegyrnant in the western part of the Site. All other flights were of single birds in direct flight over the Site.

4.71 Peregrine flight lines are shown on **Figure 15**.

Kestrel, Hobby and Merlin

4.72 Kestrel was recorded on five dates: two during September and three during October. Two flights were recorded on each of 07 September and 13 October over moorland near Cwmderwen. Six flights were recorded during watches from VPs 2 and 3 on 10 September, and are likely to have been made by the same first winter bird making multiple flights between the met mast adjacent to the VP at Esgair y Maes and nearby plantation. A single flight was recorded at Ffridd Ganol on 18 October.

4.73 Hobby was recorded on one date (19 September) flying west over Ffridd Ganol, and merlin on three dates: 11 October (east of Clegyrnant), 08 March (near Dolwen) and 24 March (at Ffridd Ganol).

4.74 Kestrel, hobby and merlin flight lines are shown on **Figure 15**.

Activity in Non Focal Species

4.75 Lapwing were recorded on one date (28 November) during the winter work. The record involved a flock of 40 birds heading east over Esgair Priciau, and appearing to land near the south-eastern boundary of the Site.

4.76 A total of 21 flights of common snipe were recorded during the winter work. Flocks of two or more birds were noted on 06 September (two flocks of eight and 13 birds respectively), 13 October (five birds), 14 December (14 birds), and 10 January (seven birds).

4.77 Buzzard and raven were the most frequently recorded secondary species during the winter period, with sightings of both species made from all VP locations. Buzzard was recorded in greatest number from VP 9 at the centre of the Site, with up to eight birds noted in flight concurrently from

this location during survey on 13 April. Single birds were most frequently recorded, with regular flights by between two and four birds (noted on 20 dates).

4.78 Raven was recorded throughout the winter period, with flocks of two or more birds on all survey dates. A peak count of 42 birds was recorded at VP 11 on 22 December 2017, and flocks of more than 10 birds were recorded on an additional 17 dates.

4.79 Sparrowhawk was recorded on fourteen dates during the winter period. One flight involved two birds soaring over plantation with five raven on 26 September. Two birds were also heard calling from plantation near the north of the Site. All other observations were of single birds.

4.80 Tawny owl was heard calling to the south of VP 12 on one date during the winter work.

4.81 Carrion crow were recorded from the majority of VP locations (except 1, 3, 5 and 16), but were noted infrequently, and in low number (typically one or two birds).

4.82 Great black-backed gull were less frequently recorded during the winter period compared to the breeding season. A total of nine flights were recorded, all were made by single birds except one flight on 13 March for which two birds were recorded. Two flights were recorded for each of lesser black-backed gull and herring gull.

4.83 Fieldfare *Turdus pilaris* and redwing *Turdus iliacus* were recorded sporadically between October and February inclusive, with flocks of up to 160 (fieldfare) and 36 (redwing).

4.84 Other non-focal species include: cormorant (two flights were recorded (not directly associated with either waterbody on Site)); mallard (three flights recorded in small flocks of up to six birds); tufted duck (one flight by one bird); Canada goose (two flights of 16 birds, both recorded on the same date); and grey heron (three flights of single birds).

Black grouse survey (March to May 2016 inclusive)

4.85 A black grouse was heard approximately 1 km west of the Site boundary (between 4 and 5 km from the nearest provisional turbine location), to the west of Bryn-glas during survey on 08 April. No black grouse, or signs of their presence, were noted within the Site during the species-specific survey work in 2016 or during the course of any other survey between April and August 2016 (inclusive).

Breeding wader survey (April to June 2016 inclusive)

4.86 Waders recorded during the Brown and Shepherd and supplementary wader VP surveys between April and June 2016 inclusive were curlew and snipe. Other target species recorded were hen harrier, red kite, and peregrine, the details of which are reported in the *Breeding raptor survey* section below.

Curlew

4.87 Curlew were noted during Brown and Shepherd survey on 08 April, 14 April, 13 May, 14 June, and 16 June. Two birds were also noted during the targeted curlew survey on 21 April.

4.88 On 08 April, one bird was noted briefly flying south over the boundary of the Site at Dol-y-Garreg Wen-Isaf. Two birds were also noted calling near Trwyn-y-bryn, approximately 500 m east of the Site boundary.

4.89 Seven records of curlew were made on 14 April; five were between Cwmderwen and Neinthinion at the eastern boundary of the Site, one near Dolwen, and one near Cannon. Given the location and timing of the records between Cwmderwen and Neinthinion, it is likely that they relate to three events recorded by two surveyors. A pair (presumed male and female) were noted flying east over the Nant yr Eira to land in an area of rough grassland approximately 800 m beyond the Site boundary. A bird was then heard calling from an area approximately 500 m further north a few

minutes later. A third record was made later during the same survey of a bird (presumed to be a female on bill length) flying south approximately 1 km north east of Cwmderwen.

4.90 The birds recorded near Dolwen and Cannon were heard calling briefly, but not seen.

4.91 Two birds were noted in flight during targeted curlew survey on 21 April. The birds flew east within the Site and landed in a field at Dolwen. A search of the area, and areas in which curlew activity had been noted on previous Brown and Shepherd surveys, following targeted watches did not result in any further observations.

4.92 Four observations of curlew were made on 13 May. A bird was heard calling at Ffridd Fawr followed by observation of a pair in flight landing in a field near Pentre-Lludw, approximately 600 m east of the Site boundary. The pair were watched by the surveyor for evidence of nesting behaviour, but none were observed. The birds didn't react to low passes by a red kite and carrion crow, further suggesting that no nest active was present.

4.93 The male bird was later observed making a short flight west to a field approximately 100 m east of the Site boundary, and then returned to Ffridd Fawr in display flight. The female was not re-located. A bird was also heard calling briefly near Trwyn-y-Bryn, approximately 3 km further north.

4.94 A curlew was seen flying south west within the Site boundary, north of Dolwen during survey on 14 June. A bird was later observed feeding in a field at Y Rhos on the same day.

4.95 Three observations were made on 16 June. A bird was recorded foraging and occasionally singing north-east of Cwmderwen, approximately 400 m east of the Site boundary. Three birds were later noted feeding at Cwmderwen before moving further north over Site. A further observation was made of a bird feeding approximately 500 m further north-west. A bird was later recorded in this area by a second surveyor.

4.96 Curlew were generally noted foraging on the moorland around the eastern Site boundary. Birds did not appear to be faithful to any particular location and, although two or more birds were seen together regularly, the behaviour of female birds did not suggest nesting within the survey area.

4.97 Curlew registrations from the survey work are shown on **Figure 8**.

Snipe

4.98 Twelve observations of snipe were noted during Brown and Shepherd survey on 08 and 14 April, with most birds being recorded around Cwmderwen. The timing of these records suggests that the birds were on passage, particularly given that snipe were not recorded in subsequent survey months.

Nightjar survey (June and July 2016)

4.99 No nightjar were noted during the species-specific survey work in 2016. In addition, no nightjar were noted by surveyors completing bat survey work across the Site on 14 June, 27 June and 19 August.

4.100 This is consistent with the result of the 2005 and 2006 surveys at Carnedd Wen.

4.101 A long-eared owl was heard calling between survey locations 9 and 17, east of Ffridd Ganol, during nightjar survey on 27 June. A male tawny owl was heard calling near survey location 2 on 05 July, and to the south-west of survey location 9 on 12 July.

Breeding Raptor Surveys (April to May 2016 and March to July 2017)

Hen harrier

4.102 Hen harrier was not recorded during the targeted hen harrier survey survey between April and May 2016 inclusive. However, two flights of male hen harrier were recorded during Brown and Shepherd survey on 14 April. The first was a quartering flight over moorland approximately 1 km west of Dol-y-Garreg Wen-Isaf. The second a direct flight north towards Ffridd Goch, approximately 5.5 km further north, within the north-eastern corner of the Site.

4.103 There was no evidence from the raptor survey or VP work that hen harrier bred within the Site in 2016.

4.104 Other target species recorded incidentally during hen harrier survey were red kite, goshawk, peregrine, and kestrel. Details of these records are summarised in the relevant species accounts below.

4.105 A ringtail hen harrier was noted flying near Canon Farm and a male bird at Esgair Priciau during goshawk VP survey work on 05 April 2017.

Red Kite

4.106 Ten flights of red kite were noted during hen harrier survey: six were recorded over the northern tip of the Site around Nant-y-Dugoed, and one over plantation at Ffridd Ganol during survey on 19 April; two were noted between 1 and 2 km north-west of Dolwn on 20 April; and one over Llyn Gwyddior on 09 May.

4.107 A total of seventeen flights of red kite were recorded incidentally during Brown and Shepherd survey visits. Three pairs were also noted during targeted curlew survey on 21 April. The greatest activity levels were noted around Cwmderwen in the south-eastern part of the Site. Seven flights were recorded in this area during Brown and Shepherd survey. Two pairs of kite were observed were active in this area during curlew survey on 21 April suggesting two possible territories. A third pair was noted circling over Ffridd Fawr on the same day.

4.108 Six days of targeted red kite walkover survey were completed between 19 April and 08 May 2017, and a further six days were completed between 27 June and 24 July 2017.

4.109 Kites were frequently observed in flight during the work. Two birds were noted in flight concurrently during surveys on 19 April, 05 May, 08 May, 29 June, and 30 June 2017. A single bird was noted landing in a wood at Esgair Priciau on 05 May, but no evidence of nesting was found during subsequent survey of the area. Flights by red kite were also noted on 09 March, 04 April, 05 April, and 07 April 2017 during goshawk VP work.

4.110 The targeted surveys in 2017 did not result in any evidence of breeding red kite (either through observation of nests, newly fledged birds, or adults carrying food / nesting materials) being found within the survey area.

Goshawk

4.111 A cumulative total of 48 hours of survey work was completed from the sixteen goshawk survey VP locations between February and April 2017 inclusive.

4.112 Twelve goshawk flights were recorded during the targeted survey work and three observations were made of perched birds. Taken in combination with the results of the general VP survey work, a total of 55 records of goshawk were made between January and April 2017 inclusive.

4.113 Twelve days of walkover survey were completed between 17 May and 23 June 2017. Dates and times of survey are provided in **Table 9** in **Appendix 3**. One active nest and an additional ten

inactive nests were recorded during the survey work in 2017. The nest locations are provided in a confidential annex.

4.114 Five goshawk flights were recorded during hen harrier survey in 2016. Three were noted on 19 April: two male birds (possibly the same bird) over plantation near Mynydd Talyglannau in the northern part of the Site, and one male in the southern part of the Site over Cors Fforchog. A second year male was recorded heading south along plantation edge approximately 1.5 km north-west of Cannon on 20 April, and an adult male again noted near Mynydd Talyglannau on 12 May.

Peregrine

4.115 A check of historical peregrine nest sites on 12 May 2016 confirmed active territories at two sites (both outside of the Site boundary).

4.116 No peregrine activity was recorded at any of the four historical sites during the visit on 08 May 2017. However, a juvenile bird was observed at one of the nest sites, confirming breeding success.

4.117 The locations of the peregrine nest sites are provided in a confidential annex**.**

4.118 Four flights of peregrine were recorded during hen harrier survey on 19 April 2016, and one on 20 April 2016. The flights recorded on 19 April were all around the Mynydd Llyn Coch-Hwyad area and the bird noted on 20 April was at Y-Rhos near the eastern boundary of the Site.

4.119 A peregrine was also recorded flying north-east at Cwmderwen during targeted curlew survey on 21 April 2016.

4.120 Three peregrine flights were noted during VP work for goshawk on 09 March 2017: one involved a juvenile bird flying west over Llyn Gwyddior, and two (separate) flights involved adult birds near Clegyrnant.

Kestrel

4.121 A kestrel was noted perched on a post on moorland edge approximately 1 km north-east of Bryn Ysguthan during hen harrier survey on 19 April. There was no clear evidence of breeding within the Site from the 2016 breeding season work.

4.122 A female bird was recorded flying through along the Afon Cannon valley during a goshawk targeted VP survey on 09 March 2017.

Osprey

4.123 An osprey was recorded flying south over Llyn Gwyddior towards Cors Fforchog in the southern part of the Site during targeted hen harrier survey on 19 April. The infrequency of osprey sightings during the 2016 breeding season work does not suggest local breeding.

Other species recorded during raptor survey work

4.124 Other species of note recorded during the raptor survey work were:

- Crossbill – a male bird was noted during hen harrier survey on 19 April, and a pair seen during black grouse survey on each of 20 and 22 April.
- Firecrest *Regulus ignicapilla* – a male bird was recorded holding territory at Craig y Llyn, west of Llyn Coch-Hwyad on 09 May. Crossbill and firecrest are listed under Schedule 1 Part 1 of the Wildlife & Countryside Act 1981 (as amended).
- Great grey shrike – a bird was seen flying along plantation edge at Ffridd Goch on 20 April.
- Grasshopper warbler – a bird noted holding territory near nightjar survey location 16, west of Cwmderwen, during nightjar surveys on 27 June and 11 July. The bird was again recorded incidentally during bat survey on the 13 July.

- Whooper swan *Cygnus Cygnus* – one adult and one juvenile with three gadwall *Anas strepera* were present on Llyn Coch-Hwyad on 08 April.
- Goosander *Mergus merganser* - One male and two female / second calendar year birds were also seen on Llyn Coch-Hwyad during a hen harrier survey visit on 22 April 2016.
- Short-eared owl - a plucked bird was noted near VP G (see **Figure 5**) at Bryn Brith during hen harrier survey on 20 April.

Waterfowl Counts (September 2016 to March 2017 Inclusive)

4.125 Whooper swan were recorded on Llyn Coch-hwyad and Llyn Gwyddior on five dates during the winter work. The maximum count was 14 birds (including 13 adults and 1 juvenile) on Llyn Coch-hwyad on 09 November 2016. A peak count of eleven birds (including 10 adults and 1 juvenile) was noted on Llyn Gwyddior on 16 and 29 November. No observations of whooper swan were made after 07 February.

4.126 Other waterfowl species recorded on the lakes (with maximum counts in parenthesis) included: Canada goose (16), cormorant (1), goosander (2), great crested grebe (4), little grebe (2), mallard (10), teal (2) and wigeon (7).

5 Interpretation

5.1 The breeding season work undertaken at the Site between April and August 2016 inclusive resulted in records of the following focal species (based on SNH (2014) guidance): curlew, hen harrier, marsh harrier, red kite, goshawk, peregrine, kestrel and osprey. Black grouse were also recorded outside of the Site.

Black grouse

5.2 Black grouse was recorded beyond the Site boundary on one occasion during targeted survey in 2016. The work resulted in no observations of black grouse within the Site. Historical data from annual monitoring of the area suggest that up to 11 lekking males were present between 1997 and 2004. Up to 17 displaying males were recorded during the survey work at Carnedd Wen in 2006 to 2008 inclusive, but no records were reported during the 2012 work suggesting that the species had become locally extinct by that time. Anecdotal evidence from a local landowner (following discussion on 13 April) suggests that black grouse have not bred on Carnedd Wen for more than six years.

Curlew

5.3 The results provide further evidence of a significant decline in the local curlew population (since 2005). Eleven pairs were recorded in the area during survey in 2005, and ten pairs in 2006. Only two curlew territories were identified during the 2011 and 2012 surveys, with behavioural observations indicating that neither of these pairs bred. In 2013, one pair was noted beyond 800 m of the proposed turbine array.

5.4 There was no evidence to suggest that curlew bred on the Site or within 800 m of the proposed turbine locations during 2016. However, regular records of the species were made between April and June 2016 inclusive. Curlew was generally noted foraging on the moorland at the eastern Site boundary, and the behaviour of female birds, when recorded, did not suggest nesting.

Golden Plover

5.5 Golden plover were recorded on two occasions during the autumn 2016. The timing of observations suggests that these were passage birds. No further records of golden plover were made during the work indicating that the Site is unlikely to be important for wintering plovers.

Whooper Swan

5.6 Whooper swan were recorded regularly on Llyn Coch-hwyad and Llyn Gwyddior during the winter period. Two flights were recorded during VP watches. It is unlikely that whooper swan make frequent flights over the Site, but observations of birds on the lakes indicate that they do move between Llyn Coch-hwyad and Llyn Gwyddior.

5.7 Survey work in 2006 and 2007 to support the Carnedd Wen application recorded a pair using the lakes in early 2006, and a flight by eight birds during the winter of 2006/2007.

Hen harrier

5.8 Hen harrier was noted fairly infrequently during the breeding season work, with observations being of low quartering flights typical of the species. Hen harrier was not recorded during the targeted surveys. No hen harriers were recorded breeding during the 2012 surveys at Carnedd Wen. This followed unsuccessful breeding attempts by up to three pairs noted in 2005, 2006, 2007 and a probable breeding attempt in 2008.

5.9 Records of hen harrier were more frequent during Autumn 2016 and early spring 2017 (a total of 38 flights were recorded between September 2016 and March 2017 inclusive). Few observations of

hen harrier were made at or around dusk and dawn; there was no indication of the presence of a regular roost within the Site.

5.10 Given the results of the 2016 breeding season survey work, and lack of successful breeding attempts reported during the 2006 to 2012 work, it is unlikely that hen harrier currently uses the Site or areas close to it for breeding, but do use the Site for foraging, particularly during the winter period. The absence of breeding hen harrier from the site seems likely to be linked to the maturation of commercial plantation reducing opportunities for nesting and foraging within it.

Red kite

5.11 Red kite were the most frequently recorded species during the 2016 breeding season work. However, the level of activity was low in comparison to many other upland wind farm sites in Powys, and typically involved flights by single birds. Activity in this species observed during the winter period was typically associated with the presence of carrion (also attracting large numbers of corvids).

5.12 Three pairs of red kite were noted during targeted curlew survey on 21 April 2016; two at Cwmderwen in the south-eastern part of the Site, and one at Ffridd Fawr near the southern Site boundary. The level of activity observed suggest possible territories in these areas, but no breeding was confirmed.

5.13 Targeted survey work to locate nesting kite in 2017 did not confirm breeding despite frequent flight activity being noted over the Site during the work.

Goshawk

5.14 Goshawk was recorded frequently during VP work in Spring 2016, and throughout the winter period of 2016/17. Targeted survey work in early 2017 located one active nest (considered likely to have failed) and six further unoccupied nests within 1.25 km of turbine locations. The locations of the nests and distribution of flight activity recorded during VP and targeted work (presented in a confidential annex) suggest that there are at least five territories present within 1.25 km of turbine locations.

5.15 Survey work to support the Carnedd Wen application in 2007 and 2008 concluded that the breeding population within the Site was between three and five pairs.

5.16 It should be noted that on-going forestry operations within the Site and the natural aging of forest coupes are likely to affect the number and distribution of goshawk territories between years. Further pre-construction survey will be required to determine the location of nests within areas affected by construction work.

Peregrine

5.17 Three peregrine nest sites were identified within 2 km of the Carnedd Wen site during the survey work completed in 2006 to 2008 inclusive, with a further two nest locations identified beyond the 2 km survey area. Four of these nests were confirmed as productive in 2006, and two in each of 2007 and 2008.

5.18 The targeted survey work during 2016 resulted in confirmed active territories at two of these known eyries (the locations of which are presented in a confidential annex), with possible occupation of a third site beyond 2 km of the Site boundary (not confirmed during the raptor survey work). Breeding was confirmed at one of the historical breeding sites in 2017, and some evidence of use (but breeding not confirmed) at a second location (both more than 2 km beyond the Site boundary).

5.19 Despite confirmed local breeding, peregrine flights were recorded infrequently during the 2016 breeding season VP work suggesting that peregrine do not use the Site for foraging with regularity.

Kestrel

5.20 Kestrel was recorded infrequently during the 2016 breeding season work, and on a total of five dates during the winter period. Two pairs were recorded during the Llanbrynmair survey work in 2005 and 2006. It is possible that a pair breeds on or close to the Site, but there was no clear evidence of this in 2016.

Other species

5.21 Marsh harrier and osprey were recorded infrequently during the 2016 breeding season work. The respective species are listed as scarce passage migrant and rare breeding species at the county level respectively (Haigh, 2016).

5.22 Hobby was recorded on one occasion during the autumn 2016 (on passage), and merlin on one date during autumn 2016 and two dates in spring 2017. The timing of the hobby merlin observations do not indicate that they breed at the Site.

5.23 Nightjar were not recorded during the targeted survey for this species in 2016. This finding was consistent with the outcome of the 2005 and 2006 survey work at Carnedd Wen.

5.24 Long-eared owl was noted on one occasion in 2016. The 2006 and 2007 survey work at Carnedd Wen identified a single pair, but suggested that this was an underestimate of the population on the site.

5.25 The passerine community of the Site includes a variety of species typical of moorland and plantation edge habitat, including species of conservation concern in Wales. A singing male firecrest and a male crossbill were recorded incidentally during hen harrier survey. Both species are listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

6 References

Anon. (1989) Goshawk breeding habitat in lowland Britain. British Birds 82: 56-67.

Balmer D., Gillings, S., Caffrey, B., Swann, B., Downie, I., & Fuller, R. (2013). Bird Atlas 2007 – 2011. The breeding and wintering birds of Britain and Ireland. BTO Books, Thetford.

BSG Ecology (2016) Confidential Breeding Bird Survey Report 2016. Issued to RES Ltd

Calladine, J., Garner, G., Wernham, C. & Thiel, A. (2009). The influence of survey frequency on population estimates of moorland breeding birds. Bird Study 56: 381-388.

Cramp, S. (1980). Handbook of the Birds of Europe the Middle East and North Africa. The Birds of the Western Palearctic. RSPB / Oxford University Press.

Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

Ecology Consulting in RES Ltd, (2013) Llanbrynmair windfarm. Supplementary Environmental Information. Chapter 6: Ornithology.

Haigh, M.D., (2016). Montgomeryshire Bird Report 2015. Published online.

Haigh, M.D., (2015). Montgomeryshire Bird Report 2014. Published online.

Hardey, J., Crick, H., Riley, H., Etheridge, B., and Thompson, D. (2013) Raptors: A field guide to surveys and monitoring. The Stationery Office; 3rd revised edition.

Marchant, J.H. (1983). Common birds census instructions. BTO, Tring. 12pp.

Pearce-Higgins, J. W., Stephen, L., Douse, A. and Langston, R. H. W. (2012), Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology, 49: 386–394.

RES Ltd, (2008) Llanbrynmair windfarm. Environmental statement. Volume 2, Chapter 7: Ornithology.

RWE Npower Renewables (2008) Carnedd Wen wind farm and habitat restoration project. Environmental Statement. Chapter 8: Avian ecology.

RWE Npower Renewables (2013) Carnedd Wen wind farm and habitat restoration project. Environmental Statement. Chapter 8: Avian ecology.

Scottish Natural Heritage (2014). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage, Inverness.

Sharps, K., Henderson, I., Conway, G., Armour-Chelu, N. & Dolman, P.M. (2015) Home-range size and habitat use of European Nightjars Caprimulgus europaeus nesting in a complex plantation-forest landscape. Ibis.

Snow, D.W. & Perrins, C.M. (1998) The Birds of the Western Palearctic (Concise Edition): Volume 1 Non-Passerines. pp. 929–932. Oxford University Press

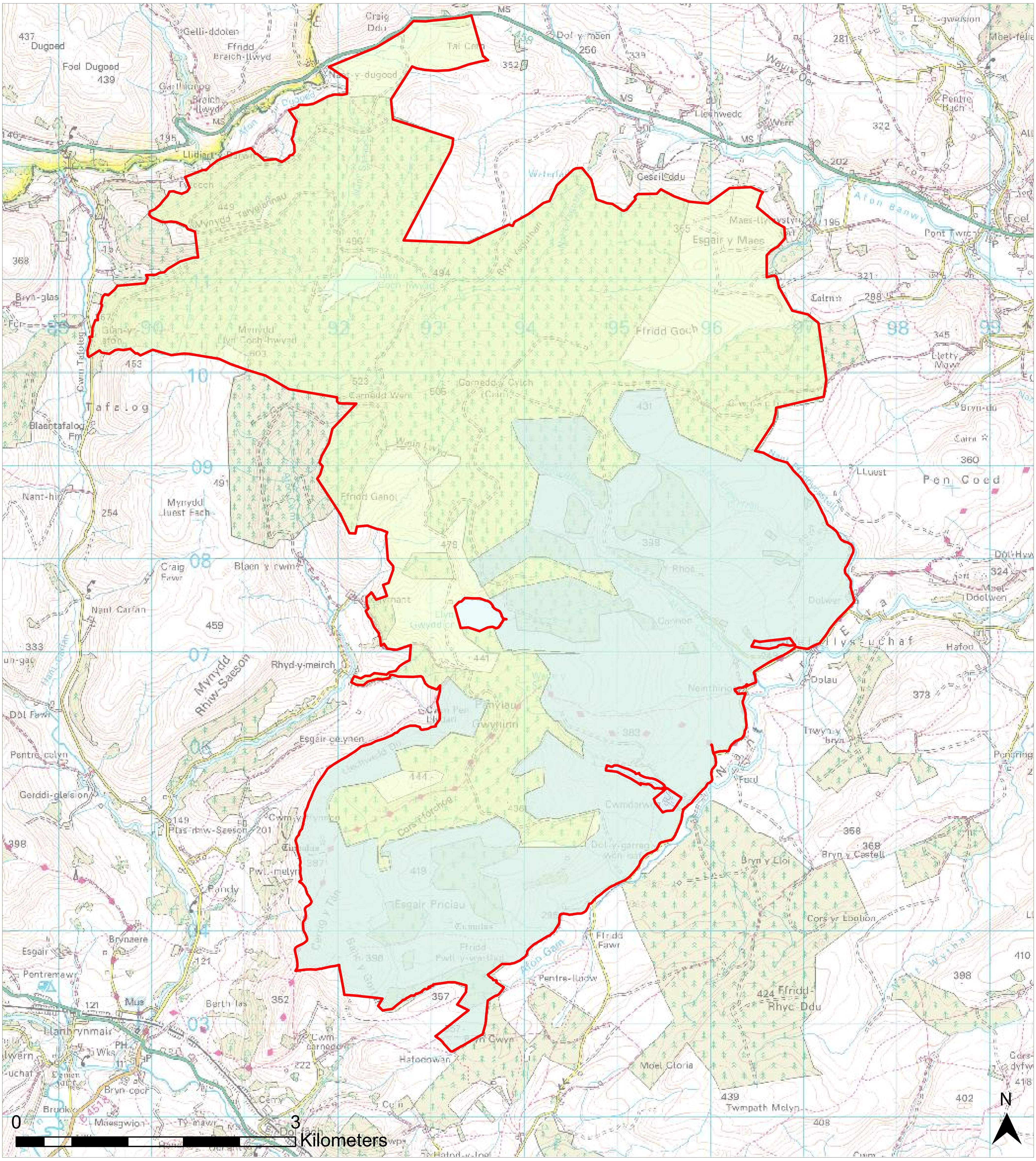
The Welsh Ornithological Society (2014) Birds in Wales. Vol.11 No.2. Welsh Bird Report No.27 for 2013. CMP UK Ltd, Poole, Dorset.

Wernham, C.V., Toms, M.P., Marchant, J.H., Clark, J.A., Sitiwardena, G.M., & Baillie, S.R. (2002). The migration atlas: movements of the birds of Britain and Ireland. T. & A.D. Poyser. London

7 Appendices

Appendix 1. Figures

(overleaf)



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure1_Site Boundary.mxd

BSG | ecology

OFFICE: Monmouth
T: 01600 891576

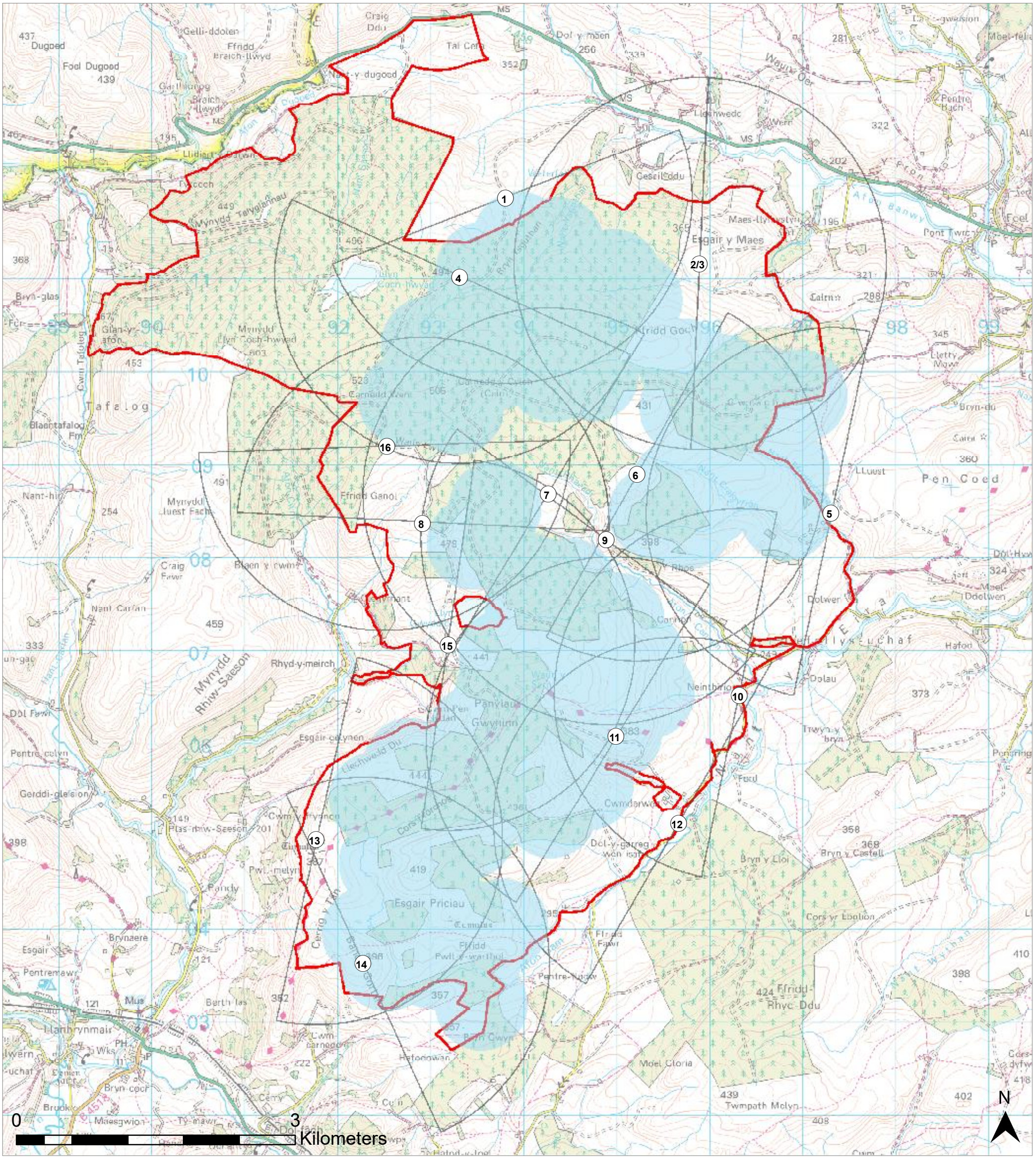
JOB REF: 8511

PROJECT TITLE
LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE
Figure 1: Site Boundary

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000
DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND
- Site Boundary
- Llanbrynmair Site
- Carnedd Wen Site



C:\Users\garyDocuments\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure2_VP Locations.mxd

BSG | ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

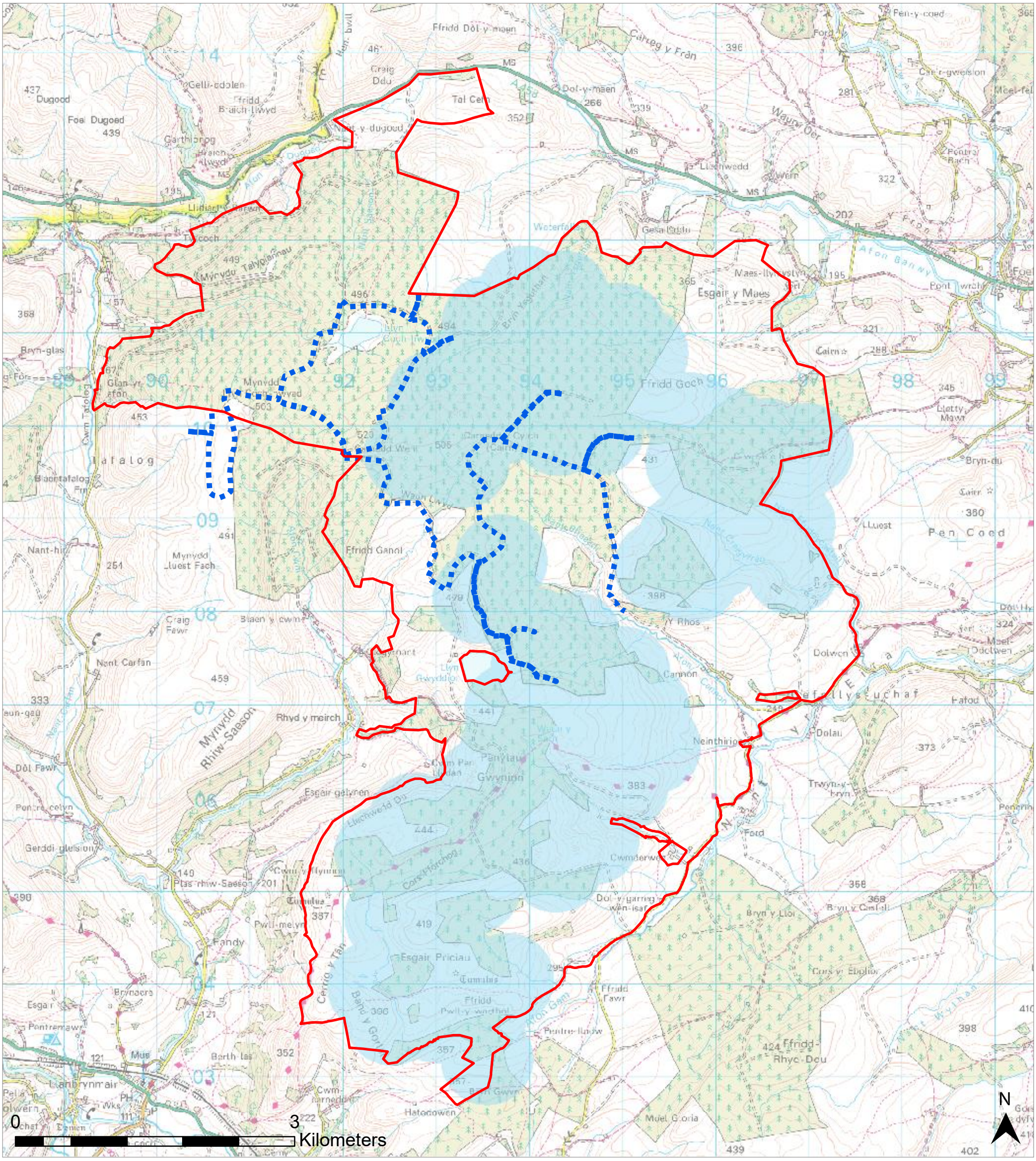
Figure 2: VP Locations

DATE: 27-07-2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

- Site Boundary
- 500 m Perimeter of Turbine Locations
- VP Locations
- 2 km VP Viewshed



BSG | ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 3: Black Grouse Survey Area (April 2016)

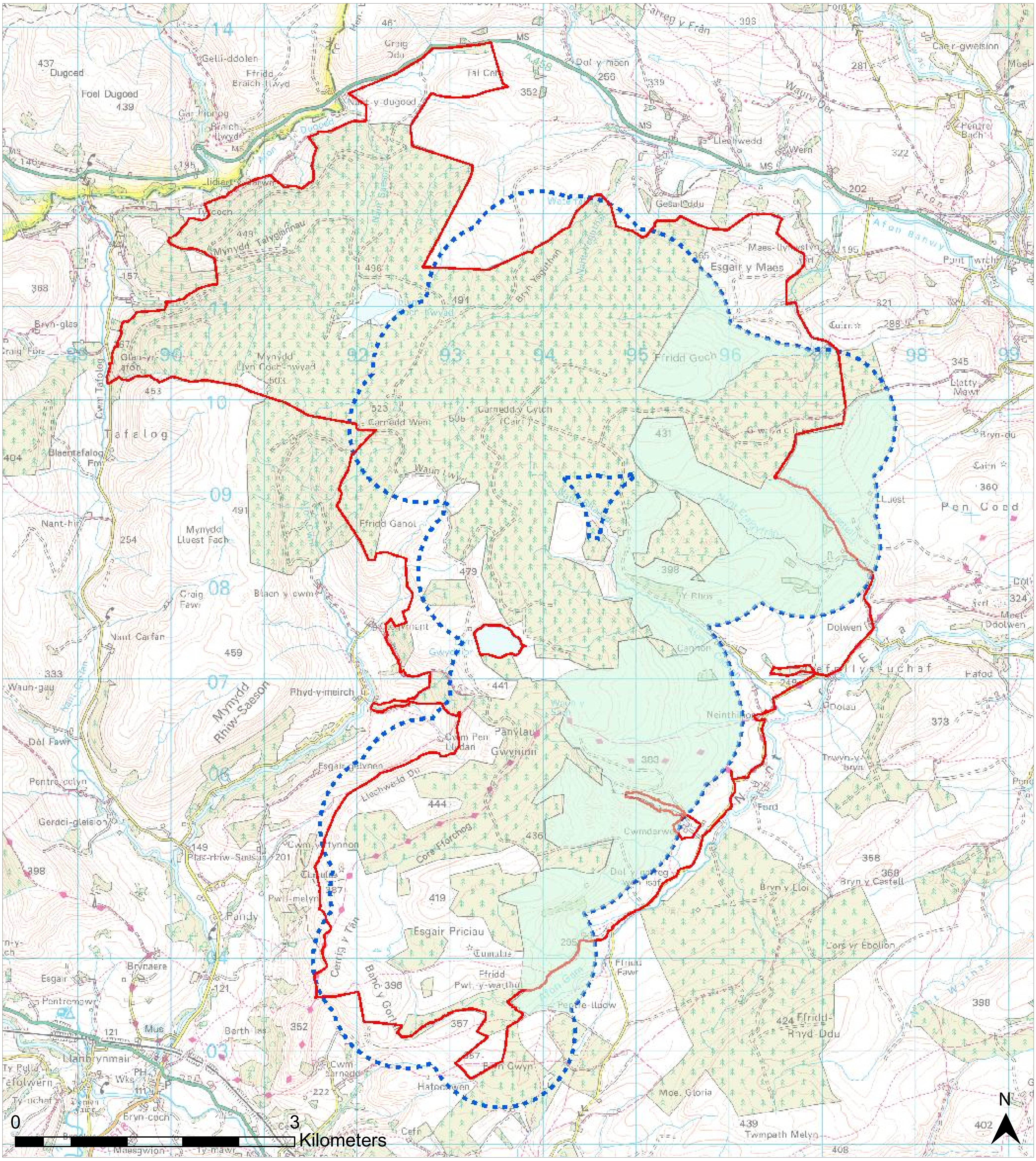
DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

- Site Boundary
- 500 m Perimeter of Turbine Locations
- Black Grouse Transect Route

C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure3_Black Grouse Survey.mxd



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure 4_Breeding Wader.mxd

BSG | ecology

OFFICE: Monmouth
T: 01600 891576

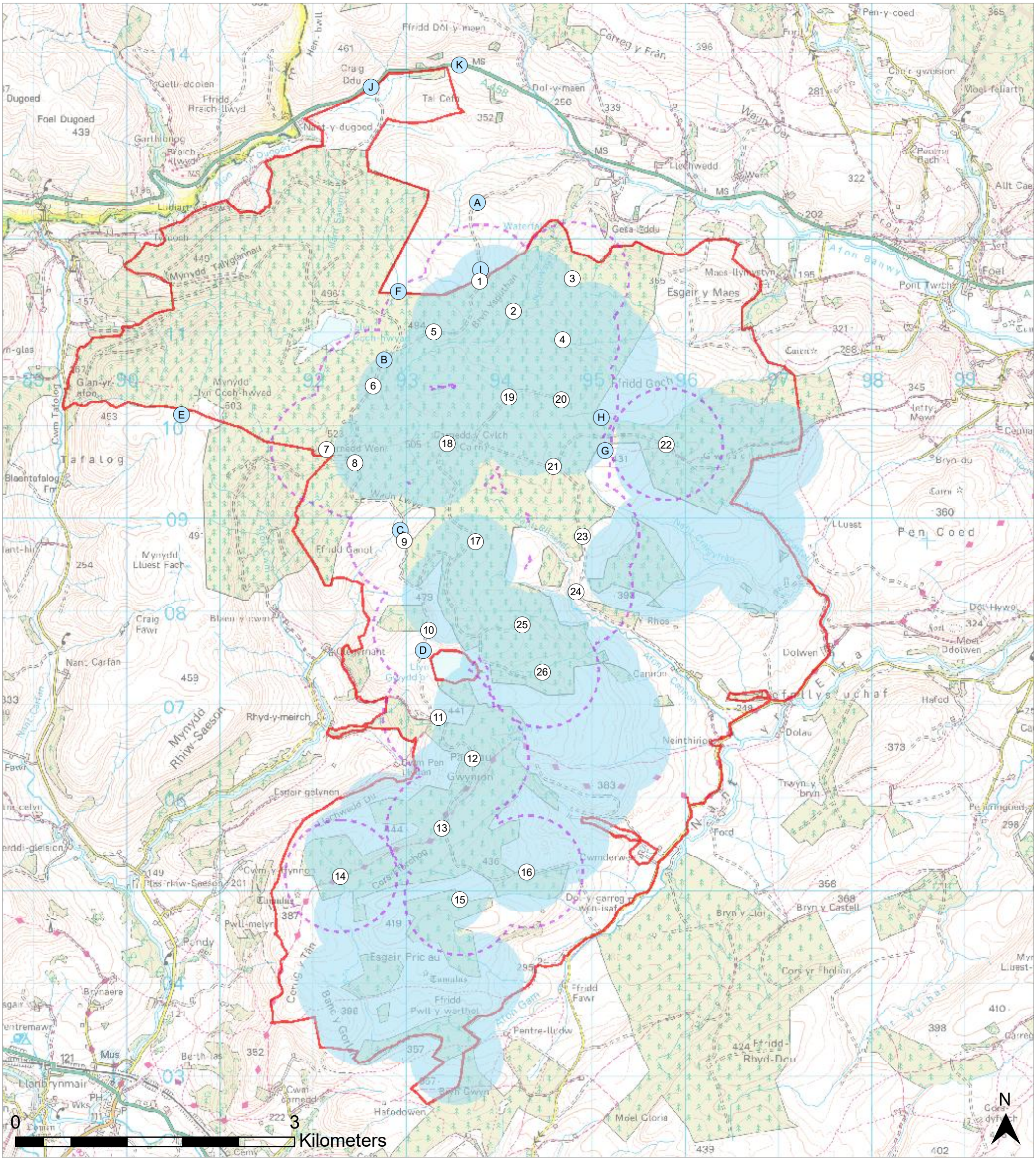
JOB REF: 8511

PROJECT TITLE
LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE
Figure 4: Breeding Wader Survey Area

DATE: 27.07.2018 | CHECKED: OG | SCALE: 1:40,000
DRAWN: GL | APPROVED: OG | STATUS: FINAL

LEGEND
- Site Boundary
- 800 m Perimeter of Turbine Locations
- Wader Survey Areas
- Curlew VP



BSG ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE
LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

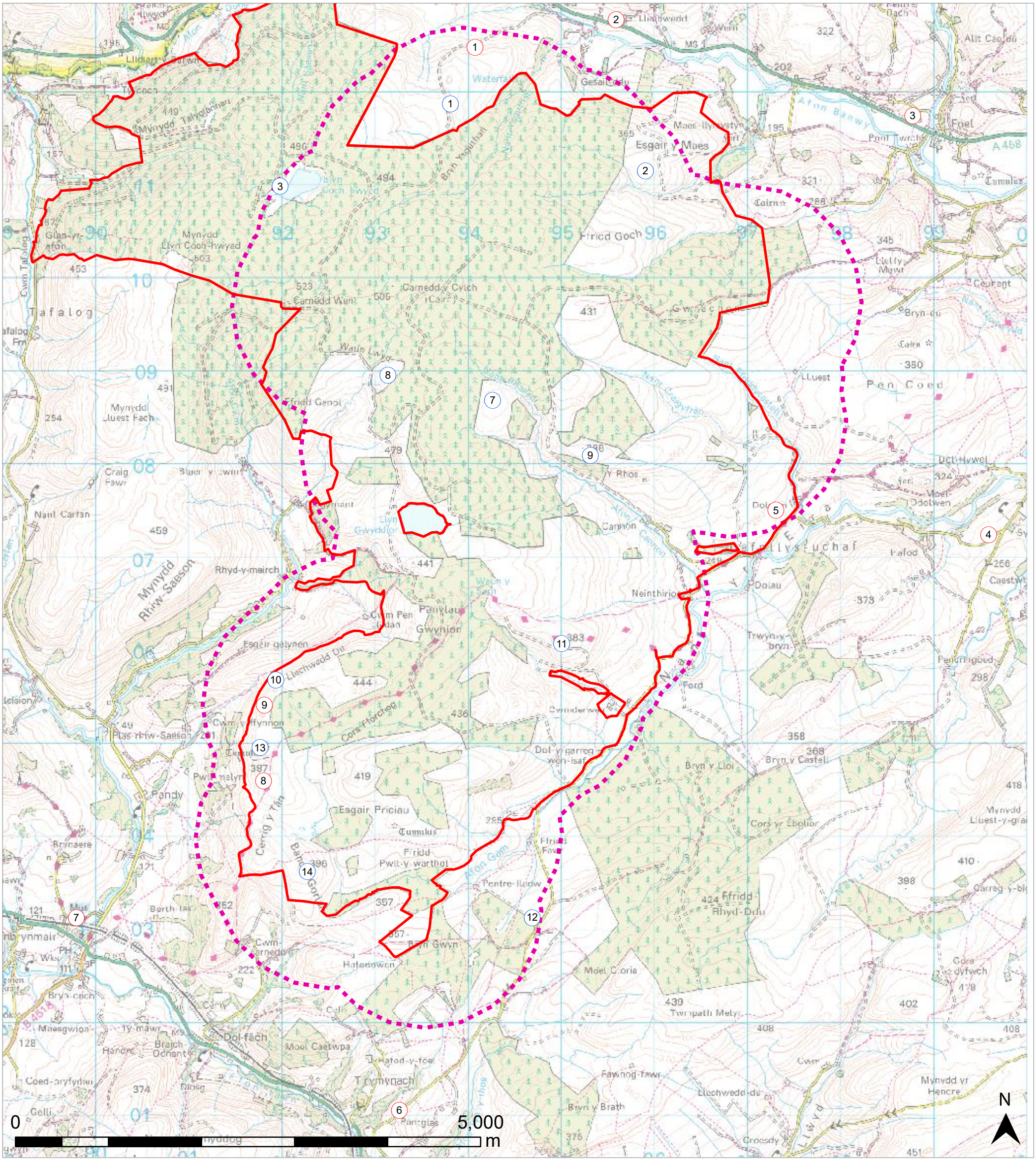
DRAWING TITLE
Figure 5: Nightjar Survey Area and Hen Harrier VP Locations

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000
DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

- Site Boundary
- 500 m Perimeter of Turbine Locations
- Nightjar Stop Point
- 600 m Audible Range
- Hen Harrier VP

C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure5_Nightjar Hen Harrier_public.mxd



BSG ecology

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 6: Goshawk and Red Kite VP Locations
(March to July 2017 Inclusive)

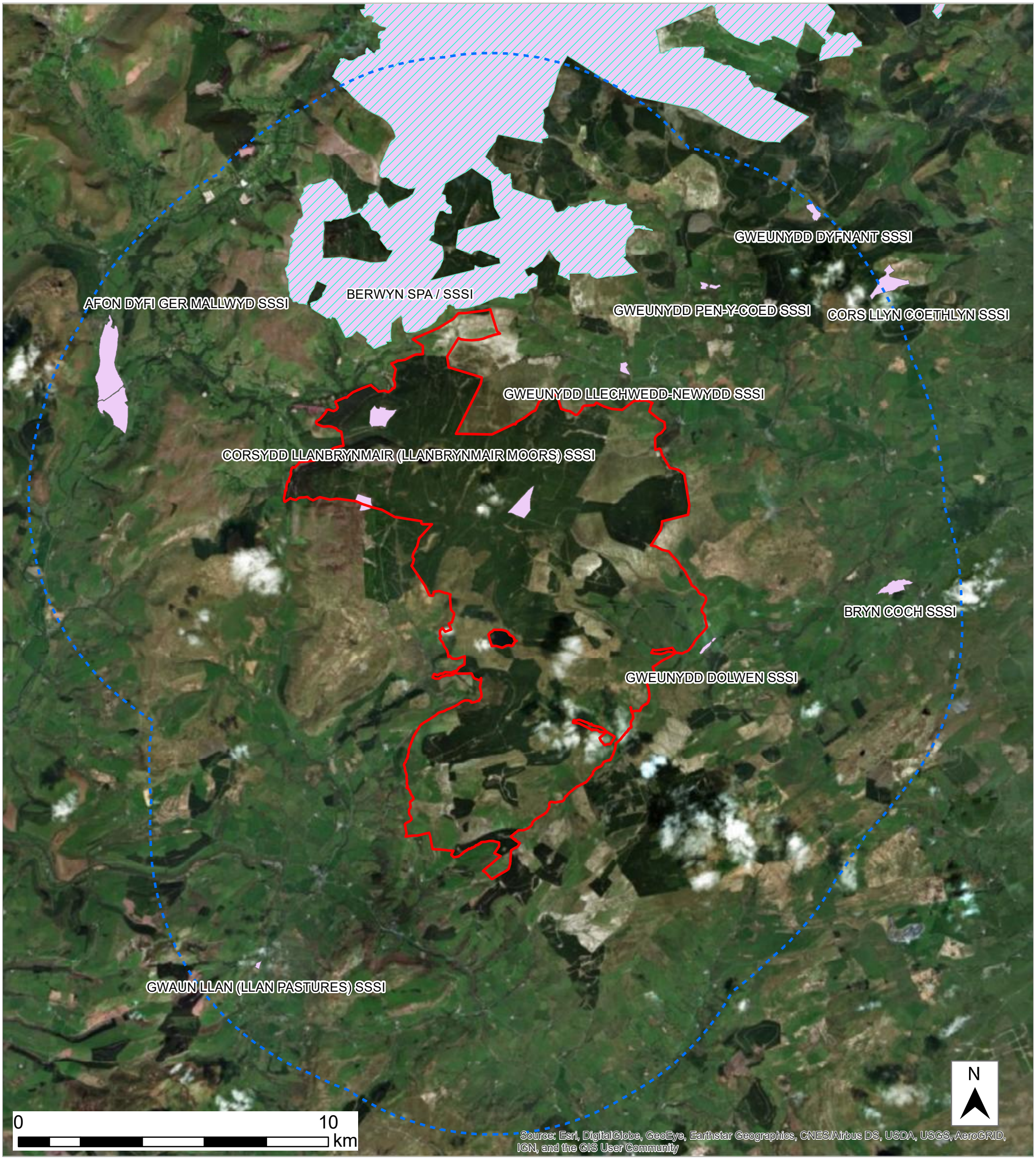
DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

- Site Boundary
- 1250 m Perimeter of Turbine Locations
- Goshawk VP Locations
- Red Kite VP Locations

C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure6_Goshawk and Kite Survey_public.mxd



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure7_Designated sites.mxd

BSG ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

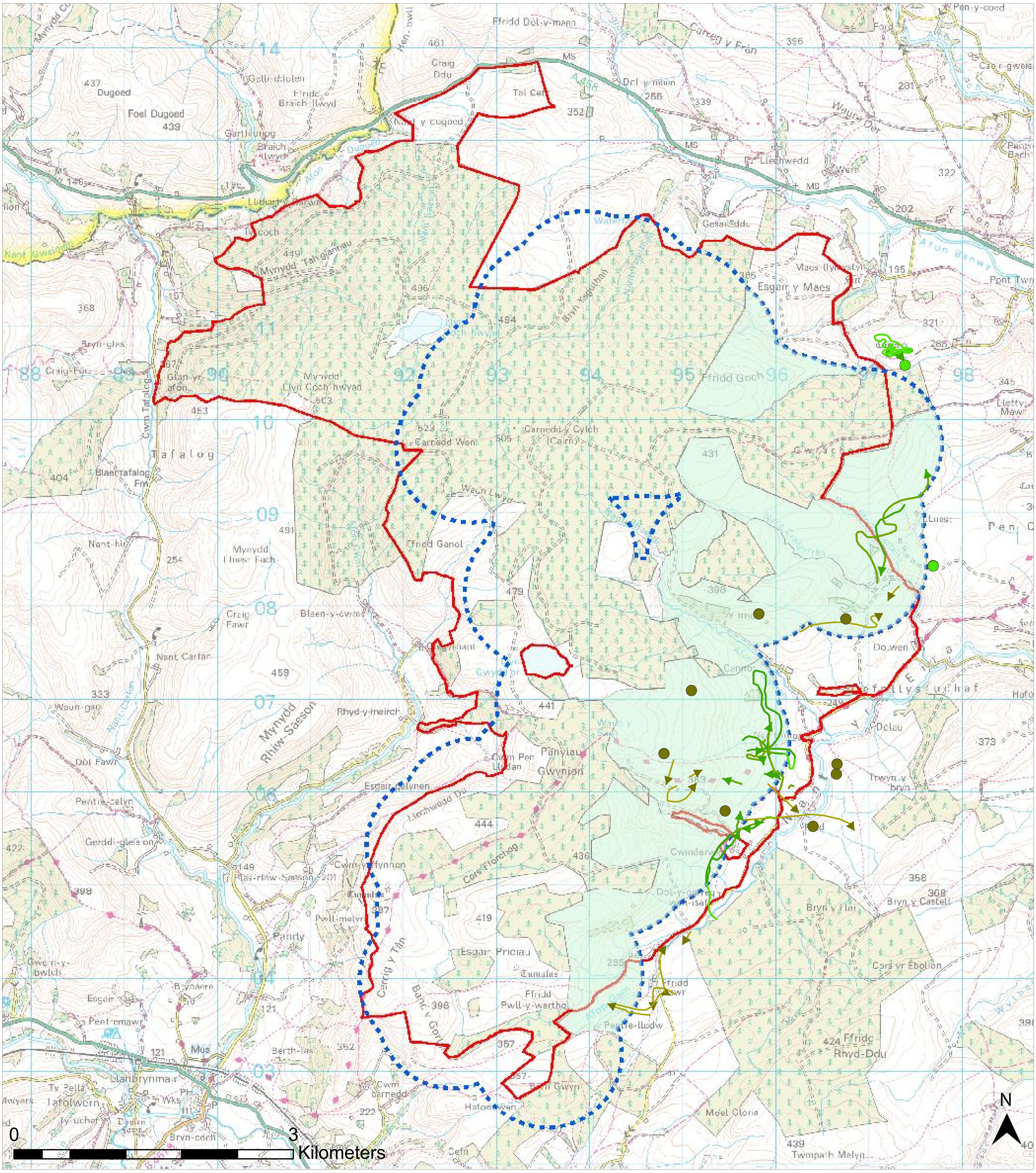
PROJECT TITLE
LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE
Figure 7: Designated Sites

DATE: 27.07.2018 CHECKED: OG SCALE: 1:120,000
DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

- Site Boundary
- 5 km Perimeter of Site Boundary
- Special Protection Areas (SPAs)
- Sites of Special Scientific Interest (SSSIs)



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure8_Curlew.mxd

BSG ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE
LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

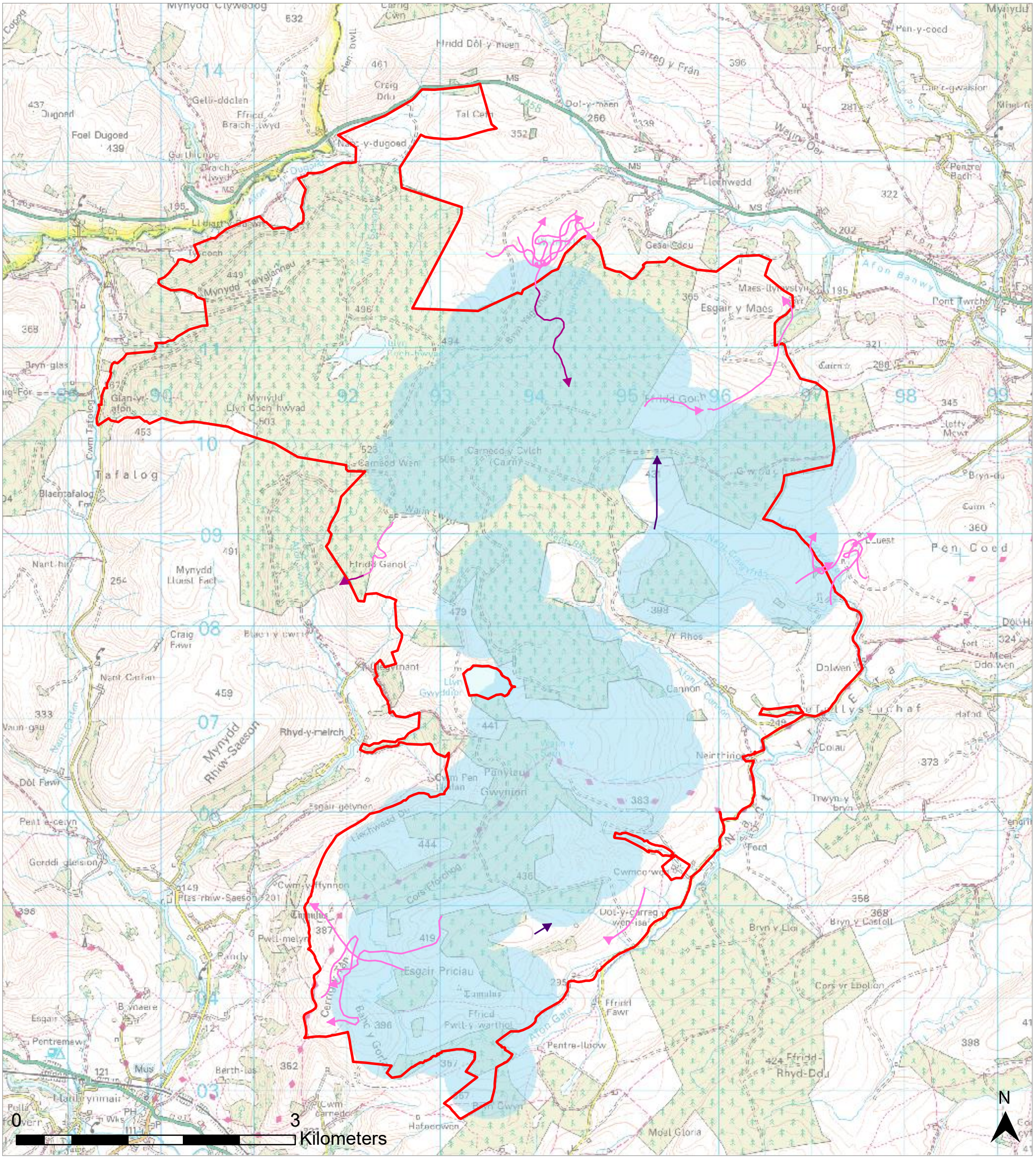
DRAWING TITLE
Figure 8: Curlew Flight Lines
(April to August 2016 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000
DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND
- Site Boundary
- 800 m Perimeter of Turbine Locations
- Wader Survey Areas

Flight Lines
- Curlew (At Collision Risk Height)
- Curlew (Below/Above Collision Risk Height)
- Curlew (Recorded During Wader Survey)

Point Records
- Curlew (Recorded During VP Survey)
- Curlew (Recorded During Wader Survey)



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure9_Hen Harrier.mxd

BSG ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 9: Hen Harrier Flight Lines
(April to August 2016 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

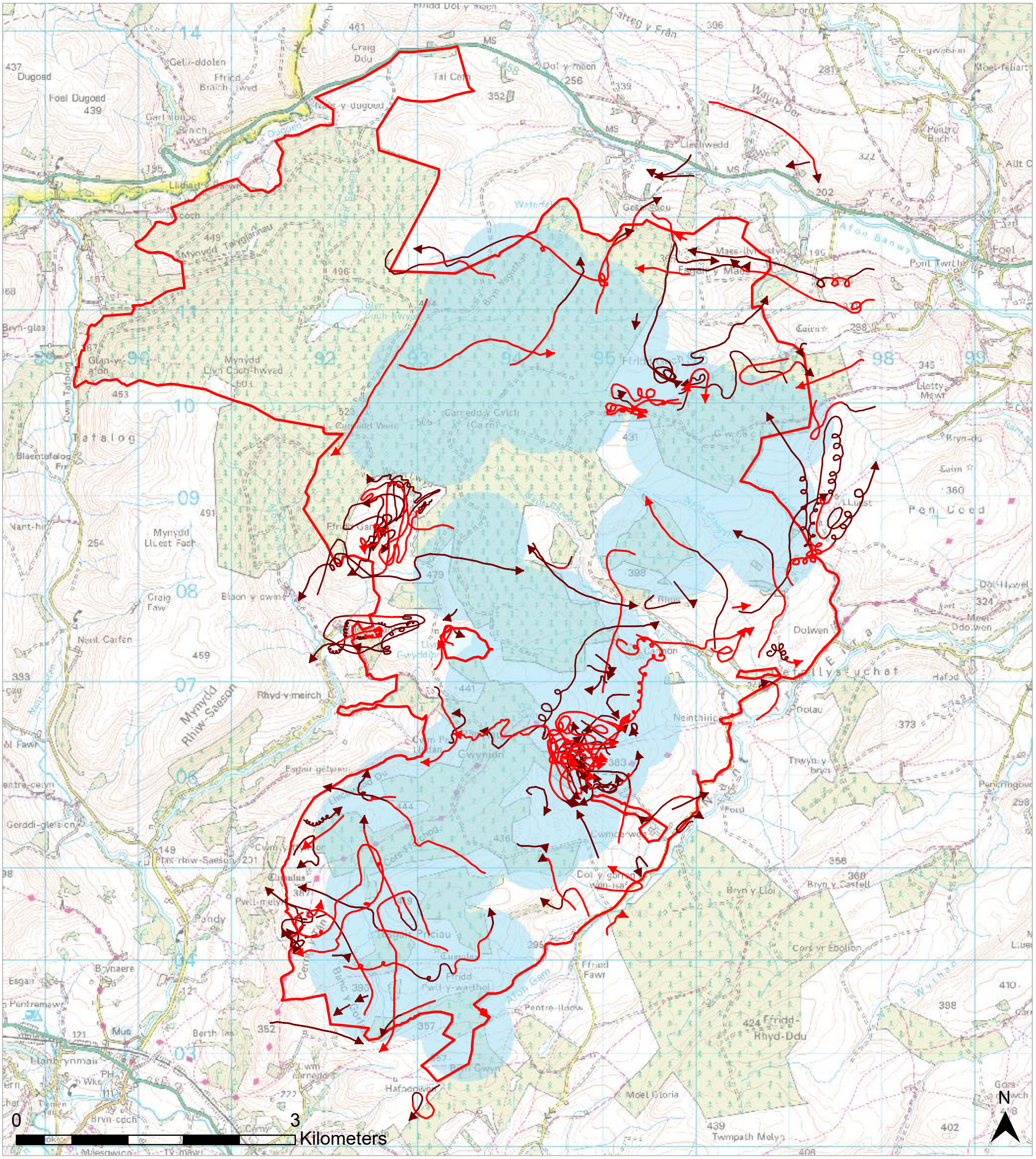
DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

- Site Boundary
- 500 m Permimeter of Turbine Locations

Flight Lines

- Hen Harrier (At Collision Risk Height)
- Hen Harrier (Below Collision Risk Height)
- Hen Harrier (Recorded During Wader Survey)



BSG | ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE
LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE
Figure 10: Red Kite Flight Lines
(April to August 2016 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000
DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

Site Boundary

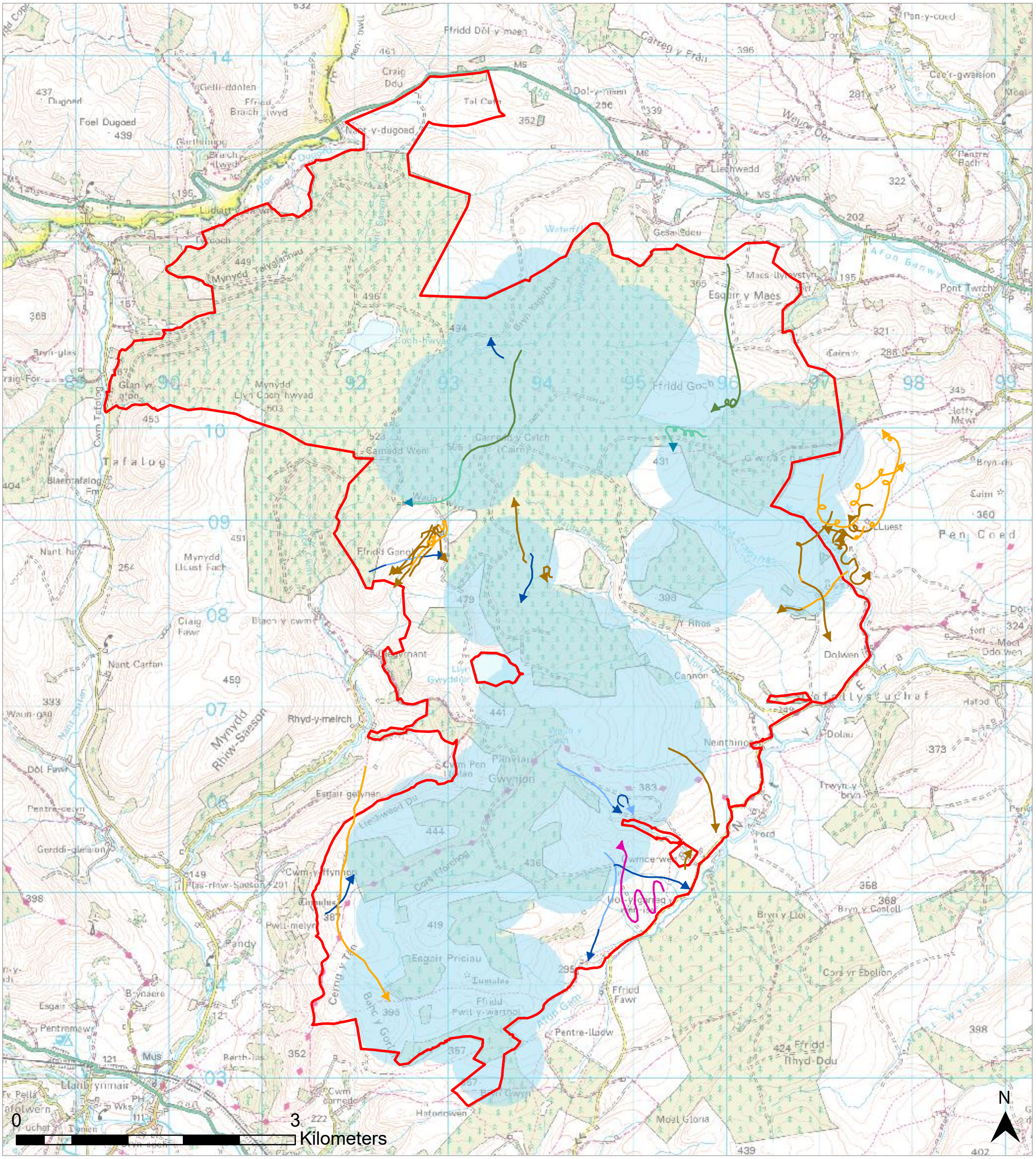
500 m Permimeter of Turbine Locations

Flight Lines

Red Kite (At Collision Risk Height)

Red Kite (Below/Above Collision Risk Height)

C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure10_Red Kite.mxd



BSG ecology

OFFICE: Monmouth
T: 01600 891576

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 11: Other Raptor Flight Lines
(April to August 2016 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

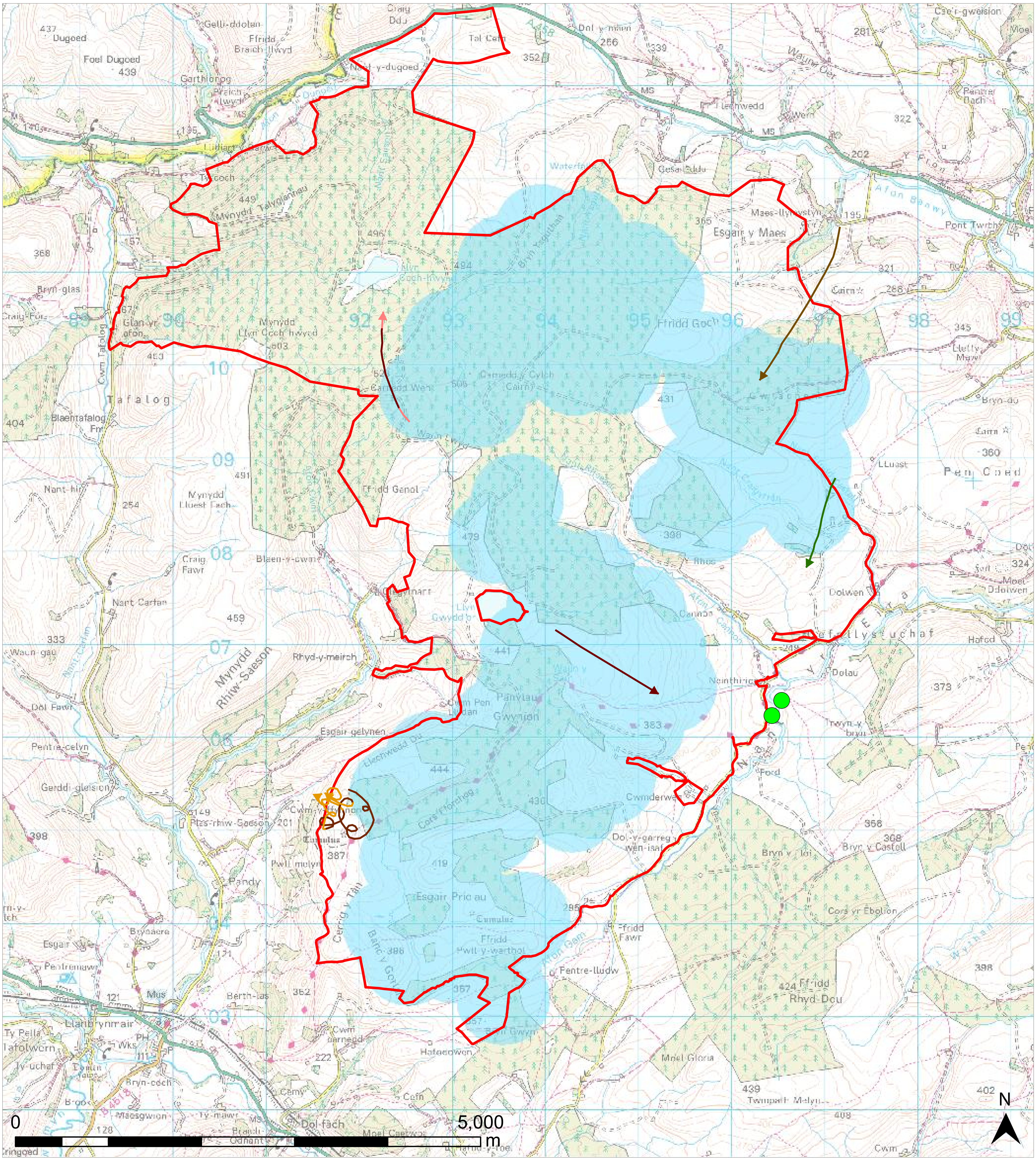
LEGEND

- Site Boundary
- 500 m Perimeter of Turbine Locations

Flight Lines

- Marsh Harrier (Below/Above Collision Risk Height)
- Osprey (At Collision Risk Height)
- Osprey (Below/Above Collision Risk Height)
- Peregrine (At Collision Risk Height)
- Peregrine (Below/Above Collision Risk Height)
- Kestrel (At Collision Risk Height)
- Kestrel (Below/Above Collision Risk Height)

C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure11_Other Raptors_public.mxd



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure12_Winter Waders_public.mxd

BSG | ecology

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 12: Waders and Whooper Swan Flight Lines (September 2016 to March 2017 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

Site Boundary

500 m Perimeter of Turbine Locations

Point Records

Curlew

Flight Lines

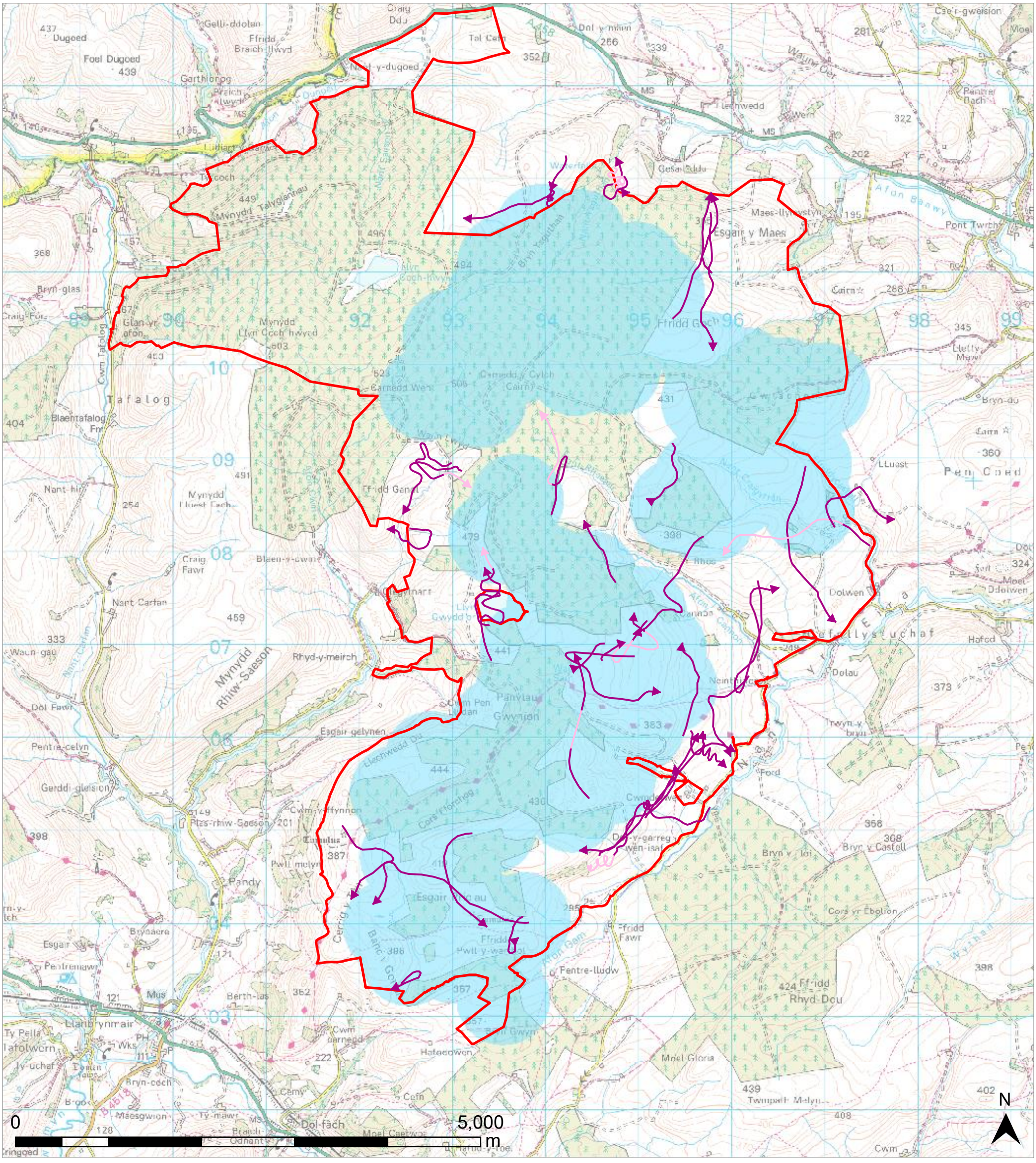
Curlew (Below/Above Collision Risk Height)

Golden Plover (At Collision Risk Height)

Golden Plover (Below/Above Collision Risk Height)

Whooper Swan (At Collision Risk Height)

Whooper Swan (Below/Above Collision Risk Height)



BSG | ecology

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 13: Hen Harrier Flight Lines
(September 2016 to March 2017 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

Site Boundary

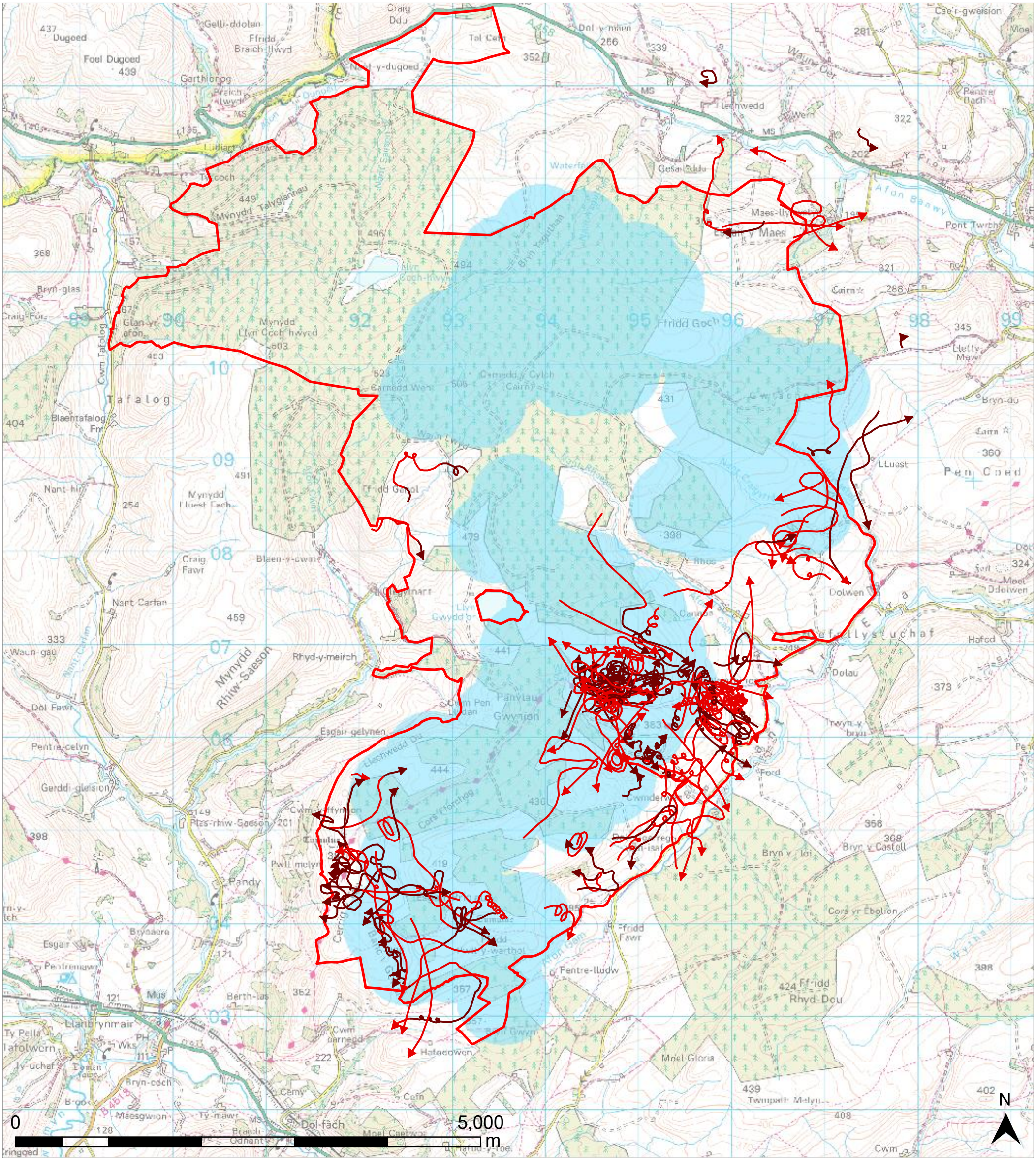
500 m Perimeter of Turbine Locations

Flight Lines

Hen Harrier (At Collision Risk Height)

Hen Harrier (Below Collision Risk Height)

C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure13_Winter Hen Harrier_public.mxd



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure14_Winter Red Kite.mxd

BSG ecology

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 14: Red Kite Flight Lines
(September 2016 to March 2017 Inclusive)

DATE: 27.07.2018 CHECKED: OG SCALE: 1:40,000

DRAWN: GL APPROVED: OG STATUS: FINAL

LEGEND

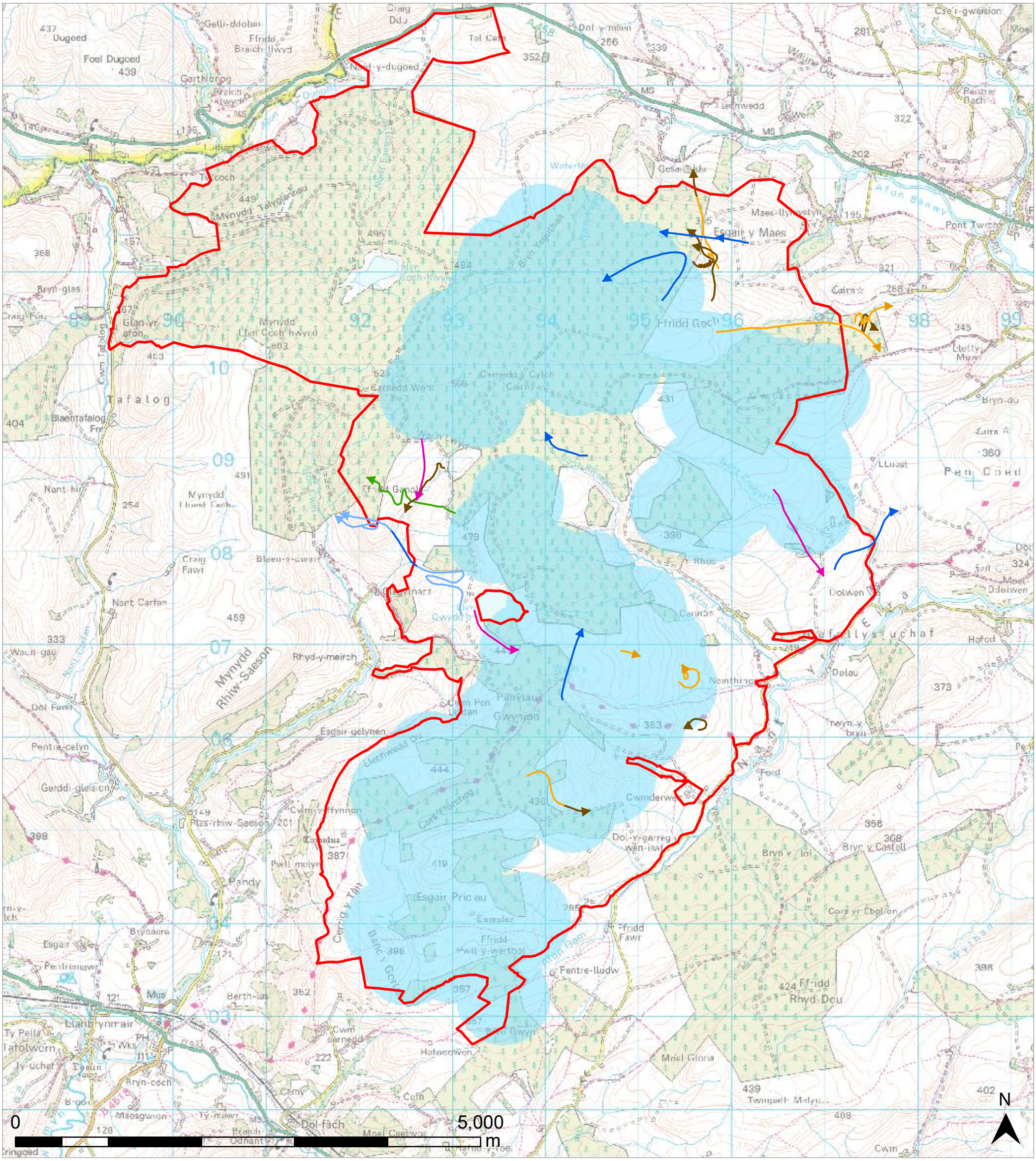
Site Boundary

500 m Perimeter of Turbine Locations

Flight Lines

Red Kite (At Collision Risk Height)

Red Kite (Below/Above Collision Risk Height)



C:\Users\gary\Documents\ArcGIS\Contracts\Llanbrynmair and Carnedd Wen\Projects\Llanbrynmair and Carnedd Wen Report Figures\Figure15_Winter Raptors_public.mxd

BSG ecology

JOB REF: 8511

PROJECT TITLE

LLANBRYNMAIR AND CARNEDD WEN ORNITHOLOGY

DRAWING TITLE

Figure 15: Other Raptor Flight Lines
(September 2016 to March 2017 Inclusive)

DATE: 27.07.2018	CHECKED: OG	SCALE: 1:40,000
DRAWN: GL	APPROVED: OG	STATUS: FINAL

LEGEND

- Site Boundary
- 500 m Perimeter of Turbine Locations

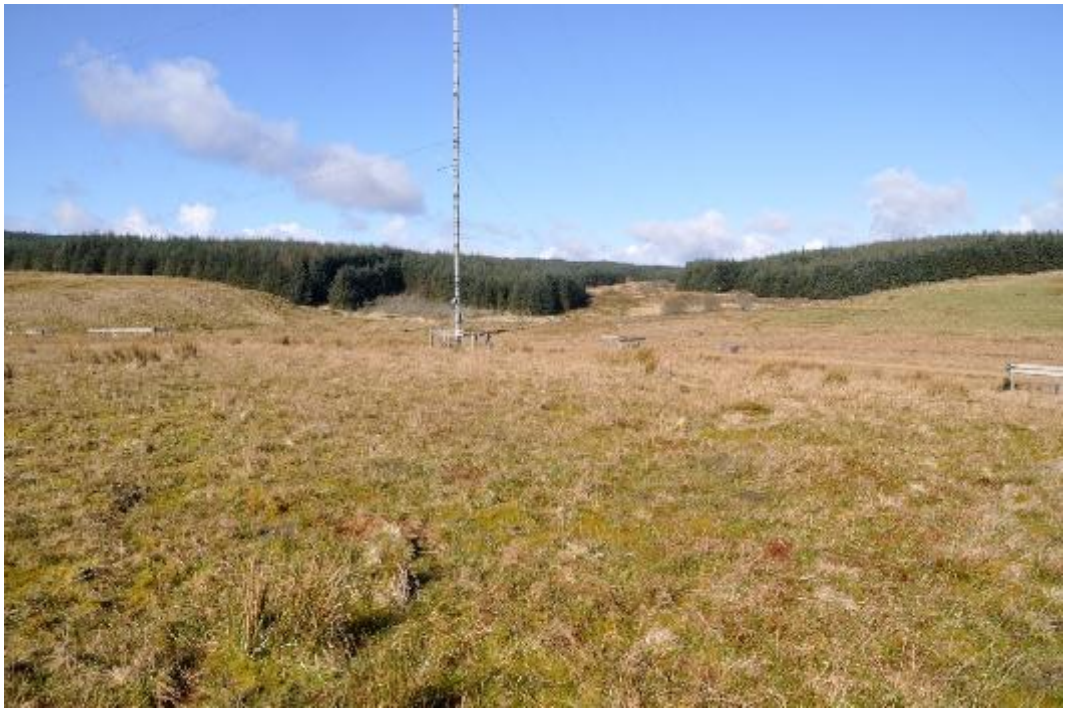
Flight Lines

- Peregrine (At Collision Risk Height)
- Peregrine (Below/Above Collision Risk Height)
- Hobby (Below Collision Risk Height)
- Merlin (Below Collision Risk Height)
- Kestrel (At Collision Risk Height)
- Kestrel (Below Collision Risk Height)

Appendix 2. Photographs

Photograph 1: View north-east over the moorland immediately north of the Site. The plantation between VPs 1 and 2 is visible in the centre right.

Photograph 2: View west from VP 2 to the Carnedd Wen plantation.



Photograph 3: View west from VP5 over sheep grazed pastures towards plantation at VP 6.

Photograph 4: View south-west over moorland from VP6 at the centre of the Site.

Photograph 5: Watercourse valleys at the plantation edge near VP 9.

Photograph 6: Sheep grazed pasture at VP11.

Photograph 7: View north along the road defining the eastern boundary of the Site at VP 12.

Photograph 8: View east from VP 14. The strip of plantation visible in the centre right defines the southern tip of the Site.

Photograph 9: View west from VP 8 to the western Site boundary.

Photograph 10: View along a forestry track as it passes into moorland at VP16.

Photograph 11: Llyn Coch-hwyad in the northern part of the Site.

Photograph 12: Llyn Gwyddior, at the centre of the Site.

Appendix 3. Detailed Survey Data

(overleaf)

Table 1a. Breeding bird season 2016 VP weather data

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
26/04/2016	1	05:30-08:30	N 2-3	SHOWERS	7/8	1								
26/04/2016	1	09:00-12:00	NW 3	SHOWERS	4/8	4								
17/05/2016	1	09:30-12:30	W 1-3	NIL	2/8-6/8	12					1			
17/05/2016	1	13:15-16:15	W 1-3	Light showers	4/8-8/8	12				1				
08/06/2016	1	10:00-13:00	E 0-2	Nil	1/8-4/8	-								
08/06/2016	1	13:40-16:40	E 1-2	Nil	5/8-6/8	-				2				
28/06/2016	1	11:00-14:00	S1-2	SHOWERS	8/8	-								
28/06/2016	1	14:45-17:45	S 1	SHOWERS	8/8	-								
20/07/2016	1	09:20-12:20	SW 1-2	Nil	2/8	19-21								
20/07/2016	1	09:20-12:20	SW 2-3	SHOWERS	7/8-8/8	17-22								
18/08/2016	1	14:00-17:00	NE-E 1-2	Light Rain	8/8	16-17		4						
18/08/2016	1	18:00-21:00	Nil	Nil	5/8-8/8	16-17				1				
07/04/2016	2	11:15-14:15	NW 2-3	SHOWERS	8/8	5								
07/04/2016	2	14:45-17:45	NW 3	SHOWERS	7/8	7								
04/05/2016	2	12:20-15:20	S 2-3	NIL	1/8	12								
04/05/2016	2	15:55-18:55	S 2-3	NIL	1/8	11		1		1				
15/06/2016	2	09:25-12:25	SW 2-3	Occ Showers	7/8	13-17				9	1 (2)			1
15/06/2016	2	12:55-15:55	SW 3	NIL	5/8	15				2				
24/06/2016	2	10:05-13:05	SW 2-3	OCCASIONAL SHOWERS	7/8	15-17								
24/06/2016	2	13:35-16:35	SW 3	Nil	5/8	15				1				
05/07/2016	2	04:55-07:55	NW 2	Nil	8/8	10								
05/07/2016	2	08:25-11:25	NW 1	NIL	6/8	12								
01/08/2016	2	14:10-17:10	SE 0-1	NIL	8/8	13								
01/08/2016	2	18:15-19:15	SE 1	DRIZZLE	8/8	12								
31/08/2016	2	18:30-20:30	SW 0-1	Oc Light Drizzle	8/8	13-14								

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
07/04/2016	3	11:15-14:15	NW 2-3	SHOWERS	8/8	5								
07/04/2016	3	14:45-17:45	W 2-4	SHOWERS	7/8	7								
04/05/2016	3	12:25-15:25	S 2-3	NiL	0/8-1/8	15-16				1				
04/05/2016	3	15:50-18:50	S 1-3	NiL	1/8-2/8	11		1		2				
15/06/2016	3	09:25-12:25	SW 2	SHOWERS	6/8	14				6				1
15/06/2016	3	12:55-15:55	SW 3-4	NIL	5/8	17								
24/06/2016	3	10:05-13:05	SW 2	SHOWERS	6/8	14								
24/06/2016	3	13:35-16:35	SW 3-4	Nil	5/8	17								
05/07/2016	3	04:55-07:55	W 3	Nil	8/8	9								
05/07/2016	3	08:25-11:25	W 2-3	NIL	5/8	11					1			
01/08/2016	3	14:10-17:10	S 1	LIGHT RAIN	8/8	13-16								
01/08/2016	3	18:15-19:15	SE 1	LIGHT RAIN	8/8	12								
31/08/2016	3	18:30-20:30	SW 1-2	DRIZZLE	8/8	13-14								
25/04/2016	4	09:20-12:20	NW 1-2	LIGHT	8/8	5					1	1		
25/04/2016	4	12:50-15:50	NW 1-2	SHOWERS	8/8	5								
24/05/2016	4	15:15-18:15	E 1-2	Nil	2/8-7/8	14-15				2				1
24/05/2016	4	18:45-21:45	E 0-1	Nil	3/8-5/8	10-14								
12/07/2016	4	13:00-16:00	N 0-1	NIL	8/8	14								
12/07/2016	4	16:30-19:30	N 0-1	NIL	6/8	15								
13/07/2016	4	10:00-13:00	NW 1	NIL	7/8	12								
13/07/2016	4	13:30-16:30	NW 1-2	NIL	5/8	12								
25/07/2016	4	13:15-16:15	SW 2	Oc Showers	8/8	15-18								
25/07/2016	4	16:45-19:45	SW 2-3	Oc Showers	6/8-8/8	14-15								
11/08/2016	4	05:30-08:30	W 4	NIL	8/8	9-11								
11/08/2016	4	09:00-12:00	W 3-4	LIGHT SHOWERS	8/8	12-13								
12/04/2016	5	09:10-12:10	SW 1	NIL	7/8	11					2		1	

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
12/04/2016	5	12:40-15:40	SW 1	NIL	7/8	15								
16/05/2016	5	15:00-18:00	W 1-3	NIL	1/8	18				2	1			
16/05/2016	5	18:30-21:30	W1-2	NIL	1/8-3/8	14	2 (3)							
23/06/2016	5	10:30-13:30	S 1-2	NIL	1/8	19	1 (2)			1			5	
23/06/2016	5	14:00-17:00	SW 2-3	NiL	1/8	22	1 (2)	1		1			2	
29/06/2016	5	15:45-18:45	W 2-4	SHOWERS	8/8	-								
29/06/2016	5	19:00-22:00	W 1-2	SHOWERS	7/8	-				1				
30/06/2016	5	07:45-10:45	W 1-2	NIL	8/8	-	1							
30/06/2016	5	11:15-14:15	NW 1-3	SHOWERS	7/8	-		1		1			1	
27/07/2016	5	08:20-11:20	N 2	SHOWERS	7/8	16-17								
27/07/2016	5	11:50-14:50	NW 1-2	SHOWERS	6/8	19-21		1		3 (5)				
06/04/2016	6	11:45-14:45	W 4-5	NIL	6/8	6								
06/04/2016	6	15:15-18:15	W 5-6	OCC HAIL	7/8	2								
03/05/2016	6	09:40-12:40	SW 2	Light	6/8-7/8	7								
03/05/2016	6	13:10-16:10	SW 2-3	Nil	4/8-6/8	7				1				
13/06/2016	6	15:40-18:40	SW 2	NIL	7/8	18								
13/06/2016	6	19:10-22:10	SW 1	Nil	8/8	15								
07/07/2016	6	04:45-07:45	W 4	LIGHT SHOWERS	8/8	12								
07/07/2016	6	08:15-11:15	W 4	DRIZZLE	8/8	13								
18/07/2016	6	14:30-17:30	SW 1	Nil	1/8	24-28								
18/07/2016	6	18:00-21:00	W 1	Nil	1/8	19-23								
23/08/2016	6	09:15-12:15	SSE 2	Nil	1/8	21								
23/08/2016	6	12:45-15:45	SE 2-3	Nil	3/8	24								
06/04/2016	7	11:41-14:41	W 4-5	NIL	6/8	6								
06/04/2016	7	15:11-18:11	W 5-6	OCC HAIL	8/8	5								
03/05/2016	7	09:35-12:35	S 2-3	Light	8/8	7								

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
03/05/2016	7	13:05-16:05	SW 2-3	Nil	4/8-6/8	7								
13/06/2016	7	15:40-18:40	E 1-2	NIL	7/8	15								
13/06/2016	7	19:10-22:10	E 1	NIL	7/8	13								
07/07/2016	7	04:45-07:45	SW 2	OCCASIONAL DRIZZLE	8/8	10								
07/07/2016	7	08:15-11:15	SW 3	MODERATE RAIN	8/8	10								
18/07/2016	7	14:30-17:30	W 0-1	Nil	1/8-2/8	22-25						1		
18/07/2016	7	18:00-21:00	W 0-1	Nil	1/8	22-24								
23/08/2016	7	09:15-12:15	S 1-2	Nil	1/8	18							1	
23/08/2016	7	12:45-15:45	S 1-2	Nil	1/8	18-20								
18/04/2016	8	14:00-17:00	SW 2-3	NIL	8/8	9								
18/04/2016	8	17:30-20:30	SW 1-2	NIL	8/8	7								
25/05/2016	8	09:15-12:15	NE 1	Nil	8/8	8								
25/05/2016	8	12:45-15:45	NE 1	Nil	8/8	10						1		
04/07/2016	8	11:20-14:20	SW 1-2	OCCASIONAL DRIZZLE	8/8	17								
04/07/2016	8	14:50-17:50	SW 1	Nil	8/8	16								
19/07/2016	8	04:50-07:50	Nil	Nil	0/8-1/8	16-18								
19/07/2016	8	08:20-11:20	W 0-1	Nil	0/8-1/8	18-22				1				
26/07/2016	8	09:05-12:05	W 0-2	Oc Showers	8/8	12							1	
26/07/2016	8	12:35-15:35	W 1-2	Oc Showers	8/8	12-13								
18/08/2016	8	14:30-17:30	SE 0-1	Nil	7/8-8/8	18								
18/08/2016	8	18:00-21:00	Nil	Nil	6/8-7/8	15-16		1					1	
13/04/2016	9	10:25-13:25	SE 0-1	NIL	2/8	7				1	1			
13/04/2016	9	13:55-16:55	S 1-2	NIL	4/8	10								
18/05/2016	9	10:00-13:00	SW 0-3	Occ Showers	6/8-8/8	12				2				
18/05/2016	9	13:30-16:30	NW 1-2	Occ Rain	6/8-8/8	8-14				1				
07/06/2016	9	15:35-18:35	N 1 -2	Nil	8/8	17				1				

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
07/06/2016	9	19:05-22:05	N 1 -2	Nil	3/8-7/8	13-16								
27/06/2016	9	15:30-18:30	W 3	Nil	6/8	15-16								
27/06/2016	9	19:00-22:00	SW 3	OCCASIONAL SHOWERS	8/8	14								
11/07/2016	9	13:20-16:20	W 2-3	OCCASIONAL DRIZZLE	8/8	14				1				
11/07/2016	9	16:50-19:50	W 2-3	Nil	8/8	14								
11/08/2016	9	05:50-08:50	W 3-5	NIL	8/8	11				1 (3)				
11/08/2016	9	09:20-12:20	W 3	DRIZZLE	8/8	11								
25/04/2016	10	09:40-12:40	WNW 1	SHOWERS	7/8	9	2 (3)							
25/04/2016	10	13:10-16:10	NW 2-3	SHOWERS	6/8	12				1				
24/05/2016	10	15:00-18:00	ENE 3	Nil	4/8	18				2				
24/05/2016	10	18:45-21:45	NE 1	Nil	4/8	18	1							
21/06/2016	10	04:20-07:20	SW 0-1	NIL	7/8	12	3							
21/06/2016	10	07:50-10:50	SW 0-1	NIL	7/8	11	1							
12/07/2016	10	13:00-16:00	W 1-2	Nil	6/8	13-15								
12/07/2016	10	16:30-19:30	W 1-2	Nil	8/8	14-15				1				
26/07/2016	10	08:15-11:15	SW 1-2	Rain	8/8	15-18				1	1			
26/07/2016	10	11:45-14:45	SW 1-2	Rain	7/8	15-20				3				
22/08/2016	10	14:15-17:15	W 3	Light Rain	8/8	17							1	
22/08/2016	10	17:45-20:45	W 3	Nil	8/8	17								
12/04/2016	11	09:15-12:15	WSW 1	NIL	8/8	5					3 (4)			
12/04/2016	11	12:45-15:45	WSW 0-1	NIL	3/8	10					2			
16/05/2016	11	15:05-18:05	NW 2-3	NIL	1/8	18				12				
16/05/2016	11	18:35-21:35	NW 2-3	Nil	1/8-3/8	13-16						1		
23/06/2016	11	10:15-13:15	W 2	NIL	1/8	17				4				
23/06/2016	11	13:45-16:45	W 2-3	Nil	1/8	18				4				
30/06/2016	11	07:40-10:40	SW 0-1	Nil	6/8	11						1		

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
30/06/2016	11	11:10-14:10	SW 3	Nil	7/8	13				1				
27/07/2016	11	08:20-11:20	NE 0-2	Oc Showers	7/8-8/8	12-14								
27/07/2016	11	11:50-14:50	E 1-2	Nil	6/8-8/8	13-15				1				
31/08/2016	11	11:00-14:00	WSW 2-4	Nil	6/8-8/8	17								
31/08/2016	11	14:30-17:30	W 1-3	Nil	6/8-7/8	15-16								
07/04/2016	12	11:10-14:10	W 1-2	LIGHT	8/8	9				1		2		
07/04/2016	12	14:40-17:40	W 1	LIGHT	7/8	8	3 (12)			2	2 (3)			
05/05/2016	12	05:20-08:20	0	Nil	0/8	.3-7	1			1			1	
05/05/2016	12	08:50-11:50	SW 1	NIL	0/8-1/8	14-.18				6				
20/06/2016	12	10:35-13:35	SW 2	OCCASIONAL SHOWERS	8/8	17								
20/06/2016	12	13:05-16:05	SW 2	Nil	7/8	20								
06/07/2016	12	09:35-12:35	W 2	NIL	1/8	17								
06/07/2016	12	13:05-16:05	W 3-4	Nil	5/8	17								
13/07/2016	12	10:00-13:00	W 1-3	LIGHT SHOWERS	6/8	14-15								
13/07/2016	12	13:30-16:30	W 1-3	NIL	6/8	15-16								
10/08/2016	12	14:30-17:30	W 2-3	LIGHT SHOWERS	8/8	14-16		1	1	2				
10/08/2016	12	18:00-20:30	W 2	DRIZZLE	8/8	12-13								
18/08/2016	12	12:30-13:00	NE 1	Nil	8/8	16								
18/04/2016	13	14:00-17:00	W 3	NIL	8/8	8				4 (5)	1			
18/04/2016	13	17:30-20:30	W 3	NIL	8/8	5				1	1			
25/05/2016	13	08:30-11:30	2 E	Nil	8/8	10-12				2				
25/05/2016	13	12:00-15:00	E 2	Nil	8/8	10				1				
29/06/2016	13	15:30-18:30	SW 4-5	SHOWERS	8/8	14								
29/06/2016	13	19:00-22:00	SW 3	NIL	8/8	12				4				
04/07/2016	13	10:55-13:55	W 1-2	LIGHT RAIN	8/8	14								
04/07/2016	13	14:25-17:25	W 3-4	LIGHT SHOWERS	8/8	13		1				1	1	

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
19/07/2016	13	05:00-08:00	SE 2-3	Nil	0/8	16-18								
19/07/2016	13	08:30-11:30	SW 2-3	Nil	0/8	21-26				1				
31/08/2016	13	10:45-13:45	W 2-4	Oc Rain	5/8-7/8	-		1						
31/08/2016	13	14:15-17:15	W 1-2	Nil	6/8-7/8	-				2				
13/04/2016	14	11:00-14:00	SW 1	NIL	2/8	2				3				
13/04/2016	14	14:30-17:30	SW 1-2	NIL	2/8	16				2	1			
18/05/2016	14	09:45-12:45	W 1-3	SHOWERS	6/8-8/8	12				2				
18/05/2016	14	13:30-16:30	NW 1-2	Heavy Rain	7/8-8/8	12		1						
07/06/2016	14	15:30-18:30	WNW 1-2	Nil	6/8-8/8	-				1				
07/06/2016	14	19:05-22:05	W 1-2	Nil	3/8-8/8	-				1				
21/06/2016	14	04:30-07:30	0	NIL	7/8	11				1				
21/06/2016	14	08:00-11:00	SW 1	NIL	8/8	13								
27/06/2016	14	15:30-18:30	W 1-3	DRIZZLE	8/8	-								
27/06/2016	14	19:00-22:00	W 1	DRIZZLE	8/8	-								
11/07/2016	14	13:00-16:00	W 2-3	DRIZZLE	8/8	-								
11/07/2016	14	16:30-19:30	W 2-3	Nil	8/8	-								
26/04/2016	15	05:30-08:30	NW 1-2	NIL	8/8	0								
26/04/2016	15	09:00-12:00	N 1	NIL	6/8	0								
17/05/2016	15	09:50-12:50	SW 2-3	NIL	5/8	13				1				
17/05/2016	15	13:20-16:20	SW 2-3	Oc Showers	4/8-8/8	12				1				
08/06/2016	15	10:20-13:20	N 0-1	Nil	1/8-2/8	20-22				1				
08/06/2016	15	13:50-16:50	N 1-2	Nil	1/8-6/8	20-22								
28/06/2016	15	11:15-14:15	SW 0-1	Nil	8/8	12								
28/06/2016	15	14:45-17:45	SSW 2	OCASIONAL SHOWERS	8/8	12								
25/07/2016	15	13:30-16:30	SW 1-3	Nil	6/8-8/8	14-15								
25/07/2016	15	17:00-20:00	SW 2-3	Nil	5/8-7/8	14-15								

							Count of flights (with count of individuals)							
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**CU**	**HH**	**MR**	**KT**	**GI**	**PE**	**K.**	**OP**
22/08/2016	15	14:15-17:15	SW 3-4	Rain	8/8	15								
22/08/2016	15	17:45-20:45	SW 3-4	OCC LIGHT RAIN	8/8	14								
07/04/2016	16	11:30-14:30	W 3	LIGHT	8/8	5				1	1		1	
07/04/2016	16	15:00-18:00	W 2-3	LIGHT	8/8	6				1				
05/05/2016	16	05:00-08:00	0	Nil	0/8	4-.5								
05/05/2016	16	08:30-11:30	S 0-1	Nil	0/8-3/8	14-18				1	1			
20/06/2016	16	10:30-13:30	SW 1-2	NIL	8/8	14								
20/06/2016	16	14:00-17:00	0	NIL	7/8	14				4			1	
06/07/2016	16	09:30-12:30	W 0-1	Nil	2/8	13								
06/07/2016	16	13:00-16:00	W 1	Nil	7/8	13				2				
20/07/2016	16	09:30-12:30	SW 1-2	Nil	1/8-3/8	20-22					2		1	
20/07/2016	16	13:00-16:00	SW 1-2	Occ Showers	1/8-8/8	20-22				1				
10/08/2016	16	14:40-17:40	W 2	OCC LIGHT RAIN	8/8	15								
10/08/2016	16	18:10-20:10	W 1-2	OCC LIGHT RAIN	8/8	15								
18/08/2016	16	12:30-13:30	SE 0-1	Nil	8/8	19-20								

Table 1b. Winter season 2016-2017 VP weather data

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
27/09/2016	1	09:15-12:15	W 2-4	Light Rain	8/8	12												
27/09/2016	1	16:15-19:15	SW 2-4	Nil	6/8-7/8	13												
11/10/2016	1	07:05-10:05	NE 1-3	Nil	8/8	9												
11/10/2016	1	13:30-16:30	E 1-3	Nil	5/8-8/8	11												
16/11/2016	1	09:45-12:45	W 3-6	Showers	6/8-8/8	3												
16/11/2016	1	13:15-16:15	W 4-5	Showers	7/8-8/8	3												
29/11/2016	1	13:30-16:30	Nil	Nil	0/8-1/8	1 - -1												
11/01/2017	1	08:05-11:05	W 5-6	Light Rain	7/8	5-6												
08/02/2017	1	09:30-12:30	NE 1-3	Drizzle	8/8	3												
08/02/2017	1	13:00-16:00	0	Nil	7/8	3	1											
08/03/2017	1	08:45-11:45	W 2-3	Nil	8/8	8	1											
08/03/2017	1	12:15-15:15	W 2	Nil	6/8	8	2 (3)											
06/09/2016	2	09:00-12:00	SW 0-1	Oc Light Rain	8/8	15-16		1 (3)									2 (21)	
06/09/2016	2	12:30-15:30	SW-W 1	Oc Light Rain	7/8-8/8	16-18												
10/09/2016	2	09:40-12:40	E-NE 0-1	Nil	6/8-8/8	8-9		1	4			3					1	
10/09/2016	2	13:10-16:10	E 0-1	Oc Light Rain	3/8-8/8	10-11		1							1 (4)		1	
30/11/2016	2	07:30-10:30	Nil	Nil	1/8	-4												
30/11/2016	2	11:00-14:00	W 0-1	Nil	1/8	0			1									
21/12/2016	2	12:20-15:20	WSW	Oc light Rain	8/8	6		1										
01/02/2017	2	09:20-12:20	S 1-2	Nil	8/8	6												
24/02/2017	2	09:30-12:30	W 1-2	Light Rain	4/8	3			3	1								
24/02/2017	2	13:00-16:00	W 1-3	Nil	6/8	5												
13/03/2017	2	12:00-15:00	SW 3	Nil	8/8	10		3 (4)										
13/03/2017	2	15:30-18:30	SW 4-5	Nil	3/8	10												
06/09/2016	3	09:00-12:00	SW 2-3	Oc Light Rain	8/8	15-16		1									2 (21)	
06/09/2016	3	12:30-15:30	SW-W 1	Oc Light Rain	7/8-8/8	16-18	1											

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
10/10/2016	3	09:40-12:40	E 0-1	Nil	5/8-8/8	11			2			3						
10/10/2016	3	13:10-16:10	NE 0-1	Nil	5/8-8/8	8-9	1	1										
30/11/2016	3	07:30-10:30	Nil	Nil	1/8-2/8	-4 - -1	1											
30/11/2016	3	11:00-14:00	W 0-1	Nil	0/8	-1 - 0											1	
21/12/2016	3	08:50-11:50	WSW 2-3	Rain	8/8	6												
01/02/2017	3	09:20-12:20	S 1-2	Nil	8/8	6			3									
24/02/2017	3	09:30-12:30	W 1-2	Nil	6/8	4			4	2								
24/02/2017	3	13:00-16:00	W 1-2	Nil	7/8	6												
13/03/2017	3	12:00-15:00	SW 1-3	Nil	7/8	10												
13/03/2017	3	15:30-18:30	SW 2-4	Nil	7/8	8												
07/09/2016	4	08:45-11:45	S 0-1	Nil	4/8-7/8	14-15												
07/09/2016	4	12:15-15:15	S 0-1	Nil	6/8-7/8	18												
03/11/2016	4	07:10-10:10	SW 1	Nil	0/8	4												
03/11/2016	4	10:40-13:40	SW 2-3	Nil	8/8	5												1 (5)
17/11/2016	4	08:40-11:40	SW 2-3	Heavy Rain	8/8	6-7												
17/11/2016	4	12:10-15:10	SW 2-3	Oc Rain/sleet	7/8-8/8	6												
22/12/2016	4	12:35-15:35	S 1	Nil	8/8	5-7												
11/01/2017	4	11:40-14:40	W 5-6	Nil	7/8	-												
07/02/2017	4	09:30-12:30	W 1-3	Showers	8/8	4-5			1									
07/02/2017	4	13:00-16:00	SW 1-3	Showers	8/8	6			1									
07/03/2017	4	11:30-14:30	SW 1-2	Nil	6/8	5												
07/03/2017	4	15:00-18:00	SW 1	Drizzle	8/8	7.5-4												
12/05/2016	5	13:30-16:30	S 1-3	Light Rain	7/8-8/8	-												
12/09/2016	5	17:00-20:00	S 1-2	Oc Light Rain	8/8	-		1									1 (2)	
13/10/2016	5	12:00-15:00	NE 1-2	Showers	5/8-8/8	-		2 (3)										
13/10/2016	5	15:30-18:30	NE 1-2	Oc. Light Showers	3/8-8/8	-	1											
08/11/2016	5	09:45-12:45	SW 0-2	Nil	8/8	3	1			1							1	

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
08/11/2016	5	13:15-16:15	SW 1-2	Showers	8/8	3		1										
22/12/2016	5	08:45-11:45	SW 1-4	Heavy Showers	8/8	6		1										
01/02/2017	5	13:15-16:15	S 1-4	Light Rain	6/8	6			1									
17/02/2017	5	09:45-12:45	S 1-2	Nil	7/8	-	1		1									
17/02/2017	5	13:15-16:15	S 1-2	Drizzle	8/8	-	1	1										
08/03/2017	5	09:30-12:30	W 3	Nil	8/8	9		3					1	1				
08/03/2017	5	13:00-16:00	W 4	Nil	7/8	9		2										
28/09/2016	6	07:00-10:00	SW 3-5	Rain	8/8	10												
19/10/2016	6	09:15-12:15	WSW 1-2	NIL	5/8-7/8	10												
19/10/2016	6	12:45-15:45	SW 1-2	NIL	4/8-7/8	10												
02/11/2016	6	10:30-13:30	-	-	-	-												
02/11/2016	6	14:00-17:00	-	-	-	-			1									
14/12/2016	6	12:55-15:55	S 1	NIL	2/8-3/8	5-6	1											
10/01/2017	6	09:40-12:40	WNW 3-5	Drizzle	8/8	5											1 (7)	
25/01/2017	6	13:15-16:15	S 1-2	Nil	0/8	3												
07/03/2017	6	11:30-14:30	SW 2	Nil	6/8	10												
07/03/2017	6	15:00-18:00	SW 2	Nil	8/8	9												
24/03/2017	6	08:30-11:30	E 2-3	Nil	8/8	3			3									
24/03/2017	6	12:00-15:00	SSE 2-3	Nil	8/8	6			4									
28/09/2016	7	06:55-09:55	S 4-5	Rain	8/8	10-11												
19/10/2016	7	09:20-12:20	NE 1-2	Nil	3/8	9-10												
19/10/2016	7	12:50-15:50	NW 1-2	Nil	4/8-7/8	9-10				1								
02/11/2016	7	10:40-13:40	NW 2-3	Nil	1/8	7			1									
02/11/2016	7	14:10-17:10	NNW 0-1	Nil	1/8	8-1			1									
14/12/2016	7	09:25-12:25	S 1-2	Nil	1/8-3/8	5-6	1										2 (15)	
11/01/2017	7	08:20-11:20	WNW 4-6	Nil	3/8	4			1									
25/01/2017	7	09:45-12:45	S 1-2	Nil	3/8	2												

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
07/03/2017	7	11:45-14:45	S 1	Nil	7/8	6												
07/03/2017	7	15:15-18:15	S 1	Rain	7/8	8												
27/03/2017	7	13:30-16:30	E 1	Nil	8/8	7												
27/03/2017	7	17:00-20:00	E 1	Nil	8/8	7												
19/09/2016	8	13:00-16:00	N 1-2	Nil	5/8-7/8	16-17					1							
19/09/2016	8	16:30-19:30	S 1	Nil	2/8-6/8	13-15												
18/10/2016	8	10:30-13:30	W 3-4	Nil	4/8-7/8	9-10						1						
18/10/2016	8	14:00-17:00	W 2-4	Nil	4/8-7/8	9-10	2											
29/11/2016	8	09:50-12:50	Nil	Nil	0/8	0												
21/12/2016	8	09:00-12:00	SW 3-4	Rain	8/8	7												
10/01/2017	8	09:50-12:50	NW 2-3	Drizzle	8/8	5												
18/01/2017	8	12:40-15:40	Nil	Nil	8/8	6	1											
16/02/2017	8	10:25-13:25	W 1-2	Nil	8/8	7												
16/02/2017	8	13:55-16:55	SW 3	Light Rain	8/8	6												
27/03/2017	8	13:30-16:30	E 2-3	Light Mist	8/8	5												
27/03/2017	8	17:00-20:00	E 1-2	Nil	6/8	5												
20/09/2016	9	06:45-09:45	Nil	Nil	8/8	10-13												
20/09/2016	9	10:15-13:15	Nil	Nil	8/8	14												
26/10/2016	9	09:30-12:30	SE 2-3	Nil	7/8-8/8	10												
26/10/2016	9	13:00-16:00	SE 1-3	Oc Light Rain	8/8	10												
28/11/2016	9	10:00-13:00	E 1	Nil	5/8-7/8	6		4 (5)										
28/11/2016	9	13:30-16:30	E 0-1	Nil	1/8-2/8	6-7												
21/12/2016	9	12:30-15:30	SW 1-4	Oc heavy rain	6/8-8/8	6-7			1									
18/01/2017	9	09:10-12:10	Nil	NIL	8/8	5												
08/02/2017	9	09:50-12:50	N 0-1	NIL	8/8	5		1	2 (3)									
08/02/2017	9	13:20-16:20	N 0-1	Drizzle	8/8	6	1											
13/03/2017	9	09:20-12:20	N 2-3	Light Rain	8/8	6												

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
13/03/2017	9	12:50-15:50	N 3-4	Light Rain	8/8	6		1	1									
07/09/2016	10	09:00-12:00	SW 1-2	Nil	8/8	17		1										
07/09/2016	10	12:30-15:30	SW 2-3	Nil	7/8	21	1					2						
03/11/2016	10	07:15-10:15	S 0-1	NIL	8/8	7												
03/11/2016	10	10:45-13:45	s 1-2	NIL	8/8	7	1	1										
17/11/2016	10	09:00-12:00	SW 3-7	Showers	7/8-8/8	4												
17/11/2016	10	12:30-15:30	SW 3-5	Rain	8/8	2-3												
15/12/2016	10	08:15-11:15	SW 1-2	Nil	8/8	9		1									1	
18/01/2017	10	12:15-15:15	Nil	Drizzle	7/8	8												
27/02/2017	10	09:15-12:15	SSW 1	Showers	7/8	1-3												
27/02/2017	10	12:45-15:45	SW 1	Showers	6/8	1.5-4	1	1										
27/03/2017	10	13:40-16:40	E 1	Nil	8/8	7		8						1 (2)				
27/03/2017	10	17:10-20:10	NE 0-1	Nil	8/8	8								1 (3)				
12/09/2016	11	13:30-16:30	S 1-4	Nil	8/8	16	1											
12/09/2016	11	17:00-20:00	S 1	Nil	8/8	13-15												
13/10/2016	11	12:00-15:00	NE 2	Oc Light Showers	6/8-8/8	13	3					1					1	
13/10/2016	11	15:30-18:30	NE 1-2	Nil	6/8-8/8	10-13		1				1					3 (7)	
08/11/2016	11	09:55-12:55	W 0-1	Nil	8/8	4-5		4		1								
08/11/2016	11	13:25-16:25	W 0-1	Oc. Light Showers	8/8	5		1										
22/12/2016	11	08:45-11:45	SW 1-2	Oc Light rain	6/8-8/8	4-6		1										1
01/02/2017	11	13:10-16:10	S 2-3	Nil	6/8	6		1										
24/02/2017	11	09:30-12:30	W 2	Nil	6/8	3			4									
24/02/2017	11	13:00-16:00	NW 2-3	Nil	7/8	4			1									
08/03/2017	11	09:45-12:45	W 3-4	Nil	6/8	5		1	3									
08/03/2017	11	13:15-16:15	SW 3-4	Nil	7/8	8	1		1									
26/09/2016	12	10:45-13:45	SW 1-2	Showers	8/8	11												
26/09/2016	12	14:15-17:15	SW 1-3	Oc Light Rain	7/8-8/8	12												

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
25/10/2016	12	11:30-14:30	Nil	NIL	8/8	10		3 (4)										
25/10/2016	12	15:15-18:15	NIL	NIL	7/8-8/8	10-12	1	3 (4)										
09/11/2016	12	09:15-12:15	NW 1-4	Showers	7/8-8/8	7												
09/11/2016	12	12:45-15:45	NW 1-2	Showers	6/8-8/8	6-8												
15/12/2016	12	11:50-14:50	SW 1	Nil	8/8	11		16 (22)										
18/01/2017	12	08:45-11:45	SW 1	Nil	7/8	6												
17/02/2017	12	09:30-12:30	W 1	Nil	8/8	8	4	8 (12)	1									
17/02/2017	12	13:00-16:00	0	Nil	8/8	8	1	4	4									
14/03/2017	12	06:30-09:30	SW 2-3	Nil	8/8	6												
14/03/2017	12	10:00-13:00	SW 5	Occasional Light Rain	8/8	7												
19/09/2016	13	12:45-15:45	N 1-2	Nil	7/8-8/8	15												
19/09/2016	13	16:30-19:30	N 1-2	Nil	3/8-7/8	15		2										
18/10/2016	13	10:00-13:00	NW 3-7	SHOWERS	2/8-7/8	10	1	1	1									
18/10/2016	13	13:30-16:30	NW 2-5	Showers	5/8-8/8	9	1	1										
29/11/2016	13	09:30-12:30	ESE 1	Nil	0/8	0												
21/12/2016	13	08:45-11:45	WNW 4-6	Heavy Showers	8/8	5			2									
21/12/2016	13	12:15-15:15	W 5-6	Heavy Showers	7/8	6												
25/01/2017	13	10:10-13:10	SW 2-3	Nil	5/8	5		3	1									
27/02/2017	13	09:25-12:25	S 2	Snow	8/8	-1		2										
27/02/2017	13	12:55-15:55	W 2	Rain / Snow	8/8	2		3										
24/03/2017	13	09:45-12:45	E 4	Nil	8/8	7		2									1	
24/03/2017	13	13:15-16:15	E 4	Nil	1/8	8		3										
20/09/2016	14	06:45-09:45	Nil	Nil	8/8	10	1											
20/09/2016	14	10:20-13:20	NW 0-1	Nil	7/8-8/8	13												
26/10/2016	14	09:30-12:30	W 2-3	Nil	7/8-8/8	8											2	
26/10/2016	14	13:00-15:00	W 1-3	Nil	6/8-7/8	8									2 (42)			
28/11/2016	14	10:15-13:15	W 2-3	Showers	5/8-8/8	0										1 (40)		

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
28/11/2016	14	14:00-17:00	E 2-4	Nil	2/8-5/8	0		1										
14/12/2016	14	09:50-12:50	ESE 2-3	Nil	3/8	10		1										
14/12/2016	14	13:20-16:20	SE 1-2	Nil	1/8	10		2										
16/02/2017	14	11:00-14:00	SW 2-4	Rain	8/8	7	1	1										
16/02/2017	14	14:30-17:30	SW 3	Light Rain	8/8	7	1											
23/03/2017	14	09:40-12:40	E 3-4	Nil	6/8	8		2										
23/03/2017	14	13:10-16:10	E 4-5	Nil	8/8	8		2										
27/09/2016	15	09:25-12:25	SW 1-3	Light Rain	8/8	13-14	1										1	
27/09/2016	15	16:15-19:15	SW3-4	Nil	6/8-8/8	11-14	1											
11/10/2016	15	07:15-10:15	NE 0-1	Nil	8/8	8-10												
11/10/2016	15	13:40-16:40	NE 0-1	Nil	8/8	8-10							1					
29/11/2016	15	13:30-16:30	Nil	Nil	0/8	2												
16/11/2016	15	10:00-13:00	W 4-5	Oc Rain	5/8-8/8	6-8												1 (11)
16/11/2016	15	13:30-16:30	W 3-4	Nil	6/8	7-8												
25/01/2017	15	13:45-16:45	SW 3	Nil	0/8	6												
16/02/2017	15	10:15-13:15	WSW 4-5	Showers	8/8	-			1									
16/02/2017	15	13:45-16:45	SW 5-6	Rain	8/8	-												
23/03/2017	15	10:00-13:00	E 3-4	Nil	6/8	3			4									
23/03/2017	15	13:30-16:30	E 3-5	Nil	7/8	6												
26/09/2016	16	11:00-14:00	S 1-2	Heavy Rain	8/8	14												
26/09/2016	16	14:30-17:30	S 0-1	Light Rain	8/8	14-15												
25/10/2016	16	11:30-14:30	SW 0-1	Nil	8/8	8-9		1										
25/10/2016	16	15:05-18:05	SW 0-1	Nil	8/8	6-8												
09/11/2016	16	09:15-12:15	W 0-1	Oc. Light Showers	5/8-8/8	7-8												
09/11/2016	16	12:45-15:45	W 1-3	Rain	8/8	8												
22/12/2016	16	12:30-15:30	SW 1-4	Showers	7/8	6												
11/01/2017	16	11:55-14:55	WNW 4-6	Nil	7/8	5												

							Count of flights (with count of individuals)											
Date	**VP**	**Time**	**Wind**	**Rain**	**Cloud cover**	**Temp °C**	**HH**	**KT**	**GI**	**PE**	**HY**	**K.**	**ML**	**CU**	**GP**	**L.**	**SN**	**WS**
07/02/2017	16	09:30-12:30	NE 0-1	Oc. Light Rain	7/8	4				2								
07/02/2017	16	13:00-16:00	0	Oc. Light Rain	6/8	6												
24/03/2017	16	09:15-12:15	E 1-3	Nil	8/8	2							1					
24/03/2017	16	12:45-15:45	E 1-3	Nil	4/8	5		1										

Table 2. Dates and times of black grouse survey.

Survey	Date	Time	Weather conditions
1	09 April 2016	06:00-08:20	4°C, Cloud: 7/8, Wind: S 0-1, Dry.
2a	13 April 2016	05:55-08:15	0°C, Cloud: 2/8, Wind: 0, Dry.
2b	20 April 2016	05:34-08:00	2°C, Cloud: 0/8, Wind: 0, Dry.

Table 3. Dates and times of Brown & Shepherd survey.

Survey	Date	Time	Weather conditions
1	08 April 2016	10:00-15:05	8°C, Cloud: 7/8, Wind: NW 1-2, Dry.
2	14 April 2016	08:50-14:10	6°C, Cloud: 4/8, Wind: E 1-2, Dry.
3	13 May 2016	09:10-16:20	14°C, Cloud: 7/8, Wind: ENE 2-3, Dry.
4a	14 June 2016	08:30-13:00	14°C, Cloud: 8/8, Wind: W 2-3, Occasional rain.
4b	16 June 2016	08:30-12:10	16°C, Cloud:8/8, Wind: 0, Dry.

Table 4. Times of curlew targeted VP survey (21 April 2016).

Survey location	Time	Weather Conditions
A	10:05-12:05	13°C, Cloud: 7/8, Wind: ENE 2-3, Dry.
B	12:10-14:10	
C	14:20-16:20	
D	10:00-12:00	
E	12:10-14:10	
F	14:20-16:20	

Table 5. Dates and times of nightjar survey.

Date	Survey location	Time	Surveyors	Weather conditions
15 June 2016	3	22:00-22:10	MM + NL	12°C, Cloud: 4/8, Wind: NW 1, Dry
	4	22:14-22:24		
	2	22:29-22:39		
	1	22:43-22:53		
	5	23:08-23:18		
	6	23:22-23:32		
	7	23:36-23:46		
	8	23:48-23:58		
	26	22:00-22:10	MO + RT	
	25	23:00-23:10		
27 June 2016	14	22:25-22:35	ST + DB	11°C, Cloud: 8/8, Calm, Rain.
	13	22:37-22:35		
	16	22:50-23:00		
	15	23:03-23:33		
	12	23:21-23:31		
	11	23:33-23:43		
	10	23:45-23:55		
	17	00:00-00:10		
	9	11:17-00:27		
28 June 2016	18	22:02-22:12	ST + DB	9°C, Cloud: 2/8, Light wind, Dry.
	20	22:16-22:26		
	19	22:29-22:39		
	21	22:42-22:52		
	22	22:54-23:04		
	23	23:11-23:21		
	24	23:22-23:32		
05 July 2016	8	22:00-22:10	MO + MM	14°C, Cloud: 2/8, Calm, Dry.
	7	22:13-22:23		
	6	22:26-22:36		
	5	22:42-22:52		
	1	22:55-23:05		
	2	23:09-23:19		
	3	23:22-23:32		
	4	23:40-23:50		

Date	Survey location	Time	Surveyors	Weather conditions
11 July 2016	16	21:56-22:06	MO + ST	11°C, Cloud: 8/8, Wind: Calm, Dry.
	15	22:10-22:20		
	14	22:26-22:36		
	13	22:40-22:50		
	12	22:52-23:02		
	11	23:05-23:15		
	10	23:17-23:27		
	26	23:36-23:46		
	25	23:38-00:08		
12 July 2016	24	21:58-22:08	MO + ST	10°C, Cloud: 2/8, Calm, dry.
	23	22:10-22:20		
	22	22:27-22:34		
	21	22:41-22:51		
	20	22:58-23:08		
	19	23:11-23:21		
	18	23:23-23:33		
	17	23:35-23:45		
	9	23:55-00:05		

Table 6. Dates and times of hen harrier survey.

Date	Survey location	Time	Weather conditions
19 April 2016	A	11:30-14:30	10°C, Cloud: 5/8, Wind: SE 1-2, Dry
	B	11:30-14:30	
	C	15:00-18:00	
	D	15:00-18:00	
20 April 2016	E	08:00-11:00	10°C, Cloud: 0/8, Wind: SE 2, Dry.
	F	08:15-11:00	
	G	11:45-14:45	
	H	11:45-14:45	
22 April 2016	I	12:20-15:20	7°C, Cloud: 8/8, Wind: NE 3, Dry.
	A	12:20-15:20	
	J	09:05-12:05	
	K	09:05-12:05	
09 May 2016	C	14:45-17:45	16°C, Cloud: 8/8, Wind: E 1-2, Dry.
	D	14:45-17:45	
	G	11:15-14:15	
	H	11:15-14:15	
11 May 2016	A	09:30-12:30	14°C, Cloud: 8/8, Wind: NE 0-1, light rain.
	I	09:30-12:30	
	J	06:00-09:00	
	K	06:00-09:00	
12 May 2016	B	14:00-17:00	19°C, Cloud: 1/8, Wind: E 3, dry.
	E	10:45-13:45	
	F	10:20-13:20	

Table 7. Dates and times of red kite walkover survey.

Visit	Date	Survey location	Time	Surveyor	Weather conditions
1	19 April 2017	KT1	08:05 - 10:05	MO	10-12°C, Cloud: 4/8, Wind: S 1, Dry
		KT2	10:15 - 12:15	MO	
		KT3	12:45 - 14:25	MO	
	03 May 2017	KT1	11:00 - 12:30	ST	15-16°C, Cloud:3/8, Wind: E 1-2, Dry.
		KT2	12:40 - 14:00	ST	
		KT5	14:10 – 15:30	ST	
	05 May 2017	KT1	10:30 - 12:30	ST	13-15°C, Cloud: 1/8, Wind: E 3-5, Dry.
		KT9	13:30 - 15:30	ST	
		KT6	09:50 - 11:50	MM	
		KT7	12:45 - 14:45	MM	
	08 May 2017	KT1	10:00 - 11:00	ST	12-16°C, Cloud: 2/8, Wind: E 1-2, Dry.
		KT3	11:15 - 12:15	ST	
		KT4	13:00 - 14:00	ST	
		KT5	14:15 - 15:15	ST	
		KT6	11:00 - 13:00	MM	
		KT7	14:00 - 16:00	MM	
2	27 June 2017	KT1	09:30 - 11:30	MO	16°C, Cloud: 7/8, Wind: S 1, Dry
		KT2	12:00 - 14:00	MO	
		KT3	14:15 - 16:15	MO	
	29 June 2017	KT7	08:05 - 10:05	MO	14-15°C, Cloud:8/8, Wind: N 1-2, Dry.
		KT8	10:25 - 12:25	MO	
		KT9	12:50 - 14:50	MO	
	30 June 2017	KT5	08:30 - 10:30	MO	14-15°C, Cloud: 7/8, Wind: S 0-1, Dry.
		KT6	11:45 - 13:45	MO	
		KT4	14:10 - 16:10	MO	
	04 July 2017	KT3	07:45 - 09:45	MO	14-15°C, Cloud: 7/8, Wind: W 1, Dry.
		KT2	09:55 - 11:55	MO	

Visit	Date	Survey location	Time	Surveyor	Weather conditions
		KT3	12:20 - 14:20	MO	
	05 July 2017	KT9	07:35 - 09:35	MO	17-20°C, Cloud: 1/8, Wind: E 0-1, Dry
		KT8	09:45 - 11:45	MO	
		KT9	12:25 - 14:25	MO	

Table 8. Dates and times of goshawk VP survey.

VP	Date	Time	Surveyor	Weather
GI1	04/04/2017	12:30-15:30	ST	5°C, Cloud: 5/8, NW1, dry.
GI2	07/04/2017	07:20-10:20	MO	9°C, Cloud: 2/8, NW1, dry.
GI3	04/04/2017	09:00-12:00	ST	5°C, Cloud: 6/8, W1-3, dry.
	07/04/2017	10:55-13:55	MO	12°C, Cloud: 4/8, Wind:0, dry.
GI7	05/04/2017	11:10-14:10	MO	10°C, Cloud: 7/8, Wind:0, dry.
GI8	09/03/2017	09:15-12:15	GL	6°C, Cloud: 1/8, NW2-3, dry.
	07/04/2017	11:45-14:45	GL	10°C, Cloud: 2/8, S2, dry.
GI9	05/04/2017	07:40-10:40	MO	8°C, Cloud: 1/8, Wind:0, dry.
GI10	09/03/2017	08:30-11:30	MO	10°C, Cloud: 1/8, W3, dry.
	05/04/2017	11:55-14:55	ST	10°C, Cloud: 6/8, NW1, dry.
GI11	04/04/2017	08:55-11:5	MO	11°C, Cloud: 7/8, NW2, dry.
GI12	04/04/2017	12:30-15:30	MO	10°C, Cloud: 8/8, N1, dry.
	07/04/2017	07:45-10:45	GL	1°C, Cloud: 0/8, Wind:0, dry.
GI13	09/03/2017	12:00-15:00	MO	10°C, Cloud: 2/8, SW1, dry.
GI14	05/04/2017	08:15-11:5	ST	3°C, Cloud: 7/8, NW1, dry.
GI15	09/03/2017	12:50-15:50	GL	8°C, Cloud: 1/8, NW2, dry.

Table 9. Dates and times of goshawk walkover survey.

Date	Survey location	Time	Surveyor	Weather conditions
17 May 2017	A	08:40-10:20	MO	15°C, Cloud: 8/8, SW1, dry.
	B	10:45-12:50	MO	15°C, Cloud: 8/8, SW1, dry.
	C	13:00-14:00	MO	15°C, Cloud: 8/8, SW1, dry.
	D	14:05-15:00	MO	15°C, Cloud: 8/8, SW1, dry.
	E	11:00-14:00	GL	15°C, Cloud: 8/8, SW1, dry.
	F	15:00-16:50	GL	15°C, Cloud: 8/8, SW1, dry.
05 June 2017	G	09:15-11:45	MO	14°C, Cloud: 8/8, W2, light rain.
	H	12:00-14:10	MO	14°C, Cloud: 8/8, W1, light rain.
	I	14:30-15:30	MO	14°C, Cloud: 8/8, W1, light rain.
06 June 2017	J	12:00-18:00	GL + JG	18°C, Cloud: 8/8, W3, occ.rain.
09 June 2017	K	10:30-16:30	ST	20°C, Cloud: 2/8, SW2, dry
09 June 2017	L	10:30-16:30	MM	20°C, Cloud: 2/8, SW2, dry
20 June 2017	M	12:30-18:00	GL	25°C, Cloud: 1/8, W1, dry
20 June 2017	N	11:35-17:30	ST+MM	25°C, Cloud: 1/8, W1, dry
22 June 2017	A	07:30-10:30	MO	18°C, Cloud: 8/8, SW1, drizzle.
	O	11:00-16:00	MO	18°C, Cloud: 6/8, SW1, dry.
23 June 2017	P	08:10-09:10	MO	14°C, Cloud: 8/8, W2-3, dry.
	Q	10:00-13:00	MO	14°C, Cloud: 8/8, W3, rain.

Table 10a – Breeding bird season 2015 detailed flight data for Curlew

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
CU1	Curlew	3	30	15		12	16:48	07/04/2016
CU2	Curlew	3	45	15		12	16:51	07/04/2016
CU3	Curlew	6	15			12	16:56	07/04/2016
CU4	Curlew	2	30			10	10:20	25/04/2016
CU5	Curlew	1	15			10	11:04	25/04/2016
CU6	Curlew	1	60			12	07:29	05/05/2016
CU7	Curlew	2	75	150		5	19:15	16/05/2016
CU8	Curlew	1	45	45		5	20:13	16/05/2016
CU9	Curlew	1	30			10	19:51	24/05/2016
CU10	Curlew	1	210	60		10	05:53	21/06/2016
CU11	Curlew	1	225			10	06:40	21/06/2016
CU12	Curlew	1	90			10	06:44	21/06/2016
CU13	Curlew	1	15			10	09:29	21/06/2016
CU14	Curlew	2				5	11:01	23/06/2016
CU15	Curlew	2				5	14:00	23/06/2016
CU16	Curlew	1	75			5	07:41	30/06/2016
CU17	Curlew	1	120			5	08:25	30/06/2016

Table 10b – Breeding bird season 2015 detailed flight data for hen harrier and marsh harrier

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
HH1	Hen Harrier	1	60			3	16:30	04/05/2016
HH2	Hen Harrier	1	135	75		2	16:31	04/05/2016
HH3	Hen Harrier	1	195			14	14:27	18/05/2016
HH4	Hen Harrier	1	45			5	14:45	23/06/2016
HH5	Hen Harrier	1	165			5	12:14	30/06/2016
HH6	Hen Harrier	1	240			13	15:04	04/07/2016
HH7	Hen Harrier	1	60			5	12:58	27/07/2016
MR1	Marsh Harrier	1	330			12	16:50	10/08/2016
HH8	Hen Harrier	1	60			12	17:12	10/08/2016
HH9	Hen Harrier	1	210			1	14:05	18/08/2016
HH10	Hen Harrier	1	180			1	16:02	18/08/2016
HH11	Hen Harrier	1	195			1	16:47	18/08/2016
HH12	Hen Harrier	1	90	180		1	16:58	18/08/2016
HH13	Hen Harrier	1	165	15		8	18:39	18/08/2016
HH14	Hen Harrier	1	240			13	12:15	31/08/2016

Table 10c – Breeding bird season 2015 detailed flight data for red kite

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
KT1	Red Kite	1	75	30		12	11:53	07/04/2016
KT2	Red Kite	1	210	75		16	12:24	07/04/2016
KT3	Red Kite	1	90	240	675	16	15:19	07/04/2016
KT4	Red Kite	1		15		12	15:26	07/04/2016
KT5	Red Kite	1	45	30		12	15:47	07/04/2016
KT6	Red Kite	1	45	120	45	14	11:10	13/04/2016
KT7	Red Kite	1			255	9	11:59	13/04/2016
KT8	Red Kite	1		60		14	13:05	13/04/2016
KT9	Red Kite	1	30	195		14	13:51	13/04/2016
KT10	Red Kite	1	30	135	75	14	16:02	13/04/2016
KT11	Red Kite	1	15			14	17:26	13/04/2016
KT12	Red Kite	2			150	13	14:43	18/04/2016
KT13	Red Kite	1	30	75		13	15:31	18/04/2016
KT14	Red Kite	1	45			13	16:22	18/04/2016
KT15	Red Kite	1	45	30		13	16:56	18/04/2016
KT16	Red Kite	1	45			13	17:38	18/04/2016
KT17	Red Kite	1	90			10	13:35	25/04/2016
KT18	Red Kite	1		285		6	16:03	03/05/2016
KT19	Red Kite	1		30		3	13:59	04/05/2016
KT20	Red Kite	1			30	3	17:40	04/05/2016
KT21	Red Kite	1	135			2	18:04	04/05/2016
KT22	Red Kite	1				3	18:25	04/05/2016
KT23	Red Kite	1	105	30		12	07:41	05/05/2016
KT24	Red Kite	1	45			12	08:55	05/05/2016
KT25	Red Kite	1	195			12	09:23	05/05/2016
KT26	Red Kite	1	465			12	10:16	05/05/2016
KT27	Red Kite	1	15	30		16	10:53	05/05/2016
KT28	Red Kite	1	105	90		12	11:19	05/05/2016
KT29	Red Kite	1	135			12	11:33	05/05/2016
KT30	Red Kite	1	225			12	11:47	05/05/2016
KT31	Red Kite	1	30	60		11	15:08	16/05/2016
KT32	Red Kite	1	60	180		11	15:16	16/05/2016
KT33	Red Kite	1	75			11	15:22	16/05/2016
KT34	Red Kite	1	30	45		11	15:31	16/05/2016
KT35	Red Kite	1	60	45		11	16:02	16/05/2016
KT36	Red Kite	1	30	30		11	16:10	16/05/2016
KT37	Red Kite	1	45	165		11	16:20	16/05/2016
KT38	Red Kite	1	45	225		11	16:31	16/05/2016
KT39	Red Kite	1	60	180		11	16:51	16/05/2016
KT40	Red Kite	1			45	11	17:07	16/05/2016
KT41	Red Kite	1		30	150	5	17:09	16/05/2016
KT42	Red Kite	1	15			11	17:17	16/05/2016

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
KT43	Red Kite	1	45			11	17:22	16/05/2016
KT44	Red Kite	1	90	105		5	17:27	16/05/2016
KT45	Red Kite	1	30			15	11:27	17/05/2016
KT46	Red Kite	1	45	75		15	13:55	17/05/2016
KT47	Red Kite	1	45	45		1	15:38	17/05/2016
KT48	Red Kite	1	150	210		14	11:30	18/05/2016
KT49	Red Kite	1	45			9	11:36	18/05/2016
KT50	Red Kite	1	75			9	11:37	18/05/2016
KT51	Red Kite	1	135	165		14	11:59	18/05/2016
KT52	Red Kite	1	75	15		9	14:19	18/05/2016
KT53	Red Kite	1	15			10	15:30	24/05/2016
KT54	Red Kite	1		90		4	16:13	24/05/2016
KT55	Red Kite	1		90		4	17:25	24/05/2016
KT56	Red Kite	1		285		10	17:41	24/05/2016
KT57	Red Kite	1	30			13	09:01	25/05/2016
KT58	Red Kite	1	75			13	09:22	25/05/2016
KT59	Red Kite	1		405		13	12:00	25/05/2016
KT60	Red Kite	1	45			9	17:29	07/06/2016
KT61	Red Kite	1	45	180		14	17:54	07/06/2016
KT62	Red Kite	1	120	90		14	21:01	07/06/2016
KT63	Red Kite	1		45		15	12:05	08/06/2016
KT64	Red Kite	1	75	90		1	13:57	08/06/2016
KT65	Red Kite	1	105	75		1	14:48	08/06/2016
KT66	Red Kite	1	15	150	15	2	09:37	15/06/2016
KT67	Red Kite	1	180			2	09:46	15/06/2016
KT68	Red Kite	1		45		3	09:47	15/06/2016
KT69	Red Kite	1	180			3	10:05	15/06/2016
KT70	Red Kite	1	30			2	10:08	15/06/2016
KT71	Red Kite	1	15			3	10:50	15/06/2016
KT72	Red Kite	1	15			2	11:21	15/06/2016
KT73	Red Kite	1	15	90		2	11:22	15/06/2016
KT74	Red Kite	1		135		2	11:52	15/06/2016
KT75	Red Kite	1	45			3	11:55	15/06/2016
KT76	Red Kite	1		240		2	11:56	15/06/2016
KT77	Red Kite	1	120			2	12:04	15/06/2016
KT78	Red Kite	1		75		3	12:05	15/06/2016
KT79	Red Kite	1	30	180		3	12:06	15/06/2016
KT80	Red Kite	1	30	45		2	12:15	15/06/2016
KT81	Red Kite	1	90			2	13:08	15/06/2016
KT82	Red Kite	1	60	30	60	2	15:28	15/06/2016
KT83	Red Kite	1	60			16	14:02	20/06/2016
KT84	Red Kite	1	60	105		16	14:04	20/06/2016

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
KT85	Red Kite	1	270			16	15:19	20/06/2016
KT86	Red Kite	1	165	90		16	15:48	20/06/2016
KT87	Red Kite	1	30			14	05:20	21/06/2016
KT88	Red Kite	1	225	180		11	10:49	23/06/2016
KT89	Red Kite	1	45	75		11	11:05	23/06/2016
KT90	Red Kite	1	30	75		11	11:16	23/06/2016
KT91	Red Kite	1		90		11	11:24	23/06/2016
KT92	Red Kite	1		60	105	5	13:13	23/06/2016
KT93	Red Kite	1		45		11	13:47	23/06/2016
KT94	Red Kite	1	75	90	300	5	14:45	23/06/2016
KT95	Red Kite	1	120			11	15:12	23/06/2016
KT96	Red Kite	1	180	45		11	15:43	23/06/2016
KT97	Red Kite	1		300		11	16:25	23/06/2016
KT98	Red Kite	1	120	60		2	15:17	24/06/2016
KT99	Red Kite	1	75			13	19:52	29/06/2016
KT100	Red Kite	1		30		13	20:09	29/06/2016
KT101	Red Kite	1	120			13	20:26	29/06/2016
KT102	Red Kite	1	90			13	20:34	29/06/2016
KT103	Red Kite	1	60	105		5	21:10	29/06/2016
KT104	Red Kite	1	60	135		11	11:16	30/06/2016
KT105	Red Kite	1		105	105	5	13:02	30/06/2016
KT106	Red Kite	1			355	16	13:31	06/07/2016
KT107	Red Kite	1		135	135	16	13:45	06/07/2016
KT108	Red Kite	1	15			9	16:01	11/07/2016
KT109	Red Kite	1		180		10	16:46	12/07/2016
KT110	Red Kite	1	30			13	09:23	19/07/2016
KT111	Red Kite	1		120		8	10:46	19/07/2016
KT112	Red Kite	1	150	90		16	13:00	20/07/2016
KT113	Red Kite	1	30			10	10:23	26/07/2016
KT114	Red Kite	1		105		10	13:47	26/07/2016
KT115	Red Kite	1	120			10	13:58	26/07/2016
KT116	Red Kite	1		30		10	14:35	26/07/2016
KT117	Red Kite	3	255			5	12:01	27/07/2016
KT118	Red Kite	1		45		11	14:13	27/07/2016
KT119	Red Kite	1		90	105	5	14:14	27/07/2016
KT120	Red Kite	1	45			5	14:48	27/07/2016
KT121	Red Kite	1	45			12	15:18	10/08/2016
KT122	Red Kite	1	60			12	16:08	10/08/2016
KT123	Red Kite	3			30	9	07:03	11/08/2016
KT124	Red Kite	1	150	135		1	19:42	18/08/2016
KT125	Red Kite	1	45	45		13	14:16	31/08/2016
KT126	Red Kite	1	165			13	16:55	31/08/2016

Table 10d – Breeding bird season 2015 detailed flight data for goshawk.

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
GI1	Goshawk	1		345		16	13:36	07/04/2016
GI2	Goshawk	2	30			12	14:48	07/04/2016
GI3	Goshawk	1		15		12	15:32	07/04/2016
GI4	Goshawk	1	15			11	09:52	12/04/2016
GI5	Goshawk	1	15			5	10:07	12/04/2016
GI6	Goshawk	1	15			5	11:11	12/04/2016
GI7	Goshawk	2	15			11	11:11	12/04/2016
GI8	Goshawk	1	60	45	75	11	12:06	12/04/2016
GI9	Goshawk	1	15	45	90	11	13:02	12/04/2016
GI10	Goshawk	1	75	15		11	14:00	12/04/2016
GI11	Goshawk	1	15	30		9	12:52	13/04/2016
GI12	Goshawk	1	15	30		14	15:01	13/04/2016
GI13	Goshawk	1	15			13	16:45	18/04/2016
GI14	Goshawk	1	15			13	18:23	18/04/2016
GI15	Goshawk	1	15			4	12:05	25/04/2016
GI16	Goshawk	1		60	60	16	10:02	05/05/2016
GI17	Goshawk	1	75			5	15:26	16/05/2016
GI18	Goshawk	1		45		1	12:07	17/05/2016
GI19	Goshawk	2		60		2	10:51	15/06/2016
GI20	Goshawk	1		15		3	09:21	05/07/2016
GI21	Goshawk	1	30			16	11:23	20/07/2016
GI22	Goshawk	1	15			16	11:35	20/07/2016
GI23	Goshawk	1	15			10	10:41	26/07/2016

Table 10e – Breeding bird season 2015 detailed flight data for peregrine, kestrel and osprey.

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
K.1	Kestrel	1	30	45		16	12:51	07/04/2016
PE1	Peregrine	1	30			12	13:01	07/04/2016
PE2	Peregrine	1	15	30		12	14:05	07/04/2016
K.2	Kestrel	1	30	45		5	11:32	12/04/2016
PE3	Peregrine	1	15			4	12:16	25/04/2016
K.3	Kestrel	1	30			12	06:20	05/05/2016
PE4	Peregrine	1	30	30		11	20:57	16/05/2016
OP1	Osprey	1		120	60	4	16:09	24/05/2016
PE5	Peregrine	1	60	30		8	14:16	25/05/2016
OP2	Osprey	1		75	45	2	12:18	15/06/2016
OP3	Osprey	1			225	3	12:19	15/06/2016
K.4	Kestrel	1	105			16	15:26	20/06/2016
K.5	Kestrel	1	30			5	11:27	23/06/2016
K.6	Kestrel	1	15			5	11:46	23/06/2016

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
K.7	Kestrel	1	105			5	12:17	23/06/2016
K.8	Kestrel	1	60			5	12:41	23/06/2016
K.9	Kestrel	1	30	150		5	12:45	23/06/2016
K.10	Kestrel	1	30	15		5	15:30	23/06/2016
K.11	Kestrel	1		120		5	15:58	23/06/2016
PE6	Peregrine	1	45	15		11	10:18	30/06/2016
K.12	Kestrel	1		270		5	13:30	30/06/2016
K.13	Kestrel	1		165		13	14:25	04/07/2016
PE7	Peregrine	1	30			13	15:28	04/07/2016
PE8	Peregrine	1	15			7	15:59	18/07/2016
K.14	Kestrel	1			45	16	09:51	20/07/2016
K.15	Kestrel	1	15	270		8	10:37	26/07/2016
K.16	Kestrel	1	45			8	18:47	18/08/2016
K.17	Kestrel	1	45			10	15:36	22/08/2016
K.18	Kestrel	1	30			7	10:56	23/08/2016

Table 11a – Winter season 2016/17 detailed flight data for curlew

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
CU1	Curlew	1		90		5	09:45	08/03/2017
CU2	Curlew	2				10	14:21	27/03/2017
CU3	Curlew	3				10	17:50	27/03/2017

Table 11b – Winter season 2016/17 detailed flight data for golden plover

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
GP1	Golden Plover	4		45		2	15:11	10/09/2016
GP2	Golden Plover	27	150	120		14	13:35	26/10/2016
GP3	Golden Plover	15	90	75		14	14:10	26/10/2016

Table 11c – Winter season 2016/17 detailed flight data for whooper swan

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
WS1	Whooper Swan	5		60		4	11:58	03/11/2016
WS2	Whooper Swan	11	15			15	12:30	16/11/2016
WS3	Whooper Swan	1		45		11	08:59	22/12/2016

Table 11d – Winter season 2016/17 detailed flight data for hen harrier

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
HH1	Hen Harrier	1	60			15:09	3	06/09/2016
HH2	Hen Harrier	1	195			12:30	10	07/09/2016
HH3	Hen Harrier	1	45			16:15	11	12/09/2016
HH4	Hen Harrier	1	225			09:07	14	20/09/2016
HH5	Hen Harrier	1	75	15		09:26	15	27/09/2016
HH6	Hen Harrier	1	90	45		16:39	15	27/09/2016
HH7	Hen Harrier	1	135			15:08	3	10/10/2016
HH8	Hen Harrier	1	75	195		12:25	11	13/10/2016
HH9	Hen Harrier	1	30			12:30	11	13/10/2016
HH10	Hen Harrier	1	270			13:46	11	13/10/2016
HH11	Hen Harrier	1	180			18:00	5	13/10/2016
HH12	Hen Harrier	1	90			10:44	13	18/10/2016
HH13	Hen Harrier	1	105			14:56	8	18/10/2016
HH14	Hen Harrier	1	90	30		15:02	8	18/10/2016
HH15	Hen Harrier	1	120			16:10	13	18/10/2016
HH16	Hen Harrier	1	255			17:20	12	25/10/2016
HH17	Hen Harrier	1	150			13:18	10	03/11/2016
HH18	Hen Harrier	1	240			10:38	5	08/11/2016
HH19	Hen Harrier	1	90			09:48	3	30/11/2016
HH20	Hen Harrier	1	45	45		10:28	7	14/12/2016
HH21	Hen Harrier	1	30			14:39	6	14/12/2016
HH22	Hen Harrier	1	75			13:36	8	18/01/2017
HH23	Hen Harrier	1	30			13:31	9	08/02/2017
HH24	Hen Harrier	1	120			15:23	1	08/02/2017
HH25	Hen Harrier	1	30			13:39	14	16/02/2017
HH26	Hen Harrier	1	60			15:53	14	16/02/2017
HH27	Hen Harrier	1	45			10:11	12	17/02/2017
HH28	Hen Harrier	1	225			10:18	5	17/02/2017
HH29	Hen Harrier	1	60			10:23	12	17/02/2017
HH30	Hen Harrier	1	165	45		10:31	12	17/02/2017
HH31	Hen Harrier	1	180			11:17	12	17/02/2017
HH32	Hen Harrier	1	45			14:25	12	17/02/2017
HH33	Hen Harrier	1		180		16:01	5	17/02/2017
HH34	Hen Harrier	1	150			13:50	10	27/02/2017
HH35	Hen Harrier	1	30			09:28	1	08/03/2017
HH36	Hen Harrier	1	30	30		13:07	1	08/03/2017
HH37	Hen Harrier	1	60	30		13:09	1	08/03/2017
HH38	Hen Harrier	1	180	30		15:23	11	08/03/2017

Table 11e – Winter season 2016/17 detailed flight data for red kite

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
KT1	Red Kite	1	60			3	10:55	06/09/2016
KT2	Red Kite	3	120			2	11:05	06/09/2016
KT3	Red Kite	1	45	135		10	10:01	07/09/2016
KT4	Red Kite	1		75		2	11:42	10/09/2016
KT5	Red Kite	1	75			2	16:04	10/09/2016
KT6	Red Kite	1	150			5	18:13	12/09/2016
KT7	Red Kite	1	60	75		13	16:31	19/09/2016
KT8	Red Kite	1	30	60		13	19:10	19/09/2016
KT9	Red Kite	1		195		3	16:05	10/10/2016
KT10	Red Kite	2	60	60		5	13:34	13/10/2016
KT11	Red Kite	1		210		5	14:20	13/10/2016
KT12	Red Kite	1		255		11	16:09	13/10/2016
KT13	Red Kite	1	45	105		13	12:32	18/10/2016
KT14	Red Kite	1	120	60		13	16:29	18/10/2016
KT15	Red Kite	1	30	75		16	12:48	25/10/2016
KT16	Red Kite	2	30	120		12	13:15	25/10/2016
KT17	Red Kite	1		195		12	13:27	25/10/2016
KT18	Red Kite	1	45	180		12	13:41	25/10/2016
KT19	Red Kite	2	15	150		12	15:17	25/10/2016
KT20	Red Kite	1		195		12	15:40	25/10/2016
KT21	Red Kite	1	45	105		12	15:49	25/10/2016
KT22	Red Kite	1	75	180		10	13:27	03/11/2016
KT23	Red Kite	1	90	60		11	10:52	08/11/2016
KT24	Red Kite	1	240	30		11	10:58	08/11/2016
KT25	Red Kite	1	195	75		11	11:06	08/11/2016
KT26	Red Kite	1		300		11	11:16	08/11/2016
KT27	Red Kite	1	75	90		5	13:50	08/11/2016
KT28	Red Kite	1	45			11	14:29	08/11/2016
KT29	Red Kite	1		75		9	11:36	28/11/2016
KT30	Red Kite	1	120	15		9	12:15	28/11/2016
KT31	Red Kite	2		45		9	12:31	28/11/2016
KT32	Red Kite	1	105	165		9	12:45	28/11/2016
KT33	Red Kite	1	150	90		14	14:25	28/11/2016
KT34	Red Kite	1	15			14	11:28	14/12/2016
KT35	Red Kite	1		75		14	15:17	14/12/2016
KT36	Red Kite	1	30	165		14	15:47	14/12/2016
KT37	Red Kite	1	30			10	09:07	15/12/2016
KT38	Red Kite	1		380		12	11:57	15/12/2016
KT39	Red Kite	1	255	90		12	12:45	15/12/2016
KT40	Red Kite	1	15	15		12	12:47	15/12/2016
KT41	Red Kite	1	30			12	13:02	15/12/2016
KT42	Red Kite	1	60			12	13:13	15/12/2016

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
KT43	Red Kite	1	105	225		12	13:14	15/12/2016
KT44	Red Kite	1		15		12	13:21	15/12/2016
KT45	Red Kite	1	15	75		12	13:24	15/12/2016
KT46	Red Kite	1	45			12	13:24	15/12/2016
KT47	Red Kite	1	30	180		12	13:31	15/12/2016
KT48	Red Kite	2	15	1185		12	13:50	15/12/2016
KT49	Red Kite	2		510		12	14:00	15/12/2016
KT50	Red Kite	2		270		12	14:15	15/12/2016
KT51	Red Kite	2		90		12	14:22	15/12/2016
KT52	Red Kite	2		270		12	14:33	15/12/2016
KT53	Red Kite	2		150		12	14:41	15/12/2016
KT54	Red Kite	1	15			2	13:50	21/12/2016
KT55	Red Kite	1	120			5	09:07	22/12/2016
KT56	Red Kite	1		120		11	10:00	22/12/2016
KT57	Red Kite	1	45			13	10:16	25/01/2017
KT58	Red Kite	1	105			13	10:21	25/01/2017
KT59	Red Kite	1	45	60		13	13:10	25/01/2017
KT60	Red Kite	1		90		11	13:26	01/02/2017
KT61	Red Kite	1	75			9	12:42	08/02/2017
KT62	Red Kite	1	165	75		14	12:40	16/02/2017
KT63	Red Kite	1	75	15		12	10:52	17/02/2017
KT64	Red Kite	1	195			12	10:54	17/02/2017
KT65	Red Kite	2		45		12	11:30	17/02/2017
KT66	Red Kite	1	105			12	11:33	17/02/2017
KT67	Red Kite	3		180	75	12	11:40	17/02/2017
KT68	Red Kite	1		105		12	11:47	17/02/2017
KT69	Red Kite	1	150			12	11:54	17/02/2017
KT70	Red Kite	2		165		12	12:18	17/02/2017
KT71	Red Kite	1	75			12	13:03	17/02/2017
KT72	Red Kite	1	120			12	13:12	17/02/2017
KT73	Red Kite	1	270			12	13:31	17/02/2017
KT74	Red Kite	1	255			12	14:13	17/02/2017
KT75	Red Kite	1	60	75		5	14:40	17/02/2017
KT76	Red Kite	1		30		13	11:56	27/02/2017
KT77	Red Kite	1	135	135		13	12:16	27/02/2017
KT78	Red Kite	1	60			13	14:18	27/02/2017
KT79	Red Kite	1	30			13	14:19	27/02/2017
KT80	Red Kite	1	90	90		10	14:39	27/02/2017
KT81	Red Kite	1	60			13	15:04	27/02/2017
KT82	Red Kite	1		75		5	09:30	08/03/2017
KT83	Red Kite	1		120		5	10:12	08/03/2017
KT84	Red Kite	1		105		5	11:23	08/03/2017

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
KT85	Red Kite	1	90	90		11	12:01	08/03/2017
KT86	Red Kite	1		105		5	14:12	08/03/2017
KT87	Red Kite	1		105		5	14:16	08/03/2017
KT88	Red Kite	2		60		2	12:36	13/03/2017
KT89	Red Kite	1		75		2	12:57	13/03/2017
KT90	Red Kite	1	45			9	13:01	13/03/2017
KT91	Red Kite	1		180		2	13:10	13/03/2017
KT92	Red Kite	1	30	90		14	09:56	23/03/2017
KT93	Red Kite	1		195		14	11:21	23/03/2017
KT94	Red Kite	1	105	45		14	13:36	23/03/2017
KT95	Red Kite	1	45			14	14:00	23/03/2017
KT96	Red Kite	1	195			13	10:38	24/03/2017
KT97	Red Kite	1	60	90		13	10:43	24/03/2017
KT98	Red Kite	1	270			13	13:46	24/03/2017
KT99	Red Kite	1	120	135		16	14:30	24/03/2017
KT100	Red Kite	1	345			13	14:31	24/03/2017
KT101	Red Kite	1	120			13	15:10	24/03/2017
KT102	Red Kite	1	180	105		10	14:43	27/03/2017
KT103	Red Kite	1	120	960		10	15:09	27/03/2017
KT104	Red Kite	1	30			10	15:39	27/03/2017
KT105	Red Kite	1	150	105		10	15:47	27/03/2017
KT106	Red Kite	1	30			10	15:56	27/03/2017
KT107	Red Kite	1	165	60		10	16:00	27/03/2017
KT108	Red Kite	1	225	210		10	16:18	27/03/2017
KT109	Red Kite	1	75	525		10	16:29	27/03/2017

Table 11f – Winter season 2016/17 detailed flight data for goshawk.

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
GI1	Goshawk	1			300	2	11:25	10/09/2016
GI2	Goshawk	1	30			2	12:05	10/09/2016
GI3	Goshawk	1	30	45		2	12:22	10/09/2016
GI4	Goshawk	1		45		2	12:30	10/09/2016
GI5	Goshawk	1			210	3	11:23	10/10/2016
GI6	Goshawk	1		105		3	12:31	10/10/2016
GI7	Goshawk	1		165		13	12:57	18/10/2016
GI8	Goshawk	1	15	90	30	7	11:04	02/11/2016
GI9	Goshawk	1		105		6	15:58	02/11/2016
GI10	Goshawk	1	15	30		7	16:22	02/11/2016
GI11	Goshawk	1		120		2	11:20	30/11/2016
GI12	Goshawk	1	75			13	09:44	21/12/2016

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
GI13	Goshawk	1	90			13	11:30	21/12/2016
GI14	Goshawk	1	15			9	14:51	21/12/2016
GI15	Goshawk	1	15	30		7	09:00	11/01/2017
GI16	Goshawk	1	45	180	120	13	12:39	25/01/2017
GI17	Goshawk	1	135			3	10:52	01/02/2017
GI18	Goshawk	1	15			3	11:21	01/02/2017
GI19	Goshawk	1	45			3	11:32	01/02/2017
GI20	Goshawk	1		45	15	5	14:35	01/02/2017
GI21	Goshawk	1		90		4	11:46	07/02/2017
GI22	Goshawk	1		105		4	15:19	07/02/2017
GI23	Goshawk	1		180	270	9	12:06	08/02/2017
GI24	Goshawk	2		135		9	12:15	08/02/2017
GI25	Goshawk	1	75	90		15	11:38	16/02/2017
GI26	Goshawk	1		45		12	10:30	17/02/2017
GI27	Goshawk	1	30	105		5	12:42	17/02/2017
GI28	Goshawk	1		90		12	13:19	17/02/2017
GI29	Goshawk	1	30	210		12	13:55	17/02/2017
GI30	Goshawk	1	30	90		12	14:03	17/02/2017
GI31	Goshawk	1	15			12	15:17	17/02/2017
GI32	Goshawk	1				11	10:00	24/02/2017
GI33	Goshawk	1				11	10:15	24/02/2017
GI34	Goshawk	1		165		2	10:32	24/02/2017
GI35	Goshawk	1	30			3	10:33	24/02/2017
GI36	Goshawk	1		180		2	10:34	24/02/2017
GI37	Goshawk	1	45			11	11:14	24/02/2017
GI38	Goshawk	1	60			11	11:15	24/02/2017
GI39	Goshawk	1	15			3	12:22	24/02/2017
GI40	Goshawk	1	45			3	12:22	24/02/2017
GI41	Goshawk	1	30			3	12:25	24/02/2017
GI42	Goshawk	1	105	150		2	12:29	24/02/2017
GI43	Goshawk	1				11	13:15	24/02/2017
GI44	Goshawk	1				11	10:30	08/03/2017
GI45	Goshawk	1		45		11	11:15	08/03/2017
GI46	Goshawk	1	60	60		11	11:29	08/03/2017
GI47	Goshawk	1				11	13:15	08/03/2017
GI48	Goshawk	1		30		9	15:02	13/03/2017
GI49	Goshawk	1				15	10:52	23/03/2017
GI50	Goshawk	1	60			15	11:54	23/03/2017
GI51	Goshawk	1	60	15		15	12:04	23/03/2017
GI52	Goshawk	1	75			15	12:15	23/03/2017
GI53	Goshawk	1				6	09:42	24/03/2017
GI54	Goshawk	1		75	150	6	11:13	24/03/2017

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
GI55	Goshawk	1	15	75		6	11:20	24/03/2017
GI56	Goshawk	1	270	45		6	12:30	24/03/2017
GI57	Goshawk	1	90			6	12:49	24/03/2017
GI58	Goshawk	1	60	150		6	14:17	24/03/2017
GI59	Goshawk	1	15			6	14:36	24/03/2017

Table 11g – Winter season 2016/17 detailed flight data for peregrine, hobby, merlin and kestrel.

			Flight Time (s)					
Flight Number	**Species**	**Count**	**0-35 m**	**35-140m**	**140m +**	**VP**	**Time**	**Date**
K.1	Kestrel	1	45			10	12:34	07/09/2016
K.2	Kestrel	1		60		10	14:43	07/09/2016
K.3	Kestrel	1		105		2	10:45	10/09/2016
K.4	Kestrel	1		30		2	10:51	10/09/2016
K.5	Kestrel	1	240	45		2	10:58	10/09/2016
HY1	Hobby	1	45			8	13:55	19/09/2016
K.6	Kestrel	1	15	75		3	09:45	10/10/2016
K.7	Kestrel	1	90			3	09:57	10/10/2016
K.8	Kestrel	1	105			3	10:25	10/10/2016
ML1	Merlin	1	30			15	15:51	11/10/2016
K.9	Kestrel	1	30	45		11	14:22	13/10/2016
K.10	Kestrel	1		45		11	16:19	13/10/2016
K.11	Kestrel	1	255			8	10:31	18/10/2016
PE1	Peregrine	1	30			7	14:18	19/10/2016
PE2	Peregrine	1	30			11	09:59	08/11/2016
PE3	Peregrine	1	60			5	11:29	08/11/2016
PE4	Peregrine	1		180	105	16	11:08	07/02/2017
PE5	Peregrine	1		90		16	11:12	07/02/2017
PE6	Peregrine	1	45			3	09:44	24/02/2017
PE7	Peregrine	1	30			3	09:45	24/02/2017
PE8	Peregrine	1	30			2	09:45	24/02/2017
ML2	Merlin	1	60			5	12:29	08/03/2017
ML3	Merlin	1	60			16	10:15	24/03/2017

Appendix 4: Legal Protection Afforded to Birds in the UK

All nesting birds are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended) which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy its nest whilst in use or being built, or take or destroy its eggs. In addition to this, for some rarer species (listed on Schedule 1 of the Act), it is an offence to disturb them whilst they are nest building or at or near a nest with eggs or young, or to disturb the dependent young of such a bird.

The Conservation of Habitats and Species Regulations 2017 places duties on competent authorities (including Local Authorities and National Park Authorities) in relation to wild bird habitat. These provisions relate back to Articles 1, 2 and 3 of the EC Directive on the conservation of wild birds (2009/147/EC, 'Birds Directive'[21]) (Regulation 10 (3)) requires that the objective is the 'preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds in the United Kingdom, including by means of the upkeep, management and creation of such habitat, as appropriate, having regard to the requirements of Article 2 of the new Wild Birds Directive…' Regulation 10 (7) states: 'In considering which measures may be appropriate for the purpose of security or contributing to the objective in [Regulation 10 (3)] Paragraph 3, appropriate account must be taken of economic and recreational requirements'.

In relation to the duties placed on competent authorities under the 2017 Regulations, Regulation 10 (8) states: 'So far as lies within their powers, a competent authority in exercising any function [including in relation to town and country planning] in or in relation to the United Kingdom must use all reasonable endeavours to avoid any pollution or deterioration of habitats of wild birds (except habitats beyond the outer limits of the area to which the new Wild Birds Directive applies).'

[21] 2009/147/EC Birds Directive (30 November 2009. European Parliament and the Council of the European Union.