CASTLEBANNY WIND FARM, CO. KILKENNY: ORNITHOLOGICAL DESK REVIEW AND SURVEY REPORT

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1. INTRODUCTION

This report contains the results of all the bird survey work carried out by the Gittings Nagle Meade survey team for the Castlebanny Wind Farm project over the period 2016-2018. It includes a desk review carried out in May 2017, and updated in December 2020 (Chapter 2), and a report on four seasons of bird survey work (winter 2016/17, summer 2017, winter 2017/18, summer 2018) (Chapter 3).

The initial bird survey study area is shown in Figure 2.1. This was used to define the scope of the winter 2016/17 and summer 2017 survey work. In August 2017, the bird survey study area was extended (Figure 2.1) and these extensions were taken into account in considering the scope of the subsequent survey work. These study areas differ from the EIAR study area. In this report all references to the study area refer to the initial bird survey study area unless otherwise stated. The maps illustrating the survey methods show the initial bird survey study area, as the scope of the surveys was based on this study area. The maps illustrating the survey results show the EIAR study area.

The full data for the bird surveys in this report are included in datasets accompanying this report, which are available online at: https://doi.org/10.5281/zenodo.4319836.

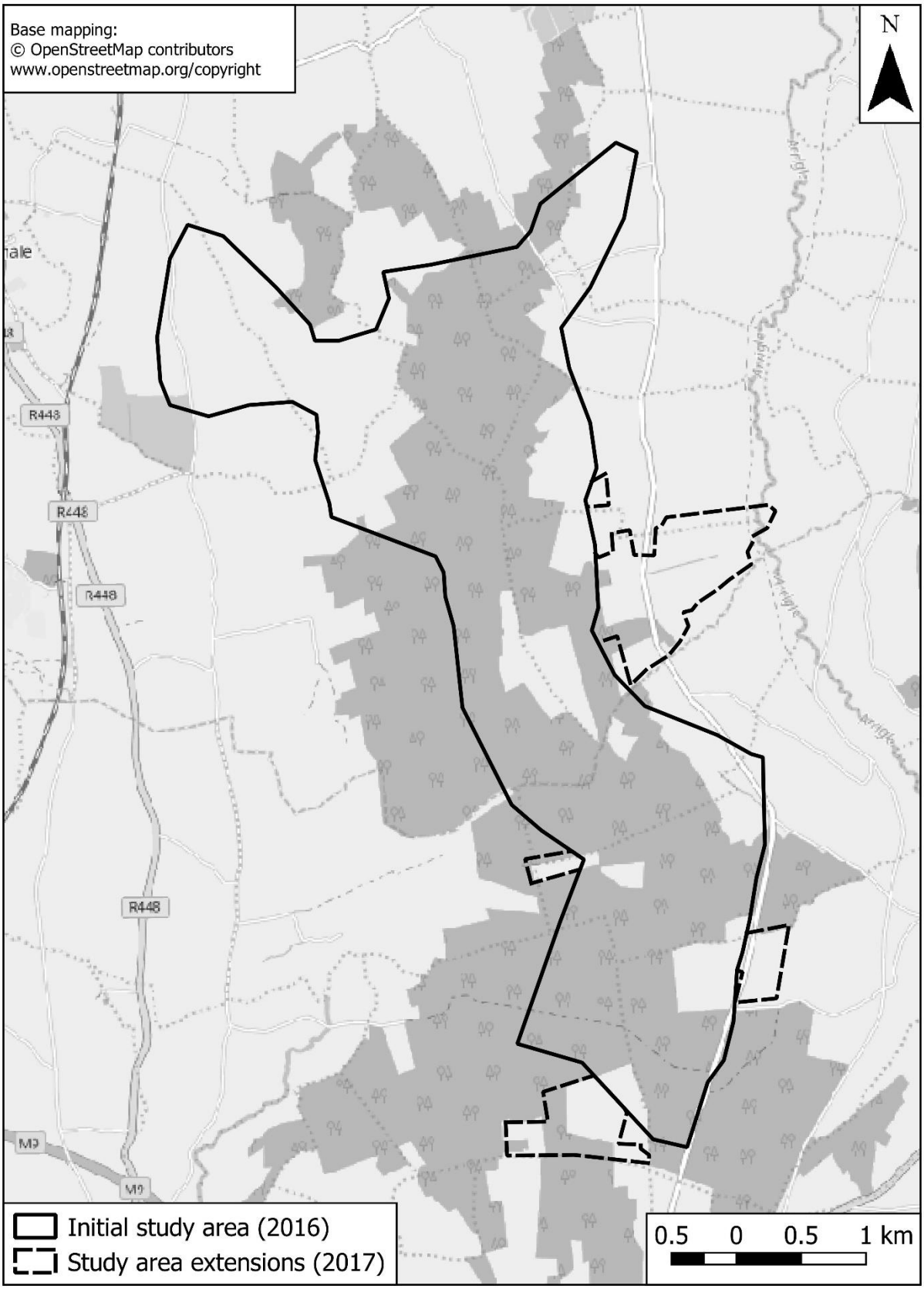

Figure 1.1. Bird survey study areas.

2. DESK REVIEW

2.1. METHODS

All the bird records held by the National Biodiversity Data Centre (accessed via Biodiversity Maps; http://maps.biodiversityireland.ie) for the four hectads (10 km squares) overlapping the study area were reviewed. These include records from the following datasets: Bird Atlas 2007 - 2011, Birds of Ireland, Kingfisher Survey 2010, The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972, The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84, and The Second Atlas of Breeding Birds in Britain and Ireland: 1988-1991. These datasets include the results of the four national bird atlases (Sharrock et al., 1976; Lack, 1980; Gibbons et al., 1993; Balmer et al., 2013). However, the focus in this review is on records from the most recent atlas (Balmer et al., 2013), as well as other recent records from the Birds of Ireland database. Records from the older atlases are mainly of historical interest (e.g., records of Corncrake, which is now extinct as a breeding species in south-east Ireland), although some of these records are discussed where they may be of relevance to understanding present day bird populations in the area.

Other data sources used include: the results of the four national Hen Harrier surveys, as presented by Ruddock et al. (2015); information from rare and protected species records supplied by NPWS; and information on site coverage from the Irish Wetland Bird Survey[1].

Categorisation of species as red-listed, or amber-listed, in *Birds of Conservation Concern in Ireland 2014 – 2019* (Colhoun and Cummins, 2013), and/or inclusion of species on Annex I of the Birds Directive, has been used to help highlight species of potential interest.

2.2. BIRD SENSITIVITY TO WIND ENERGY MAPPING

The Bird Sensitivity to Wind Energy Mapping (Mc Guinness *et al.*, 2015; available via http://maps.biodiversityireland.ie) uses species sensitivity scores to map areas of low, medium, high and highest ornithological sensitivity to wind energy. This mapping does not include classification of the Castlebanny Wind Farm site or adjacent areas.

2.3. SPECIES RECORDED

There are recent records of fourteen red-listed species from the four hectads: Wigeon, Tufted Duck, Golden Plover, Lapwing, Dunlin, Woodcock, Curlew, Redshank, Black-headed Gull, Herring Gull, Barn Owl, Grey Wagtail, Meadow Pipit and Yellowhammer.

There are recent records of the following notable amber-listed species from the four hectads: Whooper Swan, Red Kite, Hen Harrier, Goshawk, Sparrowhawk, Snipe, Short-eared Owl, Great Spotted Woodpecker and Kestrel.

2.4. HEN HARRIER

The recorded status of Hen Harrier in the four hectads overlapping the study area during the national atlas and Hen Harrier surveys is shown in Table 2.1.

During the three national breeding season atlas surveys, Hen Harriers were recorded as possibly, or probably, breeding in one, or more, of the hectads overlapping the study area. In the most recent atlas survey (2007-11), there was a probable breeding record from hectad S52. This record is most likely to relate to the south-western part of the study area and adjacent areas, or to the hills in the south-western part of the hectad, as these are the only significant areas of suitable habitat within the hectad.

The four national Hen Harrier breeding surveys have generally only had limited coverage of the hectads overlapping the study area, although the most recent survey covered three of the four hectads. There has only been a single record of Hen Harrier from these surveys: a confirmed breeding record in hectad S62 in the 2005 survey. As the main areas of forestry habitat in the

[1] https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey.

hectad are in the north-western section, it is most likely that the record was within around 5 km of the study area.

An additional record has been provided by NPWS of a possible breeding site for Hen Harriers in the study area in 2004, while a local farmer has stated that Hen Harriers used to breed in the south-eastern part of the study area around 20 years ago, before the forestry was planted.

Hen Harriers were also recorded in winter in two of the hectads overlapping the study area in the most recent atlas survey.

Table 2.1. Recorded breeding status of Hen Harrier in the four hectads overlapping the study area in the four national surveys.

Year(s)	Season	S52	S53	S62	S63
1968-72	Breeding	not recorded	not recorded	probable breeding	probable breeding
1981/82-1983/84	Winter	not recorded	not recorded	not recorded	not recorded
1998-91	Breeding	not recorded	possible breeding	not recorded	not recorded
1998-00	Breeding	not surveyed	not surveyed	not surveyed	not surveyed
2005	Breeding	not surveyed	not surveyed	confirmed breeding	not recorded
2009-13	Breeding	probable breeding	not recorded	not recorded	not recorded
2009-13	Winter	seen	seen	not recorded	not recorded
2010	Breeding	not surveyed	not surveyed	not surveyed	not surveyed
2015	Breeding	not surveyed	not recorded	not recorded	not recorded

Data sources: 1968-72 (Sharrock et al., 1976); 1981/82-1983/84 (Lack, 1986); Gibbons et al., 1993 (1998-91); 1998-00, 2005, 2010 and 2015 (Ruddock et al., 2015); 2009-13 (Balmer et al., 2013).

2.5. OTHER RAPTORS

Four other nationally rare/scarce raptor species have been recorded in the hectads overlapping the study area: Red Kite, Goshawk, Barn Owl and Short-eared Owl.

Red Kite has been recorded from three locations in hectad S63 to the east of the study area (Birds of Ireland dataset, held by the National Biodiversity Data Centre). This species has recently been reintroduced to Ireland, and these records presumably refer to birds spreading from the reintroduction area in Wicklow.

Goshawk was recorded as possibly breeding in 2009-2013 in hectad S62 (Balmer et al., 2013). No further details about the location of this record are available. This is a very rare, but probably under-recorded, species in Ireland, associated with large areas of forestry habitat. As the main areas of forestry habitat in the hectad are in the north-western section, it is most likely that the record was within around 5 km of the study area.

Barn Owl was recorded breeding, or probably breeding, in three hectads overlapping the study area in 1968-1972 (Sharrock, 1976), and in in one hectad overlapping the study area in 1998-1991 (Gibbons et al., 1993). There were no records from any of the hectads in the Bird Atlas 2009-2013 survey (Balmer et al., 2013). The only recent record is of a pair seen, and heard calling, in March 2015 at Butterbridge, around 10 km east of the study area (Birds of Ireland dataset, held by the National Biodiversity Data Centre).

There is a single breeding season record of Short-eared Owl from Killeen, around 2.5 km east of the study area (Birds of Ireland dataset, held by the National Biodiversity Data Centre). This is adjacent to Mount Alto, which holds potentially suitable breeding habitat for this species. Short-eared Owl is a very rare breeding species in Ireland.

Three other notable raptor species have been recorded from the hectads overlapping the study area: Sparrowhawk, Kestrel and Peregrine. Sparrowhawk and Kestrel are amber-listed but are both very widespread species in Ireland and can be expected to occur in most hectads in the country. Peregrine is an Annex I species but has been increasing its population in Ireland in recent years and is green-listed. There was a confirmed breeding record in 2015 from Knockdrina Quarry

(Birds of Ireland dataset, held by the National Biodiversity Data Centre), which is over 5 km north-west of the study area. There are also a number of other recent sightings from other locations in three of the hectads overlapping the study area.

2.6. BREEDING WATERBIRDS

The only notable waterbird species with recent breeding season records from the hectads overlapping the study area are Little Egret and Kingfisher.

Little Egret was recorded as possibly breeding in hectad S52 in 2007-2011 (Balmer et al., 2013), and was also recorded during the breeding season from the River Nore in the north-western part of hectad S63 in 2010 (Kingfisher Survey 2010 dataset, held by the National Biodiversity Data Centre). This species is an Annex I species, which has colonised Ireland in the last 20 years and has been expanding its population inland in recent years.

Kingfisher was recorded as possibly or probably breeding in three of the four hectads overlapping the study area in 2007-2011 (S53, S62 and S63). The main concentration of records are along the upper part of the River Nore in hectad S63 (Birds of Ireland and Kingfisher Survey 2010 datasets, held by the National Biodiversity Data Centre). This species is an Annex I species, and is amber-listed.

2.7. WINTERING WATERBIRDS

There are no recorded important waterbird sites in close proximity to the study area. The nearest sites monitored by the Irish Wetland Bird Survey (I-WeBS) are: Bishop's Lough, Tullaherin (around 12 km north of the study area); Waterford Harbour (around 15 km south-east of the study area); and the River Suir Lower (around 17 km south-west of the study area). While these sites are generally too distant to have any significant connectivity with the study are, the River Suir Lower site is an important wintering site for Icelandic Greylag Goose and the study area is within the potential core foraging range distance (15-20 km; Scottish Natural Heritage, 2016) from this site for this species.

A tidal section of the River Barrow runs through the south-eastern part of hectad S62 and, while this area is not monitored by I-WeBS, it is likely to support small populations of various waterbird species, and there are a number of such records from the Birds of Ireland dataset. Similarly, the River Nore, which runs north-west to south-east across hectad S63 is likely to support small populations of some waterbird species, particularly towards the lower end of the hectad where there is an extensive floodplain.

There are scattered winter records for a few red or amber-listed waterbird species such as Golden Plover, Lapwing, Curlew, Woodcock and Snipe from other locations within the hectads. These are all species that can occur widely in winter in non-wetland habitats.

2.8. OTHER SPECIES

Three other red-listed species have been recorded in recent years from the hectads overlapping the study area: Grey Wagtail, Meadow Pipit and Yellowhammer. Grey Wagtail and Meadow Pipit were red-listed due to large declines in their breeding populations that occurred following the severe winters of 2009/10 and 2010/11, but the populations of both species have now largely (Grey Wagtail), or completely (Meadow Pipit) recovered. Grey Wagtail is associated with riparian habitats and Meadow Pipit is a ubiquitous species in upland habitats. Both species have been widely recorded in the hectads overlapping the study area.

One other notable amber-listed species has been recorded in recent years from the hectads overlapping the study area: Great Spotted Woodpecker. There are a number of records of this species from various locations along the River Nore in hectad S63 (Birds of Ireland dataset, held by the National Biodiversity Data Centre). This species has recently colonised Ireland and is rapidly expanding its range.

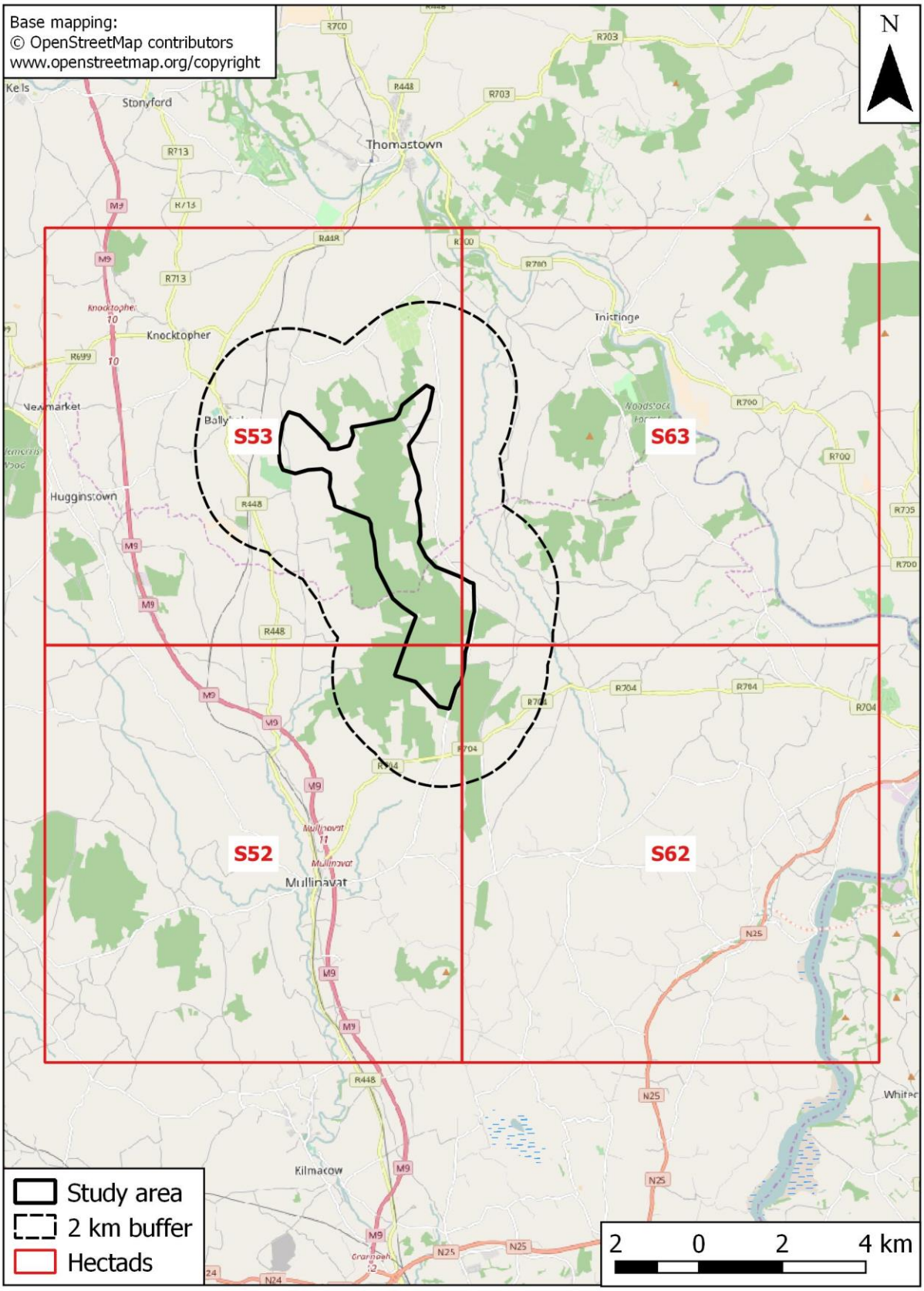

Figure 2.1. Hectads overlapping the study area.

3. BIRD SURVEYS

3.1. METHODS

3.1.1. Scope

The scope of, and methods used for, the bird surveys were based on Scottish Natural Heritage's guidance: *Recommended bird survey methods to inform impact assessment of onshore wind farms* (Scottish Natural Heritage, 2014, 2017; referred to hereafter as the SNH guidelines).

The bird surveys included vantage point surveys to monitor flight activity over the study area and transect surveys to record the general bird population in the study area. In addition, targeted surveys were carried out, focussing on particular species. These included Hen Harrier breeding and roost surveys, breeding wader surveys, roding Woodcock surveys, and breeding Peregrine surveys.

3.1.2. Vantage point surveys

Vantage point surveys were carried out between November 2016 and August 2018. These surveys were divided into four seasonal periods: winter 2016/17 (November 2016-March 2017), summer 2017 (April- August 2017), winter 2017/18 (September 2017-March 2018) and summer 2018 (April-August 2018).

Six vantage points were used to carry out the vantage point surveys in the winter of 2016/17. A seventh vantage point was added in the summer of 2017 to fill in a gap in coverage. At the start of the winter 2017/18 season, another three vantage points were added to cover the study area extensions, and a total of ten vantage points were surveyed in September and October 2017. However based on the survey results to date and the indicative turbine layout, the survey effort for the rest of the winter was scaled back to six vantage points and the same six vantage points were surveyed in the summer 2018 season. Therefore, a minimum of six vantage points received the full 36 hour survey effort in each of the four seasons (Table 3.1).

The vantage points were selected to maximise coverage of the potential collision height band over the study area, as well as to sample areas of potential Hen Harrier foraging habitat. The approximate viewsheds from each vantage point were initially mapped in the field. The angle of view, the elevation of the vantage point, contour data and positions and heights of forest edge and other obstructions were then used to draw detailed viewsheds at an elevation of 35 m above ground level. Where applicable, viewsheds were clipped at 2 km from the vantage point reflecting the SNH guidance.

The vantage point locations, and viewsheds at potential collision height, for all the vantage points surveyed are shown in Figure 3.1. The viewsheds covered in each season are shown in Figure 3.2.

Table 3.1. Total duration of surveys in hours per vantage point in each season.

Season	Vantage point									
	1	2	3	4	5	6	7	8	9	10
winter 2016/17	36	36	36	36	36	36	0	0	0	0
summer 2017	36	36	36	36	36	36	36	0	0	0
winter 2017/18	36	12	36	36	36	12	12	36	36	12
summer 2018	36	0	36	36	36	0	0	36	36	0

In each season, each vantage point covered generally received a minimum of six hours coverage per month. The exceptions were in the winter of 2017/18, when no surveys were carried out in November 2017 (due to review of the survey requirements), and VPs 2, 6, 7 and 10 were only surveyed in September and October (as these vantage points were dropped). Surveys were not carried out during poor visibility and, where the visual envelope of one vantage point overlapped another the location of another vantage point, care was taken to avoid concurrent surveys of the two vantage points.

The watches were timed to cover the full sunrise-sunset period. The diel distribution of the survey effort is compared to the diel distribution of total daylight hours in Table 3.2. This shows that there was generally a good spread of the survey effort across the available daylight hours. The lower minutes / daylight hour in the early morning and late evening periods reflect the limited occurrence of daylight hours in these periods, which mean that these hours are only available in one or two months each season. Also, overlap between survey periods will produce higher minutes / daylight hour during the middle of the day than in the early morning and evening when such overlaps will not occur (as no surveys started before sunrise or ended after sunset).

Table 3.2. Diel distribution of vantage point survey effort in relation to total daylight hours during the summer (April-August) and winter (September-March) survey periods.

Hour (GMT)	Total daylight hours		Survey effort (mins/daylight hour)	
	summer	winter	summer	winter
04:00-05:00	3,431	-	0.17	-
05:00-06:00	7,786	122	0.12	0.00
06:00-07:00	9,176	2,457	0.12	0.04
07:00-08:00	9,180	6,079	0.13	0.08
08:00-09:00	9,180	9,727	0.15	0.09
09:00-10:00	9,180	12,720	0.24	0.24
10:00-11:00	9,180	12,720	0.29	0.35
11:00-12:00	9,180	12,720	0.29	0.31
12:00-13:00	9,180	12,720	0.24	0.28
13:00-14:00	9,180	12,720	0.24	0.32
14:00-15:00	9,180	12,720	0.27	0.36
15:00-16:00	9,180	12,720	0.22	0.25
16:00-17:00	9,180	10,325	0.14	0.12
17:00-18:00	9,180	5,873	0.11	0.04
18:00-19:00	9,180	2,349	0.13	0.02
19:00-20:00	7,837	84	0.14	0.00
20:00-21:00	3,615	-	0.18	-

Daylight hours calculated using the *suncalc* package in R (Agafonkin and Thieurmel, 2019).

Observations of raptor species, and any other species of potential conservation concern, during the vantage point surveys were recorded using the methodology for focal bird sampling in the SNH guidelines. Flight activity was recorded separately in three height bands: below potential collision height (Band A: 0-35 m), at potential collision height (Band B: 35-135 m), and above potential collision height (Band C: > 135 m). The duration of all flight activity at potential collision height was recorded. However, for Buzzard, Sparrowhawk, Lesser Black-backed Gull and Kestrel, the duration of flight activity below potential collision height was not always recorded. Extended flight activity of these species could occur and timing their flight activity below potential collision height could have interfered with recording of flight activity in the rotor zone. Where extended periods of flight activity of these species occurred within the potential collision height band, the observer continued to intermittently scan the full visual envelope to avoid missing flight activity of other species.

Flight type was recorded for all flight activity observed and was classified as hovering or active, with active referring to all flight activity other than hovering. The purpose of this classification was to inform collision risk assessment as the collision risk for hovering birds will be different from birds in active flight.

Full details of the timing of, and weather conditions during, the vantage point surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

3.1.3. General bird surveys

Transect surveys were carried out in January-February 2017 to characterise the general wintering bird populations, and April-June 2017 to characterise the general breeding bird populations. The surveys were carried out along seven transects, which were selected to represent the variation in habitats across the study area (Figure 3.3). The combined total length of the transects was 10.6 km. The transect surveys were carried out using the Countryside Bird Survey methodology (BirdWatch Ireland, 2012). Each transect was surveyed twice in winter and twice in summer.

Full details of the timing of, and weather conditions during, the transect surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

3.1.4. Targeted surveys

Hen Harrier roost surveys

A 2 km buffer around the initial study area was used to define the search area for potential Hen Harrier roost habitat. Eight areas with potentially suitable habitat for roosting Hen Harrier were identified (Table 3.3). Roost surveys were carried out at these locations between December 2016 and March 2017, and between September 2017 and March 2018 (Figure 3.4). Each roost survey covered a 1-2 hour period ending around 30 minutes after sunset.

Additional potential Hen Harrier roost habitat within the study area was covered by the vantage point watches that started at sunrise, or ended at sunset.

Full details of the timing of, and weather conditions during, the Hen Harrier roost surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Table 3.3. Hen Harrier roost surveys.

Winter	Month	Number of roost surveys per month							
		R1	R2	R3	R4	R5	R6	R7	R8
2016/17	Dec	1	0	1	1	1	0	0	0
	Jan	1	1	2	1	1	0	0	0
	Feb	0	0	0	1	0	1	0	0
	Mar	0	1	0	1	0	0	0	0
	Sep	0	0	1	0	0	0	1	0
	Oct	0	0	1	0	0	0	0	1
2017/18	Dec	1	0	0	1	0	0	1	0
	Jan	1	0	0	1	0	0	1	1
	Feb	0	0	0	0	0	0	1	1
	Mar	1	0	1	0	0	0	1	0

Hen Harrier breeding surveys

Breeding Hen Harrier surveys were carried out in the summers of 2017 and 2018 and the survey methodology was based on the guidelines used in the National Hen Harrier Breeding Survey of 2015 (Ruddock et al., 2015).

A 2 km buffer around the initial study area was used to define the search area for potential Hen Harrier roost habitat. Knowledge of the area from the vantage point and Hen Harrier roost surveys along with Ordnance Survey Discovery Maps and aerial photography were used to locate areas of suitable habitats that could be surveyed (Figure 3.5). Suitable breeding habitat was defined as heather dominated and/or grass moorland, other open habitats with extensive scrub or bramble cover and developing pre-thicket forest (first and second rotation crops). The majority of available breeding habitat within the survey area was developing pre-thicket second rotation forestry. A few areas of scrub (mainly willow and gorse) habitat were also identified but these were all adjacent to or within second rotation forests. A minimum of three visits were made to the selected areas of suitable habitat between late March and the end of July.

In 2017, four areas containing large amounts of pre-thicket forest were deemed to be of high priority due to the type and extent of available habitat and these were Derrylacky, Coolnahau, Castlebanny and Castlecosker. Other areas containing suitable habitat (Ballymackillagill, Mullennakill and Glenpipe) were also surveyed on at least one occasion. Ideally two visits to establish territorial occupancy are required with the first visit between late March and mid-April and the second between mid-April and mid-May. Derrylacky was the only area that was visited twice in the early breeding period, once in early to mid-April and once in late April to mid-May. All other sites were visited once during the early breeding season. It was decided that surveying as many suitable breeding areas as possible at least once in the early breeding season presented a better chance of locating a breeding pair of Hen Harriers rather than concentrating on a few sites by visiting each one twice. In addition, monthly vantage point observations at six locations throughout the survey area also contributed to the detection of Hen Harriers at the site and most survey work was concentrated in areas of suitable habitat that were not entirely visible from the vantage point survey locations.

In 2018, a similar surveying regime was undertaken and again, survey effort was concentrated in the Derrylacky, Castlecosker and Coolnahau areas although Ballymackillagill and Glenpipe were also surveyed at least once.

Full details of the timing of, and weather conditions during, the Hen Harrier breeding surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Breeding wader surveys

Breeding wader surveys were carried out in April-June 2017 and 2018.

These surveys were focussed on detecting any breeding waders associated with wet grassland and bog/heath habitats (Lapwing, Curlew, Snipe and Redshank). The survey covered all potentially suitable habitat identified within the study area from review of aerial imagery and from reconnaissance during vantage point survey work. Six sites were surveyed in 2017 (Figure 3.6). However, two of these sites were considered to be poor quality habitat and were outside the area covered by the indicative turbine layout so they were not surveyed again in 2018 (sites 3 and 4). The potential breeding wader habitat in another two of the sites had been removed by forestry planting (site 5) or drainage work (site 6) over the winter of 2017/18, so these sites were also not surveyed again in 2018. Instead four new sites were surveyed, along with the remaining two of the 2017 sites (Figure 3.6). The four new sites included one area of potential breeding habitat within the forestry plantation that was identified from the habitat survey carried out in the summer of 2017 (site 7) and three sites within extensions to the study area (sites 8-10).

The survey methodology was based on O'Brien et al. (1992). Each site was surveyed monthly between April and June and the surveys were generally carried out within three hours of dawn. On each survey, transects were walked within and around the site so that all parts of the site were approached to a distance of within 100 m. All waders, other waterbirds and other bird species of note were recorded, their activity noted and their positions mapped. There were two exceptions to the above due to difficulties in obtaining access permission from landowners. Site 3 was only surveyed in June, with two surveys being carried out. Site 4 was not surveyed during the breeding wader survey as access permission was not received from the landowner. However, this site is adjacent to VP6, so any breeding wader activity in the site should have been detected by the vantage point surveys from VP6, which included surveys starting at sunrise and ending at sunset during the breeding wader survey period.

Full details of the timing of, and weather conditions during, the breeding wader surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Woodcock surveys

Woodcock surveys were carried out in May-June 2017 and May-June 2018. The survey methodology was based on Heward et al. (2015): the survey began 15 minutes before sunset and lasted for 75 minutes, and all aural and/or visual detections of Woodcock were recorded. However,

instead of using a fixed point for the survey, transects were walked along the roads and rides to gain an understanding of the distribution of roding Woodcock across the study area.

Three transect routes 2.4-2.8 km in length were used (Figure 3.7). These routes were chosen to sample areas of suitable habitat throughout the study area. They were all along forest roads as these provided the only practicable way of walking long transect routes through the study area in poor light conditions. Each transect was surveyed three times within each summer, with each survey being at least one week apart. The transect route was walked twice during each survey and the starting position was alternated between each survey. All Woodcock registrations were recorded, with the time and flight height (if a visual registration) being noted and the flightline (visual observation), or approximate position (aural observation) being mapped. Flight heights were categorised in 5 m height bands, using the position of the bird relative to the canopy height as a guide.

Full details of the timing of, and weather conditions during, the Woodcock surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Peregrine surveys

Surveys for breeding Peregrines were carried out in the summers of 2017 and 2018. The surveys were based on the guidelines used in the National Peregrine Survey of 2017 (Wilson-Parr and O'Brien, 2017). Knowledge of the area from vantage point and Hen Harrier surveys along with Ordnance Survey Discovery Maps and aerial photography were used to determine potential breeding sites within a 2 km radius of the initial study area that could be surveyed. Suitable breeding sites are defined as coastal and inland cliffs and man-made sites such as quarries, castles, tower houses, churches, pylons and buildings.

Very few suitable potential breeding sites were identified within a 2 km radius of the site so it was decided to extend the survey to a 4-5 km radius. One site, a quarry (7 km outside the study area) that could be seen from the site was included in the 2017 survey but not in the 2018 survey.

Three sites were surveyed in both years, with three additional sites surveyed in 2017 and five additional sites surveyed in 2018 (Table 3.13). Two to three visits were made to any likely breeding site during April and again in June.

Full details of the timing of, and weather conditions during, the Peregrine surveys are included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

3.1.5. Personnel

The bird surveys were designed and managed by Tom Gittings with input from Tony Nagle for the vantage point, Hen Harrier and Peregrine surveys. The vantage point surveys were carried out by Tom Gittings, John Meade and Tony Nagle. The general wintering and breeding bird transect surveys were carried out by Tom Gittings. The Hen Harrier roost surveys were carried out by Tom Gittings and Tony Nagle. The Hen Harrier and Peregrine breeding surveys were carried out by Tony Nagle. The breeding wader and Woodcock surveys were carried out by Tom Gittings and John Meade.

3.2. RESULTS

3.2.1. Vantage Point surveys

Data presentation

This section presents summaries of some of the key patterns in the vantage point survey data. Further analyses and interpretation of the survey results are included in the Ornithology chapter of the Castlebanny Wind Farm Environmental Impact Assessment Report and in the associated Collision Risk Model and Lesser Black-backed Gull review reports (Gittings, 2020b, 2020c).

The sighting rates in the summary analyses in these sections include records from all height bands, and include records from within, and outside, the vantage point viewsheds. References to potential collision height in this section refer to the potential collision height band used for the

vantage point surveys (35-135 m), which differs from the potential collision height band used in the collision risk model (30-155 m; see Gittings, 2020b).

The full vantage point survey data is included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Overview

The observations of flight activity in the vantage point surveys are summarised in Table 3.4 and Table 3.5. Fifteen waterbird species and six raptor species were recorded.

The most frequently observed species were Sparrowhawk, Buzzard, Lesser Black-backed Gull and Kestrel. The other more notable species recorded were Whooper Swan, Greylag Goose, Hen Harrier, Golden Plover, Lapwing, Whimbrel, Curlew, Merlin and Peregrine. Vantage point surveys are not an effective method of surveying Woodcock and Snipe. Instead targeted surveys were carried out for these species (Section 3.2.3).

Table 3.4. Waterbird and raptor species recorded in the vantage point surveys.

Species	Number of records			
	winter 2016/17	summer 2017	winter 2017/18	summer 2018
Whooper Swan	0	0	1	0
Greylag Goose	1	0	0	0
Mallard	1	2	7	2
Cormorant	0	0	1	0
Grey Heron	6	0	2	3
Hen Harrier	2	0	2	1
Harrier sp.	0	1	0	0
Sparrowhawk	27	13	24	11
Buzzard	29	37	36	47
Golden Plover	1	1	4	0
Lapwing	0	0	1	0
Whimbrel	0	4	0	3
Curlew	0	2	0	1
Woodcock	0	2	0	0
Snipe	8	2	9	0
Black-headed Gull	0	0	5	0
Lesser Black-backed Gull	1	89	8	36
Herring Gull	0	1	0	0
Great Black-backed Gull	1	0	0	0
Kestrel	59	166	83	39
Merlin	0	0	1	0
Peregrine	6	0	1	0

Table 3.5. Height distribution of waterbird and raptor flight activity recorded in the vantage point surveys.

Species	Observations			Bird-secs
	0-35 m	35-135 m	> 135 m	35-135 m
Whooper Swan	1	0	0	0
Greylag Goose	0	1	0	990
Mallard	12	1	0	375
Cormorant	0	1	0	60
Grey Heron	11	3	0	183
Hen Harrier	4	2	0	48
Harrier sp.	1	0	0	0
Sparrowhawk	67	18	3	1,795
Buzzard	126	87	14	14,818
Golden Plover	2	4	1	428
Lapwing	0	1	0	340
Whimbrel	5	2	0	55
Curlew	2	1	0	180
Woodcock	2	0	0	0
Snipe	18	4	0	618
Black-headed Gull	4	3	1	101
Lesser Black-backed Gull	106	83	13	55,446
Herring Gull	0	1	0	53
Great Black-backed Gull	0	0	1	0
Kestrel	322	152	6	19,168
Merlin	1	0	0	0
Peregrine	6	3	0	518

Sparrowhawk, Buzzard, Lesser Black-backed Gull and Kestrel

Sparrowhawk sighting rates were highest in mid-winter (November-January) and were broadly constant at a low rate across the rest of the year (Table 3.6). However, the rates of flight activity at potential collision height were more variable and were not consistently higher in the mid-winter period (Table 3.6). Sparrowhawk occurred at all the vantage points (Table 3.7 and Figure 3.9). In the winter of 2016/17, there was a high duration of flight activity in the potential collision height band at VP6 (Table 3.8), due to several observations of birds soaring above the forest on the slopes to the south-east of the vantage point. The high duration of flight activity in the potential collision height band at VP3 (Table 3.8) in the winter of 2017/18 was due to a single observation of pair circling at height for six minutes. After correcting for survey effort, the hourly distribution of Sparrowhawk records did not show any obvious diel variation (Table 3.9).

Buzzard sighting rates and rates of flight activity at potential collision height were highest in late winter/spring (February-May) (Table 3.6). Buzzards occurred at all the vantage points, but there were only a few sightings at VPs 2, 6 and 9 (Table 3.7 and Figure 3.10). The distribution of flight activity at potential collision between the vantage point locations generally reflected the sighting rates (Table 3.8). After correcting for survey effort, the hourly distribution of Buzzard records (Table 3.9) indicated higher levels of activity during the morning, compared to the afternoon and evening (Table 3.9).

Lesser Black-backed Gulls mainly occurred in summer, particularly at VPs 3, 4, 5 and 7 (Table 3.6, Table 3.7 and Figure 3.11). However, the high level of flight activity at VP7 in the summer of 2017 produced very low levels of flight activity at potential collision height (Table 3.8) and much of this activity represented local movements of birds feeding on fields within and around the viewshed. Overall, the flightlines show a NW-SE movement corridor crossing the middle of the study area, with another movement corridor along the Arrigle River to the east of the study area

(Figure 3.11). After correcting for survey effort, the hourly distribution of Lesser Black-backed Gull records did not show any obvious diel variation (Table 3.9)[2]. Further analyses of Lesser Black-backed Gull occurrence patterns at Castlebanny are included in Gittings (2020b).

Patterns of Kestrel flight activity were variable across the year (Table 3.6). Kestrels were frequently observed at all the vantage points, except VPs 2, 6 and 8, with a particularly high amount of flight activity recorded at VPs 3, 4, 5 and 7 (Table 3.7 and Figure 3.12). The highest sighting rate was recorded at VP7, but there was a relatively low frequency of flight activity at potential collision height at this vantage point, compared to the other vantage points with high sighting rates (Table 3.8). After correcting for survey effort, the hourly distribution of Kestrel records (Table 3.9) indicated higher levels of activity during the morning and afternoon, compared to the evening (Table 3.9).

Table 3.6. Monthly Sparrowhawk, Buzzard, Lesser Black-backed Gull and Kestrel sighting rates (records per 24 survey hours) and flight activity at potential collision height (bird-secs per survey hour).

Month	Sparrowhawk		Buzzard		Lesser Black-backed Gull		Kestrel	
	sightings	PCH	sightings	PCH	sightings	PCH	sightings	PCH
Jan	4.0	0.5	3.0	9.4	0.0	0.0	3.8	15.5
Feb	1.7	1.4	6.0	35.2	0.7	5.4	4.0	58.7
Mar	1.0	1.3	6.0	33.7	0.0	0.0	6.0	38.6
Apr	0.6	1.5	4.0	4.7	6.5	6.5	5.5	12.0
May	1.7	0.5	8.3	40.9	4.1	172.7	3.6	17.0
Jun	1.3	2.8	3.4	1.8	5.7	47.1	7.7	26.4
Jul	0.9	0.9	3.0	12.1	8.3	22.8	3.9	27.0
Aug	1.7	0.0	3.9	23.0	8.4	273.4	2.2	17.4
Sep	1.8	9.5	2.8	8.4	0.0	0.0	5.5	0.0
Oct	1.2	0.3	0.8	1.1	2.4	48.7	3.6	5.4
Nov	3.3	6.6	0.7	0.0	0.0	0.0	1.3	9.4
Dec	3.7	0.7	1.4	7.3	0.3	0.2	0.3	12.3

Sightings from all height bands, and from within and outside viewsheds, included.

[2] The high recording rate in the 22:00-23:00 period in the breeding season is probably an artefact due to the very limited recoding effort during this period.

Table 3.7. Distribution of Sparrowhawk, Buzzard, Lesser Black-backed Gull and Kestrel records between vantage points.

Species	Season	Number of records								
		VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9
Sparrowhawk	winter 2016/17	4	3	3	5	6	6	-	-	-
	summer 2017	1	3	4	2	1	0	2	-	-
	winter 2017/18	0	-	8	2	5	1	-	3	3
	summer 2018	2	-	3	4	0	0	-	1	1
Buzzard	winter 2016/17	2	0	14	7	6	0	-	-	-
	summer 2017	0	0	17	5	1	0	14	-	-
	winter 2017/18	3	-	1	6	11	-	-	13	1
	summer 2018	9	-	19	3	6	-	-	10	0
Lesser Black-backed Gull	winter 2016/17	0	0	1	0	0	0	-	0	0
	summer 2017	1	0	23	18	5	1	41	-	-
	winter 2017/18	0	-	0	1	3	-	-	4	0
	summer 2018	2	-	7	4	9	-	-	9	5
Kestrel	winter 2016/17	12	6	21	13	5	2	-	-	-
	summer 2017	8	6	49	27	13	3	60	-	-
	winter 2017/18	11	-	17	3	33	-	-	5	11
	summer 2018	15	-	4	5	8	-	-	1	6

Sightings from all height bands, and from within and outside viewsheds, included. Note, this table only includes data for vantage points when they were fully covered for the relevant season, so each vantage point had 36 hours survey effort for the seasons included in the table.

Table 3.8. Summary of the distribution of Sparrowhawk, Buzzard, Lesser Black-backed Gull and Kestrel flight activity at potential collision height between the vantage points.

Species	Season	Total bird-secs at PCH								
		VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9
Sparrow-hawk	winter 2016/17	0	0	677	2019	592	0	-	-	-
	summer 2017	0	0	844	265	153	0	640	-	-
	winter 2017/18	0	-	0	1073	705	-	-	2075	0
	summer 2018	860	-	1495	1270	270	-	-	1830	0
Buzzard	winter 2016/17	0	0	32	0	0	0	-	-	-
	summer 2017	25	0	2664	11549	219	290	303	-	-
	winter 2017/18	0	-	0	18	1900	-	-	1380	0
	summer 2018	11190	-	1346	1445	6205	-	-	4230	12650
Lesser Black-backed Gull	winter 2016/17	150	795	1233	3257	587	0	0	-	-
	summer 2017	420	610	2504	2114	586	130	1009	-	-
	winter 2017/18	640	-	276	386	2578	-	-	0	155
	summer 2018	220	-	330	205	275	-	-	0	580
Kestrel	winter 2016/17	0	0	677	2019	592	0	-	-	-
	summer 2017	0	0	844	265	153	0	640	-	-
	winter 2017/18	0	-	0	1073	705	-	-	2075	0
	summer 2018	860	-	1495	1270	270	-	-	1830	0

Sightings from all height bands, and from within and outside viewsheds, included. Note, this table only includes data for vantage points when they were fully covered for the relevant season, so each vantage point had 36 hours survey effort for the seasons included in the table.

Table 3.9. Diel variation in Sparrowhawk, Lesser Black-backed Gull, Buzzard and Kestrel records per survey hour.

Hourly period (GMT)	Records per survey hour				
	Sparrowhawk	Lesser Black-backed Gull		Buzzard	Kestrel
		breeding	autumn		
04:00-06:00	0.1	0.2	0.3	0.0	0.0
06:00-07:00	0.0	0.2	0.4	0.1	0.5
07:00-08:00	0.1	0.2	0.2	0.2	0.4
08:00-09:00	0.1	0.2	0.2	0.2	0.4
09:00-10:00	0.1	0.5	0.0	0.1	0.4
10:00-11:00	0.1	0.2	0.2	0.2	0.3
11:00-12:00	0.1	0.2	0.1	0.2	0.4
12:00-13:00	0.0	0.3	1.1	0.3	0.5
13:00-14:00	0.1	0.3	0.1	0.3	0.4
14:00-15:00	0.0	0.0	0.4	0.1	0.5
15:00-16:00	0.1	0.0	0.1	0.1	0.3
16:00-17:00	0.1	0.5	0.2	0.1	0.2
17:00-18:00	0.1	0.5	0.3	0.1	0.2
18:00-19:00	0.1	0.1	0.6	0.1	0.2
19:00-20:00	0.0	0.1	1.0	0.1	0.1
20:00-22:00	0.0	0.4	0.0	0.0	0.3

The first two hourly periods (04:00-05:00 and 05:00-06:00), and the last two (20:00-21:00 and 21:00-22:00) are grouped together to avoid bias due to the small survey efforts in the first and last hourly periods. Sightings from all height bands, and from within and outside viewsheds, included. For Lesser Black-backed Gull, data is only included for the vantage points with high Lesser Black-backed Gull flight activity viewsheds (see Gittings, 2020b).

Other species

The other more notable species recorded were Whooper Swan, Greylag Goose, Hen Harrier, Golden Plover, Lapwing, Whimbrel, Curlew, Merlin and Peregrine (Table 3.10). The flightlines of these species recorded in the vantage point surveys are shown in Figure 3.13.

There was a single observation of one Whooper Swan flying west past VP3 on 12th December 2017. This was during a period of very cold weather and may have represented a cold weather movement.

There was a single observation of nine Greylag Geese flying SW over VP6 at an elevation of 80-100 m on 20th December 2016. This flight-line is on a direct route between two Greylag Goose wintering sites (see Gittings, 2020a).

There were four observations of Hen Harriers during the vantage point watches, with another two incidental observations (Table 3.14). These included three records of a ringtail from VP5 in January-April 2018, suggesting the regular presence of a bird during this period. However, there were no sightings after April and no evidence of breeding was detected in the breeding surveys carried out in April-July 2018 (see Section 3.2.3). Two of the Hen Harrier observations included flight activity within the potential collision height band (Table 3.10).

A ringtail harrier was also observed flying west past VP3 on 14th June 2017. While the bird was only seen distantly, it showed characters of Montagu's Harrier, but it was not possible to definitively identify it.

There were five observations of single, or small groups of, Golden Plover. Four of these observations were in October and March-April suggesting that they may have been passage birds. No evidence of the regular presence of wintering Golden Plover in the area was found during the survey work.

Table 3.10. Details of vantage point observations of selected notable species.

Species	Date	VP	Number of birds	Duration (secs)		
				0-35 m	35-135 m	> 135 m
Whooper Swan	12/12/2017	VP3	1	36	0	0
Greylag Goose	20/12/2016	VP6	9	0	110	0
Hen Harrier	13/03/2017	VP1	1 male	12	0	0
	28/09/2017	VP4	1 ringtail	28	0	0
	29/01/2018	VP5	1 ringtail	65	23	0
	19/04/2018	VP5	1 ringtail	35	25	0
Harrier species	14/06/2017	VP3	1 ringtail	38	0	0
Golden Plover	29/11/2016	VP5	4	0	25	0
	15/04/2017	VP4	1	0	43	0
	18/10/2017	VP5	12	20	0	0
	07/03/2018	VP1	11	0	0	20
	21/03/2018	VP5	3	0	69	0
Lapwing	12/12/2017	VP3	5	0	68	0
Whimbrel	04/05/2017	VP2	14	0	0	0
	08/05/2017	VP2	23	8	0	0
	08/05/2017	VP2	1	13	0	0
	08/05/2017	VP2	23	10	0	0
	17/08/2018	VP1	1	0	30	0
	17/08/2018	VP1	1	0	25	0
	24/08/2018	VP9	1	35	0	0
Curlew	15/08/2017	VP3	88	98	0	0
	15/08/2017	VP3	22	88	0	0
	17/08/2017	VP9	2	0	90	0
Merlin	12/12/2017	VP3	1	27	0	0
Peregrine	21/12/2016	VP5	3	15	75	0
	21/12/2016	VP5	1	15	0	0
	10/01/2017	VP3	1	38	0	0
	10/01/2017	VP3	1	54	0	0
	21/02/2017	VP4	2	0	105	0
	21/02/2017	VP4	1	10	83	0
	12/12/2017	VP3	1	108	0	0

Sightings from within and outside viewsheds included.

There was a single observation of five Lapwing flying west past VP3 on 12th December 2017. As with the Whooper Swan, this was during a period of very cold weather and may have represented a cold weather movement.

There were four records of Whimbrel in early May 2017 and three records in August 2018. All the records came from the southern end of the study area. The May 2017 records were all from VP2, and included two records of birds that were flushed from the field around the vantage point location.

There were three observations of Curlew during the vantage point watches, with another incidental observation (Table 3.10). These records were all made in mid-August, with three of the records in the same vantage point watch. The VP3 records involved flocks of 22-100 Curlew flying east, low over the forest canopy.

There was a single record of a female Merlin from VP3 on 12th December 2017.

Peregrines were observed at VPs 3, 4 and 5 on three dates between December 2016 and February 2017, with two observations on each date, but only a single record after this period. The records included three observations of birds flying within the collision risk height band. The first observation on 10th January 2017 involved three birds and seemed to be two intruding birds being challenged by a territorial bird. A Peregrine was also seen during a Hen Harrier breeding survey in the VP1 viewshed in July 2018. No occupied Peregrine nest sites were found within 2 km of either the initial or extended study areas during the Peregrine breeding surveys (Figure 3.15).

There were a few records of Woodcock and Snipe during the vantage point surveys. However, these species are not effectively surveyed by vantage point surveys and were the subject of targeted surveys (see Section 3.2.3).

The other waterbird species recorded during the vantage point surveys were Mallard, Cormorant, Grey Heron, Black-headed Gull, Herring Gull and Great Black-backed Gull. These records are not considered to be of any conservation significance.

3.2.2. General bird surveys

A total of 30 species were recorded during the general wintering bird surveys: Pheasant, Snipe, Woodpigeon, Kestrel, Magpie, Jackdaw, Rook, Hooded Crow, Goldcrest, Blue Tit, Great Tit, Coal Tit, Long-tailed Tit, Treecreeper, Wren, Blackbird, Fieldfare, Song Thrush, Redwing, Mistle Thrush, Robin, Dunnock, Pied Wagtail, Meadow Pipit, Chaffinch, Bullfinch, Lesser Redpoll, Common Crossbill, Siskin and Reed Bunting. A total of 40 species were recorded during the general breeding bird surveys: Pheasant, Sparrowhawk, Stock Dove, Woodpigeon, Cuckoo, Magpie, Jay, Jackdaw, Rook, Hooded Crow, Goldcrest, Blue Tit, Great Tit, Coal Tit, Swallow, Long-tailed Tit, Chiffchaff, Willow Warbler, Blackcap, Whitethroat, Grasshopper Warbler, Treecreeper, Wren, Starling, Blackbird, Song Thrush, Mistle Thrush, Robin, Stonechat, Dunnock, Pied Wagtail, Meadow Pipit, Chaffinch, Bullfinch, Linnet, Lesser Redpoll, Common Crossbill, Goldfinch, Siskin and Reed Bunting. These represents typical bird assemblages for the mixture of forestry plantation and agricultural habitats sampled. The species recorded include one red-listed species (Meadow Pipit) and nine amber-listed species (Sparrowhawk, Snipe, Stock Dove, Kestrel, Goldcrest, Swallow, Starling, Mistle Thrush, Robin, Stonechat and Linnet) (Colhoun and Cummins, 2013). However, these are widespread/abundant species, and their amber/red-listing is not relevant to site-scale assessments.

The full transect survey data is included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

3.2.3. Targeted surveys

Hen Harrier roost survey

No observations of Hen Harriers were made at any of the locations surveyed.

Hen Harrier breeding survey

No observations of Hen Harriers were made at any of the locations surveyed.

Breeding wader survey

The results of the breeding wader surveys are summarised in Table 3.11. The only wader species recorded was Snipe. In 2017, a single drumming Snipe was recorded in Site 6. However, this site was in the process of being drained and no longer contained suitable habitat for breeding waders in 2018. In 2018, a single drumming Snipe was recorded in Site 7 and a single chipping Snipe was recorded in Site 9. Snipe were also recorded in some of the other sites during the first survey visits in April, but these were flushed birds, and as drumming/chipping was not recorded in these sites on any visit, these records are likely to have been late departing wintering birds.

No waders were recorded in Site 1. However, several other water bird species were recorded. These included a male Teal on a single date, up to 3 “sharming” Water Rails in each year, as well as small numbers of Mallard and Moorhen.

Wetland-associated passerine species recorded at various sites included Grasshopper Warbler, Sedge Warbler and Reed Bunting.

The full breeding wader survey data is included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Table 3.11. Summary of breeding wader survey results.

Site	Surveyed	Habitat	Breeding waders	Notes
Site 1	2017 and 2018	*Typha* swamp	none	breeding Water Rail
Site 2	2017 and 2018	Wet grassland adjacent to wet woodland	none	-
Site 3	2017	Wet grassland	none	poor quality habitat
Site 4	2017	Wet grassland / scrub	none	poor quality habitat
Site 5	2017	Wet grassland with acid flushes	none	planted with forestry in winter 2017/18
Site 6	2017	Degraded bog/heath	1 drumming Snipe	drained and habitat unsuitable by summer 2018
Site 7	2018	Remnant bog/heath	1 drumming Snipe	-
Site 8	2018	Wet grassland	none	-
Site 9	2018	Semi-improved grassland with wet drains and an area of dry bog	1 chipping Snipe	-
Site 10	2018	Degraded wet grassland with acid fen/flush	none	-

Note, sites 3 and 4 were not fully surveyed due to access issues (see Section 3.1.4).

Woodcock survey

Roding Woodcock were recorded on all the transect surveys. The overall numbers of roding birds recorded in each transect was very similar across the two years, with the highest numbers occurring in transect WK3 (Table 3.12). Roding birds were fairly evenly distributed along each transect. However, a cluster of registrations occurred in WK3 adjacent to the remnant bog/heath habitat complex, while very few registrations occurred in the middle section of WK1 (Figure 3.14).

The peak roding activity occurred shortly after sunset with 45% of observations in the period 5-25 minutes after sunset. Another 28% of observations occurred in period 25-45 minutes after sunset, while few observations occurred before 5 minutes after sunset (16%), or after 45 minutes after sunset (11%). Most roding birds flew at, or just above, or below the canopy and 78% of the observations were in the 15-25 m height bands. Only 2% of observations were in the 25-30 m height band, and no birds were recorded flying higher than 30 m.

The full Woodcock survey data is included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Table 3.12. Summary of Woodcock survey results.

Transect	Registrations per transect			
	2017		2018	
	mean	max	mean	max
WK1	6.3	10	6.0	9
WK2	8.3	11	6.3	8
WK3	10.7	13	10.0	14

Peregrine survey

The Peregrine breeding survey results are summarised in Table 3.13. Evidence of breeding Peregrine was found in two working quarries: Barretstown Quarry, around 5 km north-west of the study area; and Kent Quarry around 8 km south of the study area (Figure 3.15). There was a

previous breeding record from Barretstown Quarry (under the name Knockdrina Quarry) in 2015 (see Section 2.5). The study area is well outside the likely core foraging range of 2 km (SNH, 2016a) for birds from these sites. No evidence of breeding Peregrine was found at any of the other sites surveyed and several of these were deemed to be unsuitable (Table 3.13.).

The full Peregrine survey data is included in the datasets accompanying this report (https://doi.org/10.5281/zenodo.4319836).

Table 3.13. Summary of Peregrine survey results.

Site code	Site name	Site description	Surveyed	Results
BC	Ballyduff Castle	Part of house	2018	Unsuitable
BQ	Barretstown Quarry	Disused quarry	2017	Occupied
CC	Castlebanny Castle	Derelict tower house	2017 and 2018	Unoccupied
CA	Castlecolumb	Derelict tower house	2018	Unoccupied
CQ	Castlegannon Quarry	Working quarry	2018	Unoccupied
DC	Dysart Castle	Derelict tower house	2017 and 2018	Unoccupied
KE	Kent Quarry	Working quarry	2017	Occupied
KI	Kiltorcan Quarry	Working quarry	2017 and 2018	Unoccupied
KC	Knockmoylan Castle	Derelict tower house	2017	Unsuitable
KH	Knockmoylan Church	Small church	2018	Unsuitable
LC	Listerlin Church	Small church	2018	Unsuitable

3.2.4. Incidental observations

Notable incidental observations are listed in Table 3.14. The Hen Harrier, Curlew and Peregrine observations are discussed above with the vantage point survey results (see Section 3.2.1). Jack Snipe is a scarce but widely distributed wintering species that is difficult to detect: it is usually only seen when flushed and only flushes at very close range. Great Spotted Woodpecker has recently colonised Ireland and is rapidly expanding its range from it is initial colonisation sites in Wicklow (Coombes and Wilson, 2015). It is notable that the three records from the Castlebanny study area where the sex was recorded were of females and that no drumming was recorded.

Table 3.14. Notable incidental observations.

Species	Date	Location	Details
Hen Harrier	03/11/2016	near VP2	Male flew at 3-4 m over 2nd rotation Sitka Spruce and Eucalyptus
	21/03/2018	VP5	Ringtail flew south along valley in the period between the two vantage point watches.
Curlew	15/08/2017	VP3	Flock of 100 flew east past vantage point after the end of the vantage point watch
Jack Snipe	13/02/2017	near VP2	Flushed in bog south of vantage point. Flew up to 8 m into burnt bog.
Peregrine	04/07/2018	VP1	1 circled next to a Buzzard at 100 m and then glided SE during a Hen Harrier breeding survey watch.
Great Spotted Woodpecker	24/02/2017	VP3	Female flew across 2nd rotation forestry and landed on a dead stump 50 m south of the vantage point.
	01/07/2017	VP3	Female on dead stump 50 m south of the vantage point.
	10/10/2017	VP1	Female feeding on dead conifers for 10 minutes.
	17/08/2018	VP9	Flew SW from forest close to vantage point.

Note: the Hen Harrier and Curlew flightlines are mapped in Figure 3.13.

3.2.5. Other fauna

Incidental observations of other fauna recorded during the bird survey work are listed in Table 3.15.

Table 3.15. Incidental observations of other fauna recorded during the bird survey work.

Group	Species	Date	Location	Number/ signs	Notes
Butterflies	Dingy Skipper (*Erynnis tages*)	31/05/2018	Forest road around 850 m SE of VP4	1	Near-threatened
	Small Heath (*Coenonympha pamphilus*)	15/07/2017	VP3	1	Near-threatened
Mammals	Red Deer (*Cervus elaphus*)	14/06/2017	Breeding wader site 1	2	
	Sika Deer (*Cervus nippon*)	27/02/2017	Forest road between transects T1 and T3	6	
	Fallow Deer (*Dama dama*)	14/06/2017	VP2	1	A White Fallow Deer Fallow Deer also recorded on several other occasions but details of observations not recorded
	Irish Hare (*Lepus timidus hibernicus*)	14/04/2017	Transect T2	1	
		31/05/2017	Near western end of transect T1	1	
		03/03/2017	Transect T6	2	
	Pine Marten (*Martes martes*)	27/02/2017	Forest road between transects T1 and T3	1	
		17/05/2017	VP3	1	In area of fallen trees close to VP
		08/05/2018	Hen Harrier survey Coolnau VP	1	On the track below VP
Mammals	Badger (*Meles meles*)	14/04/2017	Transect T2	footprint	
		13/06/2017	Woodcock transect WK2	footprint	
		28/06/2017	VP4	footprint	In field entrance to east of VP

Butterfly conservation status from Regan et al. (2010).

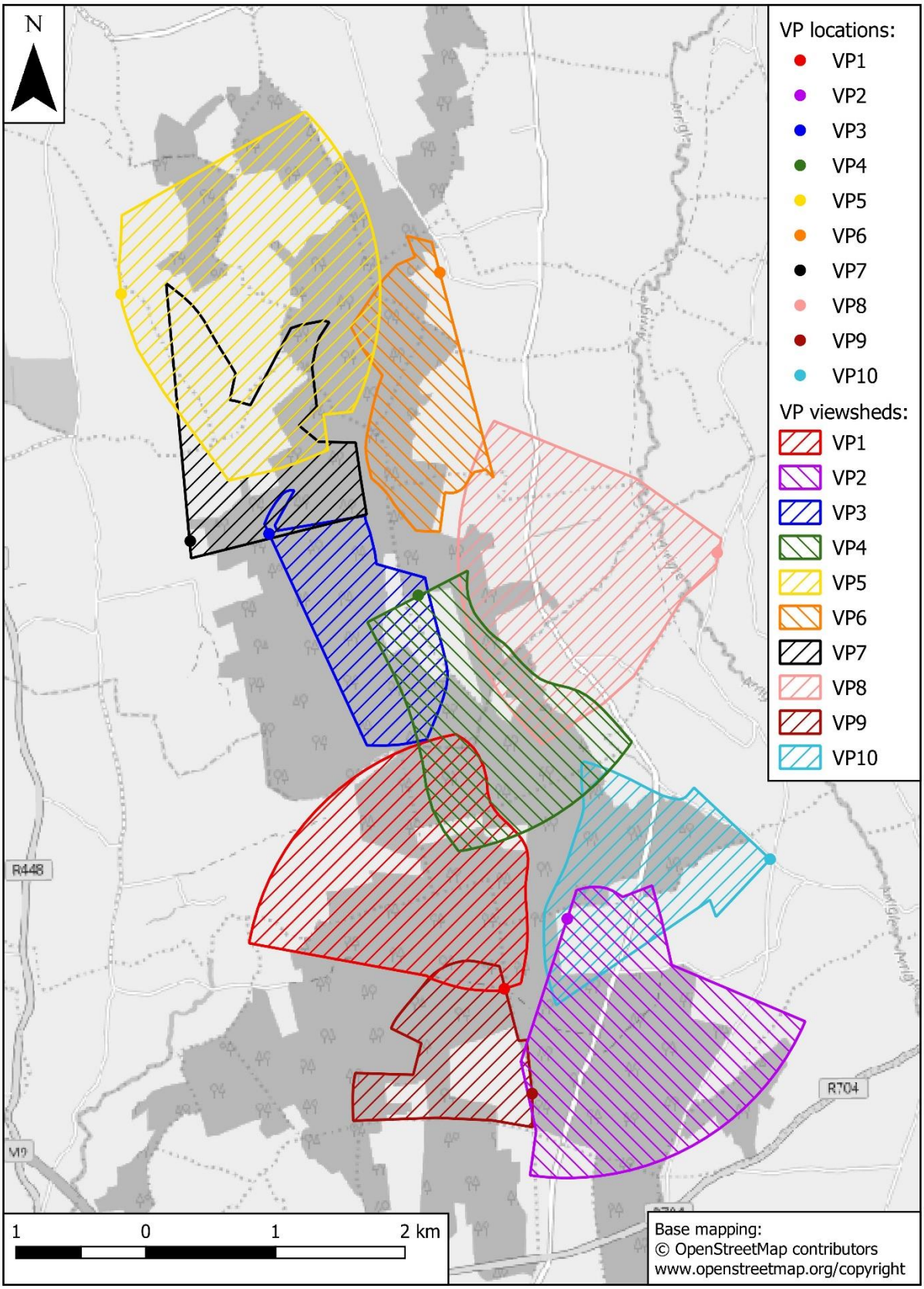

Figure 3.1. Vantage point locations and viewsheds.

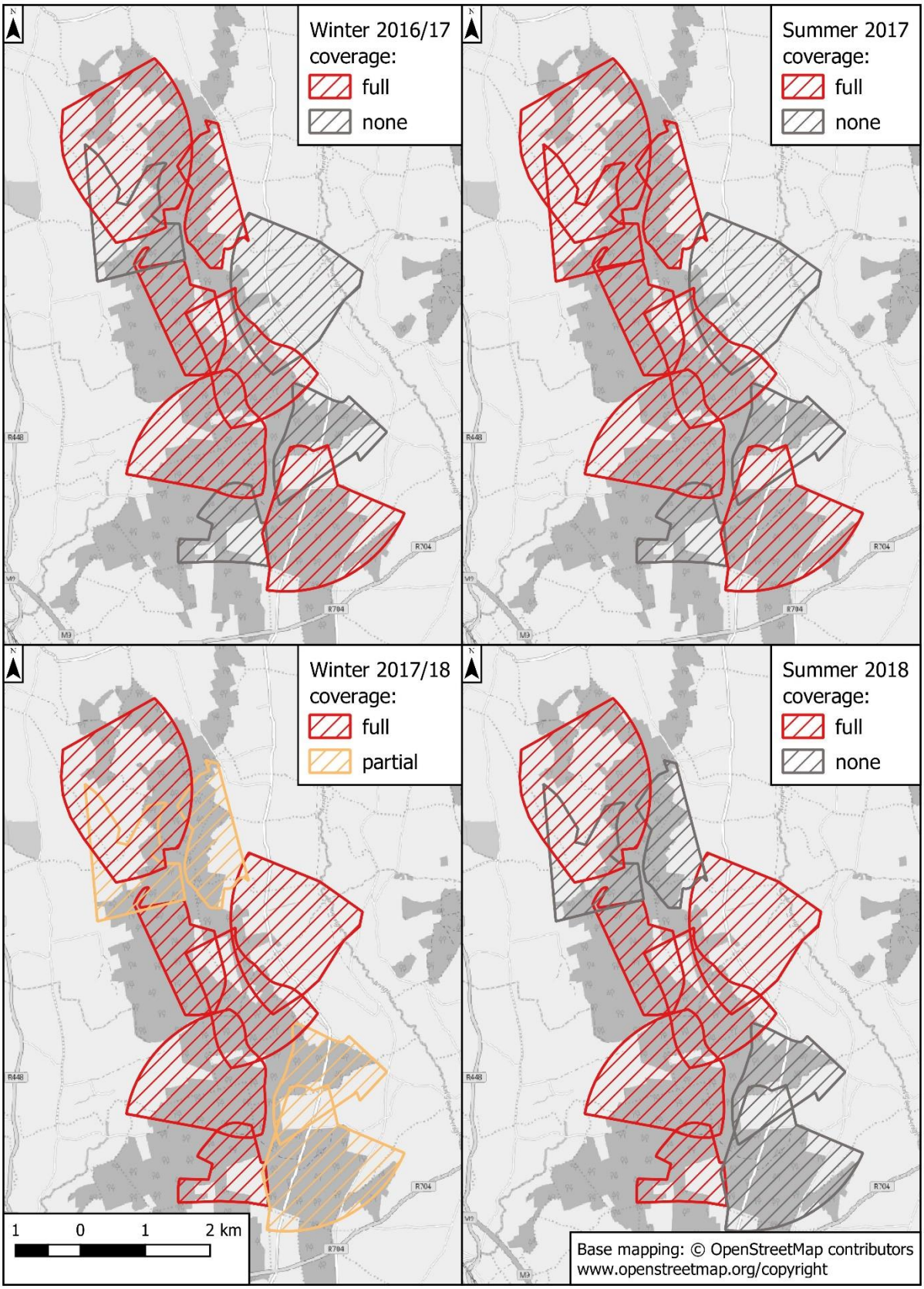

Figure 3.2. Vantage point viewshed coverage in each season.

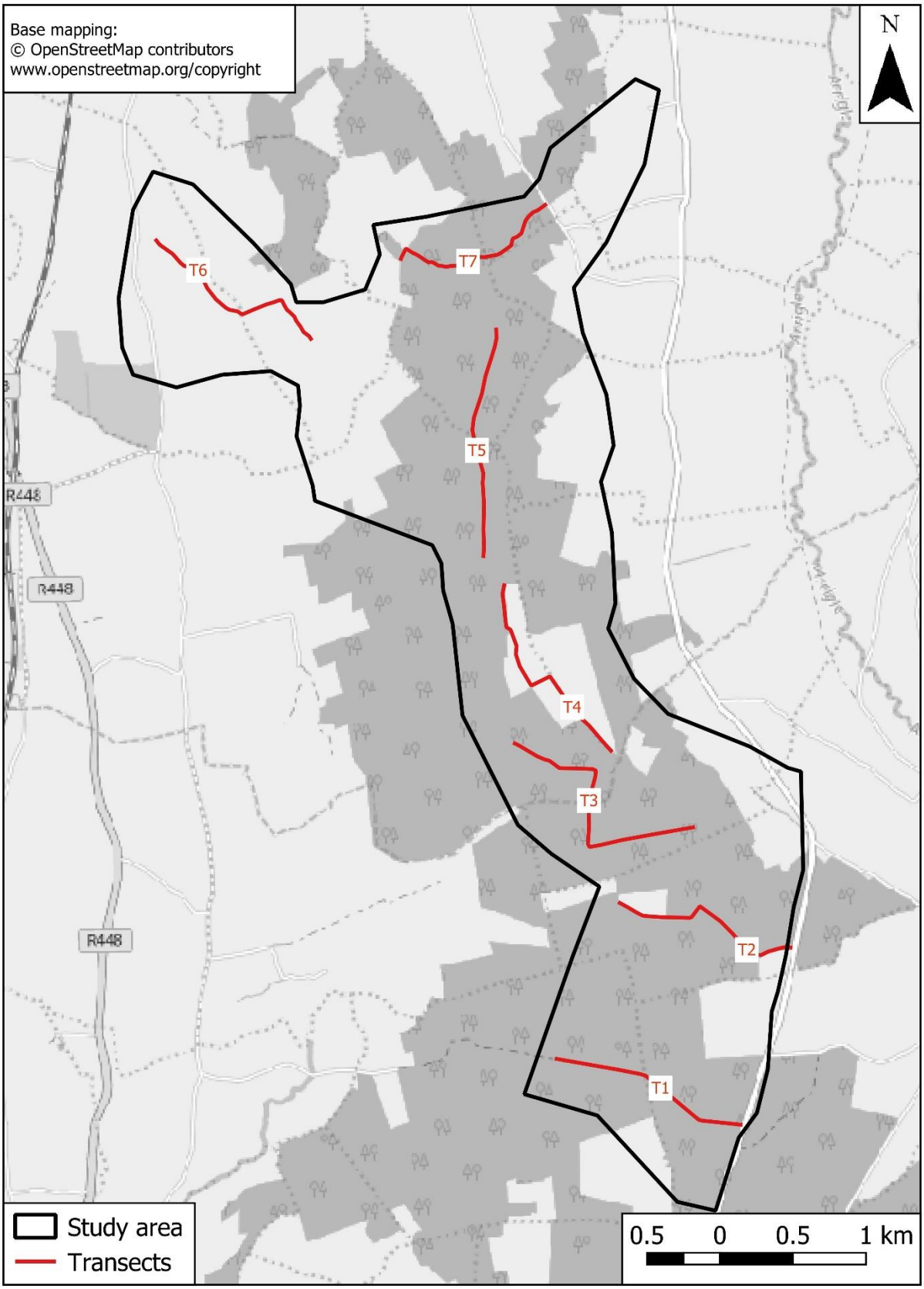

Figure 3.3. Transects used for the general winter bird survey.

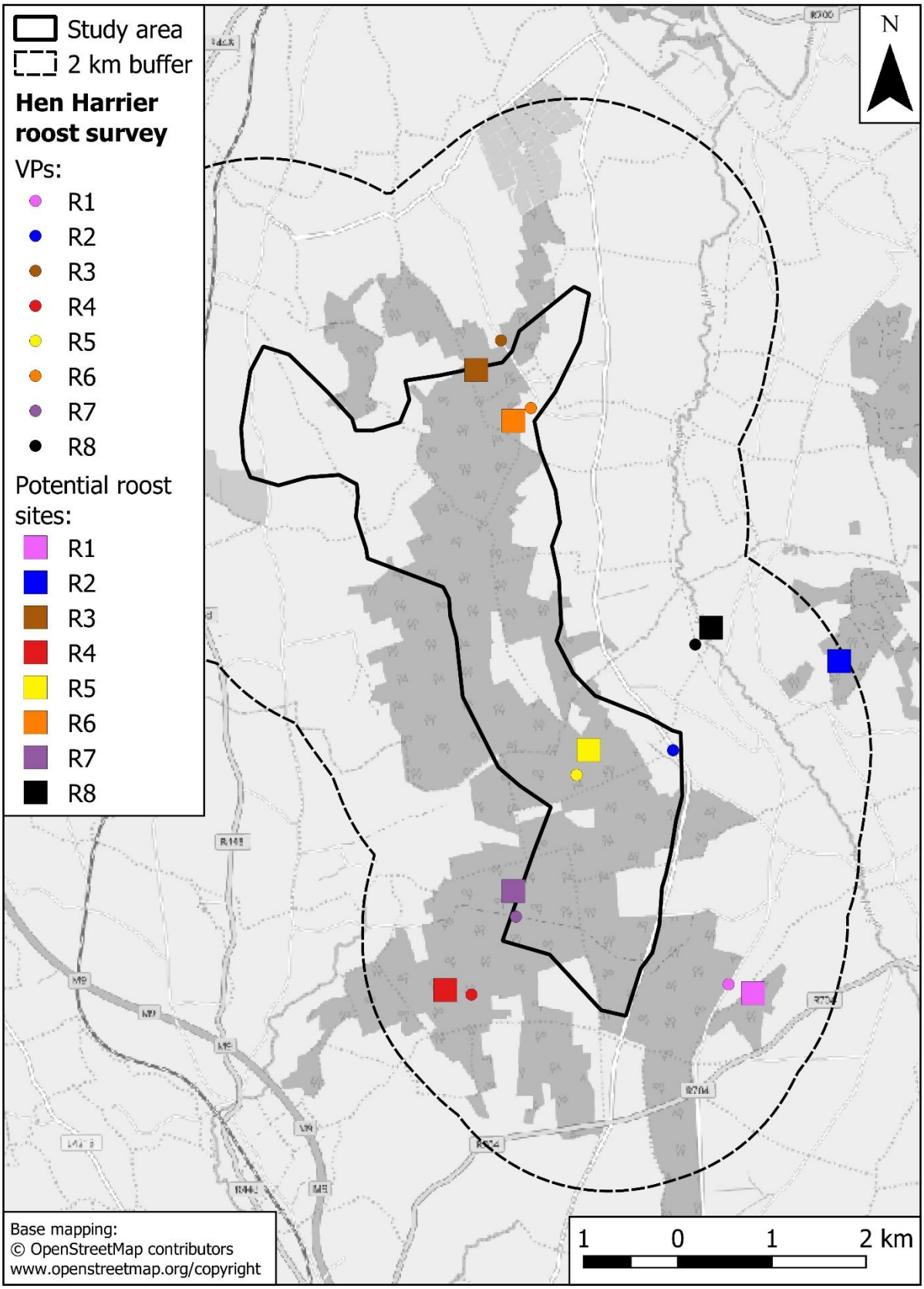

Figure 3.4. Potential roosting habitat covered by the Hen Harrier roost survey

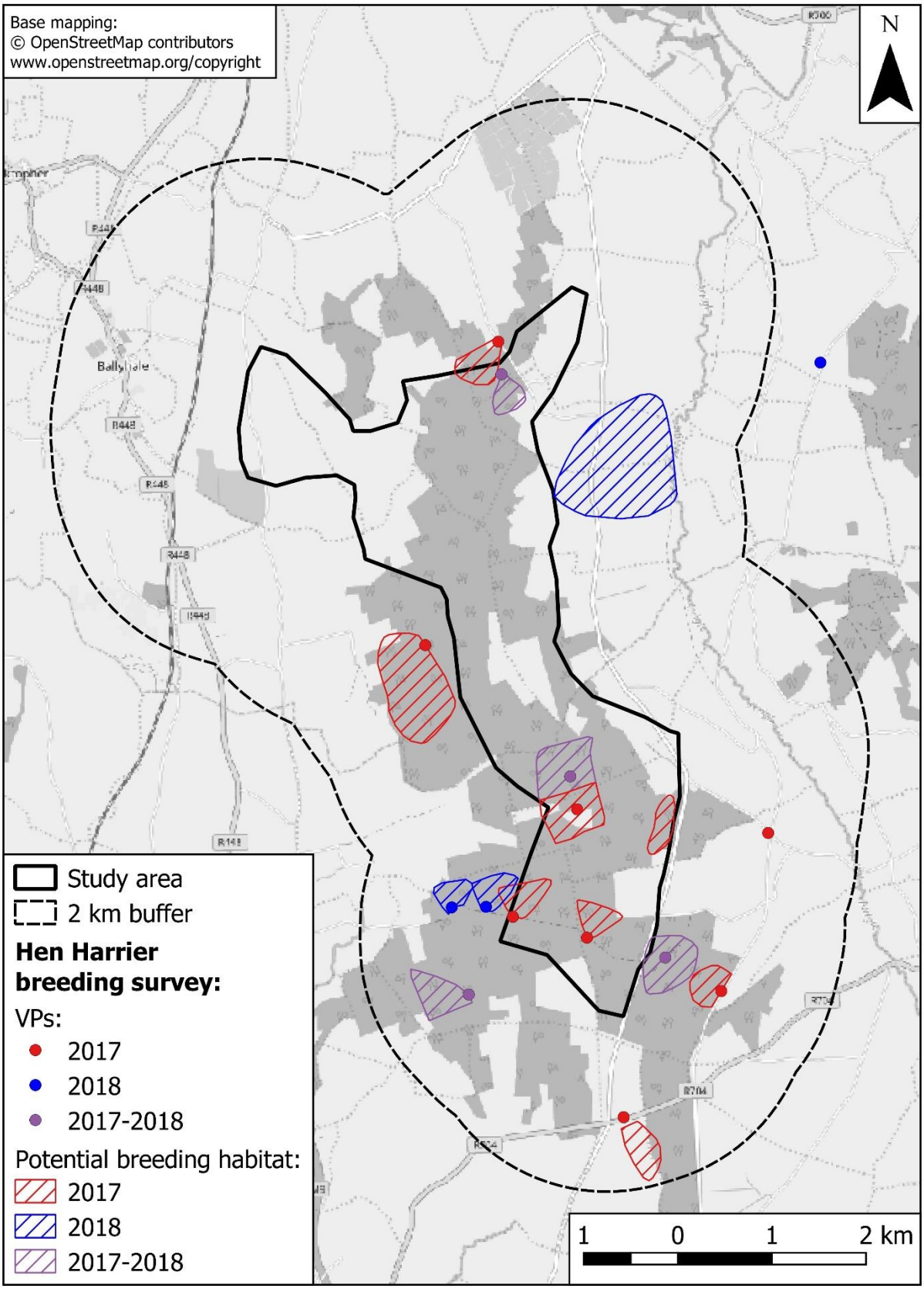

Figure 3.5. Potential breeding habitat covered by the Hen Harrier breeding survey

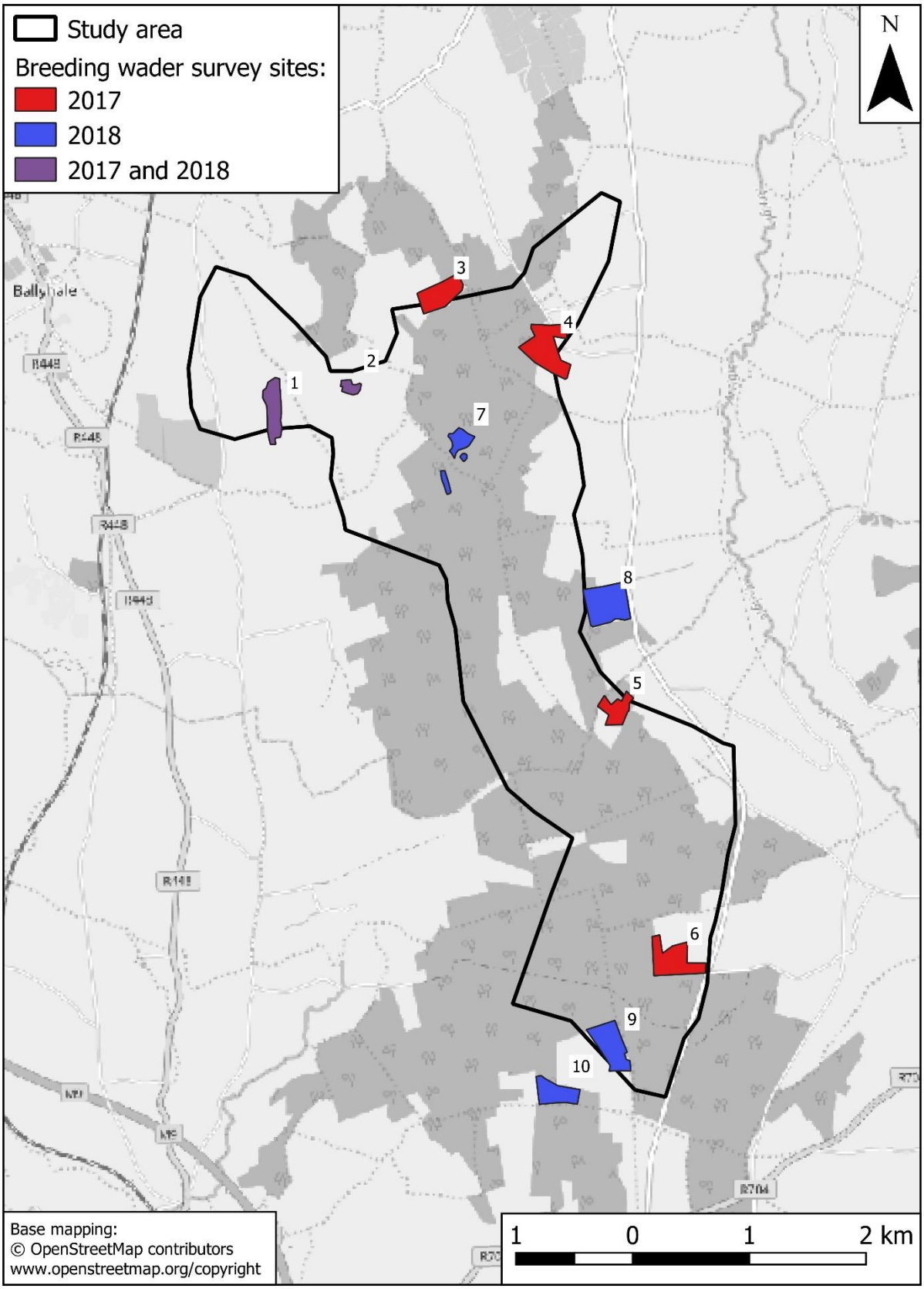

Figure 3.6. Potential wader breeding habitat covered by the breeding wader survey.

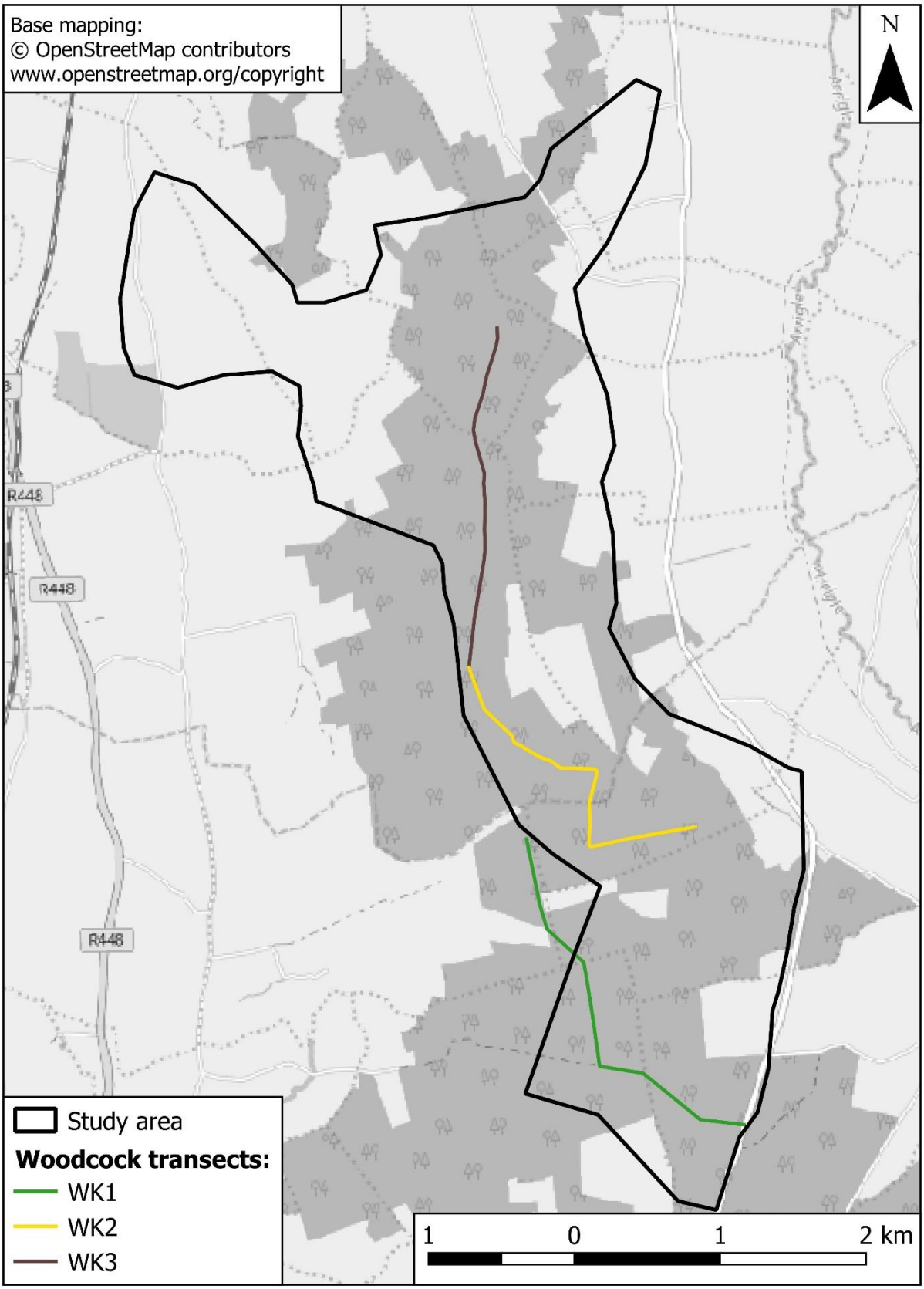

Figure 3.7. Woodcock transect routes.

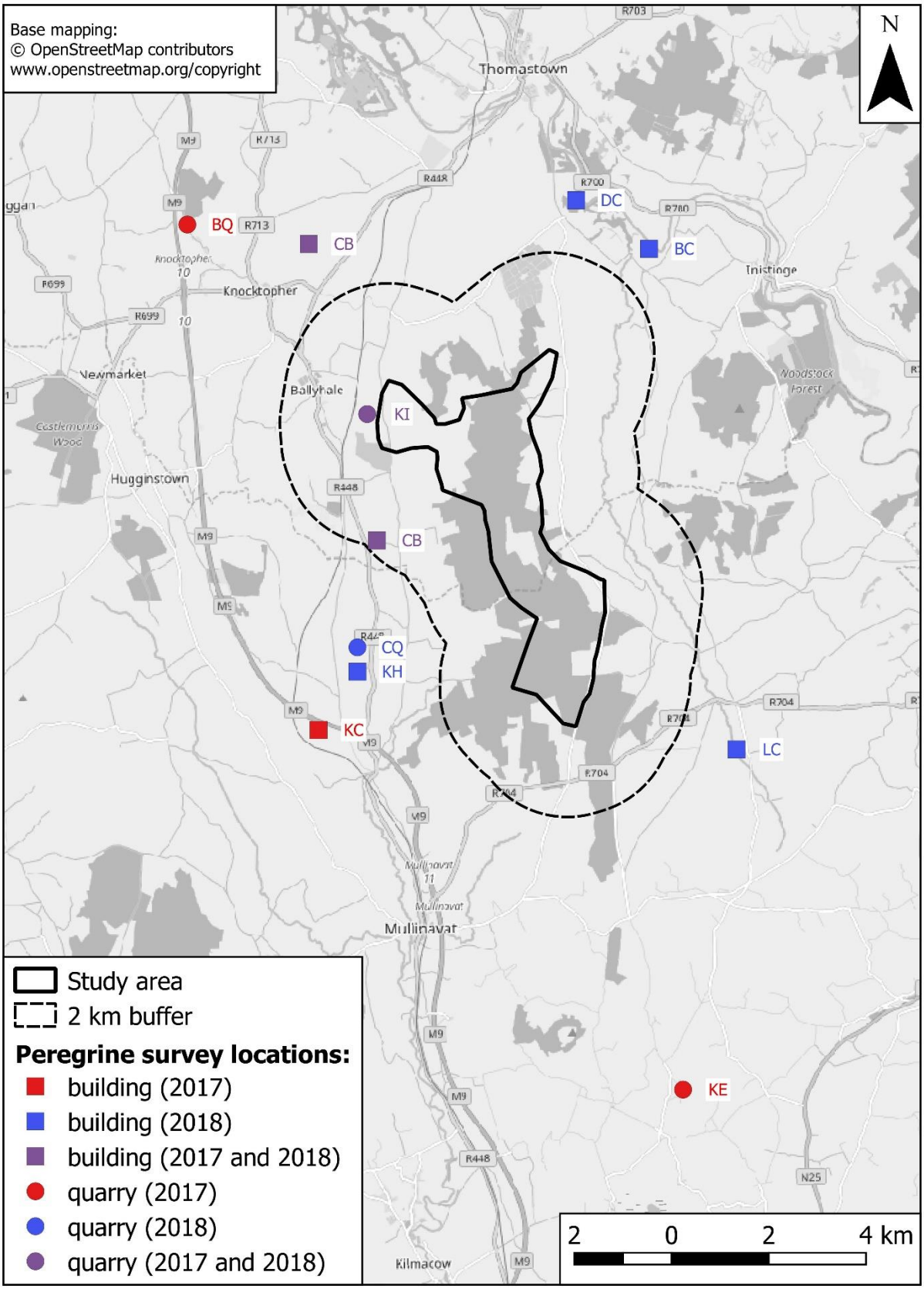

Figure 3.8. Peregrine breeding survey sites.

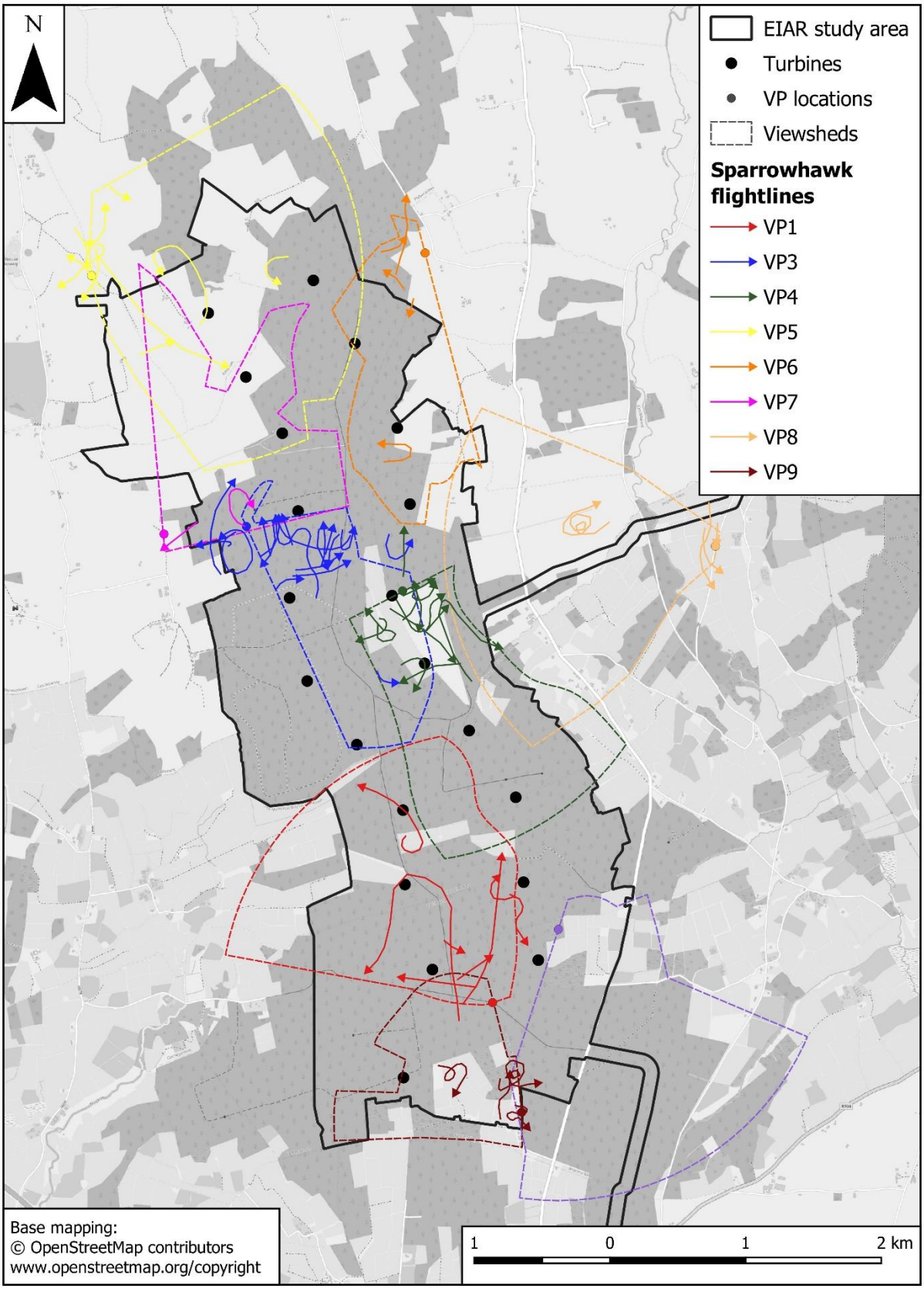

Figure 3.9. Sparrowhawk flightlines recorded during the vantage point surveys.

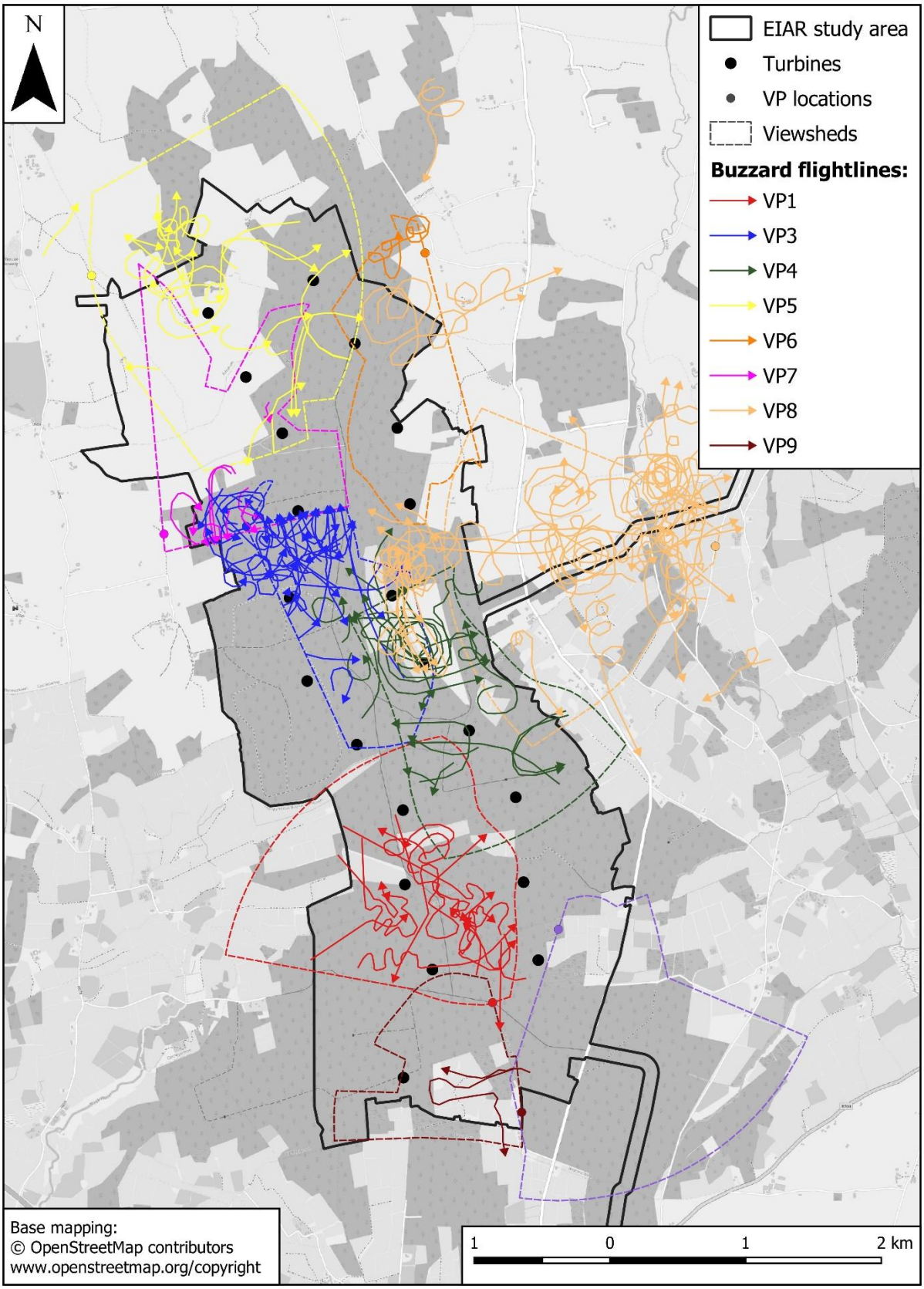

Figure 3.10. Buzzard flightlines recorded during the vantage point surveys.

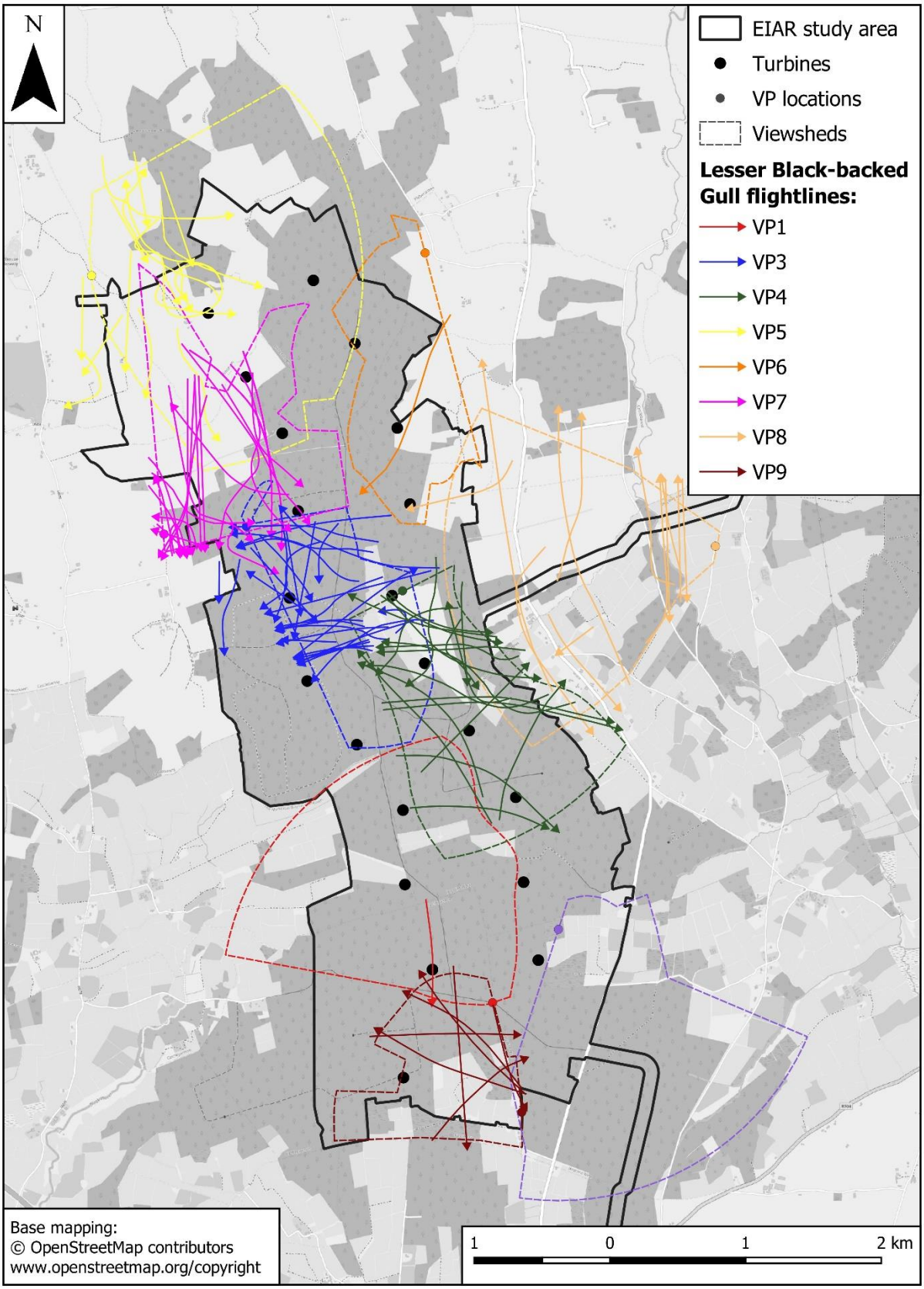

Figure 3.11. Lesser Black-backed Gull flightlines recorded during the vantage point surveys.

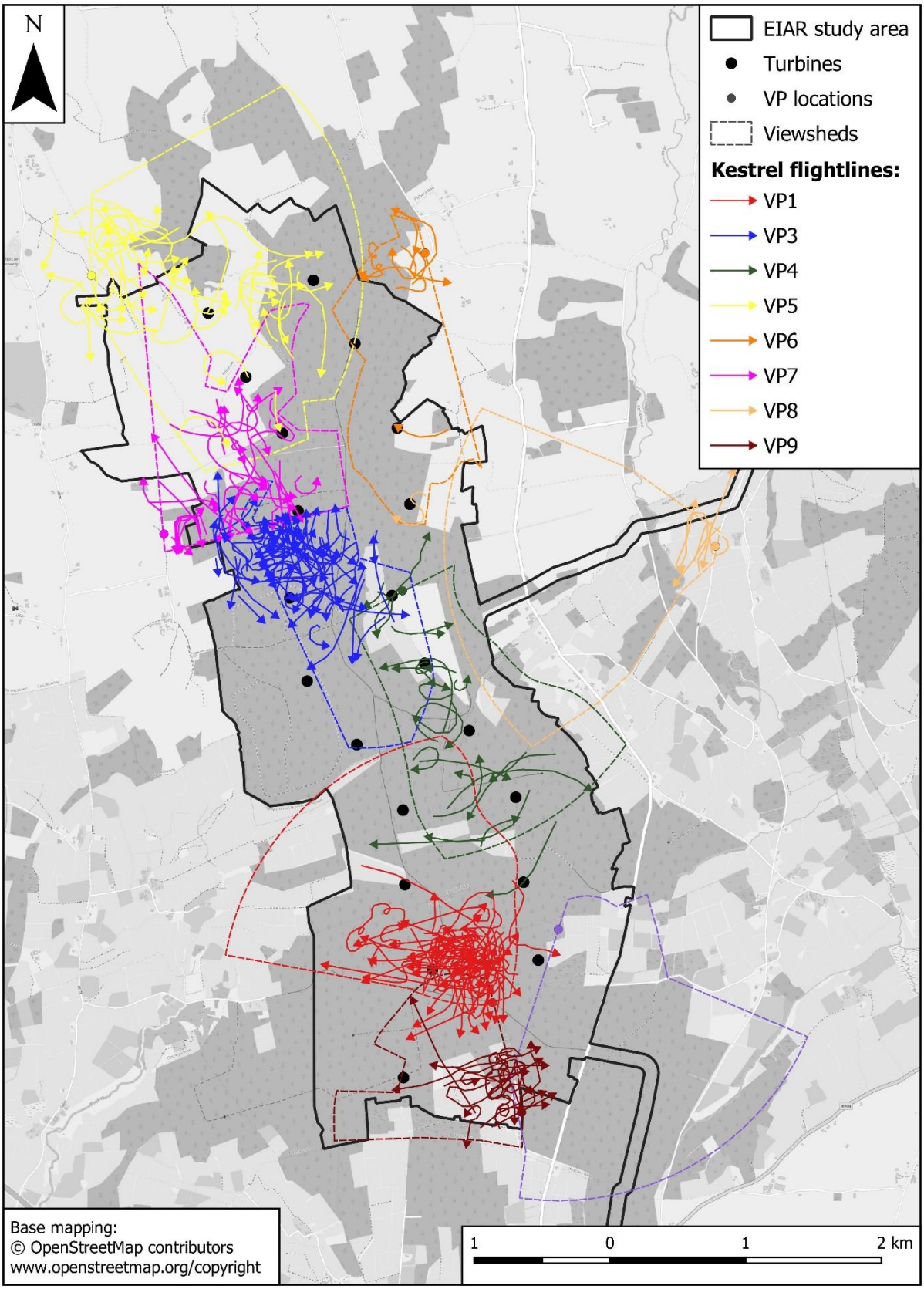

Figure 3.12. Kestrel flightlines recorded during the vantage point surveys

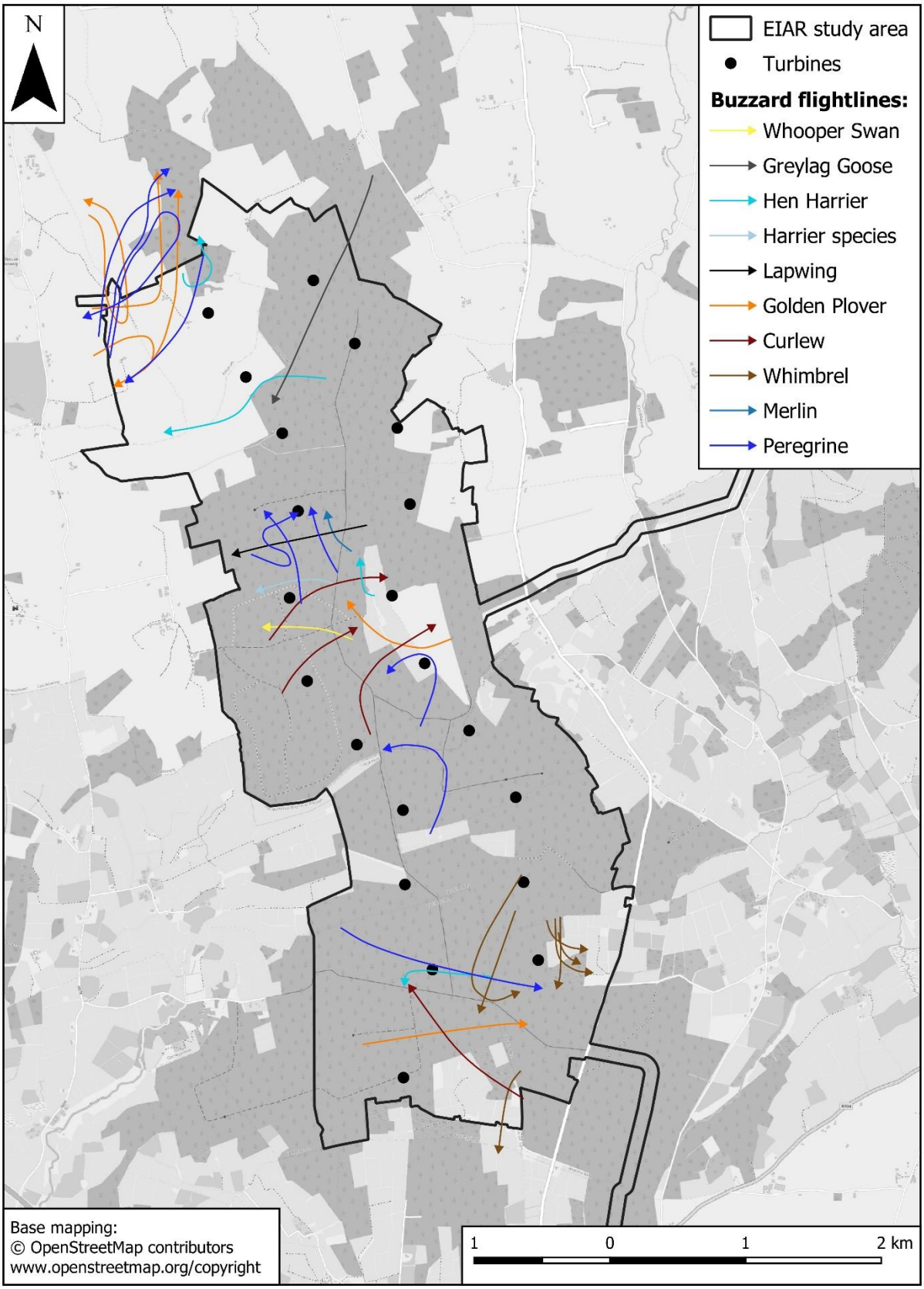

Figure 3.13. Flightlines of other notable species recorded during the vantage point surveys.

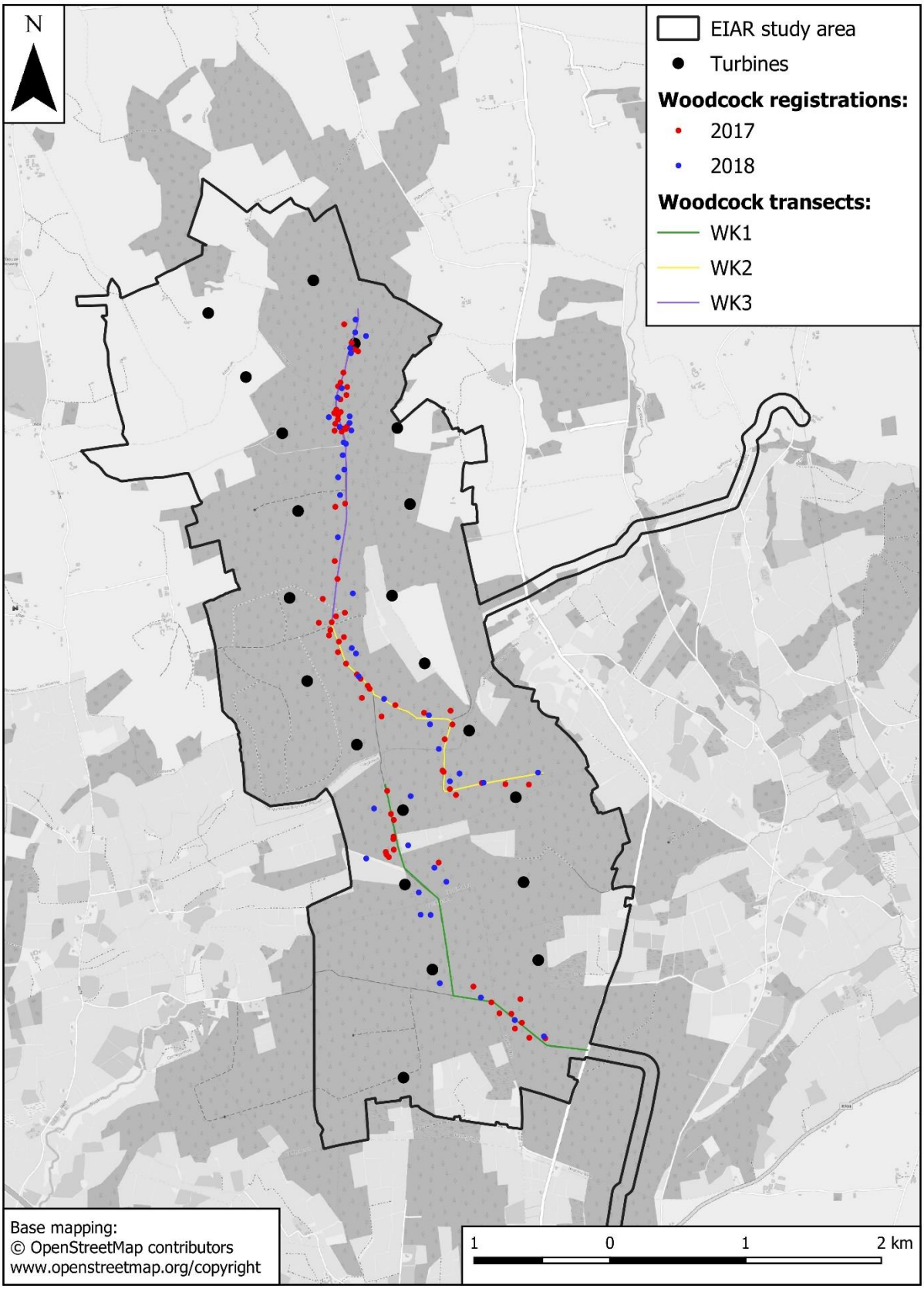

Figure 3.14. Roding Woodcock locations recorded during the Woodcock transect surveys.

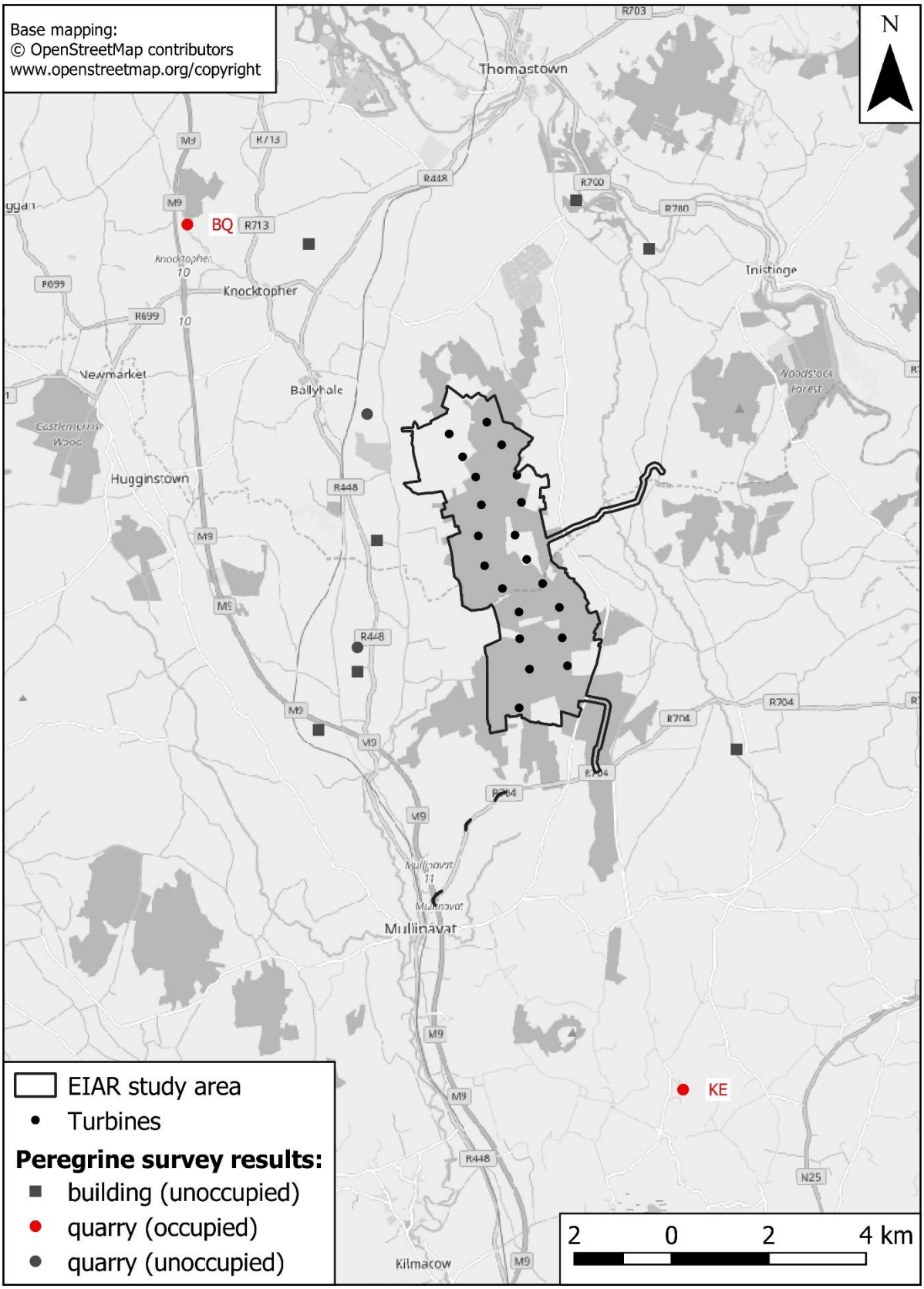

Figure 3.15. Peregrine breeding survey results.

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