

Technical Appendix 7.1. Balgray Wind Farm: Breeding Bird Surveys 2021



Report to Fred Olsen Renewables Ltd

Steve Percival, Tracey Percival, Tom Lowe and Stuart Piner

Ecology Consulting, Swallow Ridge Barn, Old Cassop, Durham DH6 4QB

Email: steve.percival@ecologyconsult.co.uk

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BALGRAY WIND FARM: BREEDING BIRD SURVEYS 2021

Introduction

1. This report describes the breeding bird survey work carried out for a proposed wind farm at Balgray, Dumfries and Galloway. It provides a breeding season's baseline data on the bird populations, activity and flight paths within the vicinity of the wind farm site, to inform subsequent ornithological impact assessment.
2. The surveys have been designed with reference to current NatureScot survey guidance on bird surveys for wind farms (SNH 2017). The survey design was also informed by the previous desk study undertaken by Arcus (November 2020). The surveys were undertaken by Tom Lowe and Stuart Piner, both highly experienced bird surveyors.

Study Area

3. The site is located about 7 km north-east of Lockerbie in Dumfries and Galloway. The breeding bird survey area (see Figure 1) was chosen to include all areas within the possible zone of ornithological influence of the proposed wind farm. This included the wind farm site, plus a 500 m buffer for the main breeding bird surveys (the core survey area, following NatureScot guidance, SNH 2017) and a 2 km buffer for the key species surveys (the wider survey area), where access was possible and where there was potentially suitable habitat. The extents of these areas are shown in Figure 1. The main core survey area covered a total area of 15.1 km² and the wider survey area 44.3 km². It comprised predominantly upland moorland habitat, currently used mainly for grazing sheep, surrounded by commercial conifer plantation and agriculturally improved grassland.

Breeding Bird Survey Methods

4. The aim of the breeding season fieldwork was to obtain data on the importance of the wind farm site and its surrounds for breeding birds, and on the flight lines of key target species. They included moorland bird surveys, raptor surveys and black grouse surveys.

Core Breeding Bird Surveys

5. The main breeding bird walkover survey followed the standard moorland survey method (Brown and Shepherd 1993) but with two additional visits as recommended in current NatureScot guidance (SNH 2017). They commenced in April and continued through to July and were done between 8:30 and 18:00 hours. The survey dates were 20 April, 18 May, 21 June and 6 July 2021. These surveys covered all of the open (i.e. non-forested) habitat within a buffer zone of 500 m around the developable area where access/viewing was possible. Access was not allowed into the buffer to the east

of the site, so in that area surveys were restricted to public access. The restricted access area is shown in Figures 2-14.

6. All bird locations and behaviour were mapped to 1:10,000 scale, using the standard BTO Common Birds Census notation. All species were recorded. In addition, the survey effort per unit area was standardised to make the surveys as repeatable as possible, recording systematically for approximately 2 hours per km². A route was chosen to ensure that all parts of the study area were covered to within about 100m of the observer, where access was possible. The survey route was plotted on the survey map as it was carried out.
7. The surveys avoided strong winds, heavy rain, fog and low cloud. Birds were located by walking, listening and scanning by eye and with binoculars. Standard BTO notation will be used to record the birds' activities; singing, calling, carrying nest material, nests or young found, repetitively alarmed adults, disturbance displaying, carrying food or in territorial dispute.
8. The survey data were analysed to determine spatially distinct clusters of records, equivalent to breeding territories (following Brown and Shepherd 1993), with the number of such territories used to calculate the breeding population for each species (Gilbert *et al.* 1998). A record in potentially suitable breeding habitat on a single visit was considered sufficient to indicate a potential breeding attempt.

Raptor Breeding Surveys

9. As the survey area was considered likely, from the results of the desk study and the site location, to be used by a range of scarce raptors, raptor surveys of a 2 km buffer zone around the developable area were undertaken during April-July 2021. Raptor surveys comprised walkovers where access was allowed and supplemented by a series of mini-VPs (shorter watches from additional VPs) to cover other areas. This detects displaying or nesting behaviour during the breeding season of raptor species in accordance with methods described in Gilbert *et al.* (1998) and Hardey *et al.* (2013). Surveys recorded all Schedule 1 and Annex I raptor species but with a focus on those species for which evidence of breeding has previously been recorded in the vicinity (including goshawk, red kite, peregrine, barn owl and short-eared owl) and where potentially suitable breeding habitat for these species is present. This included four survey visits, undertaken on 20 April, 18 May, 10/18 June and 6/8 July.

Black Grouse Surveys

10. Black grouse surveys were undertaken following the methods outlined in Gilbert *et al.* (1998). All suitable black grouse habitat within the site boundary and a 2km buffer was surveyed during April - mid-May. Surveys were carried out on 21/22 April, 8 and 18 May. Areas of suitable habitat outside the site and inaccessible were scanned with binoculars from the site boundary, from publicly accessible locations and from suitable vantage points within the site. A three-visit survey was undertaken as follows:
 - Visit 1: site visit to assess habitat for black grouse suitability;
 - Visit 2: areas of suitable habitat with the potential to support lekking black grouse were visited twice on different mornings to establish presence/absence; and

- Visit 3: any locations where black grouse were recorded as present during the second visit were revisited in order to provide an accurate count of the number of lekking birds present. The survey was undertaken one hour prior to dawn until one hour after dawn.

Vantage Point Surveys

11. Vantage Point surveys were carried out to determine bird flight activity within the wind farm site to assess collision risk. The surveys quantified the bird numbers that could potentially be at risk of collision (including roost flight observations at dawn/dusk). All flight lines of target species were mapped, and the flight height of each flock recorded. Target species included all EU Birds Directive Annex 1 species, Wildlife & Countryside Act (1981) Schedule 1 species and Red-listed birds of Conservation Concern (Eaton *et al.* 2015), as per NatureScot (SNH 2017).
12. The specific aim of the VP surveys was to collect data on key target species flight activity to enable estimates of:
 - The time spent flying over the survey area.
 - The relative use made of different parts of the survey area.
 - The proportion of flying time spent at different elevations above the ground.
13. Three vantage points were used to cover the wind farm site. The computer-generated viewsheds (using Global Mapper v21) are shown in Figure 1. For each VP, a basic 36 hours' VP surveys during the breeding season from each VP were carried out (as set out in NatureScot guidance), spread evenly across the breeding season. As the site lies within the potential SPA connectivity distance from the Castle Loch SPA (for which pink-footed geese are a qualifying feature) and within a known goose feeding area (SNH 2013, Mitchell 2012), an additional six hours' VP for each VP was carried out in April to provide extra survey effort in the main goose migration season.
14. All key target species flights (and any other species of specific nature conservation interest) were recorded, irrespective of their distance from the vantage point. Observations were carried out throughout daylight hours but not in periods of severely reduced visibility (<3 km).
15. During the VP surveys, all key target species flights were mapped and cross-referenced to a standard recording form using a numbering system, and the flight height of each recorded. Heights were estimated as accurately as possible using available reference structures and recorded as a raw estimate rather than being summarised to height classes. Below 10 m estimates were made to 1 m, between 10 and 20 m to 2 m, between 20 m and 50 m to 5 m, and above 50 m to 10 m. When birds were observed over an extended period, estimates of flight height were recorded every 30 seconds. The activity during each flight was also recorded. Particular attention was paid to any observations of birds at rotor height.

Breeding Bird Survey 2021 Results

Core Breeding Bird Survey Results

16. The breeding bird populations found within the core breeding bird survey area during the 2021 breeding bird surveys are summarised in Table 1.

Table 1. Breeding bird populations in the Balgray core survey area during April-July 2021.

Species	Estimated numbers of breeding pairs
Mute Swan	3
Canada Goose	4
Mallard	9
Tufted Duck	7
Red-legged Partridge	1
Pheasant	65
Little Grebe	2
Buzzard	10
Kestrel	1
Moorhen	4
Coot	2
Oystercatcher	2
Lapwing	5
Snipe	9
Curlew	5
Common Sandpiper	1
Feral Pigeon	1
Stock Dove	5
Woodpigeon	70
Collared Dove	1
Cuckoo	2
Great Spotted Woodpecker	5
Skylark	124
Sand Martin	3
Swallow	34
House Martin	8
Tree Pipit	3
Meadow Pipit	327
Grey Wagtail	4
Pied Wagtail	25
Dipper	2
Wren	68
Dunnock	12
Robin	55
Redstart	7
Whinchat	1
Stonechat	11
Wheatear	13
Blackbird	52
Song Thrush	41
Mistle Thrush	16
Sedge Warbler	7
Blackcap	5
Whitethroat	3
Chiffchaff	4
Willow Warbler	64
Goldcrest	24

Species	Estimated numbers of breeding pairs
Spotted Flycatcher	2
Long-tailed Tit	2
Blue Tit	26
Great Tit	24
Coal Tit	32
Nuthatch	1
Treecreeper	4
Jay	4
Magpie	1
Jackdaw	24
Carrion Crow	40
Raven	6
Starling	11
House Sparrow	7
Chaffinch	145
Goldfinch	34
Siskin	34
Linnet	12
Lesser Redpoll	16
Common Crossbill	4
Bullfinch	2
Reed Bunting	28

17. The distributions of the breeding birds of conservation importance within the survey area in 2021 are shown on Figures 2 to 14. The more abundant species (i.e. 10 or more breeding pairs) of conservation interest have been presented separately for clarity.
- **Breeding waders** (Figure 2) - five species of waders were recorded breeding within the core breeding bird survey area: oystercatcher, lapwing, snipe, curlew and common sandpiper. They were widely scattered across the open ground within the survey area with no notable concentrations, though both snipe and curlew were more abundant in the central part of the survey area.
 - **Skylark** (Figure 3) and **Meadow Pipit** (Figure 4) were both abundant over all the open moorland habitat within the survey area, though with less on the lower areas of more agriculturally improved grassland.
 - **Song Thrush** (Figure 5) and **Mistle Thrush** (Figure 6) were both common but largely restricted to the woodland habitats within the survey area.
 - **Dunnock** (Figure 7) and **Willow Warblers** (Figure 8) were common within the wooded habitat on the edges of the survey area.
 - **Starling** (Figure 9) were mainly associated with human habitation and farm buildings.
 - **Siskin** (Figure 10) were another woodland species found mainly on the edges of the survey area.
 - **Linnet** (Figure 11) were widely scattered over the more open/scrubby parts of the survey area.
 - **Lesser Redpoll** (Figure 12) were another widely distributed mainly forest species.

- **Reed Bunting** (Figure 13) were another common open ground species, associated mainly with wetter habitats across the survey area.
18. Other less abundant species of conservation importance (Figure 14) were found mainly in the fringes of the survey area, with no important concentrations noted and few within the wind farm site itself.
 19. Additional species seen during the breeding bird surveys but not showing any evidence of breeding within the survey area included (peak counts): grey heron (1), sparrowhawk (2), merlin (1), green sandpiper (1), lesser black-backed gull (48), herring gull (25), great black-backed gull (1), swift (38), redwing (1), fieldfare (343) and rook (154).

Raptor Survey Results

20. **Red Kite** - a pair of red kites were recorded nesting during the breeding bird surveys, but more than 1 km from the site boundary. Further details are given in the Confidential Appendix (Technical Appendix 7.9).
21. **Goshawk** - this species was seen during the VP and the raptor surveys, but no nest was located within the core or wider survey area. It is likely however that it was breeding in the vicinity of the wider area. Further details are given in the Confidential Appendix (Technical Appendix 7.9).
22. **Osprey** - this species was occasionally seen fishing on Hallhills Loch within the core survey area (Figure 15) but there was no evidence found of breeding within the core or the wider survey area.
23. **Merlin** - there was a single record of this species overflying during the VP surveys (Figure 15) and during the core breeding bird surveys, but no evidence of breeding within the core or the wider survey area.
24. **Peregrine** - there were two records of this species overflying during the VP surveys (Figure 15) and a single juvenile bird was seen during the raptor surveys, but no evidence of breeding within the core or the wider survey area.
25. **Barn Owl** - there was a single record of this species flying over the NE corner of the core survey area during the black grouse survey on 21/4/21, but no evidence was found of breeding within the survey area.

Black Grouse Survey Results

26. There were no records of black grouse during the 2021 surveys.

Vantage Point Survey Results

27. The rates of bird flight movement observed across the survey area during the vantage point surveys are summarised in Table 2. This gives the flight rate per hour recorded in each month and the total number of flights recorded.
28. Table 2 also gives the percentage of flights of each species that were recorded at rotor height (taking rotor height conservatively - to allow for errors in estimation and

uncertainty as to turbine specification at this stage - as between 21 m and 200 m above ground level).

29. **Red kite** flight activity was widely distributed over the whole of the core breeding bird survey area, with a concentration of activity around the nest site in the SE corner of the core breeding bird survey area. **Goshawk** were seen mostly around the forested areas in the eastern part of the survey area. Red kite and goshawk data are included within the Confidential Appendix (TA 6.9) as they indicate breeding sites. Other key species' flight lines are mapped in Figures 15-17. Figure 15 shows the flight lines observed of the other scarce raptor species seen during the VP surveys (**osprey, merlin, peregrine**).
30. **Golden plover** (Figure 16) were seen mainly in the central part of the core breeding bird survey area. All records were spring migrants passing through the site in April rather than locally breeding birds (there were no records after April).
31. Breeding wader (**oystercatcher, lapwing, snipe and curlew**) flight activity (Figure 17) was broadly similar to the distribution of the breeding birds, with birds distributed widely over the open habitats of the core breeding bird survey area.

Table 2. Bird flight rates recorded over the Balgray survey area during April-August 2021 vantage point surveys. N = 42 hours total observation from each of the three VPs.

Species	Flight rate (birds/hour)					Total number of birds overflying	% flights at rotor height
	April	May	June	July	Aug		
Mute Swan	-	0.09	-	-	0.15	5	0%
Greylag Goose	0.30	-	-	-	-	12	67%
Canada Goose	0.15	-	-	-	-	6	33%
Mallard	0.15	0.04	-	-	-	7	100%
Grey Heron	0.07	0.04	-	0.05	0.05	6	67%
Red Kite	0.32	0.58	0.14	0.20	0.45	42	69%
Goshawk	0.20	0.13	-	0.05	-	12	50%
Sparrowhawk	0.07	0.09	0.05	0.05	-	7	29%
Buzzard	3.68	1.91	1.41	1.46	0.55	264	80%
Osprey	0.05	-	-	-	-	2	100%
Kestrel	0.84	0.62	0.36	0.83	0.60	85	32%
Merlin	0.02	-	-	-	-	1	0%
Peregrine	0.05	-	-	-	-	2	100%
Oystercatcher	-	-	0.09	-	-	2	100%
Golden Plover	20.47	-	-	-	-	829	73%
Lapwing	0.25	0.80	1.45	0.24	-	65	15%
Snipe	0.02	0.62	1.41	0.10	-	48	61%
Curlew	0.94	0.09	0.14	0.20	-	47	44%
Common Gull	0.02	0.09	-	-	-	3	100%
Lesser Black-backed Gull	16.20	7.69	1.95	1.27	3.30	964	80%
Herring Gull	0.57	1.56	0.05	0.05	-	60	88%
Great Black-backed Gull	0.42	-	0.23	0.34	-	29	91%
Black-headed Gull	-	0.13	-	-	-	3	100%

Conservation Evaluation of Breeding Bird Populations

32. The conservation value of the breeding bird populations was determined using the criteria specified in Table 3 (from Percival 2007) and is summarised in Table 4. This includes the criteria adopted by NatureScot in Guidelines for Selection of Biological SSSIs (Drewitt *et al.* 2020), using 1% of the resource to define international and national importance (Frost *et al.* 2021). An additional category of regional importance was assigned for species approaching the threshold for national importance and those for which the survey area held a notable concentration in a county context. A further category of 'local importance' was used for species that did not reach regional importance but were still of some ecological value. This included all species on the red or amber lists of the 'Birds of Conservation Concern' (Eaton *et al.* 2015) that did not reach national or regional importance at the development site. National (GB) and International wintering waterfowl baseline populations have been taken from the most recently published population figures (Frost *et al.* 2021) from the national Wetland Birds Survey and other species from Woodward *et al.* (2020). In addition, listing on Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act 1981, UK Biodiversity Action Plan (BAP) priority species and Scottish BAP species were all considered in the evaluation process.

Table 3. Definition of terms relating to the sensitivity of the ornithological receptors at the site.

Conservation Value	Definition
VERY HIGH	Cited interest of SPAs, SACs and SSSIs. Cited means mentioned in the citation text for the site as a species for which the site is designated (SPAs/SACs) or notified (SSSIs).
HIGH	Other species that contribute to the integrity of an SPA or SSSI. A local population of more than 1% of the national population of a species. EU Birds Directive Annex 1, EU Habitats Directive priority habitat/species and/or W&C Act Schedule 1 species. Ecologically sensitive species, e.g. large birds of prey or rare birds (<300 breeding pairs in the UK).
MEDIUM	Regionally important population of a species, either because of population size or distributional context. NERC Act Section 41 priority species (if not covered above).
LOW	Any other species of conservation interest, e.g. species listed on the Birds of Conservation Concern not covered above, present in only locally important numbers. Scottish BAP species (if not covered above).
NEGLECTIBLE	Green-listed species (Eaton <i>et al.</i> 2015) of favourable conservation status

Table 4. Conservation evaluation of the breeding bird populations in the core Balgray survey area.

Species	Estimated breeding pairs 2021	EU Birds Dir Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
<i>Breeding Species:</i>							
Mute Swan	3			A			Low
Canada Goose	4						Negligible
Mallard	9			A			Low

Species	Estimated breeding pairs 2021	EU Birds Dir Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Tufted Duck	7						Negligible
Red-legged Partridge	1						Negligible
Pheasant	65						Negligible
Little Grebe ³	2						Negligible
Red Kite	1	✓	✓			✓	High
Buzzard ²	10						Negligible
Kestrel	1			A		✓	Low
Moorhen	4						Negligible
Coot	2						Negligible
Oystercatcher ²	2			A			Low
Lapwing	5			R	✓	✓	Medium
Snipe ²	9			A			Low
Curlew ²	5			R	✓	✓	Medium
Common Sandpiper	1			A			Low
Feral Pigeon	1						Negligible
Stock Dove	5			A			Low
Woodpigeon	70						Negligible
Collared Dove	1						Negligible
Cuckoo ^{2.5}	2			R	✓	✓	Medium
Great Spotted Woodpecker	5						Negligible
Skylark	124			R	✓	✓	Medium
Sand Martin	3						Negligible
Swallow	34						Negligible
House Martin	8			A			Low
Tree Pipit	3			R	✓	✓	Medium
Meadow Pipit	327			A			Low
Grey Wagtail ²	4			R			Low
Pied Wagtail	25						Negligible
Dipper ^{2.5}	2			A			Low
Wren	68						Negligible
Dunnock	12			A	✓		Medium
Robin	55						Negligible
Redstart	7			A			Low
Whinchat ²	1			R			Low
Stonechat ²	11						Negligible
Wheatear ¹	13						Negligible
Blackbird	52						Negligible
Song Thrush	41			R	✓	✓	Medium
Mistle Thrush	16			R			Low
Sedge Warbler	7						Negligible
Blackcap	5						Negligible
Whitethroat	3						Negligible
Chiffchaff	4						Negligible
Willow Warbler	64			A			Low
Goldcrest	24						Negligible
Spotted Flycatcher	2			R	✓	✓	Medium
Long-tailed Tit	2						Negligible
Blue Tit	26						Negligible
Great Tit	24						Negligible
Coal Tit	32						Negligible
Nuthatch	1						Negligible
Treecreeper	4						Negligible

Species	Estimated breeding pairs 2021	EU Birds Dir Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Jay	4						Negligible
Magpie	1						Negligible
Jackdaw	24						Negligible
Carrion Crow	40						Negligible
Raven ³	6						Negligible
Starling	11			R	✓		Medium
House Sparrow	7			R	✓	✓	Medium
Chaffinch	145						Negligible
Goldfinch	34						Negligible
Siskin	34					✓	Low
Linnet	12			R	✓	✓	Medium
Lesser Redpoll	16			R	✓	✓	Medium
Common Crossbill	4		✓				High
Bullfinch	2			A	✓	✓	Medium
Reed Bunting	28			A	✓	✓	Medium
<i>Additional non-breeding species:</i>	<i>Peak count</i>						
Grey Heron	1						Negligible
Osprey	1	✓	✓	A		✓	High
Goshawk	1		✓				High
Sparrowhawk	2						Negligible
Merlin	1	✓	✓	R		✓	High
Peregrine	1	✓	✓			✓	High
Green Sandpiper	1			A		✓	Low
Lesser Black-backed Gull	48			A			Low
Herring Gull	25			R	✓	✓	Medium
Great Black-backed Gull	1			A			Low
Swift	38			A		✓	Low
Fieldfare	343			R			Low
Redwing	1			R		✓	Low
Rook	154						Negligible

Note: superscripts indicate contribution to the JNCC breeding bird assemblage score for the main habitat within the survey area, 'Upland moorland and grassland with waterbodies'.

33. Two high value species were recorded breeding within the breeding bird survey area during 2021, red kite and common crossbill (though neither were breeding within the site boundary, or within the area where they would be likely to be affected by the wind farm).
34. Fourteen breeding species were classed as medium conservation value: lapwing, curlew, cuckoo, skylark, tree pipit, dunnoek, song thrush, spotted flycatcher, starling, house sparrow, linnet, lesser redpoll, bullfinch and reed bunting. All were classed as medium value because of their listing on the UK Biodiversity Action Plan list of priority species. They are mostly farmland species that have declined widely across Britain but are still common and widespread.

35. A further fifteen breeding species were classed as low sensitivity, through their listing on RSPB *et al.*'s (Eaton *et al.* 2015) amber lists of birds of conservation concern and/or the Scottish Biodiversity List.
36. The overall conservation value of the breeding bird community, measured from the core survey data as the breeding bird assemblage score, was 23. This is below the threshold for national importance (40) but above the threshold for regional importance (20) for the main habitat within the survey area, 'Upland moorland and grassland with water bodies' (Drewitt *et al.* 2020). The core survey area, therefore, supports a regionally important breeding bird community.

Conclusions

37. The 2021 breeding bird surveys have found that the survey area supports a range of upland breeding species of regional importance. It did, though, include five pairs of curlew, a species that could be vulnerable to displacement. No evidence was found of any lekking black grouse within the core area (or the surrounding 2 km buffer).
38. Two species specially protected from disturbance under Schedule 1 of the 1981 Wildlife and Countryside Act found breeding in the survey area; red kite and common crossbill. Both, though, were outside the wind farm site boundary.
39. Several additional high-value Schedule 1 species were seen in the 2 km buffer around the site. Goshawk (another species of mature conifer woodland) was occasionally seen, mainly in the eastern part of the survey area outside the site boundary in that area too, though the survey data did not indicate any evidence of nesting within the survey area. Osprey was an occasional visitor to Hallhills Loch for fishing, and there were a small number of sightings of peregrine, merlin and barn owl.
40. No migrant flocks of pink-footed geese or whooper swans were noted, suggesting that the site does not lie on any important spring migration route for these species.

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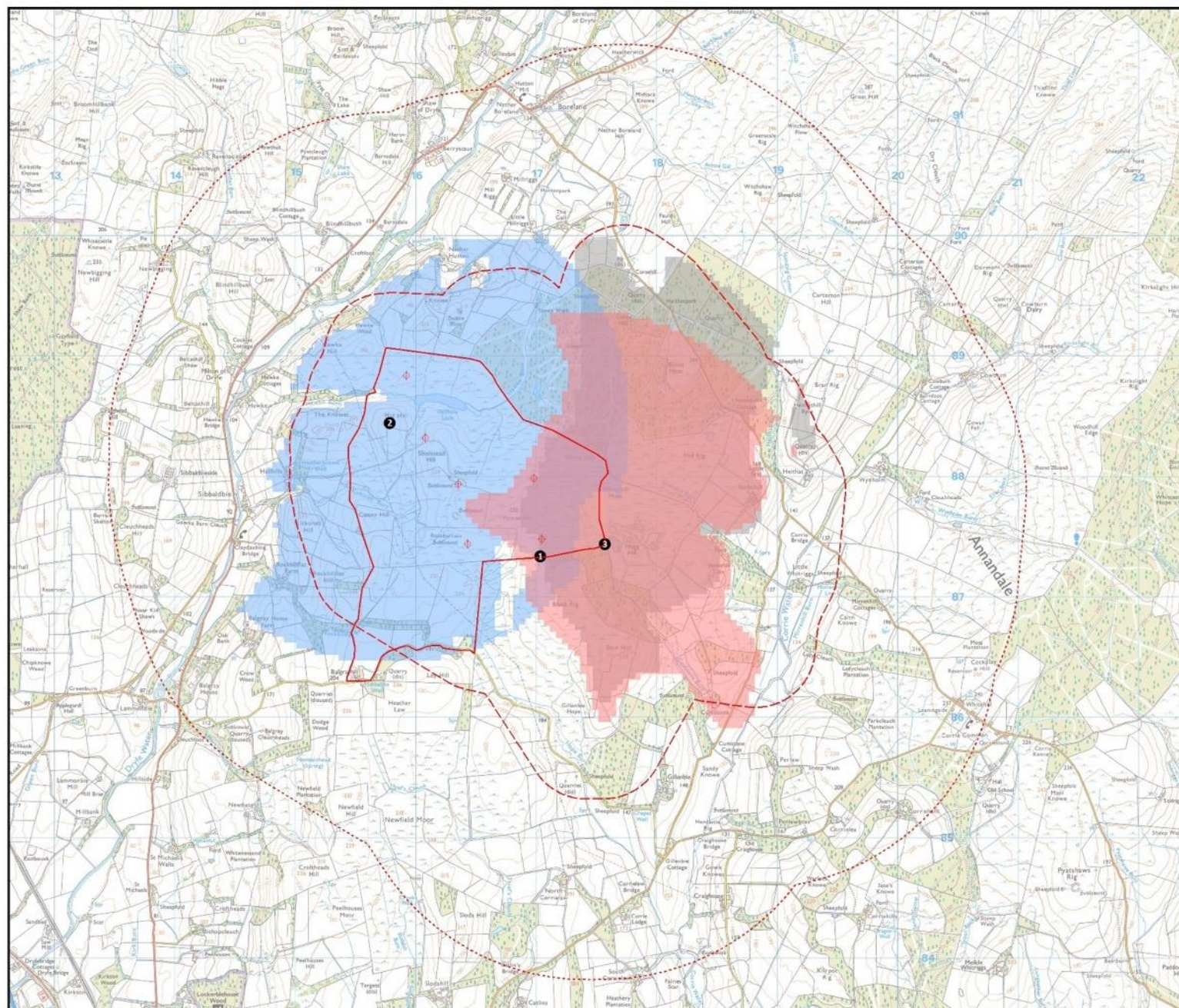
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Balgray Potential Wind Farm 2021

FIGURE 1

Core and Wider Breeding and VP Survey Areas

KEY:

- Initial turbine locations
- Site Boundary
- Core breeding bird survey area
- Wider breeding bird survey area
- VP locations 2021
- VP1 viewshed
- VP2 viewshed
- VP3 viewshed



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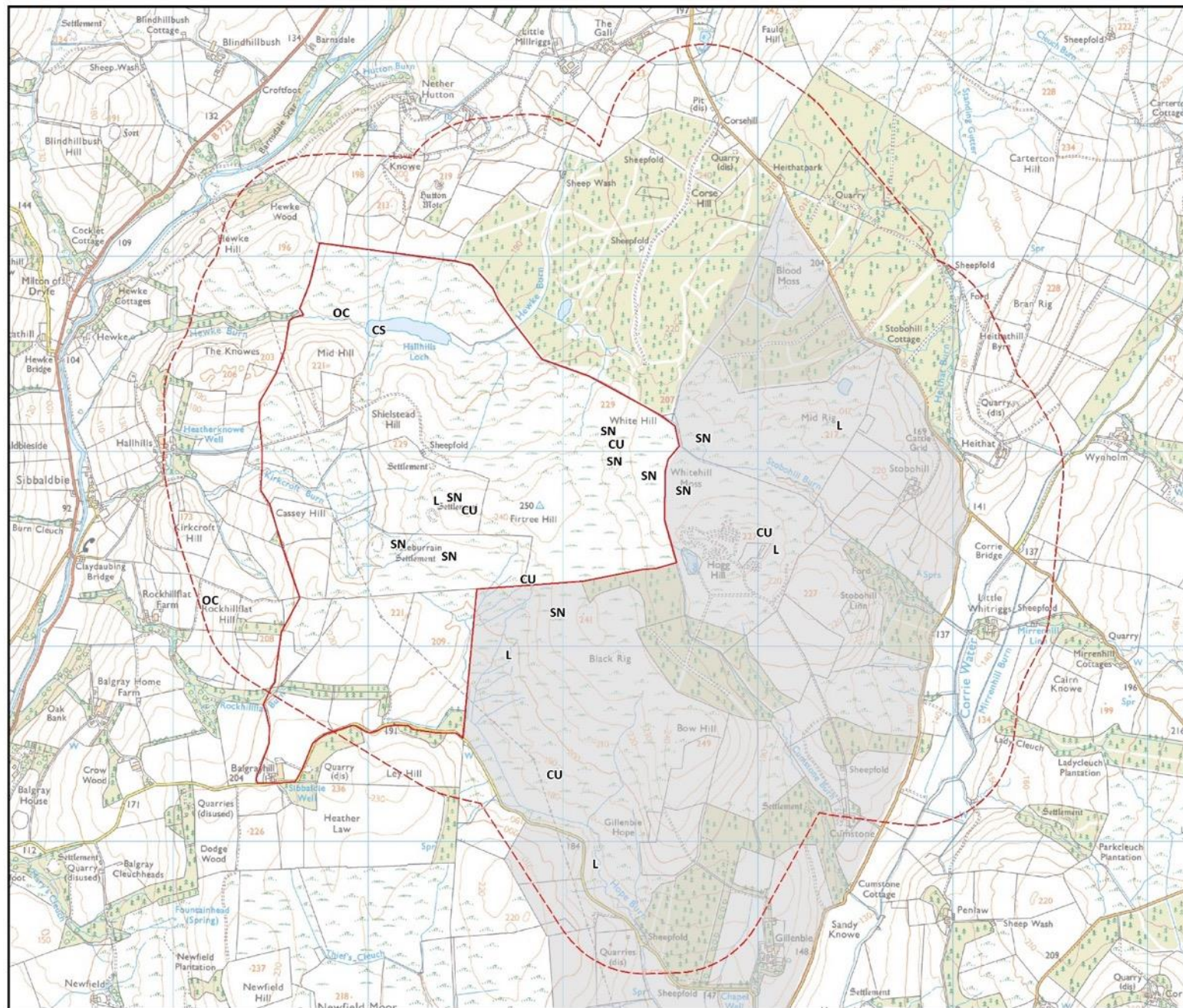
DATE: N/A

FO2021-1

SCALE - 1:30,000 @ A3

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FIGURE 2

Distribution of Breeding Waders, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area

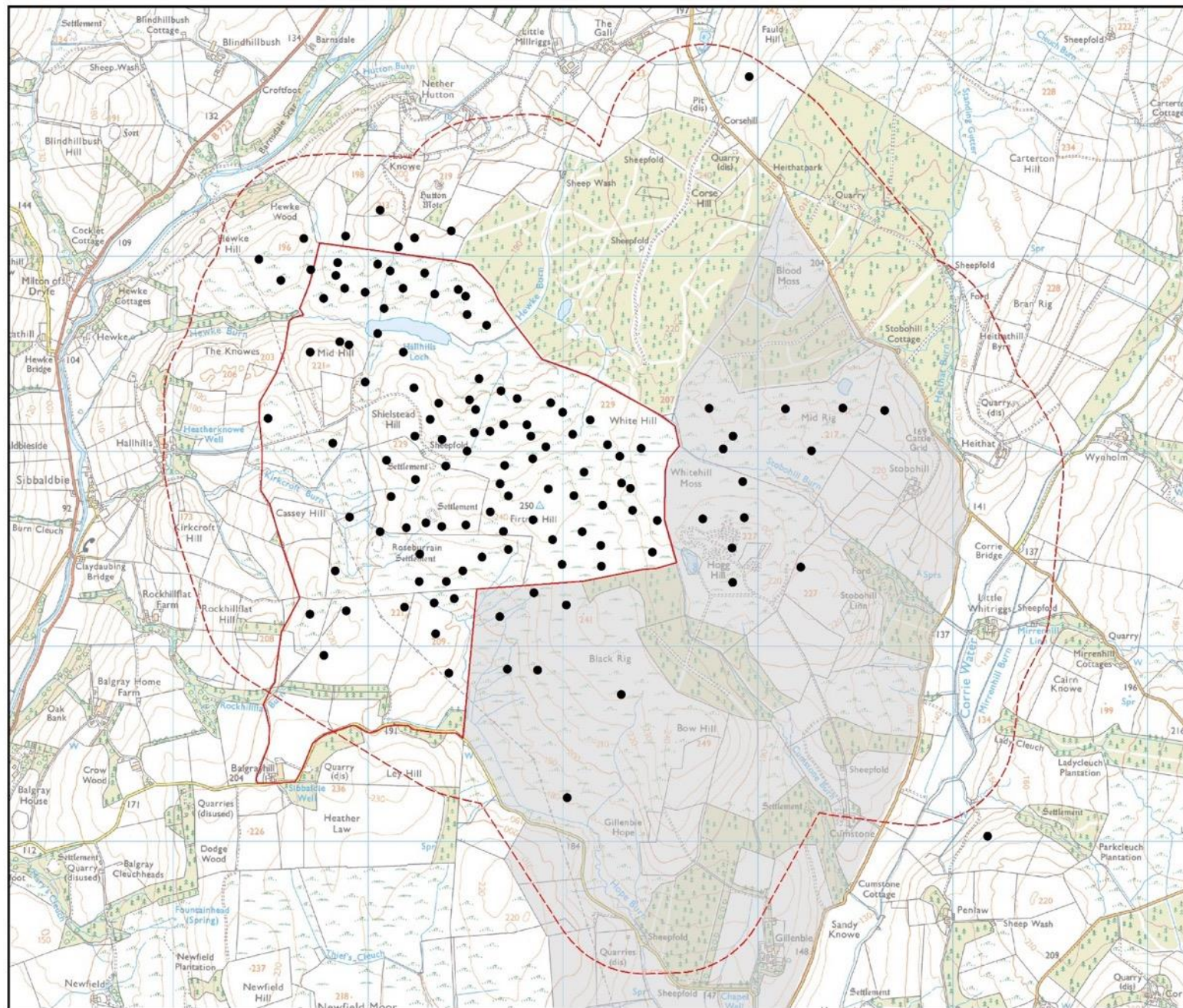
Approximate breeding locations:

- CS - Common Sandpiper
- CU - Curlew
- L - Lapwing
- OC - Oystercatcher
- SN - Snipe

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Drawing Number			
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FIGURE 3

Distribution of Breeding Skylark, 2021

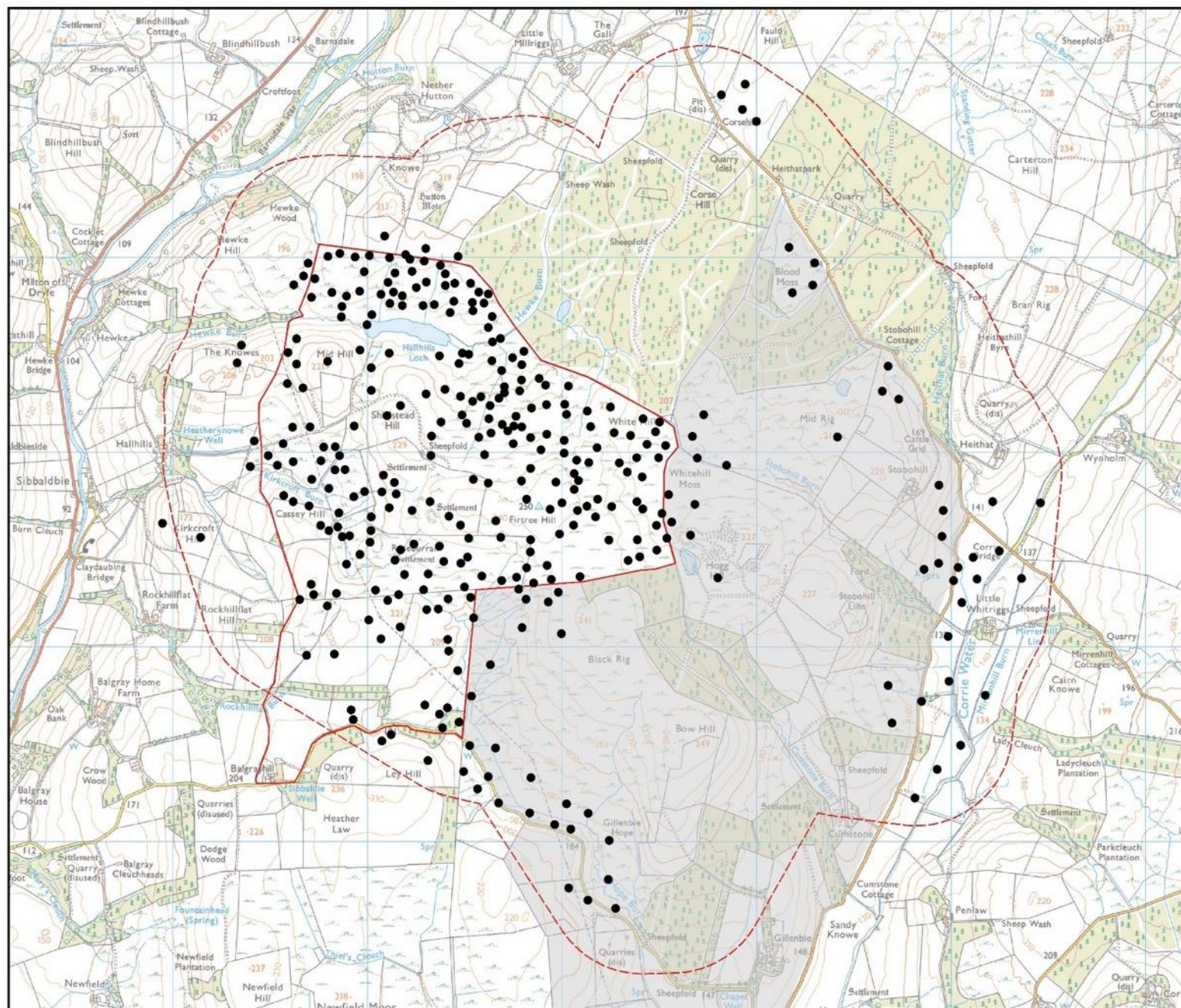
KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:

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Current Date	N/A	Revision	N/A
Document Ref	FO2021-1		
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FIGURE 4

Distribution of Breeding Meadow Pipit, 2021

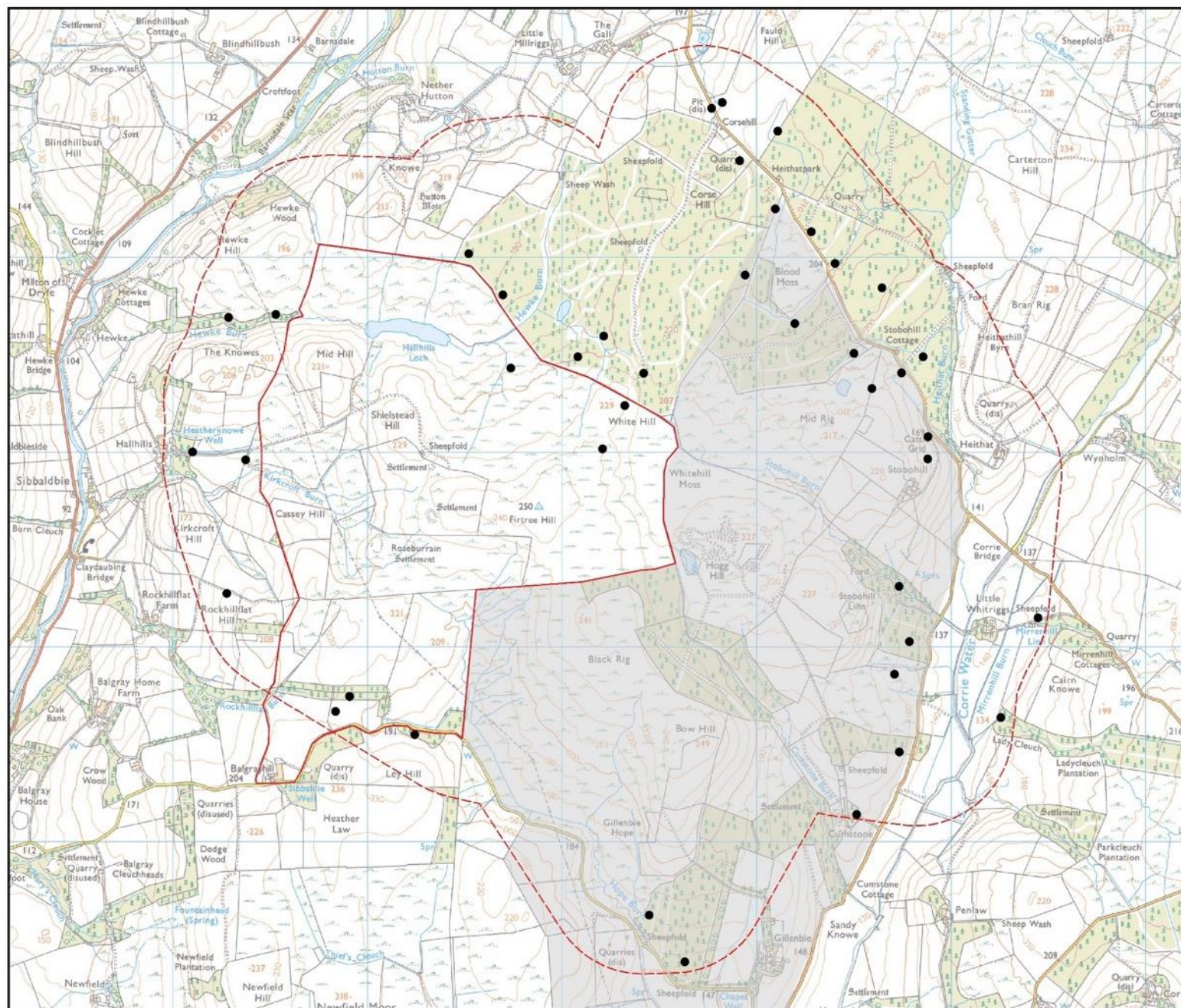
KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:

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Current Date	N/A	Expiry Date	N/A
FO2021-1			
SCALE - 1:18,500 @ A3			
BREEDING BIRD SURVEYS 2021			
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FIGURE 5

Distribution of Breeding Song Thrush, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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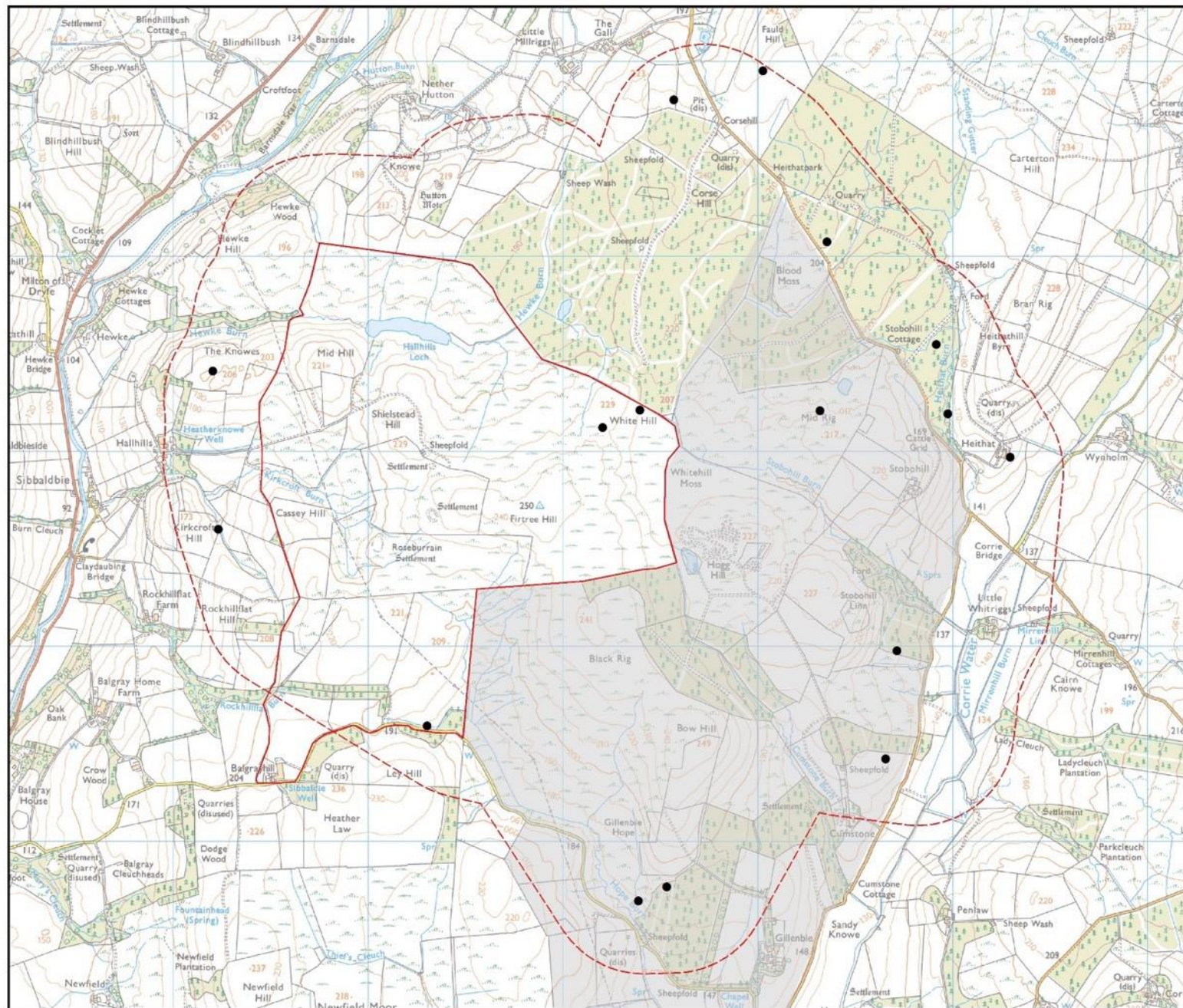
Current Date: N/A | Expiry Date: N/A

Drawing Number: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 6

Distribution of Breeding Mistle Thrush, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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Current Date: N/A

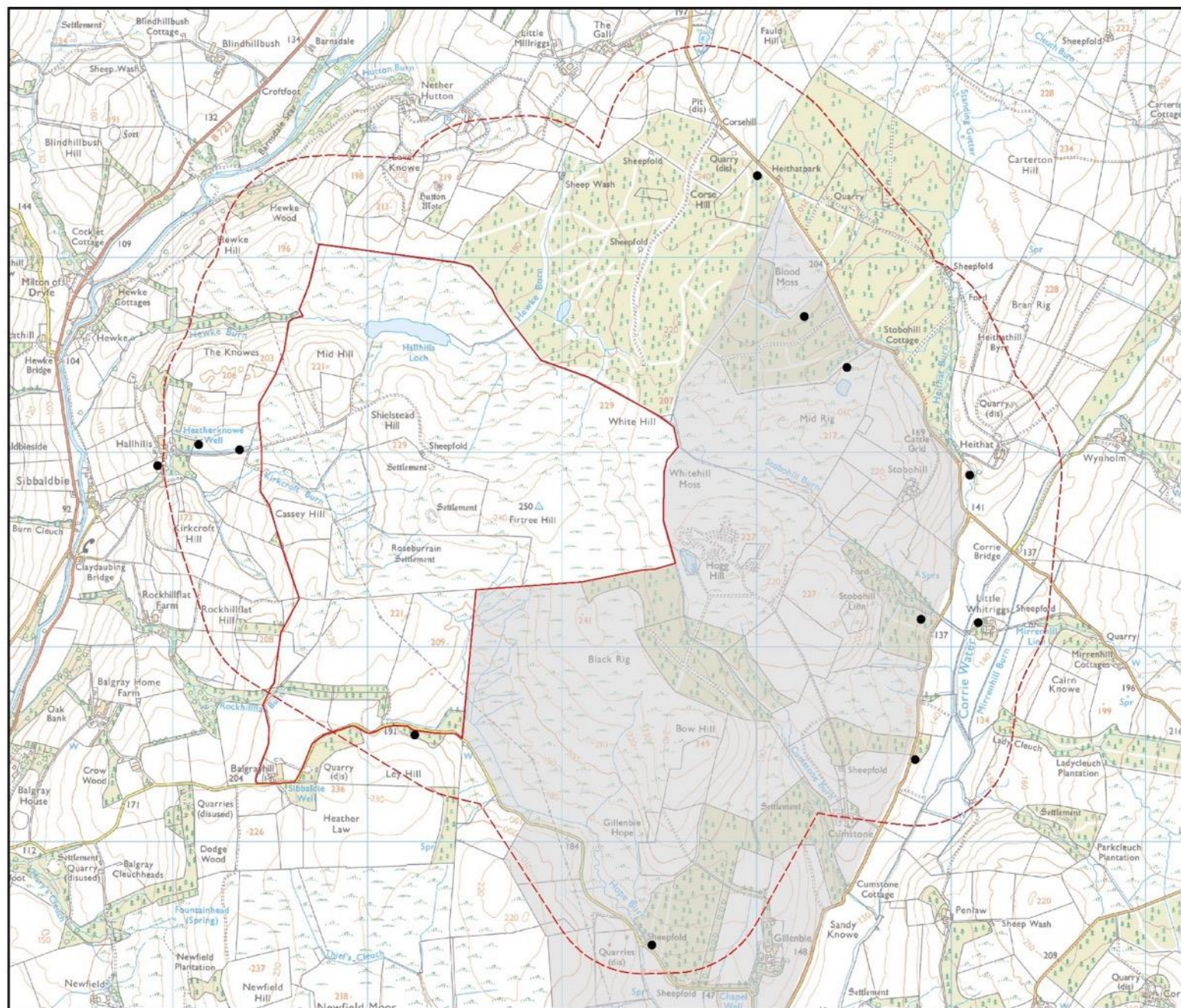
Expiry Date: N/A

Revision: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 7

Distribution of Breeding Dunnock, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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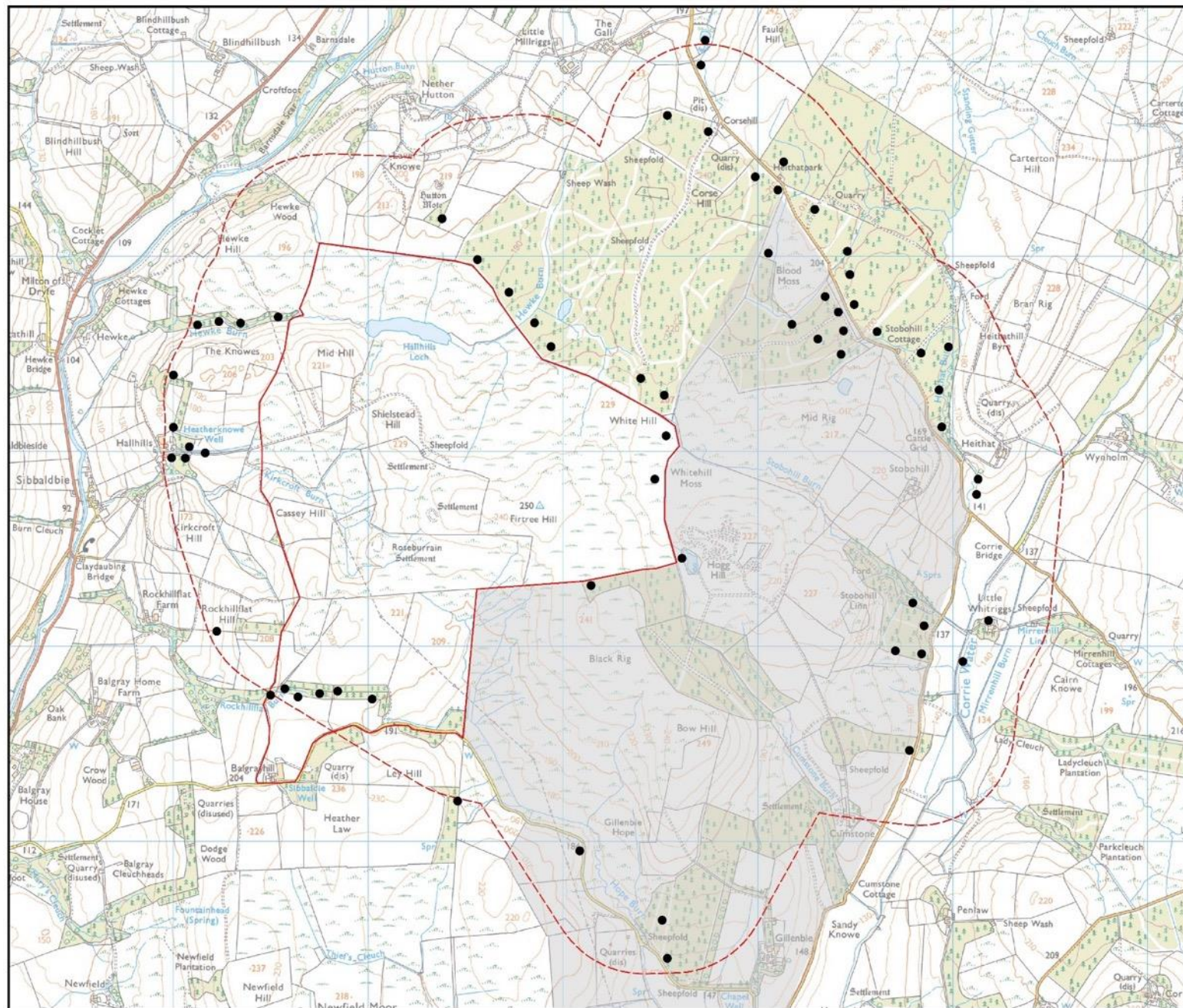
Current Date: N/A | Expiry Date: N/A

Drawing Number: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 8

Distribution of Breeding Willow Warbler, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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Current Date: N/A

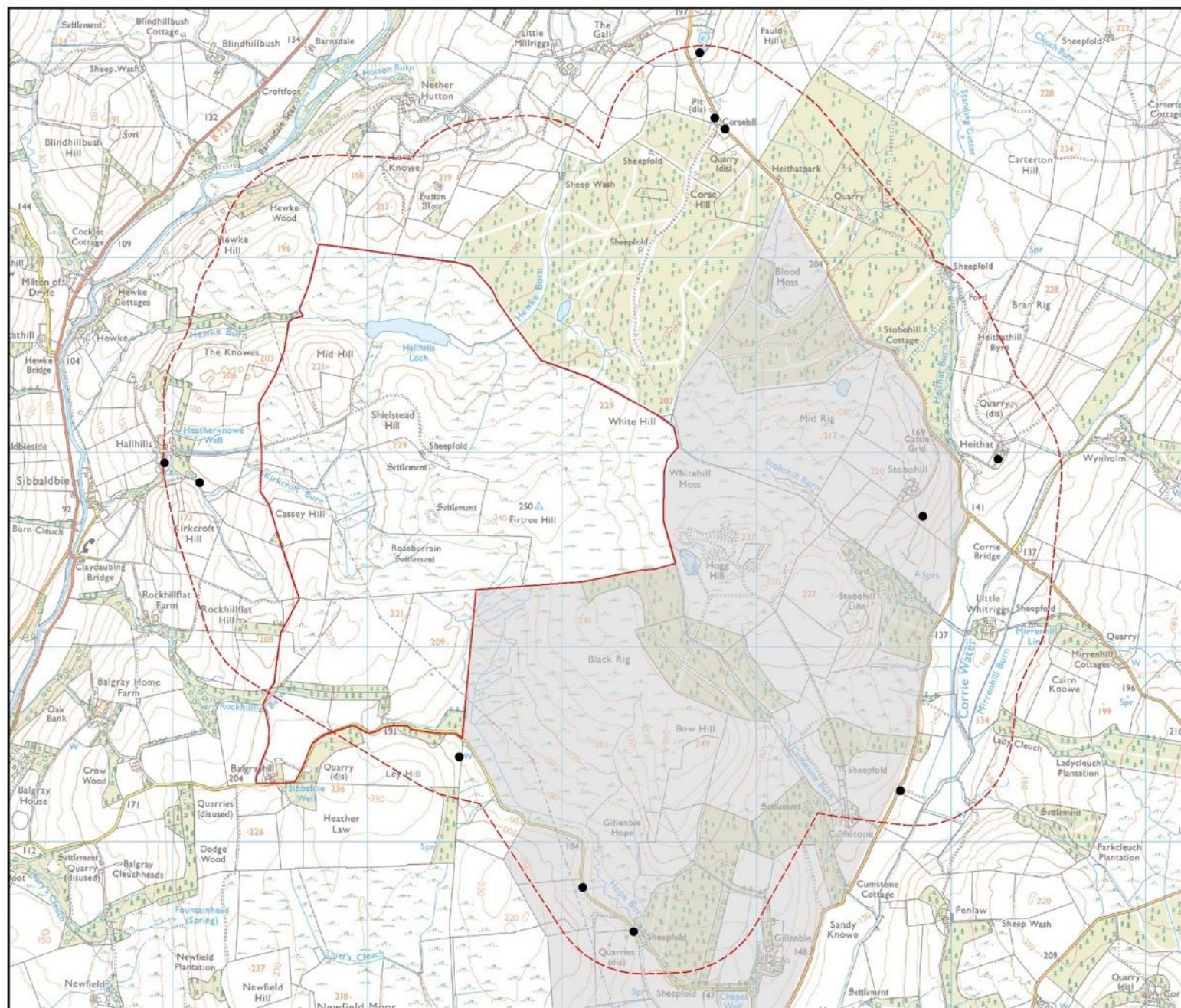
Expiry Date: N/A

Revision: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 9

Distribution of Breeding Starling, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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Current Date: N/A

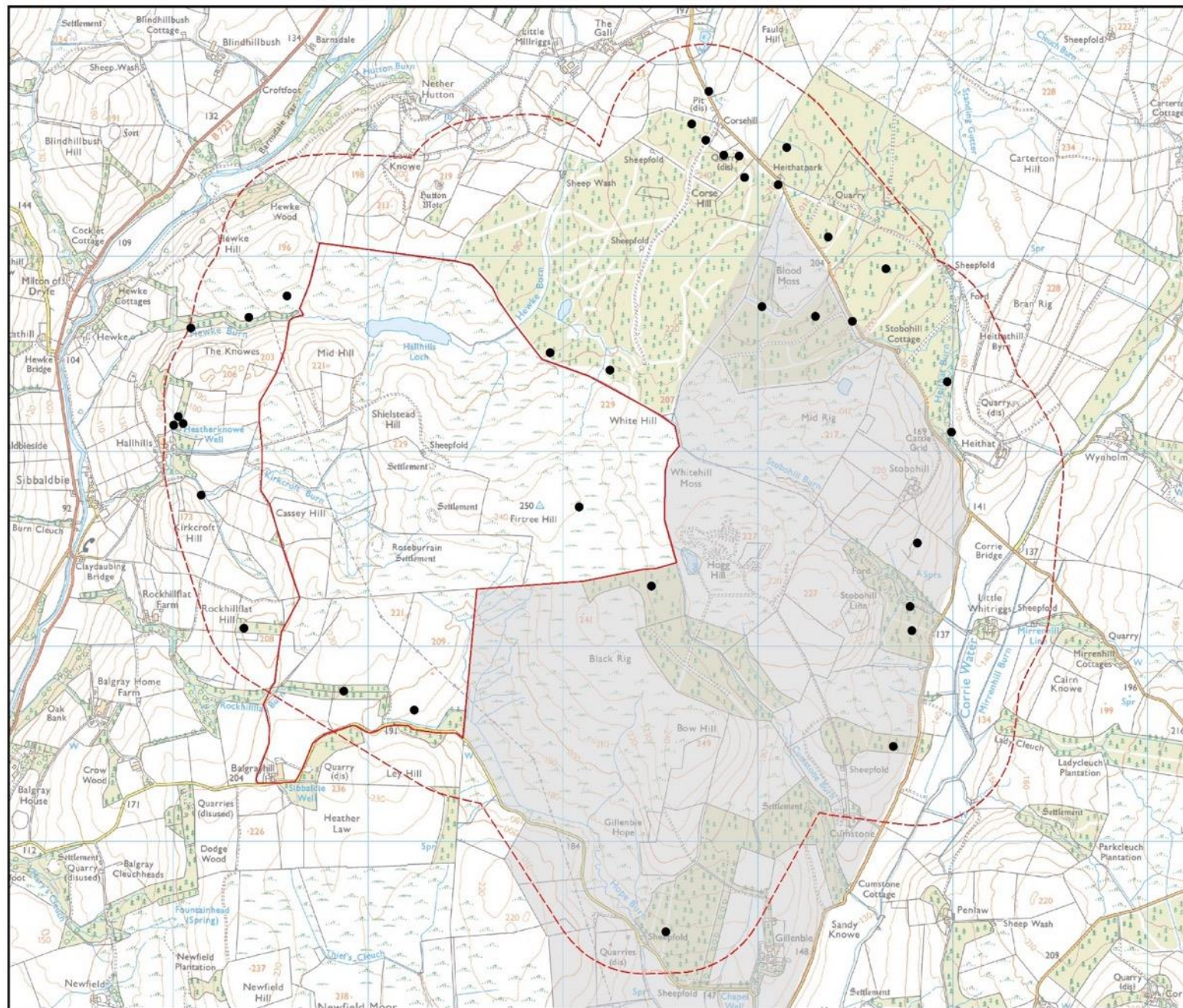
Revision: N/A

FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 10

Distribution of Breeding Siskin, 2021

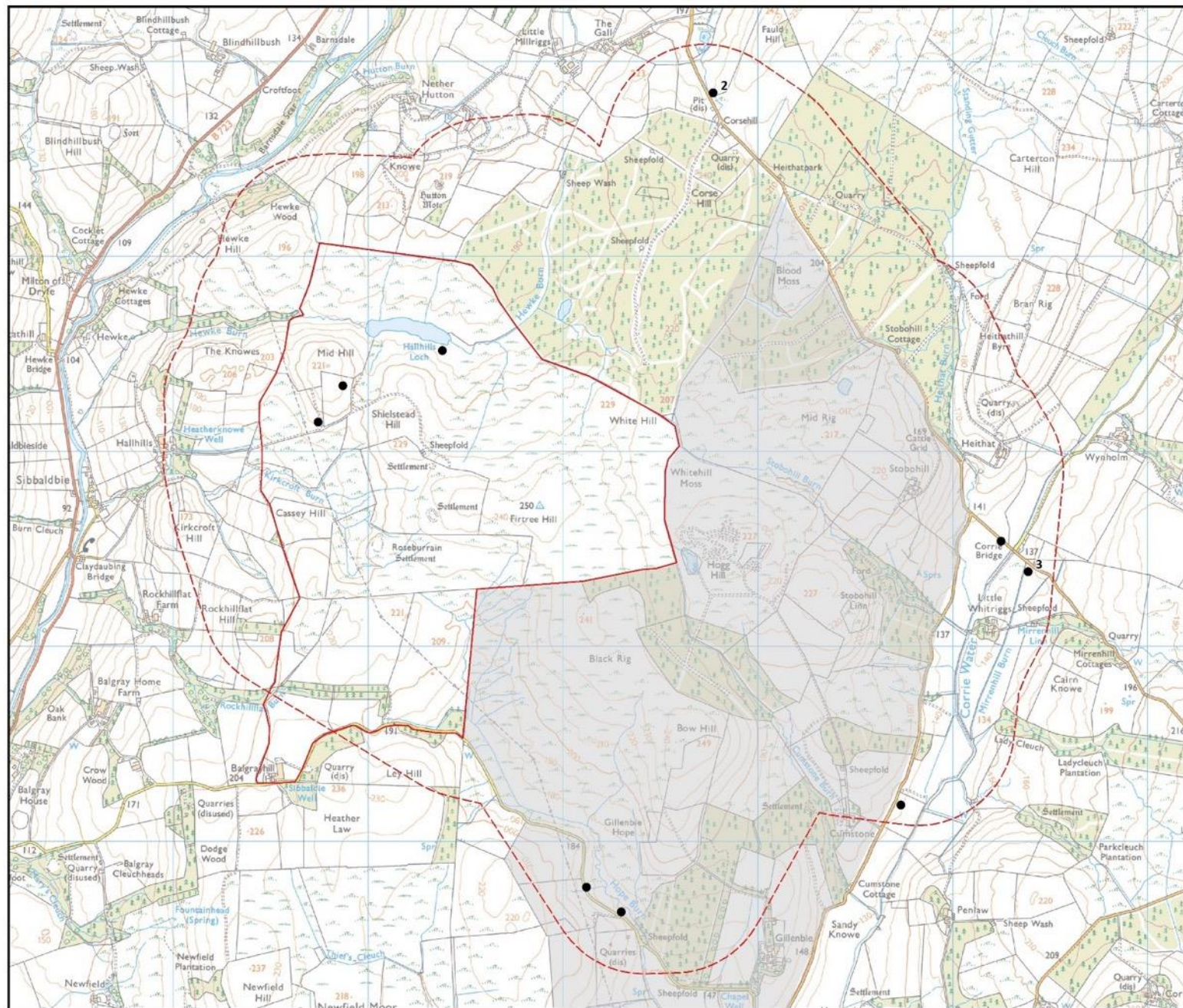
KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:




N

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DRAWING NUMBER: FO2021-1	
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FIGURE 11

Distribution of Breeding Linnet, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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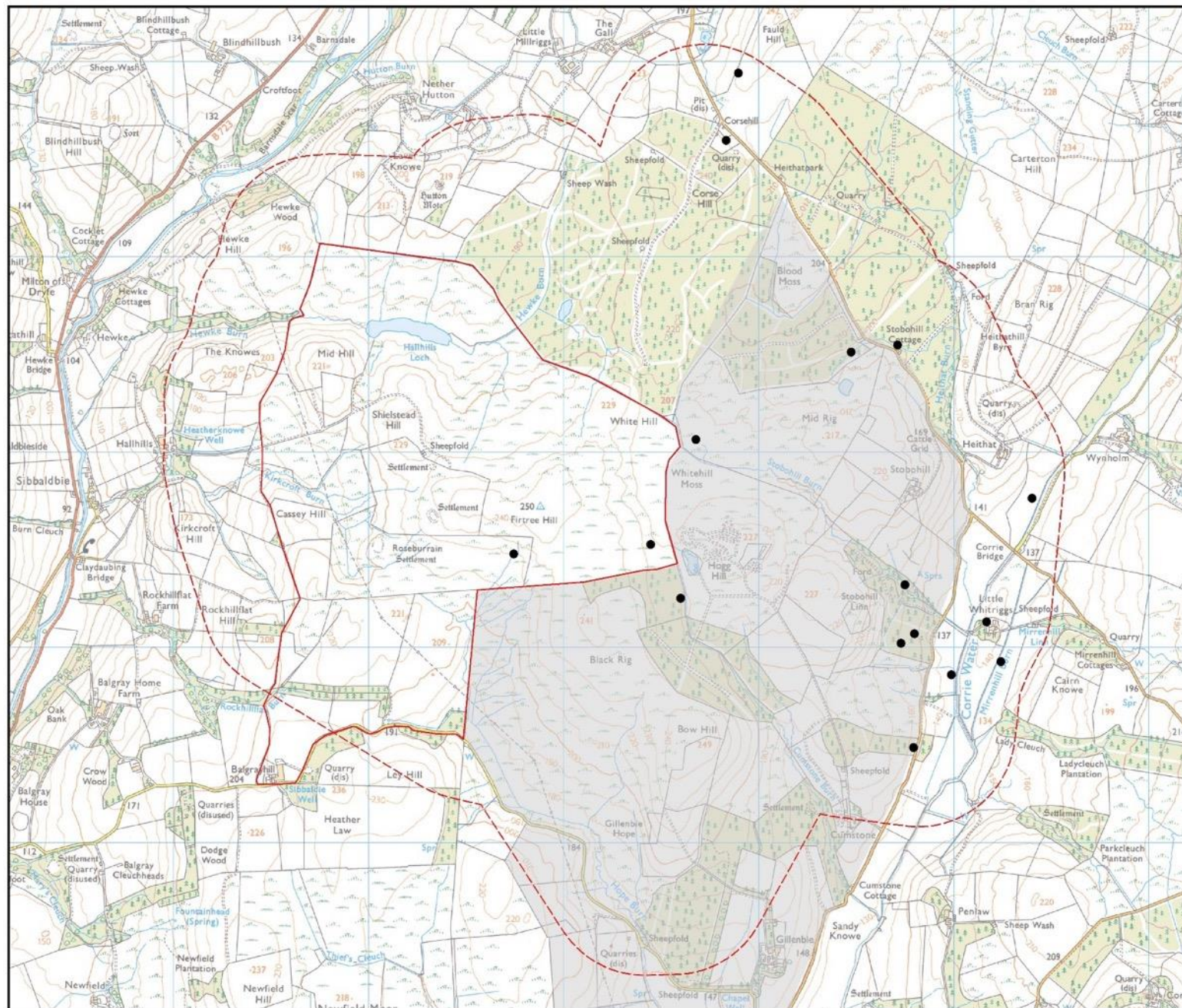
Current Date: N/A | Expiry Date: N/A

Drawing Number: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 12

Distribution of Breeding Lesser Redpoll, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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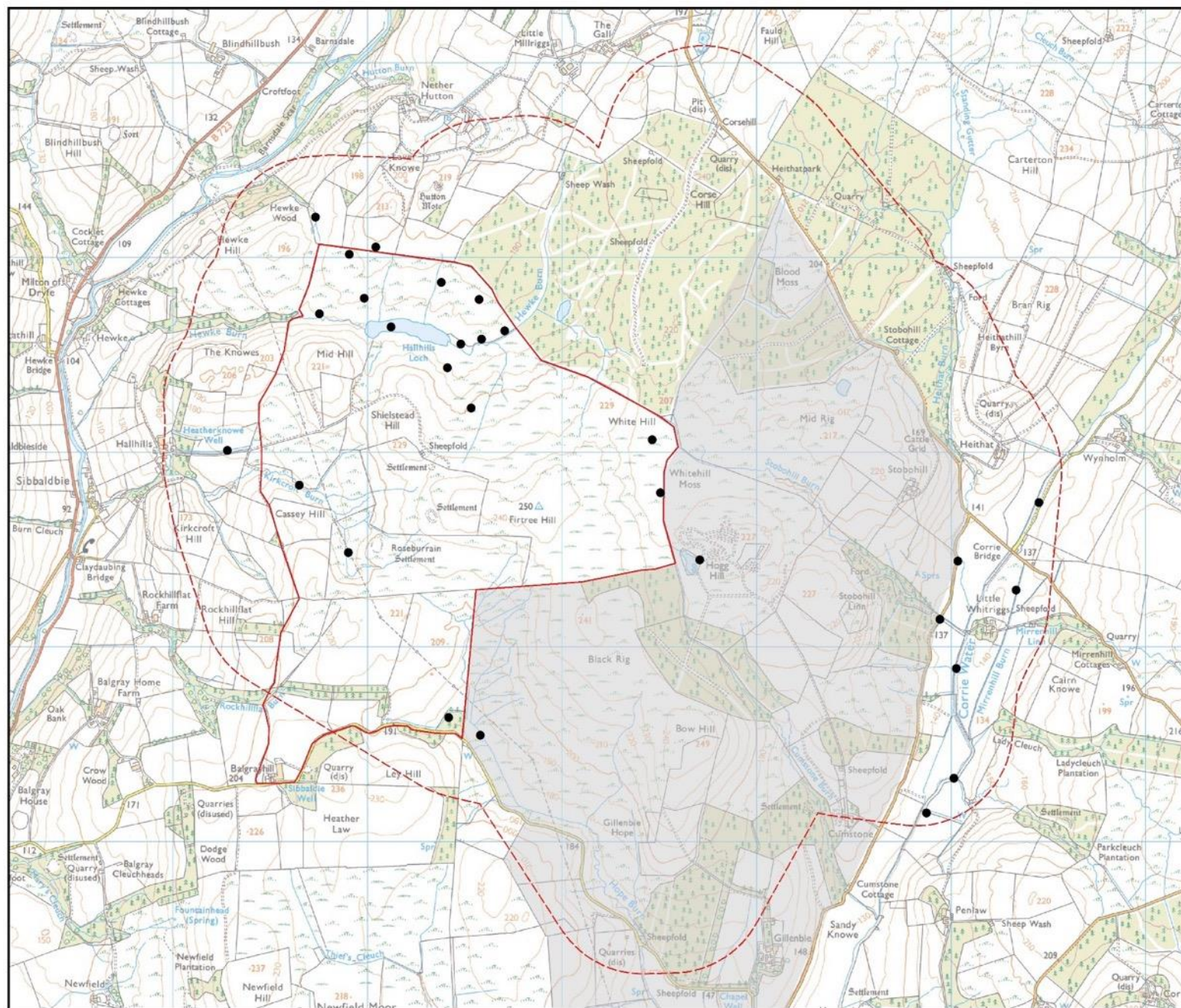
Current Date: N/A | Expiry Date: N/A

Drawing Number: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 13

Distribution of Breeding Reed Bunting, 2021

KEY:

- Site Boundary
- Core breeding bird survey area
- Restricted access area
- Approximate breeding locations:



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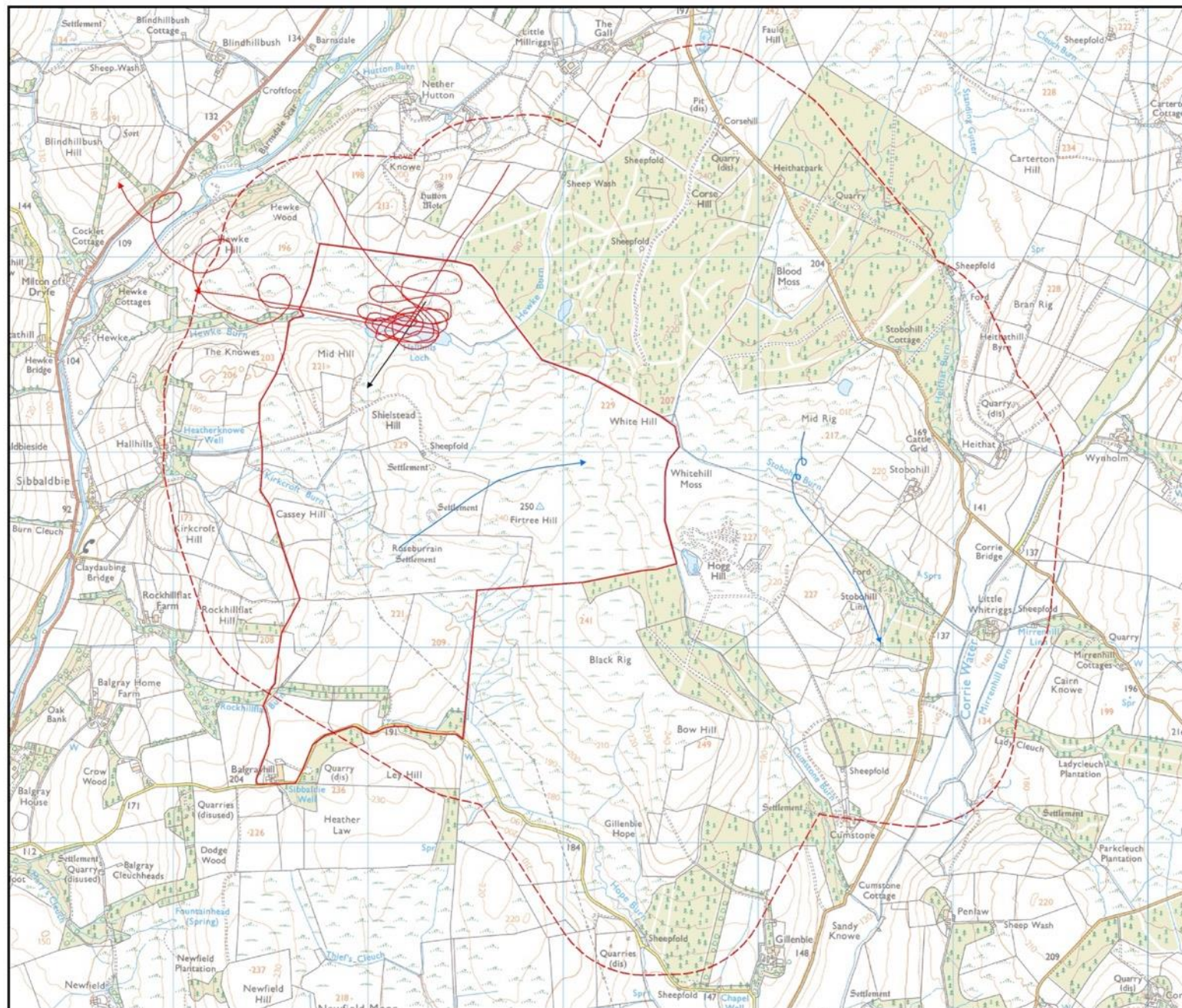
Current Date: N/A | Expiry Date: N/A

Drawing Number: FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 15

Osprey, Merlin and
Peregrine flight lines,
Apr-Aug 2021

KEY:

Species

- Merlin
- Osprey
- Peregrine
- Site Boundary
- Core breeding bird survey area



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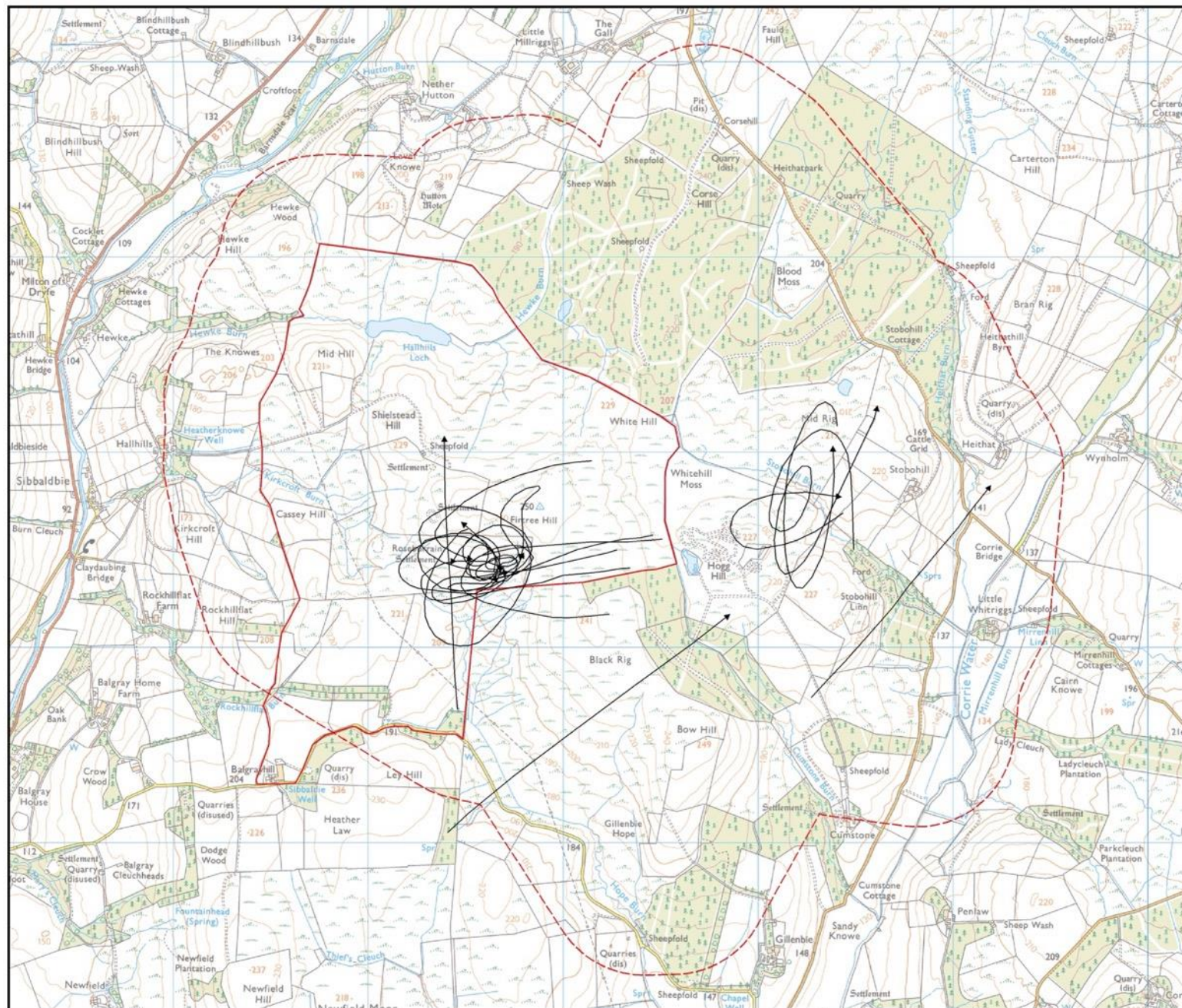
DATE: N/A

FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 16

Golden Plover flight lines,
Apr-Aug 2021

KEY:

- Flight Lines
- Site Boundary
- Core breeding bird survey area



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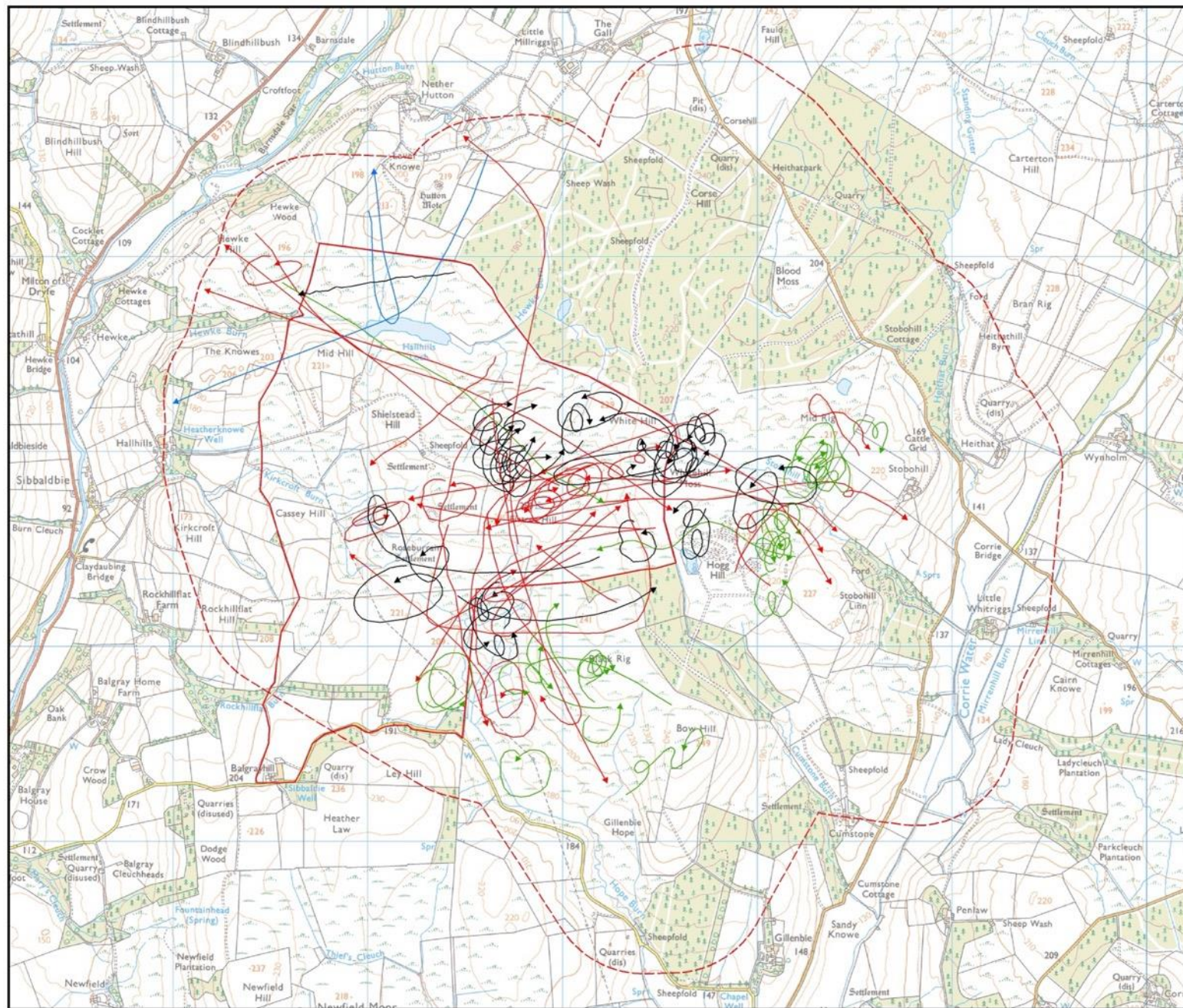
DATE: N/A

FO2021-1

SCALE - 1:18,500 @ A3

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FIGURE 17

**Breeding wader flight lines,
Apr-Aug 2021**

KEY:

Species

- Curlew
- Lapwing
- Oystercatcher
- Snipe
- Site Boundary
- Core breeding bird survey area



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CURRENT DATE	CURRENT DATE
N/A	N/A
PROJECT NUMBER	
FO2021-1	
SCALE - 1:18,500 @ A3	
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APPENDIX 1. VANTAGE POINT SURVEY DATA

Survey Information

Date	Vantage Point No	Start time	Finish time	Weather
20/04/2021	2	07:00	10:00	3-6/8 cloud, 0-1 variable wind, excellent vis
20/04/2021	1	15:10	18:10	2-4/8 cloud, 1-2 variable wind, excellent vis
20/04/2021	1	18:40	20:40	6-8/8 cloud, 1 NW - 3 E wind, excellent vis
20/04/2021	3	13:35	16:35	cloud 7/8 high and hazy, wind W 2, 11C, vis very good
20/04/2021	2	17:45	20:15	cloud 7/8, wind NW 2, 10C, vis very good
21/04/2021	1	06:30	09:30	5-8/8 cloud, 3-4 ENE wind, excellent vis
21/04/2021	3	10:00	13:00	6-2/8 cloud, 3 ENE wind, excellent vis
21/04/2021	1	13:30	16:00	1/8 cloud, 2-3 E wind, excellent vis
21/04/2021	2	16:30	18:30	1/8 cloud, 3-4 SE wind, excellent vis
22/04/2021	2	07:00	10:00	0-2/8 cloud, 0-2 SE wind, excellent vis
22/04/2021	2	10:30	13:30	0/8 cloud, 2-3 SE - SW wind, excellent vis
21/04/2021	3	06:30	09:30	cloud 7/8, wind ENE 3, 6C, vis excellent
21/04/2021	1	10:00	13:00	cloud 7/8, wind E 2, 8C, vis excellent
21/04/2021	3	13:30	16:30	cloud 0, wind E 2, 11C, vis very good
21/04/2021	3	17:00	18:30	cloud 1/8, wind SE 2, 11C, vis very good
17/05/2021	2	08:00	09:00	6-8/8 cloud, 0-2 NW - W wind, excellent vis
17/05/2021	2	09:30	11:30	6-8/8 cloud, 0-2 NW - W wind, excellent vis
17/05/2021	1	11:30	14:30	8/8 cloud, 2-3 WNW wind, very good vis
17/05/2021	1	15:00	18:00	8/8 cloud, 2-3 variable wind, excellent vis
17/05/2021	1	18:30	20:00	5-7/8 cloud, 3 SW wind, excellent vis
18/05/2021	3	12:30	15:30	cloud 4/8, wind WSW 2, 11C, vis very good
18/05/2021	3	16:00	18:30	cloud 5/8, wind SW 2, 10C, vis very good
18/05/2021	3	19:00	21:00	cloud 4/8, wind SW 2, 10C, vis very good
20/05/2021	2	05:00	08:00	cloud 4/8, wind E 2, 7C, vis excellent
20/05/2021	2	08:30	10:00	cloud 7/8, wind ESE 3, 8C, vis excellent
18/06/2021	2	10:40	13:40	3-7/8 cloud, 1-3 NE -ENE wind, excellent vis
18/06/2021	2	14:10	17:10	6/8 cloud, 2-4 ENE wind, excellent vis
18/06/2021	2	17:40	19:10	8/8 cloud, 4 ENE wind, excellent vis
21/06/2021	3	14:00	17:00	3-8/8 cloud, 2-3 ENE - ESE wind, excellent vis
21/06/2021	3	17:30	20:30	4-7/8 cloud, 3-0 E wind, excellent vis
21/06/2021	3	21:00	22:00	3-5/8 cloud, 0-2 E wind, excellent vis
21/06/2021	1	14:00	17:00	cloud 8/8, wind NE 3, 15C, vis excellent
21/06/2021	1	17:30	20:30	cloud 5/8, wind NE 1, 15C, vis excellent
21/06/2021	1	21:00	22:30	cloud 5/8, wind NE 1, 13C, vis excellent
07/07/2021	3	06:00	09:00	5-7/8 cloud, 2-3 WSW - SSW wind, excellent vis
07/07/2021	3	09:30	12:30	8/8 cloud, 3 SW wind, excellent vis
07/07/2021	3	13:00	14:00	6-8/8 cloud, 3 SW wind, excellent vis
07/07/2021	2	14:15	17:15	3-6/8 cloud, 3-4 WSW - W wind, excellent vis
07/07/2021	2	17:45	20:45	1-3/8 cloud, 4-3 WNW wind, excellent vis
07/07/2021	2	21:15	22:15	1/8 cloud, 3 SSW wind, excellent vis
07/07/2021	1	12:50	15:50	cloud 7/8, wind SSW 3, 18C, vis very good
07/07/2021	1	16:20	19:20	cloud 3/8, wind SW 2, 19C, vis very good
07/07/2021	1	19:50	21:50	cloud 2/8, wind WSW 2, 18C, vis very good
02/08/2021	1	19:20	21:50	cloud 0, wind SW 2, 16C, vis very good
03/08/2021	1	05:00	06:00	cloud 8/8, wind 0, 10C, patchy for vis good
02/08/2021	2	19:20	21:50	0/8 cloud, 3 S wind, excellent vis
03/08/2021	2	05:00	06:00	8/8 cloud, 1-2 variable wind, ok - poor vis
03/08/2021	2	16:45	19:15	6-8/8 cloud, 2-1 W wind, excellent vis
03/08/2021	2	19:45	20:30	6-8/8 cloud, 2-1 W wind, excellent vis
03/08/2021	1	16:35	19:05	cloud 7/8, wind SW 2, 17C, vis excellent
03/08/2021	1	19:35	20:20	cloud 7/8, wind SW 2, 17C, vis excellent
05/08/2021	3	06:10	09:10	cloud 7/8, wind ESE 2, 13C, vis excellent
05/08/2021	3	09:40	12:40	cloud 6/8, wind SSE 3, 16C, vis very good
05/08/2021	3	13:10	13:55	cloud 7/8, wind SSE 4, 17C, vis very good, rain from 13:35

Key Species Data

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
2	20/04/2021	07:00	CU		1 WNW	90		110	
2	20/04/2021	07:26	PE		1 NE	25		40	adult
2	20/04/2021	09:09	CU		1 SW	15	display	70	
2	20/04/2021	09:16	ML		1 SW	5	hunt	20	lost to view
1	20/04/2021	15:10	CU		1 WSW	15	display	50	landed
1	20/04/2021	16:37	SN		1	15	display	360	
1	20/04/2021	16:40	CU		3 ENE	15		40	
1	20/04/2021	16:54	CU		1 WSW	5		30	landed
1	20/04/2021	17:29	CU		1 ENE	30	display	70	
1	20/04/2021	17:53	GP		13 WSW	20		60	landed
1	20/04/2021	18:44	GP		55 W	30		75	landed
1	20/04/2021	19:10	GP		37	13		40	flew between fields
1	20/04/2021	19:23	GP		14 WSW	30		170	landed
1	20/04/2021	19:29	CU		1 WNW	28		30	split from 7
1	20/04/2021	19:29	CU		1 WSW	35		70	split from 6
1	20/04/2021	19:30	GP		65 WSW	30		120	landed
1	20/04/2021	19:39	CU		1 SSW	25	display	180	
1	20/04/2021	19:41	CU		1 NE	25		45	presumably to join 9
1	20/04/2021	19:45	GP		30 WSW	30		110	landed
1	20/04/2021	20:31	GP		110	75		540	until VP end
3	20/04/2021	13:37	GI		1 SW	170	soar	400	2 cy male
3	20/04/2021	13:52	KT		2 SW	165	soar	200	
3	20/04/2021	14:15	KT		1 ENE	150	soar	180	
3	20/04/2021	14:38	GI		1 NNE	20	hunt	70	2 cy male, same as 2, dropped out of sight
3	20/04/2021	15:20	KT		1 WSW	43	soar	780	adult
3	20/04/2021	15:47	L		1 WNW	28		80	
2	20/04/2021	17:45	CU		2 NNW	43		120	
2	20/04/2021	18:14	GP		92 WSW	25	roost	60	dropped out of sight
2	20/04/2021	18:31	GP		200 N	80		220	
2	20/04/2021	19:01	GP		120 N	35	flushed	150	same as 4
1	21/04/2021	06:54	CU		1	20	display	75	
1	21/04/2021	07:11	GP		40 NE	105		60	
1	21/04/2021	07:20	GP		6 WNW	15		120	landed
1	21/04/2021	07:39	CU		1 SW	15		190	landed
1	21/04/2021	08:29	GP		2 NNW	135		210	
1	21/04/2021	08:31	CU		1	10	display	30	
1	21/04/2021	09:03	KT		1 WSW	20		130	
1	21/04/2021	09:14	CU		1 NE	10	display	35	
3	21/04/2021	10:16	CU		1 NW	13		60	
3	21/04/2021	10:37	CU		1 WSW	13		30	
3	21/04/2021	12:51	KT		1 NNE	60		210	
1	21/04/2021	14:50	CU		2 WSW	13		30	landed
2	21/04/2021	17:42	CU		1	15	display	50	
2	21/04/2021	17:48	OP		1 SE	125	hunt	840	fished loch, caught fish and departed NW
2	21/04/2021	17:50	KT		1 SW	20		180	
2	22/04/2021	07:30	CU		1 WSW	5		10	
2	22/04/2021	07:41	KT		1 NNW	33		25	
2	22/04/2021	07:55	CU		1	20	display	210	
2	22/04/2021	07:55	CU		1 NW	35		80	
2	22/04/2021	08:19	CU		1	20	display	50	
2	22/04/2021	09:40	CU		1	13	display	30	
2	22/04/2021	10:47	KT		1 circle SW	300		260	
2	22/04/2021	10:50	KT		1 SW	300		210	
2	22/04/2021	10:58	OP		1 SW	70	fishing	320	no fish caught
2	22/04/2021	11:55	CU		1	15	display	105	
3	21/04/2021	06:49	GI		1 NW	8	hunt	10	2 cy male
3	21/04/2021	06:56	L		1 NNW	8	display	60	landed
3	21/04/2021	07:13	CU		1 NNE	18	display	80	male
3	21/04/2021	07:14	GP		36 NNE	40		90	
3	21/04/2021	07:21	L		1 NNW	10	display	170	
3	21/04/2021	07:29	GP		9 WSW	18		80	
3	21/04/2021	07:38	CU		1 WNW	16		60	male
3	21/04/2021	07:51	GI		1 SSW	5	hunt	50	2 cy male, same as 3
3	21/04/2021	08:06	GI		1 NNE	2	hunt	50	2 cy male, same as 16

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
3	21/04/2021	08:08	L		1 circle	8	display	50	landed
3	21/04/2021	08:19	GI		1 SSE	6	hunt	15	2 cy male, same as 17
3	21/04/2021	09:03	CU		2 NW	19	flushed	70	
3	21/04/2021	09:05	PE		1 SSW	40	hunt	150	2 cy male
3	21/04/2021	09:06	KT		1 NW	38	hunt	540	
3	21/04/2021	09:15	CU		1 ESE	29		90	male
3	21/04/2021	09:18	CU		1 E	33	display	130	male
1	21/04/2021	10:44	L		3 NE	18	display	130	
1	21/04/2021	10:46	CU		1 SSW	3	display	30	male, landed
1	21/04/2021	10:52	CU		1 SSE	25	display	70	male, same as 4, landed
1	21/04/2021	11:28	L		3 WNW	20	display	170	landed
1	21/04/2021	12:44	CU		1 WSW	25	display	110	
3	21/04/2021	14:48	KT		1 W	28	hunt	70	
3	21/04/2021	17:02	GI		1 N	75	soar/hunt	390	2 cy male
3	21/04/2021	18:18	KT		1 ENE	60	soar	350	
3	21/04/2021	18:21	GI		1 NE	80	soar	290	2 cy male, same as 26
1	17/05/2021	11:59	KT		1 WSW	225		420	
1	17/05/2021	16:06	KT		1	140		330	
1	17/05/2021	16:10	KT		3 circle N	150		660	
1	17/05/2021	16:26	KT		3 circle NE	300		300	same 3 birds as flight 5
1	17/05/2021	17:12	CU		1 NW	10	flushed	40	flushed by BZ
1	17/05/2021	17:12	L		1	20	flushed	35	flushed by BZ
1	17/05/2021	17:28	SN		1	45		420	
1	17/05/2021	19:42	L		1	35		90	
3	18/05/2021	13:13	KT		1 WNW	40	hunt	90	
3	18/05/2021	13:27	SN		1 NNW	55	display	120	chipping
3	18/05/2021	13:34	SN		1 E	30	display	140	chipping and drumming, landed
3	18/05/2021	14:07	L		1 circle	15	display	100	landed
3	18/05/2021	14:16	L		2 circle	16	mob	110	
3	18/05/2021	14:48	KT		1 N	50	hunt	290	
3	18/05/2021	15:00	GI		1 SSW	25	hunt	110	2 cy male
3	18/05/2021	15:00	L		1 circle	20	display	60	set off by GI
3	18/05/2021	15:19	L		2 circle	15	display	140	
3	18/05/2021	16:01	L		2 circle	14	display	150	
3	18/05/2021	18:22	L		2 circle	10	display	140	landed
3	18/05/2021	18:28	L		1 circle	8	display	120	
3	18/05/2021	19:04	KT		1 NNW	20	hunt	170	
3	18/05/2021	19:05	L		1 circle	18	mob	200	mobbing KT
3	18/05/2021	19:11	GI		1 SSE	40	hunt	55	2 cy male
3	18/05/2021	19:20	GI		1 NNE	19	with prey	65	2 cy male
3	18/05/2021	19:23	SN		1 circle	30	display	290	drumming, landed
3	18/05/2021	19:33	SN		1 circle	35	display	240	chipping
3	18/05/2021	19:36	SN		1 circle	40	display	600	chipping and drumming
3	18/05/2021	19:51	L		2 circle	13	display	160	
3	18/05/2021	20:37	KT		1 NNW	33	hunt	230	
3	18/05/2021	20:38	SN		1 circle	45	display	200	
3	18/05/2021	20:48	L		1 circle	8	display	60	landed
2	20/05/2021	05:36	SN		1 circle	30	display	360	landed
2	20/05/2021	05:55	SN		1 circle	40	display	270	
2	20/05/2021	05:56	SN		1 circle	50	display	200	
2	20/05/2021	05:56	SN		2 circle	50	display	180	
2	20/05/2021	06:46	SN		1 circle	25	display	120	
2	20/05/2021	07:05	CU		1 SSE	38		230	
2	20/05/2021	07:18	KT		1 SSE	8	hunt	290	appeared to land out of sight
2	20/05/2021	08:35	L		1 ESE	35		230	
2	20/05/2021	09:00	SN		1 circle	40	display	200	
2	18/06/2021	11:38	OC		1 S	23		70	
2	18/06/2021	12:01	OC		1 SW	25		70	
2	18/06/2021	19:08	SN		1 WSW	40		35	
3	21/06/2021	14:01	SN		1 NW	5		25	landed
3	21/06/2021	14:06	CU		2 NW	35		20	
3	21/06/2021	14:25	KT		1 ENE	80		360	
3	21/06/2021	14:36	SN		1	18	display	100	

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
3	21/06/2021	14:40	L	4		10		50	
3	21/06/2021	14:48	SN	1		20	display	1200	on & off
3	21/06/2021	15:08	L	26		15		140	
3	21/06/2021	15:37	SN	1		15	display	90	
3	21/06/2021	15:45	SN	2		20	display	1260	
3	21/06/2021	16:40	SN	1		10	display	40	
3	21/06/2021	17:47	SN	1		8	display	130	
3	21/06/2021	18:24	SN	1		20	display	300	
3	21/06/2021	18:35	SN	1		15		3600	
3	21/06/2021	19:09	SN	2		15	display	660	
3	21/06/2021	19:20	SN	2		20	display	4200	until VP end
3	21/06/2021	21:00	SN	2		20	display	5400	throughout VP
3	21/06/2021	21:00	SN	1		20	display	5400	throughout VP
3	21/06/2021	21:09	SN	1		30	display	2100	
1	21/06/2021	14:20	KT	1	SSE	82	hunt	370	ad
1	21/06/2021	14:25	KT	1	ENE	225	hunt/soar	140	ad, heavy moult, followed 2 briefly
1	21/06/2021	15:02	L	1	NNW	6	feed	40	landed
1	21/06/2021	15:34	SN	1	SW	40	display	160	drumming
1	21/06/2021	15:52	SN	1	SW	38	display	60	same as 6, drumming
1	21/06/2021	18:18	SN	2	SW	35	display	140	landed
1	21/06/2021	19:01	SN	1	SW	35	display	180	drumming
1	21/06/2021	19:23	SN	1	W	38	display	220	
1	21/06/2021	19:25	SN	2	ESE	55		70	
1	21/06/2021	19:38	SN	1	NW	50	display	480	
1	21/06/2021	19:38	SN	1	circle	45	display	240	drumming
1	21/06/2021	19:50	L	1	WNW	10		50	landed
1	21/06/2021	20:28	CU	1	SSE	30		140	
1	21/06/2021	21:55	SN	1	SSW	40	display	660	drumming
1	21/06/2021	22:01	SN	1	W	45	display	200	landed
3	07/07/2021	06:10	KT	1	E	25		100	
3	07/07/2021	06:11	SN	1		20	display	900	
3	07/07/2021	06:24	SN	1		20	display	7200	
3	07/07/2021	07:13	KT	1	E	55		330	
3	07/07/2021	08:18	KT	1	circle N	103		480	
3	07/07/2021	13:08	GI	1	circle	28		130	adult
2	07/07/2021	16:42	CU	2	SW	75		210	
1	07/07/2021	13:25	L	1	W	8		45	
1	07/07/2021	13:49	L	2	circle	18	mob	100	
1	07/07/2021	17:47	L	1	circle	20	display	80	male, landed in tree
1	07/07/2021	18:12	CU	2	SSW	45		150	ad
1	07/07/2021	18:15	KT	1	WNW	48	hunt	1260	
1	07/07/2021	18:28	L	1	circle	25	display	70	
1	03/08/2021	17:01	KT	1	ENE	15	hunt	110	ad, landed in harvested hay meadow
1	03/08/2021	17:08	KT	1	SW	20	hunt	280	ad, same as 8
3	05/08/2021	10:26	KT	1	NNE	31	hunt	400	ad
3	05/08/2021	11:10	KT	1	SSW	45	hunt	45	ad
3	05/08/2021	11:25	KT	2	ESE	90	hunt	140	
3	05/08/2021	11:45	KT	1	NNE	43	hunt	200	ad
3	05/08/2021	12:20	KT	1	SSE	28	hunt	190	ad
3	05/08/2021	13:18	KT	1	SSE	60	soar	250	ad