TECHNICAL APPENDIX 8-2 KILLEAN WIND FARM: BREEDING BIRD SURVEYS 2023

Report to Renewables Energy Systems Ltd

Steve Percival, Tracey Percival, Tom Lowe, Stuart Piner and Scott Smith

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

November 2023

Email: ***steve.percival@ecologyconsult.co.uk***

TABLE OF CONTENTS

Cover photos:

Top left – Black grouse, female © Steve Percival

Top right – Golden eagle, immature. © Steve Percival

KILLEAN WIND FARM: BREEDING BIRD SURVEYS 2023

INTRODUCTION

1. This report presents the results of breeding bird survey work for a proposed wind farm at Killean, near Tayinloan, Argyll. It provides a second breeding season of baseline data on the breeding bird populations, activity and flight paths within the vicinity of the proposed development site to inform subsequent ornithological impact assessment. The same survey methodology was followed as used in the first breeding season's surveys in 2022.

2. The specific objectives of this work were to:

   - Undertake breeding bird surveys of the proposed development site and its surrounds, to determine the numbers of birds present, and the flight activity of key target species.
   - Use this information to evaluate the importance of the site's breeding bird populations.

3. The surveys have been designed with reference to current NatureScot survey guidance on bird surveys for wind farms (SNH 2017). The surveys were undertaken by Tom Lowe, Stuart Piner and Scott Smith, all highly experienced bird surveyors.

4. Details of the nesting location of a species specially protected from disturbance under Schedule 1 of the Wildlife and Countryside Act are not included in this report but can be found in **Technical Appendix 8-8 Confidential Addendum on Breeding Birds**.

STUDY AREA

5. The site is located about 22km north of Campbeltown in Argyll. The breeding bird survey areas were chosen to include all areas within the possible zone of ornithological influence of the potential wind farm. This included the wind farm site, plus a 500m buffer for the main breeding bird surveys (following NatureScot guidance, SNH 2017) and a 2km buffer for the wider raptor, diver and black grouse surveys (the wider survey area), where access/viewing was possible and where there was potentially suitable habitat. The extents of the survey areas are shown in Figure 1. They are a mix of open moorland and conifer plantation, covering a total area of 8.1km^2 (core) and 23.0km^2 (wider). The site lies within the Argyll West and Islands NatureScot Natural Heritage Zone (NHZ 14).

BREEDING BIRD SURVEY METHODS

Core Breeding Bird Surveys

6. 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, Calladine *et al.* 2009). They commenced in April and continued through to July, and were done between 8:30 hours and 18:00 hours. The survey dates were 11 April, 23 May, 13 June and 17 July 2023. These surveys covered all of the open (i.e. non-forested) habitat within a buffer zone of 500m around the developable area where access/viewing was possible.

7. 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 km^2. 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.

8. 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.

9. 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 and Owl Breeding Surveys

10. As the survey area was considered likely, given its location and the habitats present, to be used by a range of scarce raptors, raptor surveys were undertaken during April-August 2023. Raptor surveys comprised walkovers where access was allowed (within the site land ownership), supplemented by a series of mini-VPs (shorter watches from additional VPs) to cover other areas (looking out from the site itself), to detect displaying or nesting behaviour during the breeding season of raptor species following the methods described in Gilbert *et al*. (1998) and Hardey *et al.* (2013) where access allowed. Surveys recorded all Schedule 1 and Annex I raptor species. This included four survey visits, undertaken on 11 April, 18 May, 13 June and 25-26 July.

Black Grouse Survey

11. Black grouse surveys were undertaken following the methods outlined in Gilbert *et al*. (1998). All suitable black grouse habitat from within the site boundary (to which access was restricted) was surveyed during April - mid-May. Surveys were carried out on 12-13 April, and 22/25 May. Areas of suitable habitat outwith the site to which access was not possible 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

12. 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 was 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 (Stanbury *et al*. 2021), as per NatureScot (SNH 2017).

13. The specific aim of the VP surveys was to collect data on key target species flight activity to enable estimates to be made 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.

14. Two vantage points were used to cover the potential wind farm site. The computer-generated viewsheds (using Global Mapper v21) are shown in Figure 1. For each VP, the basic 36 hours' VP surveys from each VP (as set out in NatureScot guidance) were supplemented by a further 24 hours/VP to capture more information on the use of the site by golden eagle. These surveys were spread evenly across the breeding season.

15. 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 (<3km).

16. 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 was recorded. To estimate flight height as accurately as possible available reference structures were used. Heights were estimated as accurately as possible and recorded as a raw estimate, rather than being summarised to height classes. Below 10m estimates were made to 1m, between 10 and 20m to 2m, between 20m and 50m to 5m, and above 50m to 10m. 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 SURVEYS 2023: RESULTS

17. The breeding bird populations recorded in the survey area on each visit are summarised in Table 1, which gives the estimated number of breeding pairs recorded during each survey visit and the overall breeding population estimate for each species. The breeding population estimates for 2022 are given for comparison.

TABLE 1. Breeding bird numbers in the core Killean survey area recorded during April-July 2023. Numbers given are the number of breeding pairs recorded on each survey visit, and the overall number of breeding pairs.

Species	April	May	June	July	Estimated number of breeding pairs in 2023	Estimated number of breeding pairs in 2022
Canada Goose	0	0	1	0	1	2
Teal	1	2	0	3	4	2
Mallard	1	2	5	1	5	4
Goldeneye	0	0	0	0	0	1
Red Grouse	3	1	1	2	6	5
Black Grouse	0	2	1	0	4	5
Pheasant	0	1	0	0	1	0
Red-throated Diver	1	1	1	1	1	1
Little Grebe	1	1	1	0	1	1
Buzzard	2	0	1	2	2	4
Kestrel	0	0	0	0	0	1
Snipe	3	3	2	0	4	6
Common Sandpiper	0	0	0	0	0	1
Common Gull	0	1	2	0	2	2
Woodpigeon	1	2	0	7	9	7
Collared Dove	0	0	0	0	0	1
Cuckoo	0	9	5	0	12	7
Skylark	24	61	56	36	94	116
Sand Martin	0	0	0	1	3	0
Swallow	0	0	0	0	0	3
Tree Pipit	0	13	5	2	16	4
Meadow Pipit	226	442	641	445	733	734
Grey Wagtail	1	2	2	0	4	9
Pied Wagtail	1	1	1	0	3	9
Wren	43	68	102	65	137	132
Dunnock	4	6	6	13	22	23
Robin	36	46	48	45	91	67
Redstart	0	0	1	0	1	0
Whinchat	0	11	9	6	16	17
Stonechat	9	21	19	15	45	22
Wheatear	0	0	0	0	0	2

Species	April	May	June	July	Estimated number of breeding pairs in 2023	Estimated number of breeding pairs in 2022
Blackbird	3	10	3	4	19	15
Song Thrush	4	8	7	5	18	17
Mistle Thrush	0	0	1	2	3	9
Grasshopper Warbler	0	2	1	0	3	5
Sedge Warbler	0	1	1	0	2	2
Blackcap	0	0	0	0	0	1
Whitethroat	0	3	1	1	4	6
Chiffchaff	2	0	0	0	2	0
Willow Warbler	12	144	112	13	176	144
Goldcrest	11	11	13	41	52	53
Blue Tit	0	1	0	0	1	0
Great Tit	0	1	1	0	2	5
Coal Tit	20	20	11	43	58	46
Treecreeper	2	0	0	2	4	0
Jay	0	1	2	7	7	7
Jackdaw	0	1	0	0	1	0
Carrion Crow	1	0	0	0	1	2
Hooded Crow	1	5	3	6	10	10
Raven	4	1	1	0	4	2
Chaffinch	32	58	74	32	112	130
Goldfinch	2	1	4	4	11	2
Siskin	12	13	15	15	39	28
Linnet	0	1	1	2	4	4
Lesser Redpoll	15	24	19	14	47	43
Common Crossbill	4	1	2	0	6	5
Bullfinch	2	1	3	10	13	7
Reed Bunting	0	10	4	5	14	17

18. The distributions of the breeding birds of conservation importance within the survey area in 2023 are shown in Figures 2 to 14. The more abundant species (i.e. 10 or more breeding pairs) of conservation interest have been presented separately for clarity.

- **Skylark** (Figure 2) and **Meadow Pipit** (Figure 3) were both abundant over all of the open ground across the survey area (including, for meadow pipit, within the clear-fell forestry areas).
- **Tree Pipit** (Figure 4) were found mostly within the more open clear-fell and associated habitats within the forestry plantations.
- **Wren** (Figure 5) and **Dunnock** (Figure 6) were found mostly within the woodland habitat.
- **Whinchat** (Figure 7) were found mostly on the open ground in the western part of the survey area.
- **Song Thrush** (Figure 8), **Willow Warblers** (Figure 9), **Siskin** (Figure 10), **Lesser Redpoll** (Figure 11) and **Bullfinch** (Figure 12) were all found largely in the forested areas.

- **Reed Bunting** (Figure 13) was another species found mostly on the open ground in the western part of the survey area.

19. Of the other less abundant species of conservation importance (Figure 14), these were widely distributed across the survey area. The waterbodies held red-throated diver, mallard, teal and common gull, the open moorland on the eastern side of the site red grouse and snipe, common crossbill were found in the forest and the open habitats to the west held cuckoo and grasshopper warbler.

20. Species recorded during the 2023 breeding bird surveys but without any evidence of breeding within the survey area included: goldeneye (2), grey heron (1), hen harrier (2), white-tailed eagle (1), golden eagle (1), golden plover (185 – a spring migrant flock) and snow bunting (1).

21. Additional species seen during the 2022 breeding bird surveys but not showing any evidence of breeding within the survey area included (peak counts): pink-footed goose (22 – a spring migrant flock over-flying), Greenland white-fronted goose (31 – a late record of this over-wintering species), goosander (2), grey heron (1), hen harrier (1), white-tailed eagle (2), golden eagle (2), osprey (1), peregrine (2), golden plover (18 – a spring migrant flock), herring gull (1), great black-backed gull (1), black-headed gull (1) and fieldfare (1).

Black Grouse survey results

22. Three black grouse leks were recorded in 2023, two of which held up to 2 lekking males and one just a single male (Figure 15). Leks had been recorded in similar locations during the 2022 surveys, though with two additional single-male leks about 1km north in that year. The survey area population was estimated at a total of four lekking males (compared to five in 2022).

Raptor and diver survey results

23. **Red-throated Diver** – this species nested and successfully raised one chick in 2023. his species had nested within the core breeding bird survey area in 2022, though it was unsuccessful that year (no chick was seen). Details and flight lines are given in the Confidential Addendum in TA8-8.

24. **Hen Harrier** – there were regular flights over the site during the VP surveys, but no notable concentrations of flight activity and no evidence of breeding within 2km of any proposed wind turbines in 2022 or 2023. An active nest was located outside the site boundary during the wider area surveys, in the same area as 2022. Details and flight lines are given in the Confidential Addendum in TA8-8.

25. **Golden Eagle** – a pair were active within the territory in which the site is located in 2023, as they had been in 2022. Again though, no evidence was found of any egg-laying, or in 2023 any definitive nest-building. They were also seen regularly over-flying the proposed wind farm. Details and flight lines are given in the Confidential Addendum in TA8-8.

26. **White-tailed Eagle** – there were 7 records of this species over-flying during summer 2023 (there were 12 in 2022) (Figure 16), and again no evidence of breeding within 2km of the proposed wind farm.

27. **Osprey** – five osprey flights were observed during the 2023 VP surveys (Figure 16), compared with three in 2022, but no evidence of breeding within the survey area.

28. **Merlin** – there were no records of this species during the 2023 surveys. There had been a single record of a female overflying the site in 2022 during the VP surveys, and a wider survey area record of a single seen flying over potentially suitable breeding habitat 3km south-east of the site.

29. **Peregrine** - there was only a single VP survey record of this species in 2023 (Figure 16). There had been three records of this species overflying during the 2022 VP surveys (an adult male and two records of a juvenile), but no evidence of breeding within the core or the wider survey area.

30. **Barn Owl** – an active nest with small chicks was located in the wider survey area to the north the site in June 2023, over 1km from the nearest current proposed turbine location. Details are given in the Confidential Addendum in TA8-8.

Vantage Point Survey Results

31. The rates of bird flight movement observed across the survey area during the vantage point surveys from the two VPs are summarised in Table 2. This gives the monthly mean flight rates observed, and the total number of flights recorded during the survey period. Key species flight lines are shown in Figures 16 and in the Confidential Addendum in TA8-8.

TABLE 2a. Bird flight rates recorded over the Killean breeding bird survey area during April – August 2023 vantage point surveys. N = 60 hours total observation at each of two VPs.

Species	Flight rate (birds/hour)					Total number of flights	% flights at rotor height
	Apr	May	Jun	Jul	Aug		
Canada Goose	0.09	0.12	0	0	0	5	50%
Mallard	0.18	0.24	0.04	0	0	11	43%
Red-throated Diver	0	0.16	0.41	0.05	0.73	36	97%
White-tailed Eagle	0	0.04	0	0	0.11	4	100%
Hen Harrier	0.09	0.37	0.15	0.27	1.05	49	56%
Sparrowhawk	0.09	0	0	0	0.40	13	69%
Buzzard	0.77	1.18	0.59	0.38	1.89	121	77%
Golden Eagle	0.77	0.29	0.30	0.32	0.44	50	87%
Osprey	0	0	0	0	0.18	5	40%
Kestrel	0	0.16	0.04	0.05	1.20	39	38%
Peregrine	0	0.04	0	0	0	1	100%
Golden Plover	10	0	0	0	0	220	100%
Snipe	0	0.12	0.04	0	0	4	100%
Common Gull	0.23	0.29	0.19	0.11	0	19	25%
Lesser Black-backed Gull	0	0	0.04	0	0	1	100%
Herring Gull	0	0	0.11	0	0	3	100%
Great Black-backed Gull	0	0.04	0	0	0	1	100%

TABLE 2b. Bird flight rates recorded over the Killean breeding bird survey area during April – August 2022 vantage point surveys. N = 60 hours total observation at each of two VPs.

Species	Flight rate (birds/hour)					Total number of flights	% flights at rotor height
	Apr	May	Jun	Jul	Aug		
Pink-footed Goose	1.05	-	-	-	-	22	0%
Greenland White-fronted Goose	1.48	-	-	-	-	31	100%
Red Grouse	-	-	-	0.03	-	1	0%
Red-throated Diver	-	0.24	0.69	0.89	0.37	56	84%
White-tailed Eagle	0.52	-	-	0.03	-	12	50%
Hen Harrier	0.10	0.16	0.07	0.06	0.24	15	40%
Sparrowhawk	0.29	0.08	0.21	0.11	0.29	22	50%
Buzzard	1.48	1.00	0.90	0.63	1.18	120	68%
Golden Eagle	1.24	0.08	-	0.26	0.49	49	85%
Osprey	-	0.08	-	0.03	-	3	100%
Kestrel	0.10	-	-	-	0.98	26	50%
Merlin	-	-	-	-	0.04	1	100%
Peregrine	0.10	-	-	-	0.04	3	100%
Golden Plover	0.48	-	-	-	-	10	100%
Snipe	-	0.12	0.14	0.11	-	9	100%
Common Gull	0.19	0.48	-	0.09	-	19	26%
Herring Gull	-	0.04	-	-	-	1	100%
Great Black-backed Gull	0.05	0.04	-	0.06	-	4	100%
Black-headed Gull	-	-	-	0.03	-	1	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 shown 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 (Austin *et al*. 2023). 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 v.5' (Stanbury *et al.* 2021) 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 (Austin *et al.* 2023) 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 and UK/Scottish BAP priority species were all considered in the evaluation process.

TABLE 3.Definition of terms relating to the conservation value of the ornithological receptors at the site.

Sensitivity	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. UK BAP priority species (if not covered above), red-listed species of conservation concern.
LOW	Any other species of conservation interest, e.g. species listed on the Birds of Conservation Concern not covered above. Scottish BAP priority species (if not covered above).

TABLE 4. Conservation evaluation of the breeding bird populations in the KJillean survey area, 2022 and 2023.

Species	Breeding pairs (peak 2022 and 2023)	EU Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Canada Goose	2						Nil
Teal [3]	4			A			Low
Mallard	5			A			Low
Goldeneye [4]	1		✓	R			High
Red Grouse [1]	6				✓		Medium
Black Grouse [3]	5			R	✓	✓	Medium
Pheasant	1						Nil
Red-throated Diver [3]	1	✓	✓			✓	High
Little Grebe [3]	1						Nil
Buzzard [2]	4						Nil
Kestrel	1			A		✓	Low
Snipe [2]	6			A			Low
Common Sandpiper [2]	1			A			Low
Common Gull [2]	2			A			Low
Woodpigeon	9			A			Low
Collared Dove	1						Nil
Cuckoo [2.5]	7			R	✓	✓	Medium

Species	Breeding pairs (peak 2022 and 2023)	EU Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Skylark	116			R	✓	✓	Medium
Sand Martin	3						Nil
Swallow	3						Nil
Tree Pipit	16			R	✓	✓	Medium
Meadow Pipit	734			A			Low
Grey Wagtail [2]	9			A			Low
Pied Wagtail	9						Nil
Wren	137			A			Low
Dunnock	23			A	✓		Medium
Robin	91						Nil
Redstart	1						Nil
Whinchat [2]	17			R			Low
Stonechat [2]	45						Nil
Wheatear [1]	2			A			Low
Blackbird	19						Nil
Song Thrush	18			A	✓	✓	Medium
Mistle Thrush	9			R			Low
Grasshopper Warbler	5			R	✓	✓	Medium
Sedge Warbler	2			A			Low
Blackcap	1						Nil
Whitethroat	6						Nil
Chiffchaff	2						Nil
Willow Warbler	176			A			Low
Goldcrest	53						Nil
Blue Tit	1						Nil
Great Tit	5						Nil
Coal Tit	58						Nil
Treecreeper	4						Nil
Jay	7						Nil
Jackdaw	1						Nil
Carrion Crow	2						Nil
Hooded Crow	10					✓	Low
Raven [3]	4						Nil
Chaffinch	130						Nil
Goldfinch	11						Nil

Species	Breeding pairs (peak 2022 and 2023)	EU Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Siskin	39					✓	Low
Linnet	4			R	✓	✓	Medium
Lesser Redpoll	47				✓	✓	Medium
Common Crossbill	6		✓				Low
Bullfinch	13			A	✓	✓	Medium
Reed Bunting	17			A	✓	✓	Medium

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. Three high value species were recorded breeding within the core breeding bird survey area during 2022 and 2023, goldeneye, red-throated diver and common crossbill. All are specially protected under Schedule 1 of the Wildlife and Countryside Act, and red-throated diver is additionally listed on Annex 1 of the EU Birds Directive.

34. Twelve breeding species were classed as medium conservation value: red grouse, black grouse, cuckoo, skylark, tree pipit, dunnock, song thrush, grasshopper warbler, 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.

35. A further 18 breeding species were classed as low sensitivity, through their listing on RSPB *et al*.'s (Stanbury *et al*. 2021) amber lists of birds of conservation concern and/or the Scottish Biodiversity List.

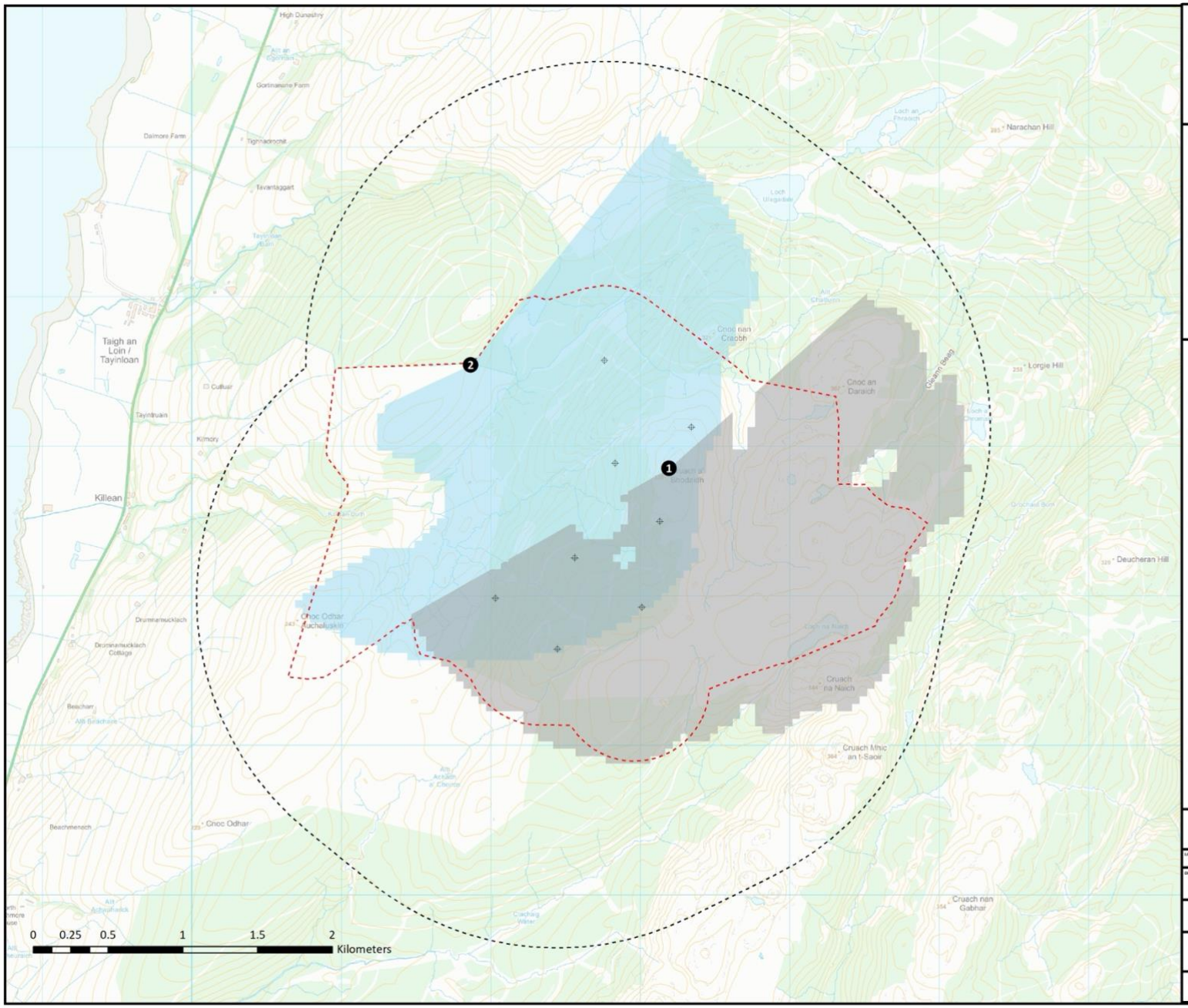
36. The overall conservation value of the breeding bird community in 2022 and 2023, measured from the core survey data as the breeding bird assemblage score, was 37.5. This just below the threshold for national importance (40) for the main habitat within the survey area, 'Upland moorland and grassland with water bodies' (Drewitt *et al.* 2020). The core survey area therefore supports a regionally important breeding bird community.

37. The evaluation of the conservation importance of the non-breeding species observed during these surveys is given in Table 5. This included one very high value species (Greenland white-fronted goose, linked to the Kintyre Goose Roosts SPA – see previous winter report (Percival *et al.* 2022a) for a more detailed assessment of this wintering species), seven high value species (white-tailed eagle, hen harrier, golden eagle, osprey, merlin, peregrine and golden plover), all EU Annex 1/Wildlife and Countryside Act Schedule 1 species), one medium value (herring gull, a UK BAP priority species), present in regionally important numbers), and four additional low value species (through their red/amber listing). All these species were seen only infrequently in generally low numbers during the breeding bird surveys.

TABLE 5. Conservation evaluation of the non-breeding bird populations in the Killean survey area, 2022 and 2023.

Species	Peqk count 2022 and 2023	EU Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
Pink-footed Goose	22			A			Low

Species	Peqk count 2022 and 2023	EU Ann 1	W and C Act Sch 1	Red [R]/ Amber [A] List	UK BAP priority sp	Scottish BAP sp	Conservation Value
White-fronted Goose	31			R	✓	✓	Very high
Goosander	2						Nil
Grey Heron	1						Nil
White-tailed Eagle	2	✓	✓	A		✓	High
Hen Harrier	2	✓	✓	R		✓	High
Golden Eagle	2	✓	✓			✓	High
Osprey	1	✓	✓	A		✓	High
Merlin	1	✓	✓	R		✓	High
Peregrine	2	✓	✓			✓	High
Golden Plover	185	✓				✓	High
Herring Gull	1			R	✓	✓	Medium
Great Black-backed Gull	1			A			Low
Black-headed Gull	1			A			Low
Fieldfare	1			R			Low



res
power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 1

Survey areas, VP locations and viewsheds

KEY:

- Indicative turbines (July 22)
- VP locations
- Breeding bird core area 2023
- Wider survey area (2km buffer)
- VP1 viewshed
- VP2 viewshed

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

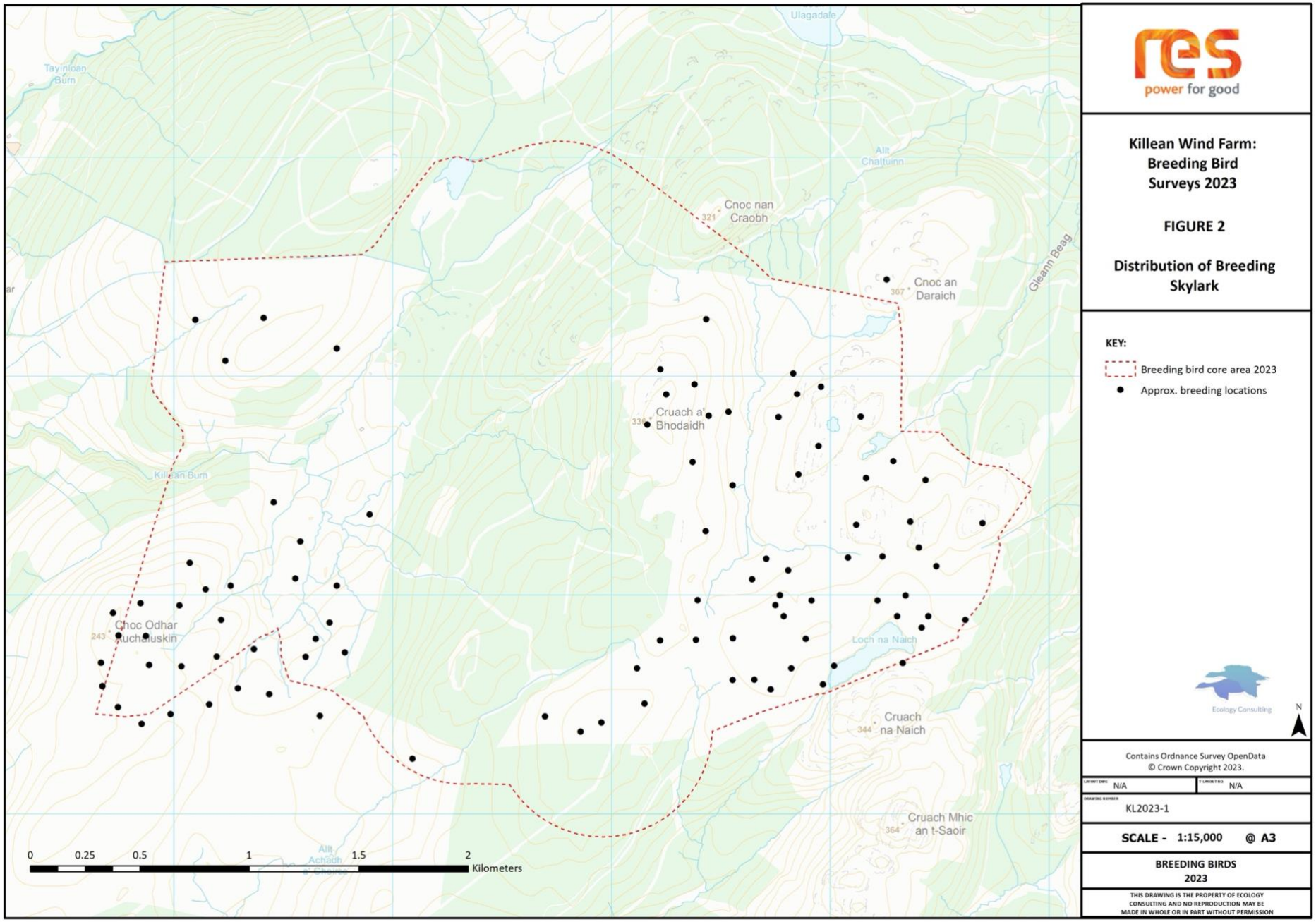
LAYOUT DWG.	N/A	T LAYOUT NO.	N/A

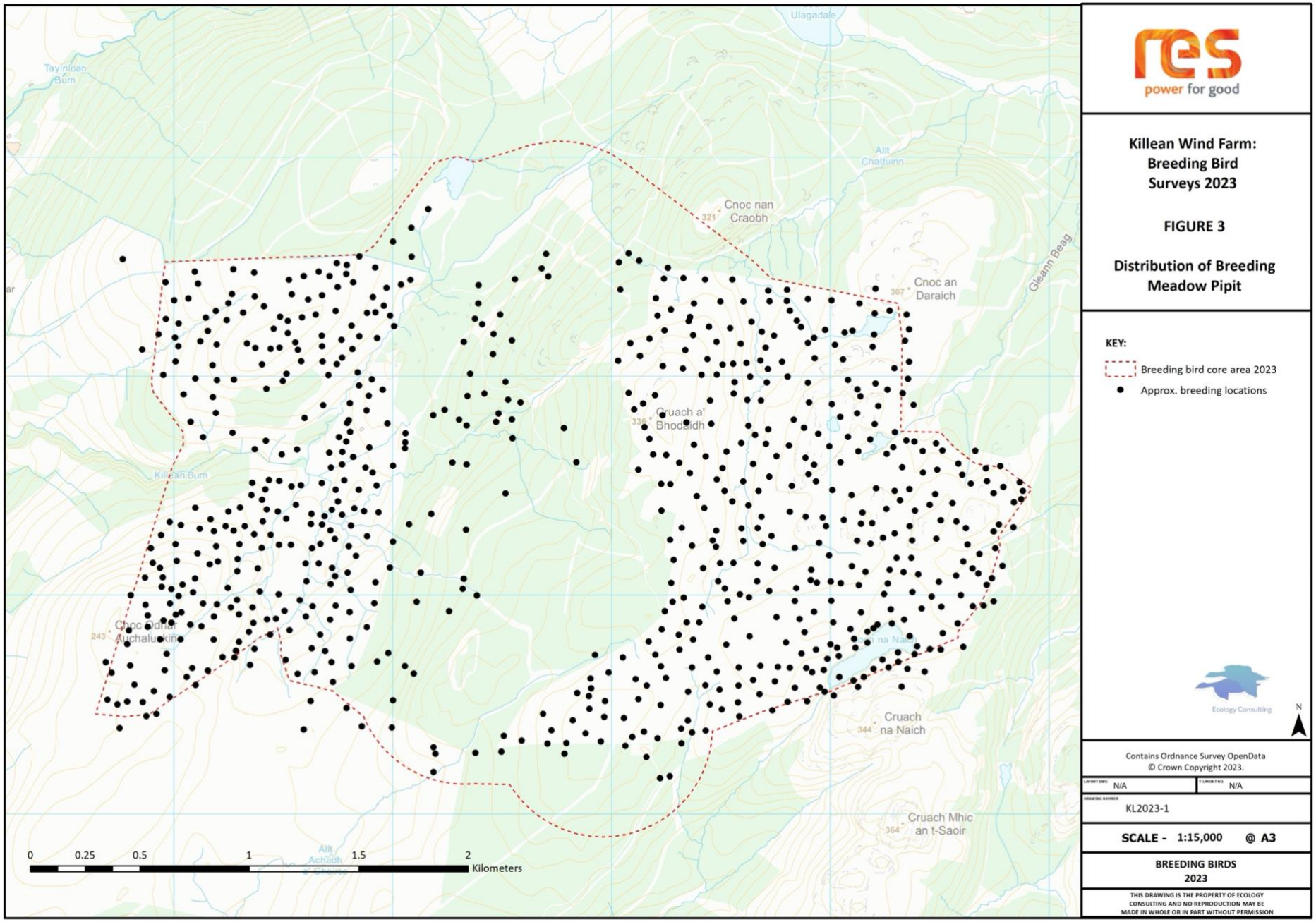
DRAWING NUMBER: KL2023-1

SCALE - 1:24,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION


Ulagadale
Tayinloan Burn
Allt Chalfuinn
Cnoc nan Craobh
321
Cnoc an Daraich
307
Gleann Beag
Cruach a' Bhodaidh
336
Killean Burn
Choc Odhar Auchalluskin
243
Loch na Naich
Cruach na Naich
344
Cruach Mhic an t-Saoir
364
Allt Achadh a' Ghairbh
0
0.25
0.5
1
1.5
2
Kilometers
res
power for good
Killean Wind Farm:
Breeding Bird
Surveys 2023
FIGURE 2
Distribution of Breeding Skylark
KEY:
Breeding bird core area 2023
Approx. breeding locations
Ecology Consulting
N
Contains Ordnance Survey OpenData
© Crown Copyright 2023.
LAYOUT DWG N/A
T-LAYOUT NO. N/A
DRAWING NUMBER KL2023-1
SCALE - 1:15,000 @ A3
BREEDING BIRDS
2023
THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 3

Distribution of Breeding Meadow Pipit

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

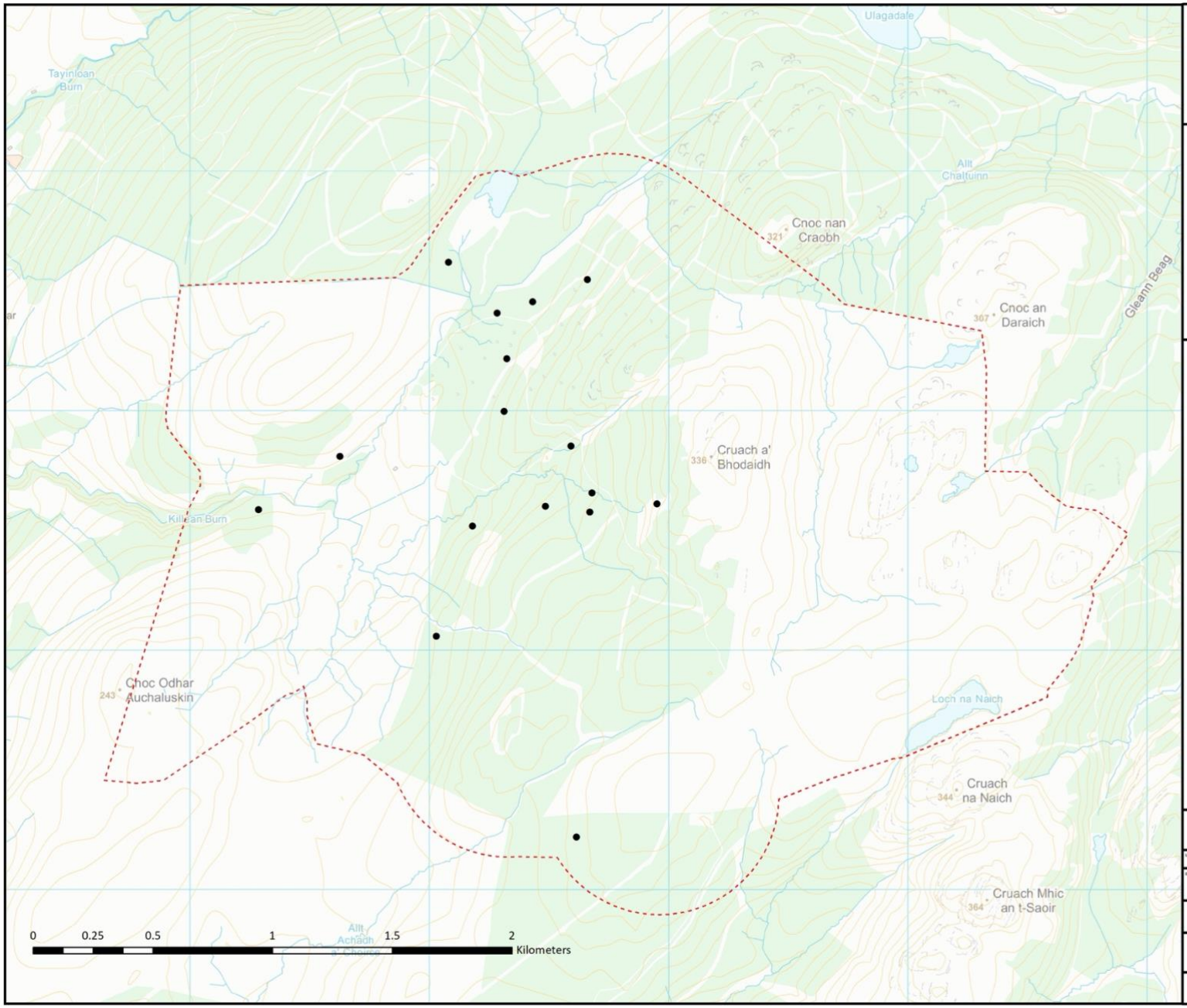
LAYOUT DWG	N/A
T-LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 4

Distribution of Breeding Tree Pipit

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

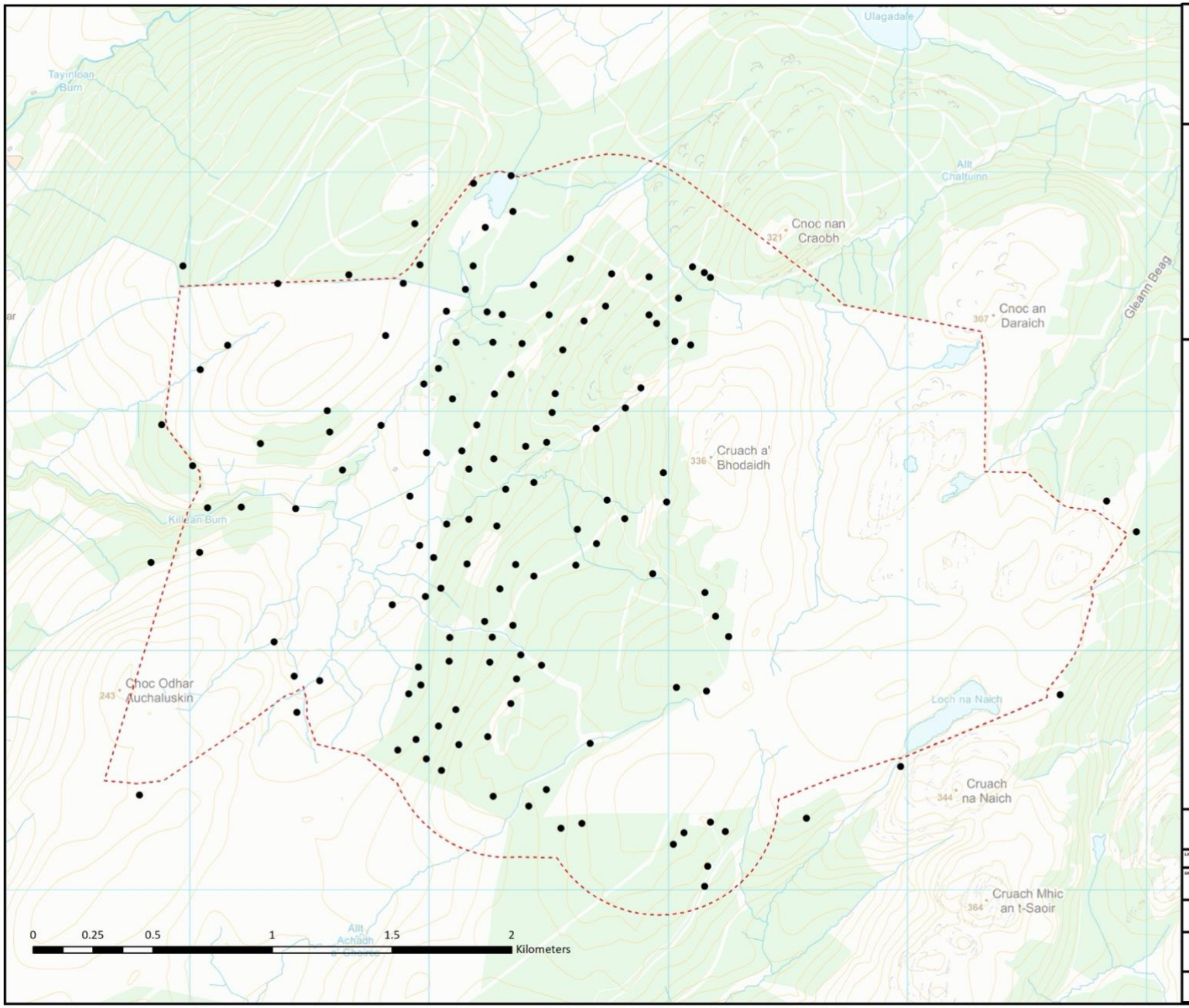
LAYOUT DWG	N/A	T-LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 5

Distribution of Breeding Wren

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

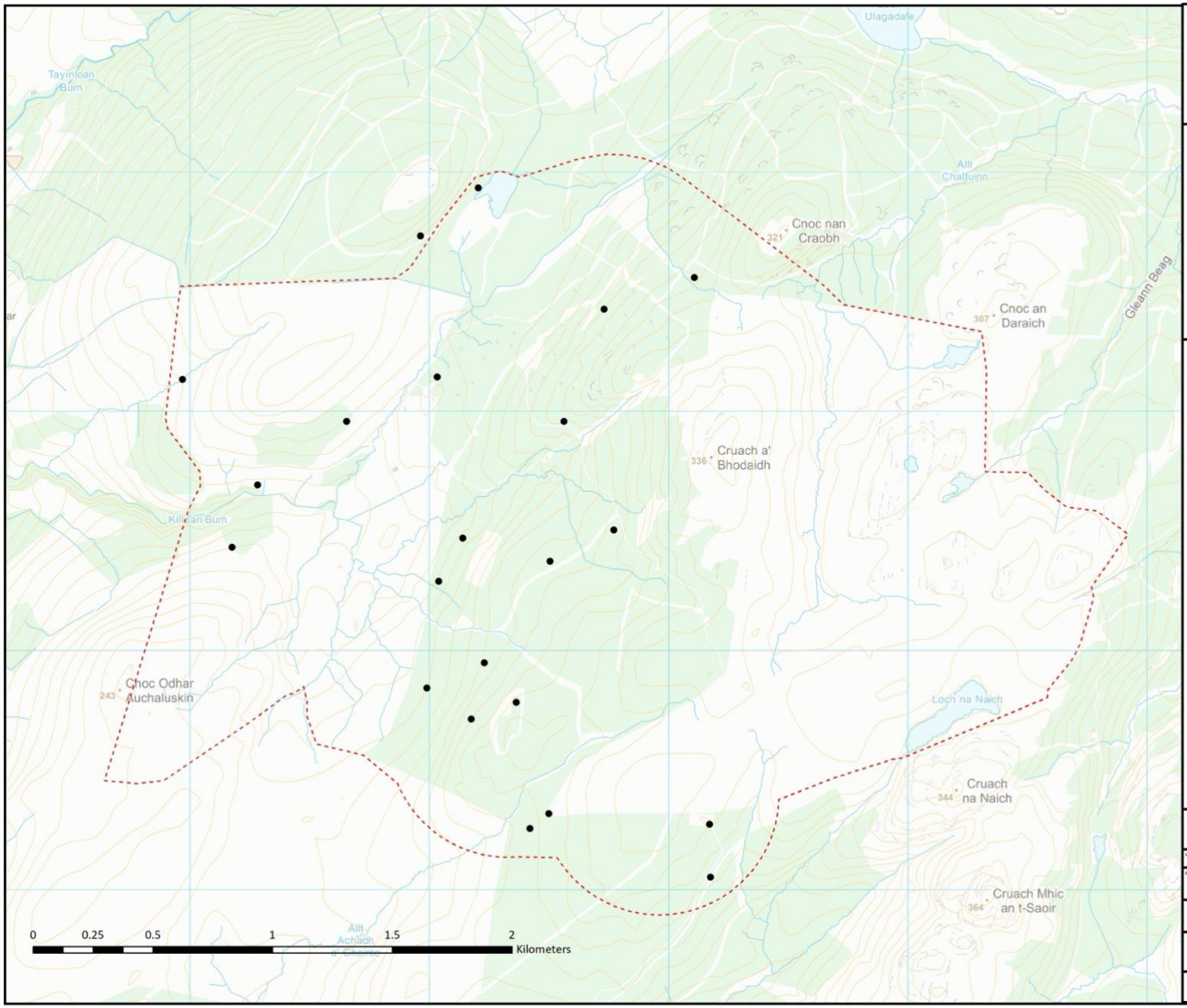
LAYOUT DWG	N/A	T-LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 6

Distribution of Breeding Dunnock

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

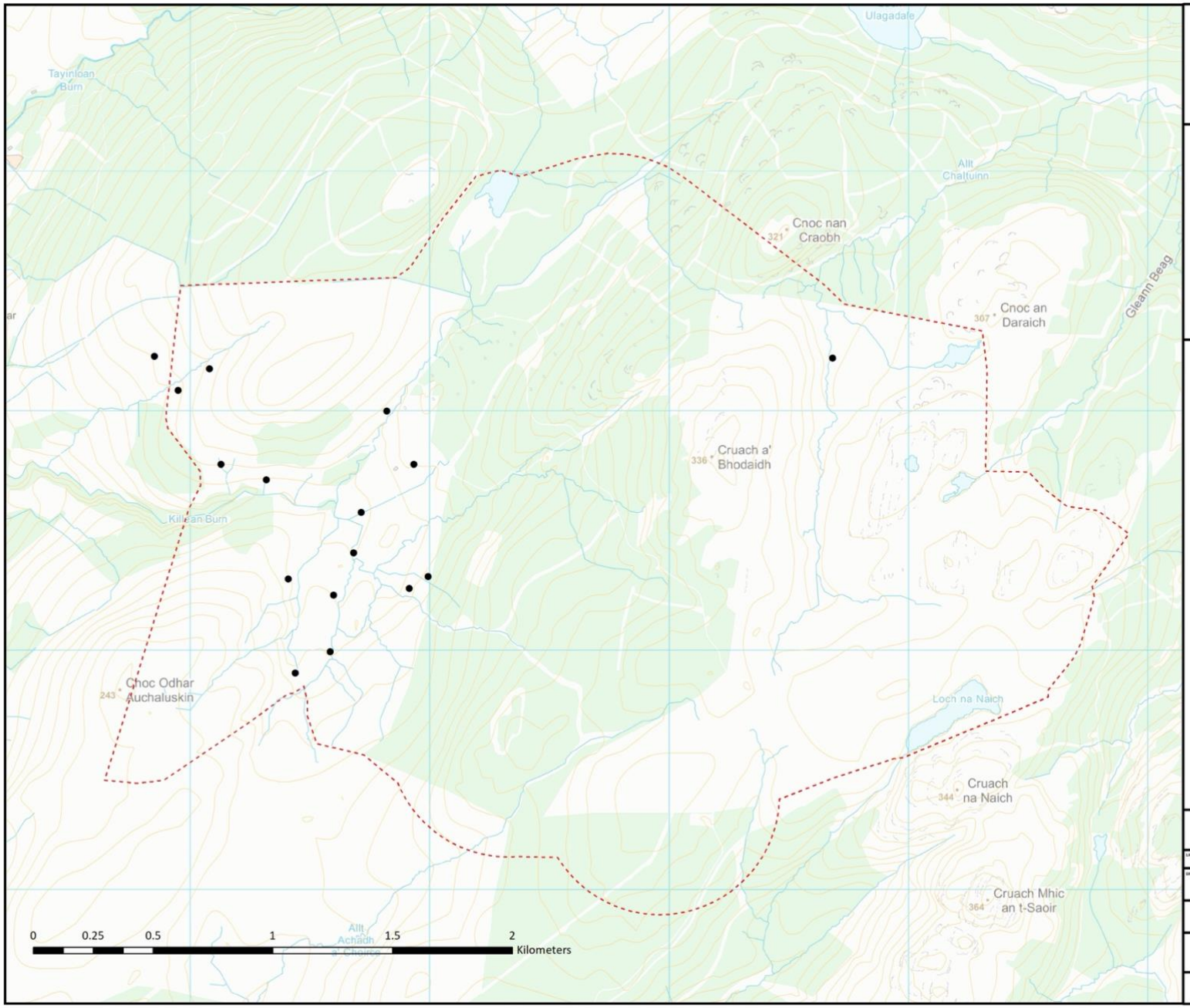
Contains Ordnance Survey OpenData
© Crown Copyright 2023.

LAYOUT DWG	N/A
T-LAYOUT NO.	N/A
DRAWING NUMBER	KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



res
power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 7

Distribution of Breeding Whinchat

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

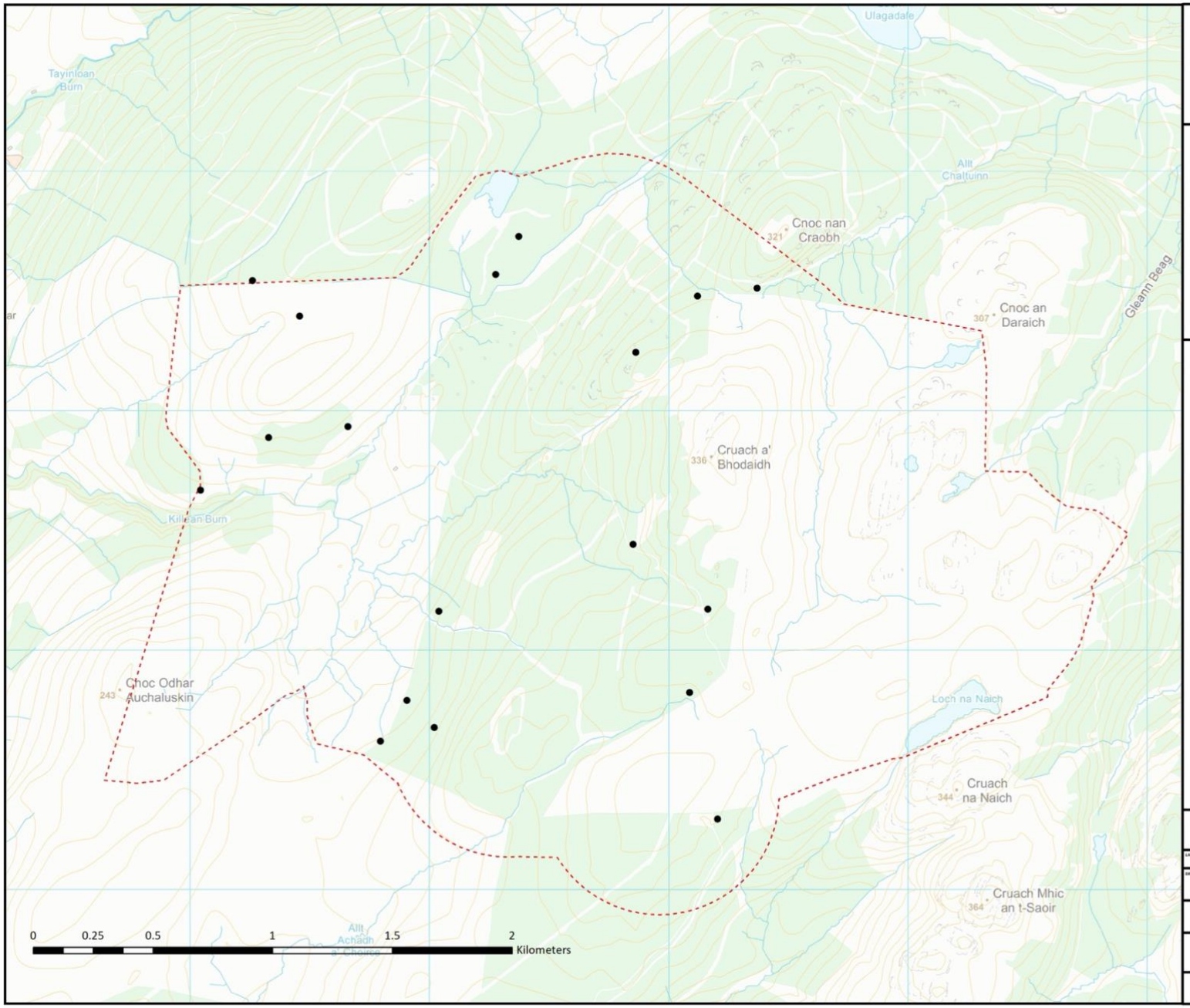
LAYOUT DWG. N/A	LAYOUT NO. N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 8

Distribution of Breeding Song Thrush

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

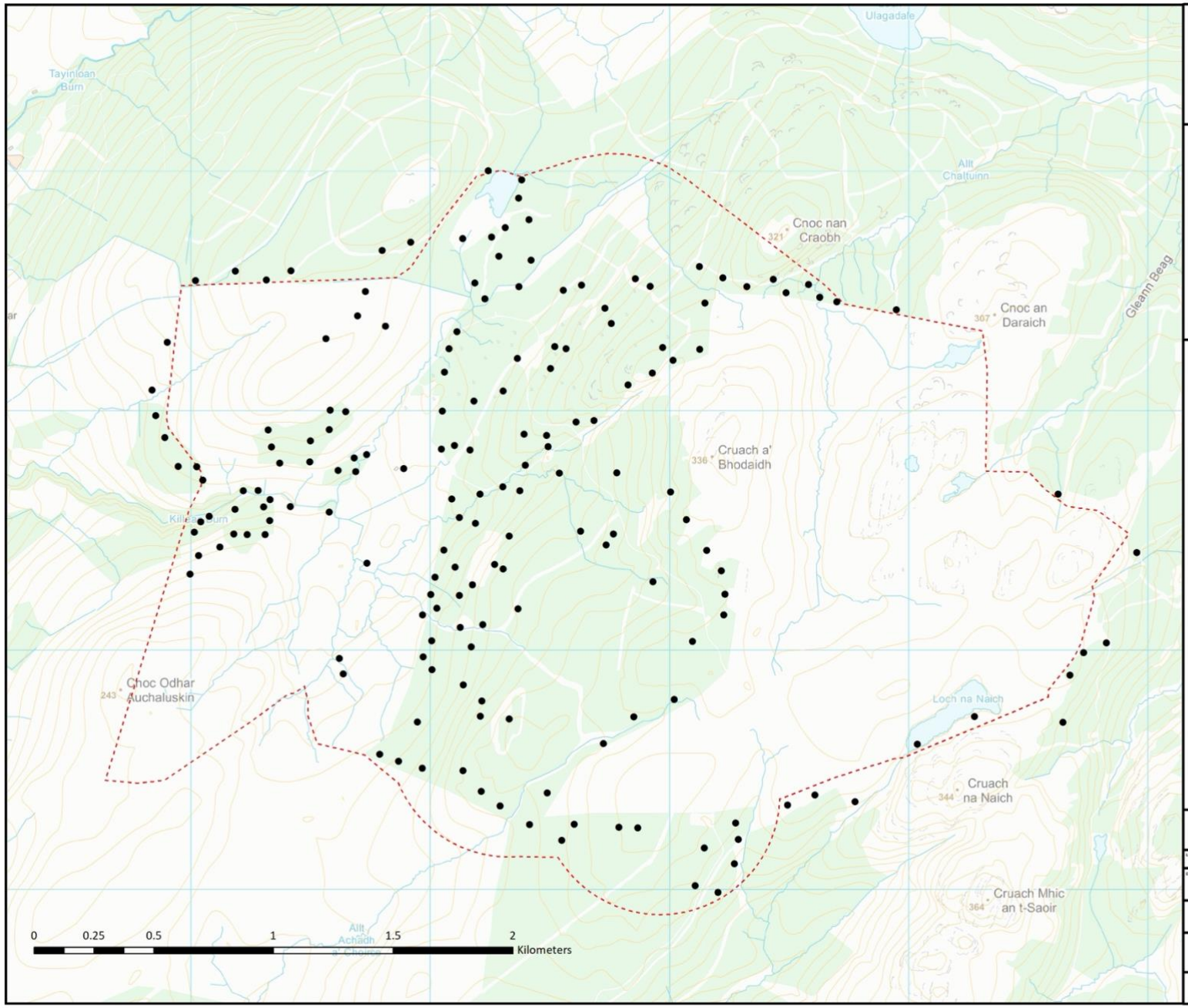
Contains Ordnance Survey OpenData
© Crown Copyright 2023.

LAYOUT DWG	N/A
T LAYOUT NO.	N/A
DRAWING NUMBER	KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 9

Distribution of Breeding Willow Warbler

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

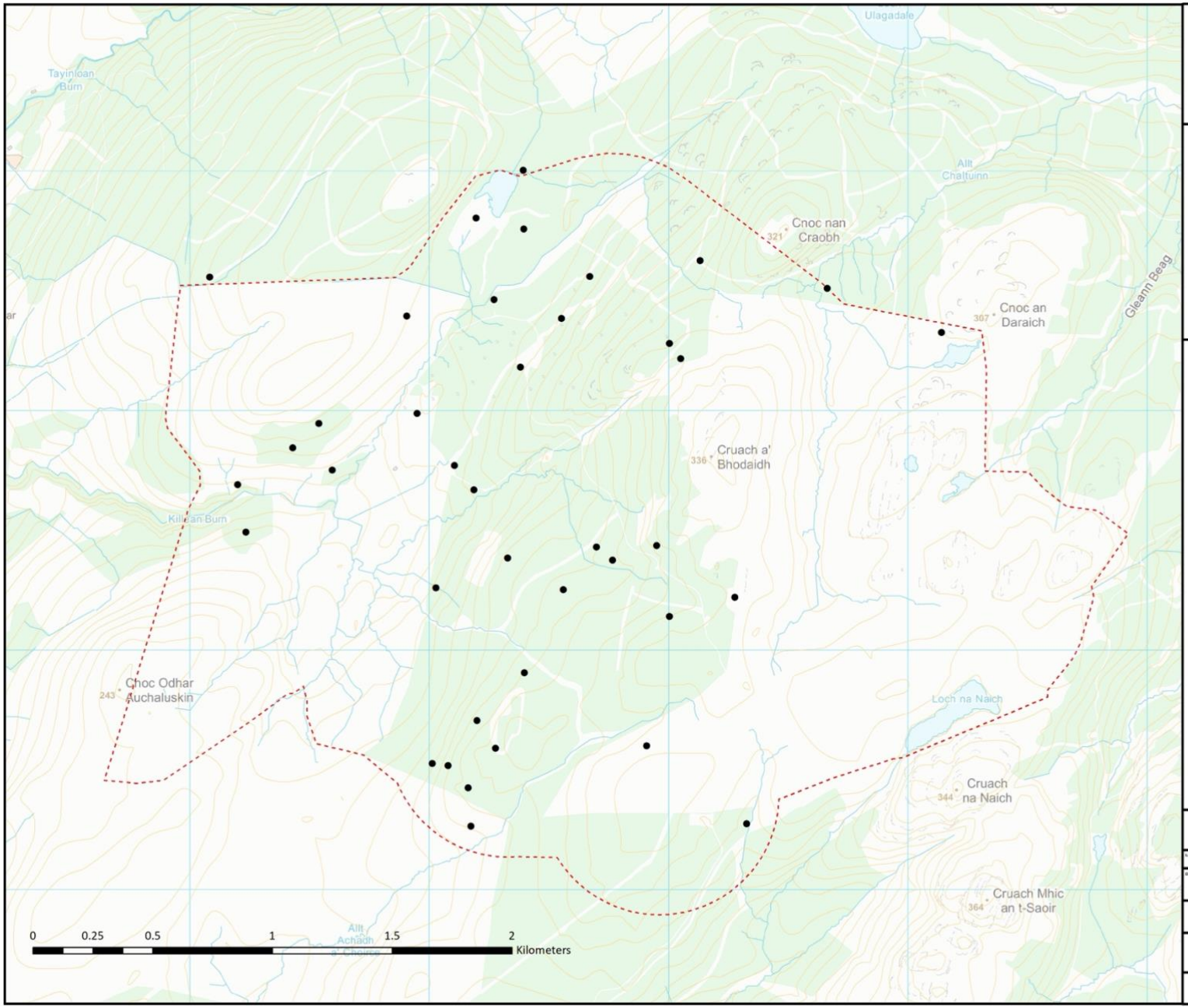
LAYOUT DWG.	N/A	T LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 10

Distribution of Breeding Siskin

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

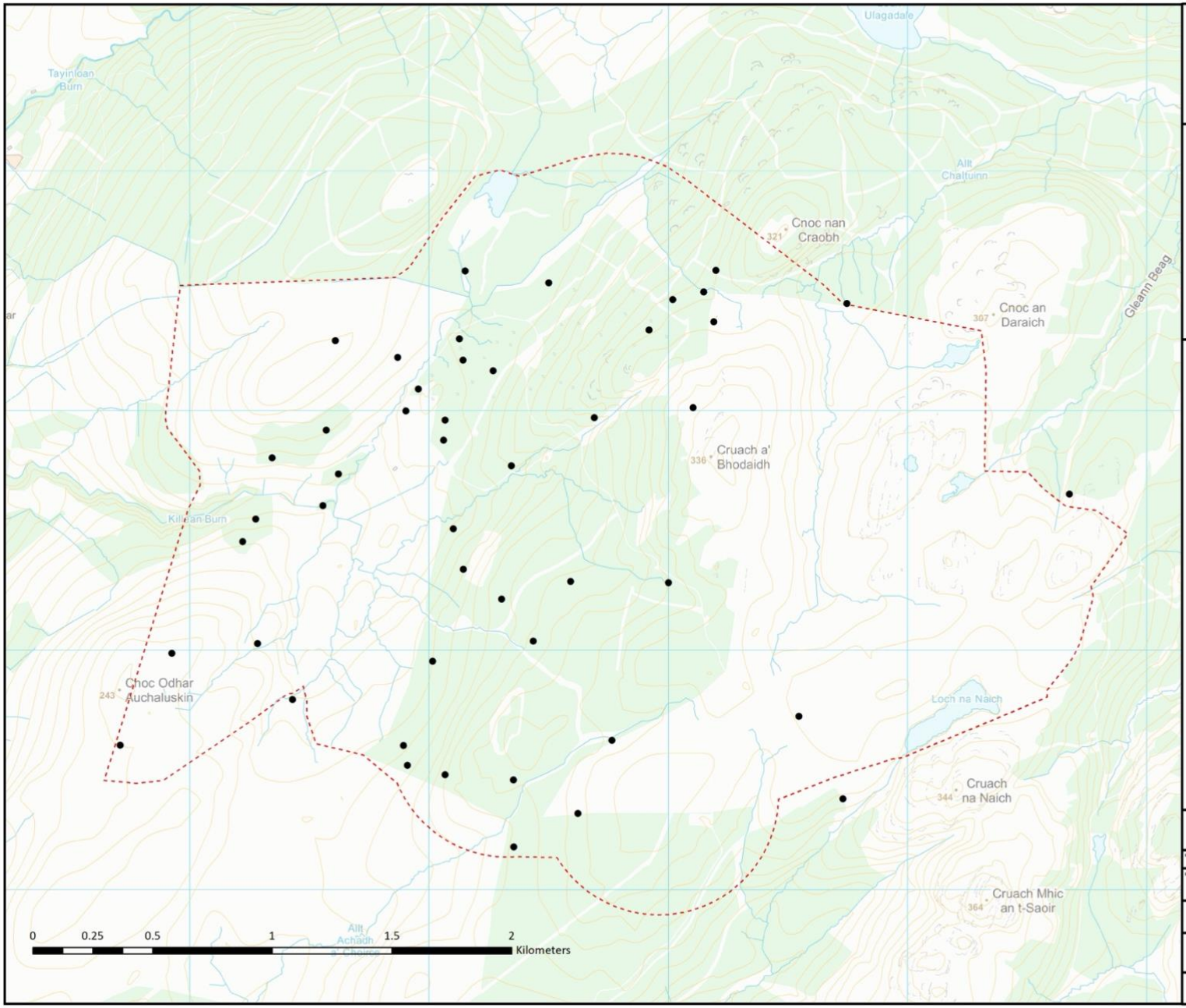
LAYOUT DWG.	LAYOUT NO.
N/A	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 11

Distribution of Breeding Lesser Redpoll

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

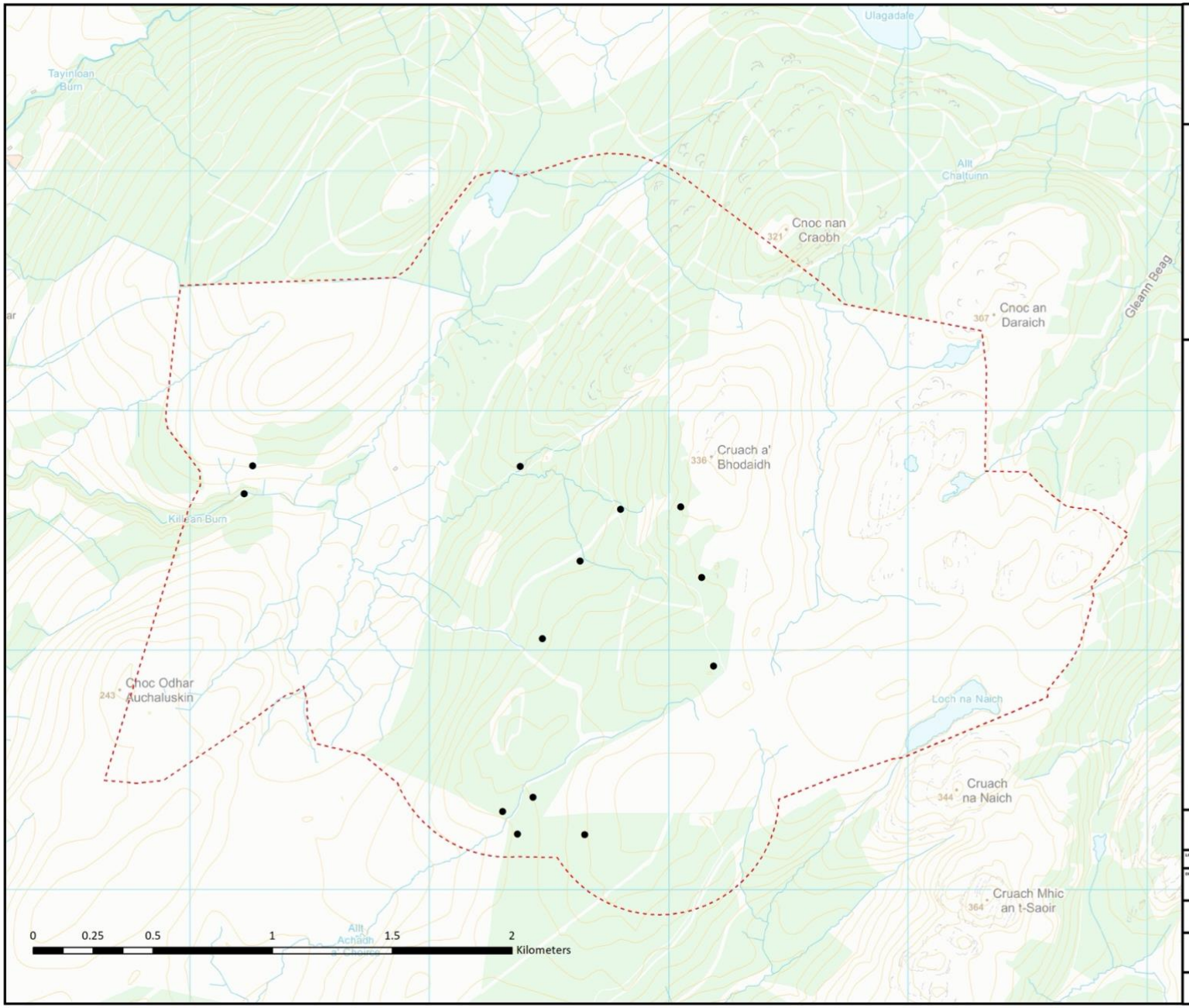
LAYOUT DWG	N/A	T LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 12

Distribution of Breeding Bullfinch

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

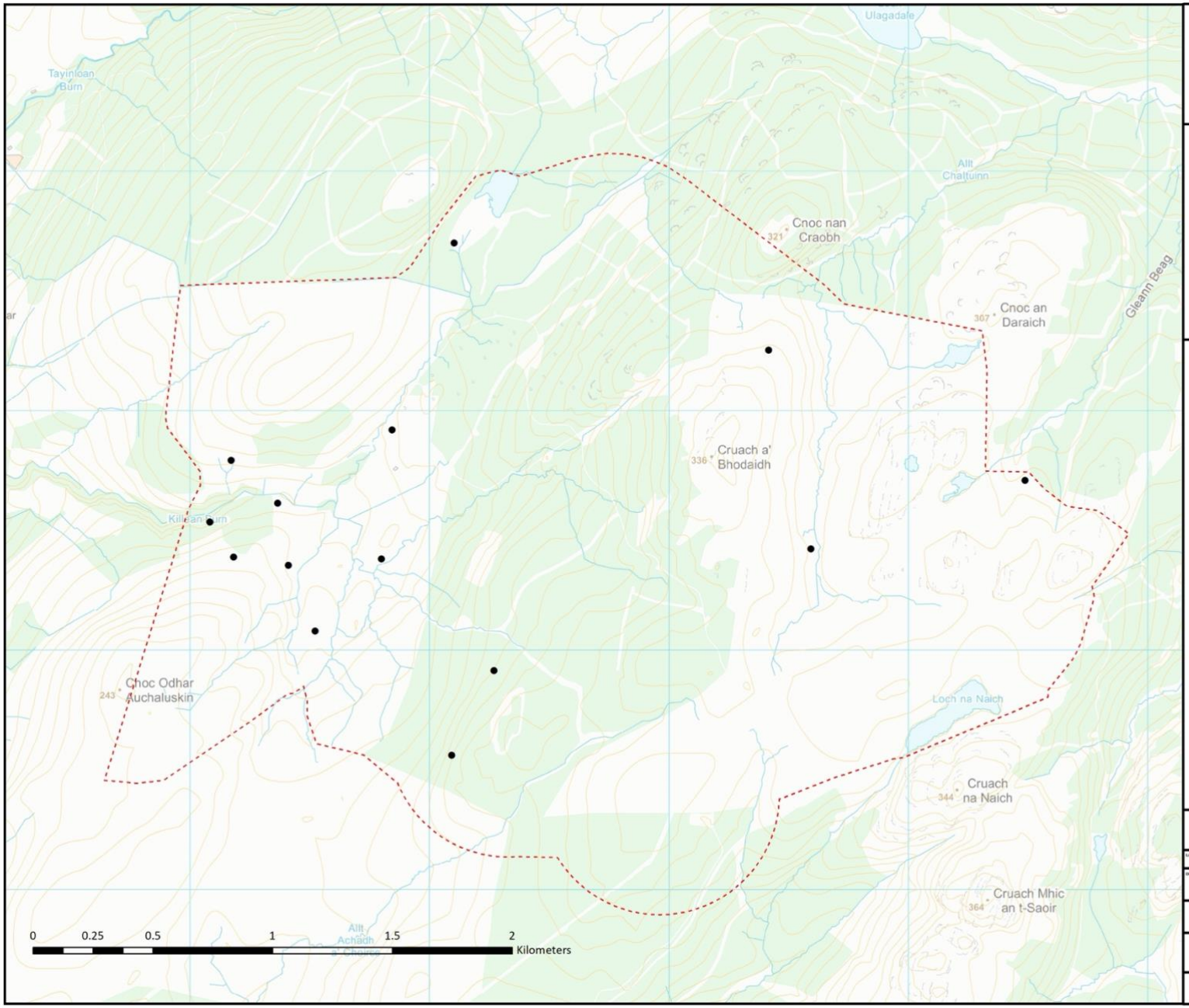
LAYOUT DWG	N/A	T-LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



res
power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 13

Distribution of Breeding Reed Bunting

KEY:

- Breeding bird core area 2023
- Approx. breeding locations

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

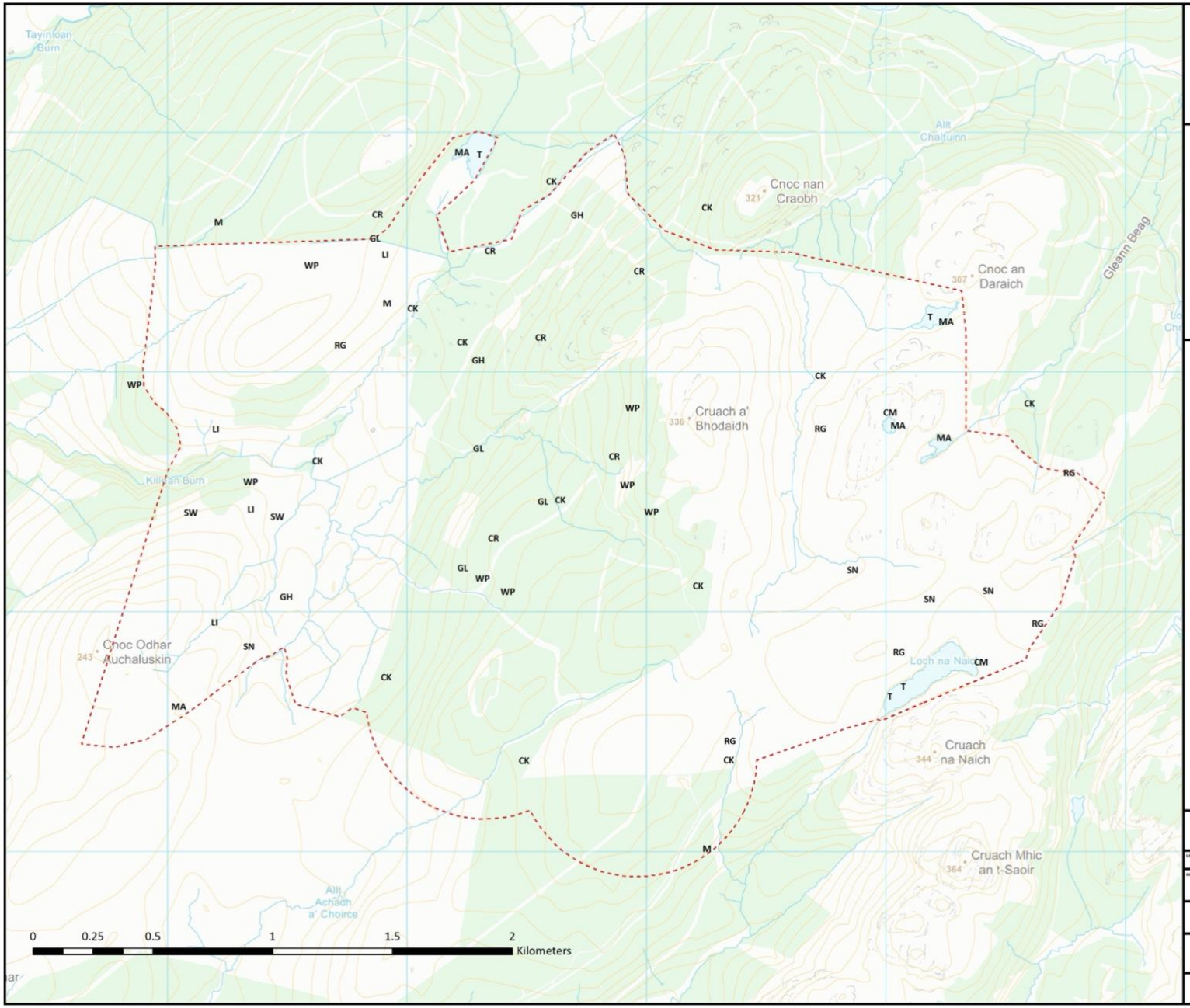
LAYOUT DWG	N/A	T-LAYOUT NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 14

Distribution of Other Breeding Species

KEY:

Breeding bird survey area (core)

Appox. breeding locations:

BF - Bullfinch
CK - Cuckoo
CM - Common Gull
CR - Common Crossbill
GH - Grasshopper Warbler
GL - Grey Wagtail
LI - Linnet
M - Mistle Thrush
MA - Mallard
RG - Red Grouse
SN - Snipe
SW - Sedge Warbler
T - Teal
TP - Tree Pipit
W - Wheatear
WP - Woodpigeon

N

Contains Ordnance Survey OpenData
© Crown Copyright 2024.

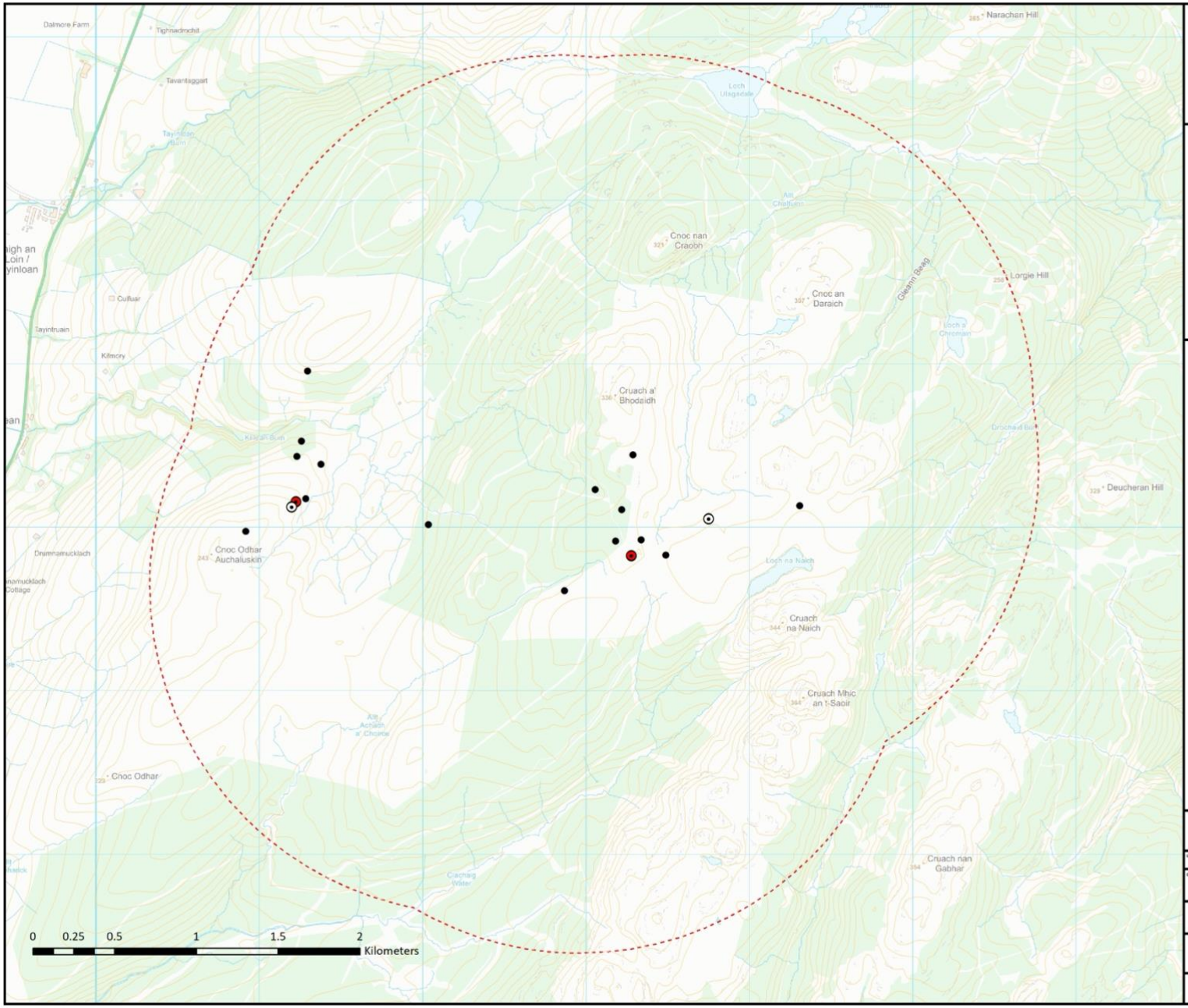
LAYOUT DWG N/A | T-LAYOUT NO. N/A

DRAWING NUMBER KL2023-1

SCALE - 1:15,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



res
power for good

Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 15

Distribution of Black Grouse Leks

KEY:

- Black Grouse Survey Area

Black Grouse Records

- Other records (singles)
- Single male lek
- Two-male lek

Ecology Consulting

N

Contains Ordnance Survey OpenData
© Crown Copyright 2023.

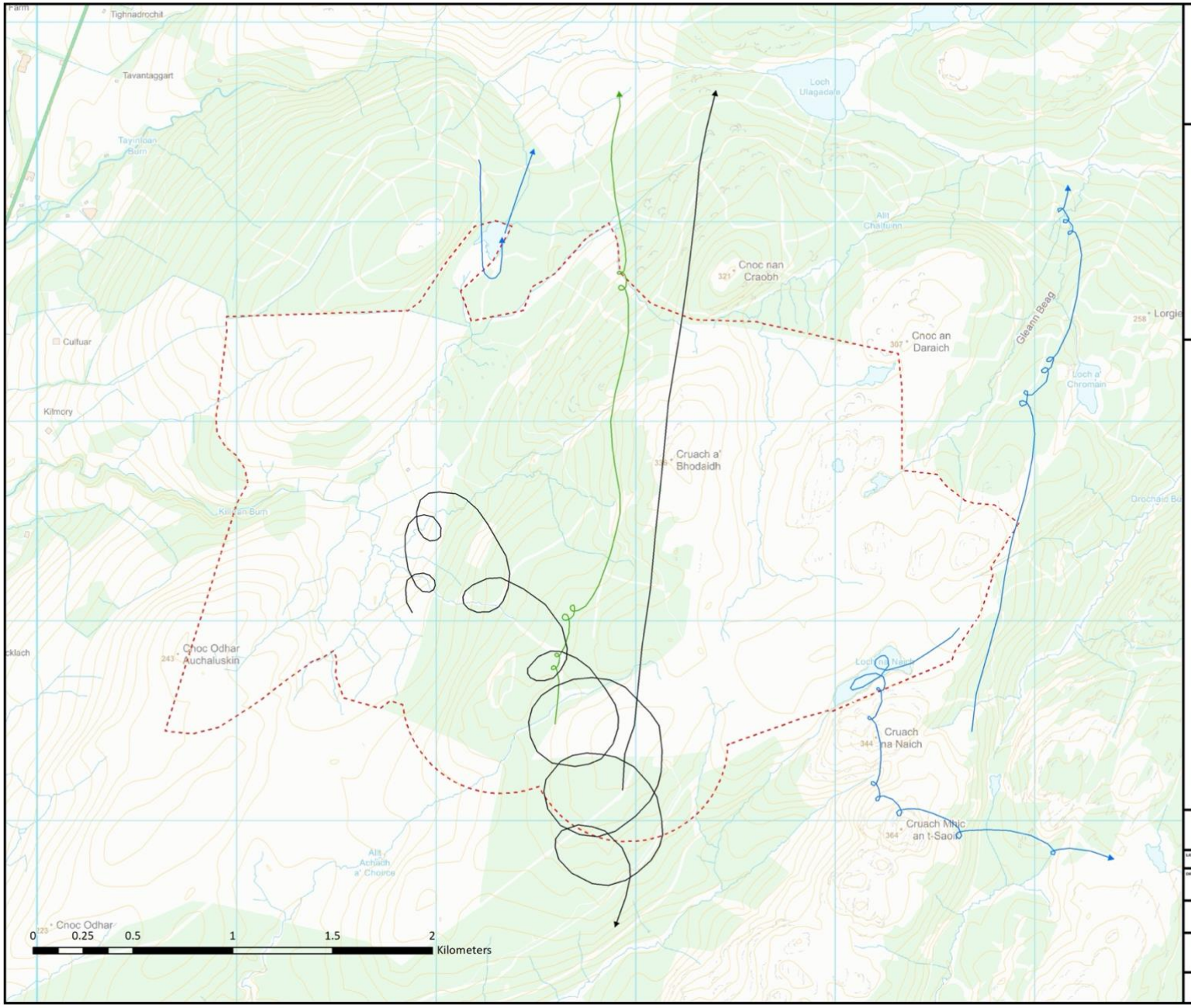
LAYOUT DWG	N/A	FLAN/DET NO.	N/A

DRAWING NUMBER: KL2023-1

SCALE - 1:22,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



Killean Wind Farm: Breeding Bird Surveys 2023

FIGURE 16

VP Survey Flight Lines: Other Raptor Species

KEY:

Breeding bird survey area (core)

Flight Lines:

- Osprey
- Peregrine
- White-tailed Eagle

Ecology Consulting

Contains Ordnance Survey OpenData
© Crown Copyright 2024.

Layout DWG: N/A | T-Layout No.: N/A

Drawing Number: KL2023-1

SCALE - 1:18,000 @ A3

BREEDING BIRDS 2023

THIS DRAWING IS THE PROPERTY OF ECOLOGY CONSULTING AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION

CONCLUSIONS

38. The 2022 and 2023 breeding bird surveys have shown that the survey area supported a range of upland breeding species of importance, including three species specially protected from disturbance under Schedule 1 of the 1981 Wildlife and Countryside Act (goldeneye, red-throated diver and common crossbill). Red-throated diver is additionally listed on Annex 1 of the EU Birds Directive.

39. Four black grouse leks were identified in 2022 and three in 2023, two of up to two males and two single-male leks. The two leks that were used repeatedly (the two with up to two males) were not specifically tied to a single location but occurred in a range of locations.

40. The site was also used regularly by several scarce raptor species, including golden eagle, white-tailed eagle and hen harrier. None of these were breeding within or in close proximity to the site in 2022 or 2023.

41. The initial proposed turbine locations have already been modified to move them further from the eagle site and locating more turbines within the forestry rather than the open moorland habitat preferred by this species. This has additionally reduced the potential impact of the wind farm on red-throated diver and hen harrier (moving turbines away from the open moorland in the eastern part of the survey area).

42. The following recommendations are made for the buffering of wind turbine locations in the site design process and other mitigation to avoid disturbance impacts:

- **Red-throated diver** – potential diver breeding lochs should be avoided by a minimum 300m buffer to avoid disturbance to breeding birds during the operational phase. Buffers of at least 500m would be required to avoid the possibility of any disturbance to breeding divers during construction (Ruddock and Whitfield 2007). Alternatively, this could be mitigated by timing of construction works to avoid all works within 500m of any loch being actively used by breeding divers (and where there was line of sight between the works and the lochs) during March-August, if that were possible.
- **Golden eagle** – initial recommendations for site design to reduce impacts on this species were produced following eagle range modelling, to move turbines away from areas preferred by the eagles into the afforested areas. This has now been implemented in the current site design. The 2022 breeding season surveys have shown that this species regularly uses the site, though there was no evidence of this pair breeding this year. This species (and other Schedule 1 species such as hen harrier and merlin) would need to be included in the Breeding Bird Protection Plan in case they did breed within/in proximity to the site during the construction period.
- **Goldeneye** – a pair may have bred in the area. The recommended diver buffer around its loch would be sufficient to avoid any potential disturbance to this species as well.
- **Common crossbill** – the only potential impact on this forest species would be through felling. Pre-felling surveys should be undertaken as part of a Breeding Bird Protection Plan to inform the need for any mitigation following Forestry Commission Scotland (2006) guidance, and managed by an Ecological Clerk of Works.
- **Black grouse** – given that the black grouse leks recorded during the 2022 and 2023 surveys were small (peak two males) and transient (rather than tied to a specific location), applying specific buffers would not be likely to be the most effective mitigation for this species. Instead it is recommended that any black grouse leks located during construction should be buffered by 750m, and no construction activity allowed before 09:00 between April and May. This species should also be included in the Habitat Management Plan.

43. Given that the survey area supports a range of upland breeding birds and is also used for foraging by several important protected raptor species, it is recommended that as well as implementing these measures, a Habitat Management Plan should be implemented to accommodate any displaced birds.

REFERENCES

Austin, G. E., Calbrade, N.A., Birtles, G.A., Peck, K., Wotton, S.R., Shaw, J.M., Dawn E. Balmer, D.E. and Frost, T.M. 2023. Waterbirds in the UK 2021/22: The Wetland Bird Survey and Goose & Swan Monitoring Programme. BTO, RSPB, JNCC and NatureScot. British Trust for Ornithology, Thetford.

Brown, A. F. and K. B. Shepherd. 1993. A method for censusing upland breeding waders. Bird Study 40: 189-195.

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

Drewitt, A.L., Whitehead, S. and Cohen, S. 2020. Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 17: Birds (Version 1.1). Joint Nature Conservation Committee, Peterborough.

Forestry Commission Scotland 2006. FCS Guidance Note 32: Forest operations and birds in Scottish forests: November 2006.

Gilbert, G., D. W. Gibbons, and J. Evans. 1998. Bird Monitoring Methods: a manual of techniques for key UK species. RSPB /BTO/WWT/JNCC/ITE/ The Seabird Group.

Hardey, J., H. Q. P. Crick, C. V. Wernham, H. T. Riley, B. Etheridge, and D. B. A. Thompson. 2013. Raptors: a field guide to survey and monitoring. 3rd Edition. The Stationary Office Ltd, Edinburgh.

Percival, S. M. 2007. Predicting the effects of wind farms on birds in the UK: the development of an objective assessment methodology.in M. de Lucas, Janss, G.F.E. and Ferrer, M., editor. Birds and Wind Farms: risk assessment and mitigation. Quercus, Madrid

Percival, S.M., Percival, T., Lowe, T. and Piner, S. 2022a. Killean Proposed Wind Farm: Wintering Bird Survey 2021-22. Ecology Consulting report to RES Ltd.

Percival, S.M. 2022b. Killean Proposed Wind Farm: Golden Eagle Habitat Analysis and Modelling. Ecology Consulting report to RES Ltd

Ruddock, M. and Whitfield, D.P.A. 2007. A Review of Disturbance Distances in Selected Bird Species. Natural Research (Projects) Ltd report to Scottish Natural Heritage.

Scottish Natural Heritage. 2013. Assessing connectivity with Special Protection Areas (SPAs). Guidance. pp. 3pp.

Scottish Natural Heritage. 2017. Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH Guidance. SNH, Battleby.

Stanbury, A., M. Eaton, N. Aebischer, D. Balmer, A. Brown, A. Douse, P. Lindley, N. McCulloch, D. Noble, and I. Win. 2021. The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds 114:723-747.

Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D. and Noble, D. 2020. Population estimates of birds in Great Britain and the United Kingdom. British Birds, 113: 69-104.

Appendix 1. Vantage Point Survey Data

Survey Information

Date	Vantage Point No	Start time	Finish time	ObsTime	Weather	Observer
11/04/2023	2	15:50	17:50	02:00	8/8 cloud, 4-5 SE wind, very good - good - ok vis, steady rain	Stuart Piner
11/04/2023	1	17:05	18:05	01:00	cloud 8/8, wind SE 4, 6C, vis good, rain	Tom Lowe
12/04/2023	2	08:30	11:30	03:00	cloud 5/8, wind SSW 3, 3C, vis excellent	Tom Lowe
12/04/2023	2	12:00	15:00	03:00	cloud 7/8, wind SSW 3, 5C, vis very good	Tom Lowe
12/04/2023	2	15:30	18:30	03:00	cloud 7/8, wind SSW 3, 6C, vis very good	Tom Lowe
13/04/2023	2	16:00	17:00	01:00	cloud 7/8, wind W 3, 8C, vis very good	Tom Lowe
12/04/2023	1	08:30	11:30	03:00	8-7/8 cloud, 3-4 SW - SSW wind, very good vis	Stuart Piner
12/04/2023	1	12:00	15:00	03:00	7-8/8 cloud. 3-4 S - SSE wind, very good vis	Stuart Piner
12/04/2023	1	15:30	18:30	03:00	7-8/8 cloud, 3 S wind, very good vis, light rain towards end of VP	Stuart Piner
22/05/2023	2	13:00	16:00	03:00	7-3/8 cloud, 2-3 NW wind, very good vis	Stuart Piner
22/05/2023	2	16:30	19:00	02:30	4-7/8 cloud, 2-3 NW - NNW wind, very good vis	Stuart Piner
22/05/2023	1	13:15	15:45	02:30	cloud 5/8, wind NW 4, 12C, vis very good	Tom Lowe
22/05/2023	1	16:15	19:15	03:00	cloud 2/8, wind NW 4, 13C, vis very good	Tom Lowe
23/05/2023	1	15:45	18:45	03:00	8/8 cloud, 3-4 W wind, good - ok vis	Stuart Piner
23/05/2023	1	19:15	20:45	01:30	8/8 cloud, 4 W wind, good - ok vis	Stuart Piner
23/05/2023	2	15:10	18:10	03:00	cloud 8/8, wind W 3, 11C, vis good	Tom Lowe
23/05/2023	2	18:40	20:40	02:00	cloud 8/8, wind W 3, 10C, vis good	Tom Lowe
25/05/2023	1	07:30	10:30	03:00	2-7/8 cloud, 2-3 NNW wind, very good vis	Stuart Piner
25/05/2023	1	11:00	12:00	01:00	7-8/8 cloud, 2-3 NW wind, very good vis	Stuart Piner
12/06/2023	2	12:15	15:15	03:00	4-7/8 cloud, 1-2 W wind, very good vis	Stuart Piner
12/06/2023	2	15:45	18:45	03:00	cloud, 1-2 variable wind, very good vis	Stuart Piner
12/06/2023	2	19:15	22:15	03:00	4-6/8 cloud, 2-1 variable wind, very good vis	Stuart Piner
13/06/2023	2	14:20	14:50	00:30	0/8 cloud, 3 ESE - ENE wind, excellent vis, then 2 W wind	Stuart Piner
13/06/2023	2	14:50	17:20	02:30	0/8 cloud, 3 ESE - ENE wind, excellent vis, then 2 W wind	Stuart Piner
13/06/2023	2	17:50	20:50	03:00	0-2/8 cloud, 2-0 W wind, excellent vis	Stuart Piner
12/06/2023	1	12:35	15:35	03:00	cloud 2/8, wind NW 1, 22C, vis good (heat-haze)	Tom Lowe
12/06/2023	1	16:05	19:05	03:00	cloud 4/8, wind NW 1, 19C, vis very good	Tom Lowe
12/06/2023	1	19:35	22:05	02:30	cloud 4/8, wind NW 2, 17C, vis very good	Tom Lowe
13/06/2023	1	17:15	18:15	01:00	cloud 1/8, wind SSW 2, 24C, vis very good	Tom Lowe
13/06/2023	1	18:45	21:15	02:30	cloud 1/8, wind W 2, 23C, vis very good	Tom Lowe
17/07/2023	2	11:20	13:50	02:30	cloud 7/8, wind W 2, 13C, vis very good, shower	Tom Lowe
17/07/2023	2	17:30	18:30	01:00	cloud 3/8. wind WNW 2, 15C, vis very good	Tom Lowe
17/07/2023	2	19:00	22:00	03:00	cloud 2/8, wind WNW 2, 15C, vis very good	Tom Lowe
17/07/2023	1	11:50	13:50	02:00	5-8/8 cloud, 3-4 W wind, very good vis	Stuart Piner
17/07/2023	1	17:30	18:30	01:00	3/8 cloud, 3-4 WNW wind, very good vis	Stuart Piner
17/07/2023	1	19:00	22:00	03:00	4-2/8 cloud, 3 WNW wind, very good vis	Stuart Piner
19/07/2023	2	05:30	07:30	02:00	8/8 cloud, 0 wind, good - ok vis	Stuart Piner
19/07/2023	1	11:25	14:25	03:00	4-6/8 cloud, 3 NW wind, very good vis	Stuart Piner
19/07/2023	1	14:55	15:55	01:00	4/8 cloud, 3 NW wind, very good vis	Stuart Piner
05/08/2023	2	06:30	09:00	02:30	8/8 cloud, 1-2 N wind, very good vis, very light rain on and off	Stuart Piner
05/08/2023	2	10:00	13:00	03:00	7-8/8 cloud, 1-2 N wind, very good vis, very light showers	Stuart Piner
05/08/2023	2	13:30	16:30	03:00	8/8 cloud, 1-0 N wind, very good vis	Stuart Piner
05/08/2023	1	07:15	10:15	03:00	cloud 8/8, wind NE 2, 12C, vis very good	Tom Lowe
05/08/2023	1	10:45	13:45	03:00	cloud 8/8, wind NNW 2, 14C, vis very good, light showers	Tom Lowe
05/08/2023	1	14:15	17:15	03:00	cloud 8/8, wind NW 3, 16C, vis very good	Tom Lowe
06/08/2023	2	06:15	09:15	03:00	6-8/8 cloud, 0-1 W wind, very good vis	Stuart Piner
06/08/2023	2	09:45	11:45	02:00	4-6/8 cloud, 1-2 W wind, very good vis	Stuart Piner
06/08/2023	1	06:15	09:15	03:00	cloud 7/8, wind 0, 9C, vis very good	Tom Lowe
06/08/2023	1	09:45	11:45	02:00	cloud 6/8, wind NW 1, 14C, vis very good	Tom Lowe

Survey Data

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
2	12/04/2023	09:09	EA	1	SSE	50	soar/hunt	230	ad male, off map
2	12/04/2023	09:18	GP	25	SSE	55		60	
2	12/04/2023	10:09	EA	1	circle	33	soar/hunt	120	ad male, same as above, landed on forest edge NR 733 471
2	12/04/2023	10:25	EA	1	circle	25	soar/hunt	40	ad, out of same area, poss different bird
2	12/04/2023	11:18	EA	1	S	110	soar/display	180	ad male, same as above, dancing
2	12/04/2023	12:28	EA	1	SW	213	soar/hunt/display	2880	ad female, 'local' female, initially off map over Loch Ulagadale, down onto site, back NNW very high, displayed over valley where male landed earlier, then over site again, before finally leaving NNW with lots of display
2	12/04/2023	16:00	HH	1	SW	61	hunt	460	female
2	12/04/2023	16:51	HH	1	NNE	26	hunt	780	female
2	12/04/2023	17:10	EA	1	WSW	125	soar	900	ad female, new 'visiting' female
2	12/04/2023	17:10	EA	1	WSW	135	soar	90	male mobbing female
1	12/04/2023	08:30	GP	55		45		960	from VP start
1	12/04/2023	09:11	EA	1	circle	118		270	male
1	12/04/2023	09:25	GP	23		20		300	
1	12/04/2023	10:09	EA	1	circle	63		210	male, Tom watched same flight from VP2 and judged it to fly slightly to N of y line and land at forest edge
1	12/04/2023	11:19	EA	1					male, displaying to north of map
1	12/04/2023	12:28	EA	1	SSW	173		540	female, circled off to N of map
1	12/04/2023	12:56	EA	1		225		1140	female
1	12/04/2023	15:50	GP	22		30		360	
1	12/04/2023	16:12	GP	95		40		600	
1	12/04/2023	16:52	EA	1	SE	55		160	female dropped
1	12/04/2023	17:07	EA	2	circle	100		720	female and male
1	12/04/2023	17:07	EA	1	circle	100			female
1	12/04/2023	17:07	EA	1	circle	100			male
2	22/05/2023	14:27	HH	1	NNW	45		140	female
1	22/05/2023	13:15	EA	1	NE	95	soar/display	1620	ad male, usual male soaring then dancing over Cruach Mhic, plummeted in but straight back out again
1	22/05/2023	13:24	EA	2	NNE	65		240	ads, not identified to individuals
1	22/05/2023	13:45	EA	1	circle	80	display	220	ad male,
1	22/05/2023	14:09	WE	1	NNE	200		170	imm
1	22/05/2023	14:24	HH	1	NNW	20	hunt	50	female, lost behind trees (but picked up by Stuart VP2)
1	22/05/2023	14:46	EA	1	NNE	53	display	290	ad male, same as 1, dropped behind Cruach Mhic
1	23/05/2023	15:45	SN	1		21	display	7200	from VP start
1	23/05/2023	16:22	HH	1	E	10		15	male
1	23/05/2023	17:13	SN	2		21	display	1920	joined bird at 1 making 3 in total
1	23/05/2023	18:31	RH	1	W	30		70	landed
2	23/05/2023	15:59	PE	1	NNE	125	hunt/soar	320	2cy
2	23/05/2023	16:20	HH	1	S	26	hunt	120	male
2	23/05/2023	16:21	HH	1	ENE	48	hunt/soar	150	female, appeared to get up to greet male, but went their separate ways!
2	23/05/2023	17:51	HH	1	NNE	5	hunt	170	male
2	23/05/2023	19:32	HH	1	SW	9	hunt	90	male, looked cleaner, older male than 9
2	23/05/2023	20:15	HH	1	NE	38	with prey	160	male, same as 12
2	23/05/2023	20:31	RH	1	WSW	80	feed	60	
2	23/05/2023	20:39	HH	1	S	18	hunt	50	male, prob same as 6
1	25/05/2023	08:21	EA	1	SW	45		45	male
1	25/05/2023	09:05	RH	2	WSW	75		140	
1	25/05/2023	11:52	EA	1		75	display	240	
2	12/06/2023	20:24	RH	1	SSE	80		20	
2	12/06/2023	20:35	RH	1	WNW	135		50	same as 7
2	12/06/2023	21:10	RH	1	WNW	80		20	
2	13/06/2023	20:10	RH	1	ESE	70		50	
1	12/06/2023	15:03	EA	1	SSW	120	soar/hunt	540	imm, 3cy/4cy off map, mobbed by BZ, HH pair, CM pair, BZ pair
1	12/06/2023	15:30	RH	1	W	80	feed	100	off map
1	12/06/2023	15:32	EA	1	ESE	40	soar	130	ad, off map, landed N of Beinn Bhreac
1	12/06/2023	16:24	EA	1	ENE	50	soar	140	ad male, off map, same as 15:32 (Blary Hill male)
1	12/06/2023	18:25	EA	1	NNE	36	hunt/soar	280	ad male, local male (prob same as perched on rock 16:05 - 17:52) dived at something behind trees, circled up with something in talons, dropped behind crag
1	12/06/2023	18:30	HH	1	WSW	28	soar/hunt	130	male
1	12/06/2023	18:39	EA	1	W	5	roost	15	ad male, same as 11, landed
1	12/06/2023	18:40	EA	2	N	95	soar	750	ads, Blary Hill pair off amp
1	12/06/2023	19:44	RH	1	SW	45		130	landed out of sight
1	12/06/2023	19:55	RH	1	NNW	8		15	landed (prob same as 14)
1	12/06/2023	20:03	RH	1	SSE	35		90	landed, started displaying with 15 (3rd ad on Loch Luireach throughout)
1	12/06/2023	20:08	RH	1	SSW	90	display	120	
1	12/06/2023	20:23	RH	1	NNW	35		80	same as 16?
1	12/06/2023	20:53	HH	1	ENE	7	hunt	1080	female, poss caught something
1	12/06/2023	21:14	HH	1	E	21	with prey	250	male
1	12/06/2023	21:20	EA	1	W	10	roost	30	ad, off map, landed on summit of Bheinn Bhreac
1	12/06/2023	21:25	SN	1	circle	40	display	150	
1	13/06/2023	20:05	HH	1	NNW	26	hunt/soar	170	male
1	13/06/2023	20:15	RH	1	SSE	30	roost	60	landed on loch
2	17/07/2023	19:46	RH	1	WSW	60	feed	50	

2	17/07/2023	20:52	HH	1	WNW	95		210	2cy male
1	17/07/2023	13:26	HH	1	SSW	5	hunt	30	male
1	17/07/2023	13:31	EA	1		20		85	landed, adult female
1	17/07/2023	13:38	EA	1	S	1		2	dropped off rock
1	19/07/2023	11:37	EA	2		70		390	male and female, dropped
1	19/07/2023	11:54	HH	1	E	5	hunt	50	adult male
1	19/07/2023	12:46	EA	2		50		250	male and female
1	19/07/2023	13:36	HH	1	S	8		45	female
1	19/07/2023	15:14	HH	1	WSW	6	hunt	40	male
2	05/08/2023	06:40	HH	1	WNW	6	direct flight	20	male
2	05/08/2023	08:08	HH	1	SE	3		40	juvs
2	05/08/2023	10:04	HH	1	NW	18		70	juvs
2	05/08/2023	10:48	OP	1	S	15		80	landed in tree
2	05/08/2023	11:19	OP	1	NNE	8		30	flew from tree
2	05/08/2023	11:40	HH	1	S	23	mob	260	juv, mobbed by K
2	05/08/2023	12:20	RH	1	WNW	150		150	
2	05/08/2023	15:02	HH	1	SSW	45		270	juv
2	05/08/2023	17:40	WE	1	circle N	95		540	imm. After VP whilst moving bat boxes
1	05/08/2023	07:18	HH	1	NNW	4	hunt	110	juv, lost in gulley
1	05/08/2023	07:25	RH	2	NNE	90		450	
1	05/08/2023	08:01	RH	2					adult swam into view on Loch a Ghlian Bhig followed by half-grown chick
1	05/08/2023	08:31	WE	1	circle	125	soar	150	
1	05/08/2023	09:13	RH	2	WSW	50	feed	230	landed
1	05/08/2023	09:26	HH	1	SSE	20	hunt	60	female juv
1	05/08/2023	10:00	RH	1	NNE	20		140	landed
1	05/08/2023	11:06	RH	1	S	20		70	landed
1	05/08/2023	11:13	RH	1	NNE	75	feed	200	same as 9
1	05/08/2023	11:13	RH	1	NW	75	feed	190	joined 10
1	05/08/2023	11:24	RH	1	NW	25		60	landed, same as 11
1	05/08/2023	11:40	HH	1	SSW	25	soar/mob	60	juv
1	05/08/2023	12:14	HH	1	S	5	hunt	55	juv, lost into valley
1	05/08/2023	12:41	RH	2	circle	90	feed	130	
1	05/08/2023	13:25	EA	3	SW	150	soar	230	ads, Blary Hill pair off amp
1	05/08/2023	13:29	HH	1	WSW	8	hunt	170	juv
1	05/08/2023	13:35	HH	1	WSW	3	hunt	50	juv, lost in gulley
1	05/08/2023	14:16	HH	2	NNW	45	soar	220	female juv
1	05/08/2023	14:30	HH	1	WNW	8	hunt	200	female, same as 8
1	05/08/2023	14:33	EA	1	E	70		80	ad
1	05/08/2023	15:39	EA	1	NNE	23	hunt	380	imm, 3cy-type
1	05/08/2023	16:36	EA	3	SSE	165	soar	380	local pair and 3cy same as 15, mobbed by RN2
1	05/08/2023	16:58	HH	2	WSW	16	hunt/chase	290	juvs
1	05/08/2023	17:07	HH	1	SSW	24	hunt	250	female, juv
2	06/08/2023	07:58	RH	1	WSNW	110		60	
2	06/08/2023	10:34	HH	2	circle	170		720	juvs
2	06/08/2023	10:55	EA	1	circle	200		390	adult
1	06/08/2023	06:21	RH	1	WW	25		70	landed
1	06/08/2023	06:29	RH	1	WSW	20		100	and displayed with mate landed with a third adult
1	06/08/2023	06:41	RH	2	N	75		290	same as 2
1	06/08/2023	07:09	HH	1	SSW	4		100	juv, flushed RG from NE of VP
1	06/08/2023	07:55	RH	1	SSW	110		190	
1	06/08/2023	08:20	HH	1	NNE	5		340	juv
1	06/08/2023	08:42	HH	1	WSW	92		320	juv
1	06/08/2023	10:09	OP	1	WSW	158	hunt/soar	440	juv, immaculate plumage, bit too distant to age
1	06/08/2023	10:17	EA	1	ENE	80	soar/display	150	ad
1	06/08/2023	10:19	HH	2	SSW	65	soar	180	female, juv
1	06/08/2023	10:26	HH	1	WNW	130	soar	1260	juv, prob same as 11, joined 15 then joined 16
1	06/08/2023	10:27	WE	1	SSW	140	soar/mob	240	
1	06/08/2023	10:27	OP	1	SSW	140	soar/mob	240	
1	06/08/2023	10:28	HH	1	WNW	60	soar/hunt	390	juv, prob same as 11
1	06/08/2023	10:34	HH	1	NNW	120	soar	350	juv, with 13
1	06/08/2023	10:44	HH	1	NNE	150	soar	300	juv
1	06/08/2023	10:47	HH	1	NE	50	soar	540	juv, prob same as 15
1	06/08/2023	10:58	OP	1	NNE	210	soar	390	juv, same as 9
1	06/08/2023	11:25	EA	2	SSW	50	soar/hunt	270	ads, local pair, came onto VP map at 11:29, lost behind trees