

Killean Proposed Wind Farm: Wintering Bird Survey 2021-22



Clockwise from top left: Greenland white-fronted geese, Hen harrier, Black grouse and Golden eagle © Steve Percival

Report to Renewable Energy Systems Ltd

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KILLEAN PROPOSED WIND FARM: WINTERING BIRD SURVEYS 2021-22

Introduction

1. This report describes the wintering bird survey work carried out for a proposed wind farm at Killean, Argyll. It provides a wintering season's baseline data on the bird populations, activity and flight paths within the vicinity of the proposed 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 surveys were undertaken by Stuart Piner and Tom Lowe, both highly experienced bird surveyors.

Study Area

3. The site is located about 22km north from Campbeltown in Argyll. The wintering bird survey areas were chosen to include all areas within the possible zone of ornithological influence of the proposed wind farm plus a wider area to provide additional data on the ecological connectivity between the site and the Kintyre Goose Roosts SPA. This included the proposed wind farm site, plus a 500m buffer for the main winter walkover surveys (the core survey area, following NatureScot guidance, SNH 2017) and a 2km buffer for the wider wintering waterfowl surveys (the wider survey area), where access/viewing was possible and where there was potentially suitable habitat (Figure 1). The main core survey area is a mix of open moorland and conifer plantation, covering a total area of 10.9km². The wider waterfowl survey area covered 9.8km², and was predominantly agriculturally-improved grassland. The site lies within the Argyll West and Islands NatureScot Natural Heritage Zone (NHZ 14).

Wintering Bird Survey Methods

4. The aim of the autumn/winter field survey work was to obtain data on the ornithological importance of the wind farm site and its surrounds at that time of year, and on the flight lines of key target species. It included walkover surveys of the site, wider area waterfowl surveys and vantage point surveys of bird flight activity.

Autumn/Winter Walkover Surveys

5. Walkover mapping surveys of the wintering birds within the site and a 500m buffer took place in accordance with NatureScot guidance (SNH 2017). The survey focused on key target species which 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 guidance (SNH 2017).
6. As well as counting and mapping each species, the behaviour of each flock was also recorded, e.g. feeding/roosting. The surveys included work at dawn and dusk to check

the area specifically for roosting hen harriers and other important raptors. A total of seven surveys were undertaken at approximately monthly intervals between September 2021 and March 2022.

Waterfowl Feeding Distribution Surveys

7. Additional surveys were undertaken twice-monthly of all possible habitats that could be used by wintering waterfowl as feeding/roosting sites within up to 5km of the site (to include all of the main Tayinloan/Rhunahaorine goose feeding area, i.e. the feeding area from which geese may move to/from across the proposed wind farm site). These wider surveys gave contextual information about where goose feeding flocks were located, and provide further information the linkage to the Kintyre Goose Roosts SPA. The site lies within the potential SPA connectivity zone from this SPA (for which Greenland white-fronted geese are a qualifying feature) and within a known goose feeding area (SNH 2013).
8. The counts were carried out as instantaneous 'look-see' counts, recording a snapshot of the birds present in each field/count sector at the time it was surveyed (Gilbert *et al.* 1998). One such count of each field was made each survey day, recording the numbers of all the key species present. Any additional records made outside this time were noted as supplementary records. These snapshot counts were organised to ensure that the full range of times of day were covered in each part of the survey area.

Vantage point surveys

9. 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 were the same as those for the walkover surveys.
10. 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.
11. Three vantage points were used to cover the potential wind farm site. The computer-generated viewsheds (using Global Mapper v21) are shown in Figure 2. For each VP, a basic 36 hours' VP surveys during the autumn/winter from each VP were carried out (as set out in NatureScot guidance), spread evenly across the winter season.
12. As the site lies within the potential SPA connectivity distance from the Kintyre Goose Roosts SPA and within a known goose roosting area (from the previous application's baseline surveys), additional VP surveys were carried out. For each VP, the basic 36 hours VP surveys was extended to give 4.5 hours surveys per VP per visit over 13 visits (giving 58 hours from each of the two VPs), in line with NatureScot guidance. This extra survey effort enabled more data to be collected to cover dawn/dusk roost flights

through the site (which are likely to key period of risk at this time of year). Details of survey dates, times and conditions are given in Appendix 1.

13. 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).
14. 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. To estimate flight height as accurately as possible available reference structures (e.g. pylon lines) were used. Heights were estimated as accurately as possible recorded as a raw estimate, rather than being summarised to height classes. Below 10m estimates were made to 1m, between 10m 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.

Wintering bird survey 2021-22 results

Autumn/winter walkover survey results

15. The bird populations found within the survey area during each of the monthly walkover surveys are summarised in Table 1. The Table shows the peak numbers recorded during each month, and the overall peak counts.

Table 1. Autumn/winter bird populations recorded at Killean during the September 2021 - March 2022 walkover surveys (monthly peak counts).

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Peak 2021-22
Whooper Swan	0	0	2	4	0	0	0	4
Pink-footed Goose	0	0	1	0	0	0	0	1
White-fronted Goose	0	0	2	0	0	0	0	2
Teal	1	4	1	22	19	0	0	22
Mallard	0	0	0	0	4	3	2	4
Tufted Duck	0	1	0	0	0	0	1	1
Goldeneye	0	3	3	2	0	2	2	3
Red Grouse	0	18	8	0	2	7	10	18
Black Grouse	0	0	0	0	2	1	0	2
Little Grebe	0	0	1	0	0	0	0	1
Grey Heron	0	0	0	1	0	0	0	1
Hen Harrier	1	0	0	0	0	0	0	1
Sparrowhawk	1	0	0	0	0	0	0	1
Buzzard	5	2	1	1	0	0	1	5
Golden Eagle	0	0	0	0	1	0	0	1

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Peak 2021-22
Golden Plover	1	8	55	14	1	24	0	55
Snipe	0	3	7	7	6	3	2	7
Woodcock	0	0	0	1	1	2	2	2
Tawny Owl	0	0	0	0	0	1	0	1

Autumn/winter wider area goose feeding distribution survey results

16. The bird populations found within the survey area during each of the fortnightly goose distribution surveys are summarised in Table 2. The Table shows the peak numbers recorded during each survey, and the overall peak counts. Greenland white-fronted geese were the most abundant target species and were seen frequently during the surveys from late October onwards (peak count 575).

Species	28/09/21	15/10/21	26/10/21	08/11/21	23/11/21	06/12/21	20/12/21	10/01/22	24/01/22	07/02/22	18/02/22	09/03/22	21/03/22	Peak 2021-22
Lapwing	16	26	30	30	55	54	102	96	90	95	31	38	8	102
Snipe	0	0	0	0	0	1	6	0	0	0	0	0	0	6
Woodcock	0	0	0	1	0	0	1	0	0	0	2	0	0	2
Curlew	39	5	65	42	68	21	26	51	12	90	7	1	0	90
Common Gull	62	4	257	107	59	76	119	83	149	222	139	21	11	257
Lesser Black-backed Gull	1	0	0	0	0	0	0	0	0	0	1	0	0	1
Herring Gull	55	43	350	160	53	67	321	444	134	799	293	113	213	799
Great Black-backed Gull	0	0	0	0	1	0	0	0	1	0	6	2	2	6
Black-headed Gull	17	0	35	48	0	3	1	169	0	50	0	0	0	169

Vantage Point Survey Results: Autumn/Winter 2021-22

17. The rates of bird flight movement observed across the survey area during the vantage point surveys are summarised in Table 3. This gives the flight rate per hour recorded in each month and the total number of flights recorded. Greenland white-fronted goose was the most frequently recorded target species, with movements between feeding areas and to/from their night roosts. Lochs recorded being used for night roosts included Loch Ulagadale (adjacent to the northern edge of the core survey area), Loch Dirigadale (on the north-western edge of the core survey area), and Loch Luireach, Loch Fionn-Ghleann and Loch a' Ghlinn Bhig (all within the site).
18. There was also a small amount of whooper swan migration over the site during October-December. A range of raptor species used the site, including white-tailed eagle, hen harrier, golden eagle and merlin. Further details of key species' flights are given in Appendix 1.
19. Table 3 also gives the percentage of flights of each species that were recorded at rotor height (taking rotor height as between 25m and 180m above ground level).

Table 3. Bird flight rates recorded over the Killean survey area during the September 2021 - March 2022 vantage point surveys. N = 58 hours total observation from each of the two VPs.

Species	Flight rate (birds/hour)							Total number of birds overflying	% flights at rotor height
	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
Whooper Swan	-	0.72	0.11	0.39	-	-	-	22	75%
Pink-footed Goose	-	0.39	-	-	-	-	1.03	24	50%
White-fronted Goose	-	1.06	26.21	-	-	19.17	10.79	1040	74%
Greylag Goose	-	-	-	-	-	0.11	0.42	9	100%
Canada Goose	-	-	0.47	-	-	-	0.24	13	0%
Teal	-	-	-	-	0.33	-	-	6	0%
Red Grouse	-	0.06	-	-	0.06	-	-	2	0%
White-tailed Eagle	-	-	-	0.06	0.06	0.06	0.18	6	100%
Hen Harrier	-	-	0.32	-	0.11	0.11	0.06	11	27%
Sparrowhawk	0.22	-	0.05	-	0.06	0.06	0.06	6	40%
Buzzard	0.22	0.50	0.68	0.22	0.28	0.17	0.42	43	49%
Golden Eagle	0.22	0.06	0.53	0.06	0.33	0.28	0.06	26	83%
Kestrel	-	0.06	-	0.22	0.06	-	0.06	7	14%
Merlin	-	0.06	-	-	-	-	-	1	0%
Golden Plover	1.44	2.44	1.74	-	5.22	0.33	-	190	70%
Snipe	-	-	-	-	0.06	-	-	1	0%
Woodcock	-	-	0.05	0.11	0.11	0.17	0.06	9	0%
Common Gull	-	-	-	-	-	-	0.06	1	100%
Long-eared Owl	-	-	0.05	-	-	-	-	1	0%

Conservation Evaluation of Wintering Bird Populations

20. The conservation value of the wintering bird populations was determined using the criteria specified in Table 4 (from Percival 2007) and is summarised in Table 5. 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' (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 (Frost *et al.* 2021) from the national Wetland Birds Survey and other species from Woodward *et al.* (2020). Regional (Natural Heritage Zone, NHZ) populations were taken from Wilson *et al.* (2015). The site lies within the 'Argyll West and Islands' NatureScot Natural Heritage Zone (NHZ 14). In addition, listing on Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside, UK BAP priority species and Scottish BAP species were all considered in the evaluation process.

Table 4. 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. UK BAP 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. Scottish BAP species (if not covered above).

21. The conservation value of the wintering bird populations observed in the Killean survey area during the wintering bird surveys has been summarised in Table 5 below. This included one very high sensitivity species (Greenland white-fronted goose – the birds seen are ecologically linked to the Kintyre Goose Roosts SPA), 10 high sensitivity species (whooper swan, barnacle goose, goldeneye, little egret, white-tailed eagle, hen harrier, golden eagle, peregrine, merlin and golden plover) that are EU Birds Directive Annex 1/Wildlife and Countryside Act Schedule 1 species, 9 medium sensitivity species (UK BAP priority/ red listed species of conservation concern and/or species present in regionally important numbers; greylag goose, teal, mallard, red

grouse, black grouse, lapwing, curlew, herring gull and long-eared owl), and 13 low sensitivity species.

Table 5. Conservation evaluation of the wintering bird populations in the Killean survey area, September 2021 – March 2022.

Species	Peak count (core)	Peak count (wider)	>1% region	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
Mute Swan	0	3							Nil
Whooper Swan	4	13	✓	✓	✓	A		✓	High
Pink-footed Goose	1	0				A			Low
White-fronted Goose	155	575	✓			R	✓	✓	Very high
Greylag Goose	0	368	✓			A			Medium
Canada Goose	0	66							Nil
Barnacle Goose	0	5		✓		A		✓	High
Shelduck	0	1				A			Low
Wigeon	0	14				A			Low
Teal	22	104	✓			A			Medium
Mallard	4	53	✓			A			Medium
Tufted Duck	1	0							Nil
Goldeneye	3	0			✓	R			High
Red Grouse	18	0					✓		Medium
Black Grouse	2	0	✓			R	✓	✓	Medium
Little Grebe	1	0							Nil
Little Egret	0	1		✓					High
Grey Heron	1	1							Nil
White-tailed Eagle	1	0	✓	✓	✓	A		✓	High
Hen Harrier	1	1	✓	✓	✓	R		✓	High
Sparrowhawk	1	1				A			Low
Buzzard	5	10							Nil
Golden Eagle	1	0	✓	✓	✓			✓	High
Kestrel	1	0				A		✓	Low
Merlin	1	0	✓	✓	✓	R		✓	High
Peregrine	0	1	✓	✓	✓			✓	High
Oystercatcher	0	35				A			Low
Golden Plover	55	5		✓				✓	High
Lapwing	0	102				R	✓	✓	Medium
Snipe	7	6				A			Low
Woodcock	2	2				R		✓	Low
Curlew	0	90				R	✓	✓	Medium
Common Gull	0	257				A			Low
Lesser Black-backed Gull	0	1				A			Low
Herring Gull	0	799	✓			R	✓	✓	Medium
Great Black-backed Gull	0	6				A			Low
Black-headed Gull	0	169				A			Low
Tawny Owl	1	0				A			Low
Long-eared Owl	1	0	✓						Medium

22. The key autumn/wintering bird populations recorded were as follows:

- **Greenland White-fronted Goose** – the daytime feeding distribution of this species is summarised in Figure 3, which shows the peak count recorded in each count field. The geese were widely distributed across the wider survey area, though with fewer records in the southern part (including the fields closer to the Killean site). The goose flight lines (Figure 4) were mostly over the northern part of the site. They roosted at night occasionally on the small lochs in the north-eastern part of the core survey area: Loch Luireach – 85 on 9/11/21, Loch Fionn-Ghleann - 120 on 11/11/21, Loch a' Ghlinn Bhig – 70 on 8/2/22. Additionally, 75 were seen flying in to Loch Ulagadale on 9/11/21.
- **Other high conservation value waterfowl:**
 - **Whooper Swan** – there was one record of a flock (of 13 birds) over-flying the site on migration on 15/10/21 and three smaller flocks seen during November-January (one of 4 roosting on Loch na Naich, one of 2 on Loch Dirigadale and another of three over-flying). Three further flocks of 4-8 birds were seen over-flying during the wider surveys.
 - **Barnacle Goose** – a small flock of up to 5 birds was seen regularly mixed with the Greenland white-fronted goose flocks in the wider survey area, but none were seen using or over-flying the proposed wind farm site.
 - **Goldeneye** – this species was seen regularly on Loch na Naich within the site in small numbers (up to 3 birds), with one additional record of a bird on Loch a' Ghlinn Bhig.
- **Other wintering wildfowl** – greylag geese, teal and mallard were all recorded in the wider waterfowl survey area in regionally important numbers, but the wind farm site itself was not important for any of them, with only occasional flights recorded (Figure 5). Greylag goose distribution across the wider survey area is shown in Figure 11, and had a similar pattern to the Greenland white-fronted geese.
- **Red and Black Grouse** – the distribution of these two species during the winter surveys is shown in Figure 6. Red grouse were widely distributed over the open moorland in the higher eastern part of the survey area. The only black grouse records were from within the forestry in the central part of the site.
- **Hen harrier** – this species was regularly seen hunting over the site through the winter, with 11 flights in total (see Figure 7). No evidence was found, though, of any night roosts in the survey area, and most flights seen were below rotor height (so collision risk would be low). There were not any notable concentrations of flight activity in any particular part of the survey area, though most were seen in the central and western part of the survey area, with few in the eastern part.
- **Golden Eagle** – this species was observed regularly over-flying the site during the VP surveys, with a total of 26 records. The flight lines are shown in Figure 8. Most flights were recorded in the central part of the site, mostly over the forestry, with few over the flatter open moorland in the eastern part of the site.
- **Other scarce raptors and owls** – white-tailed eagle, merlin and long-eared owl were all recorded during the winter surveys, but only infrequently in low numbers (Figure 9). There was no indication that the survey area was important to any of these species at this time of year.

- **Golden Plover** – small numbers (peak 55) of golden plover were seen regularly through the winter using the site during the walkover and VP surveys, with most birds seen on the flatter open moorland in the eastern part of the survey area (Figure 10).

Conclusions

23. The 2021-22 wintering bird surveys found a range of wintering bird populations of conservation importance using the survey area. The highest conservation importance was the wintering Greenland white-fronted goose population, for which there was a clear ecological link between the site and the Kintyre Goose Roosts SPA. The wind farm ornithological assessment will require Habitats Regulations Assessment (including Appropriate Assessment). As the proposed wind farm site is not itself within an important goose feeding area, the main potential impacts of on this species would be (a) collision risk, which will require modelling to determine the magnitude of this risk, and (b) potential disturbance to roosting birds at night (especially during construction of the wind farm). Avoidance of the main goose flight routes would reduce collision risk to this species – collision risk modelling will help define the extent of this avoidance zone, but initial inspection of the results would suggest that it would be similar to the zone applied for the previous wind farm proposal.
24. Other wintering waterfowl of importance included whooper swan, barnacle goose, and goldeneye, though the overall numbers of these species were low, and therefore unlikely to result in significant collision risk (though this will need to be confirmed with collision risk modelling) or other impacts. The wider waterfowl survey area supported a range of regionally important waterfowl populations, including greylag goose teal, and mallard, but give the separation from the proposed wind farm site these would not be likely to be significantly affected by it.
25. Red and black grouse were both resident within the survey area. Design mitigation may be needed for black grouse but that will be informed by the results of the breeding bird surveys that are being carried out during 2022.
26. Hen harrier and golden eagle were seen regularly hunting over the survey area, though no areas of particular importance were identified for either species. Collision risk modelling will help inform the impacts of the proposed wind farm on these species, but no specific spatial constraints for them have been identified.
27. Other raptor species, including white-tailed eagle, merlin and long-eared owl, were recorded in lower numbers and less frequently, so no design or other mitigation would be likely to be required for them at this stage.
28. Golden plover were recorded regularly using the site through the winter (primarily the open moorland in the eastern part of the site) but only in small numbers, so no design or other mitigation would be likely to be required for them at this stage.

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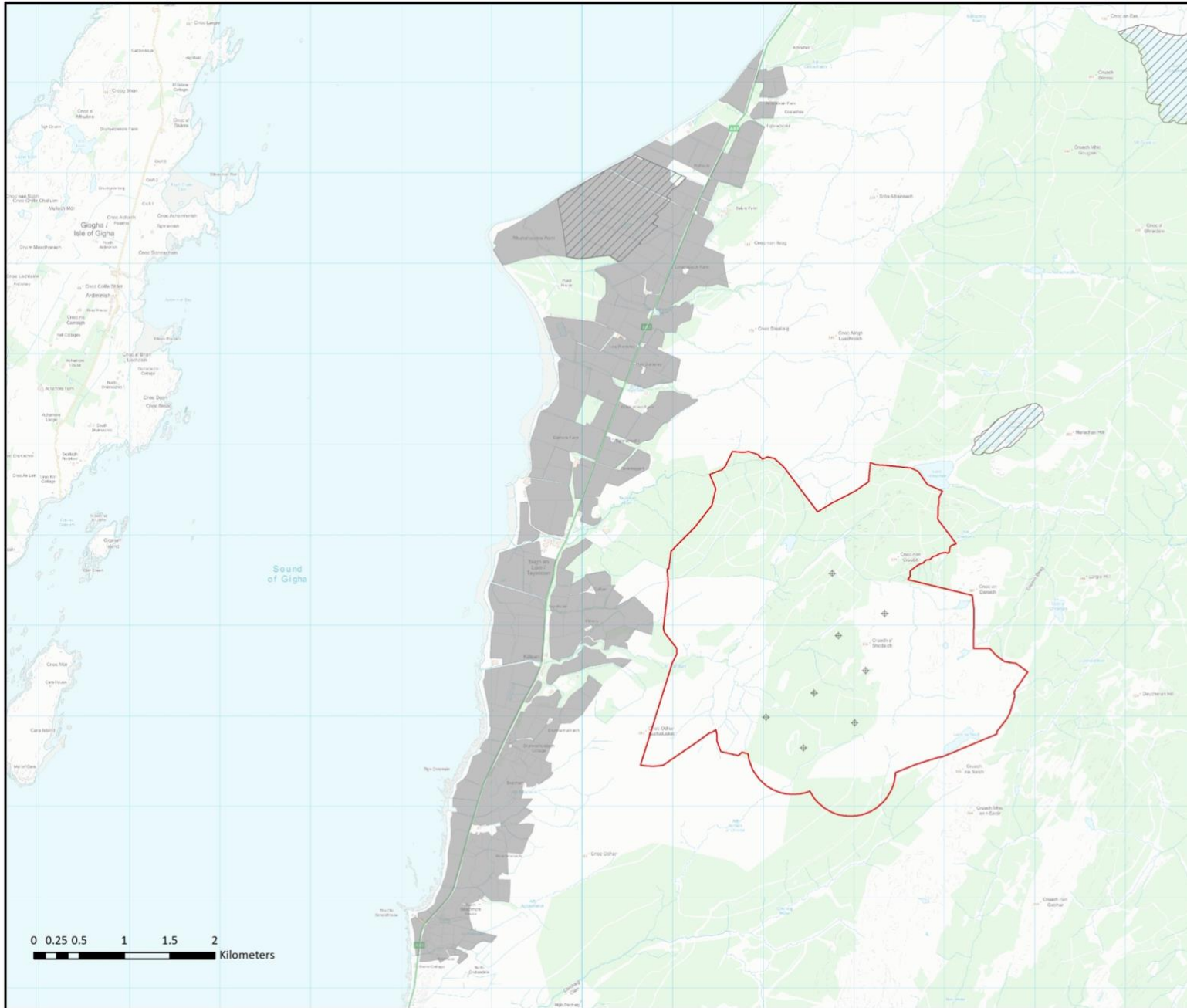
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**Killalea Wind Farm: Winter
Bird Surveys 2022-23**

FIGURE 1

**Winter Survey
Areas**

KEY:

- Wider waterfowl survey area
- Winter walkover survey area
- Kintyre Goose Roosts SPA (part)
- Indicative turbines



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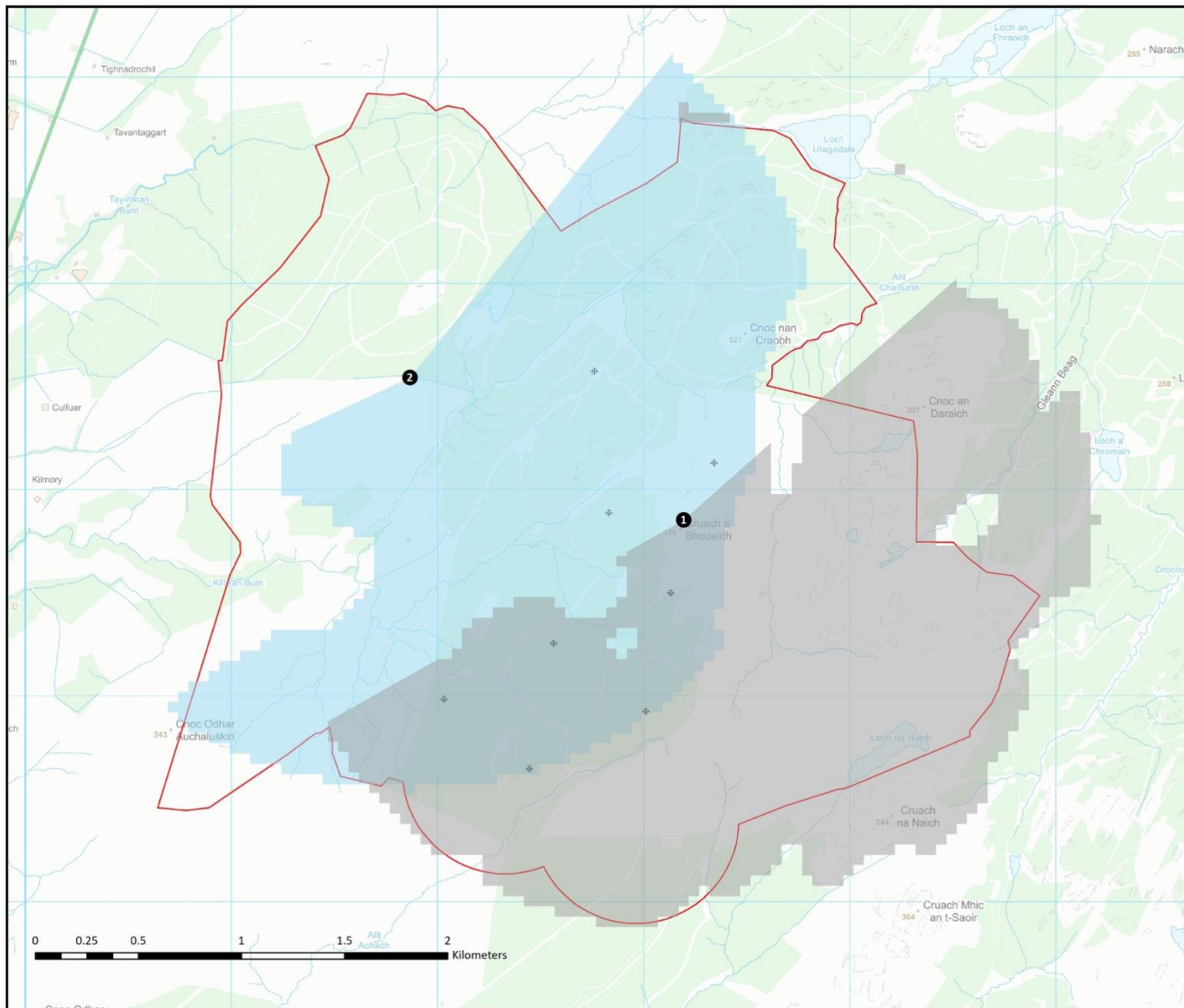
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**WINTERING BIRDS
2022-23**

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**Killen Wind Farm: Winter
Bird Surveys 2022-23**

FIGURE 2

**VP Locations and
Viewsheds**

- KEY:**
- VP locations
 - VP1 viewshed
 - VP2 viewshed
 - Winter walkover area
 - ⊕ Indicative turbines



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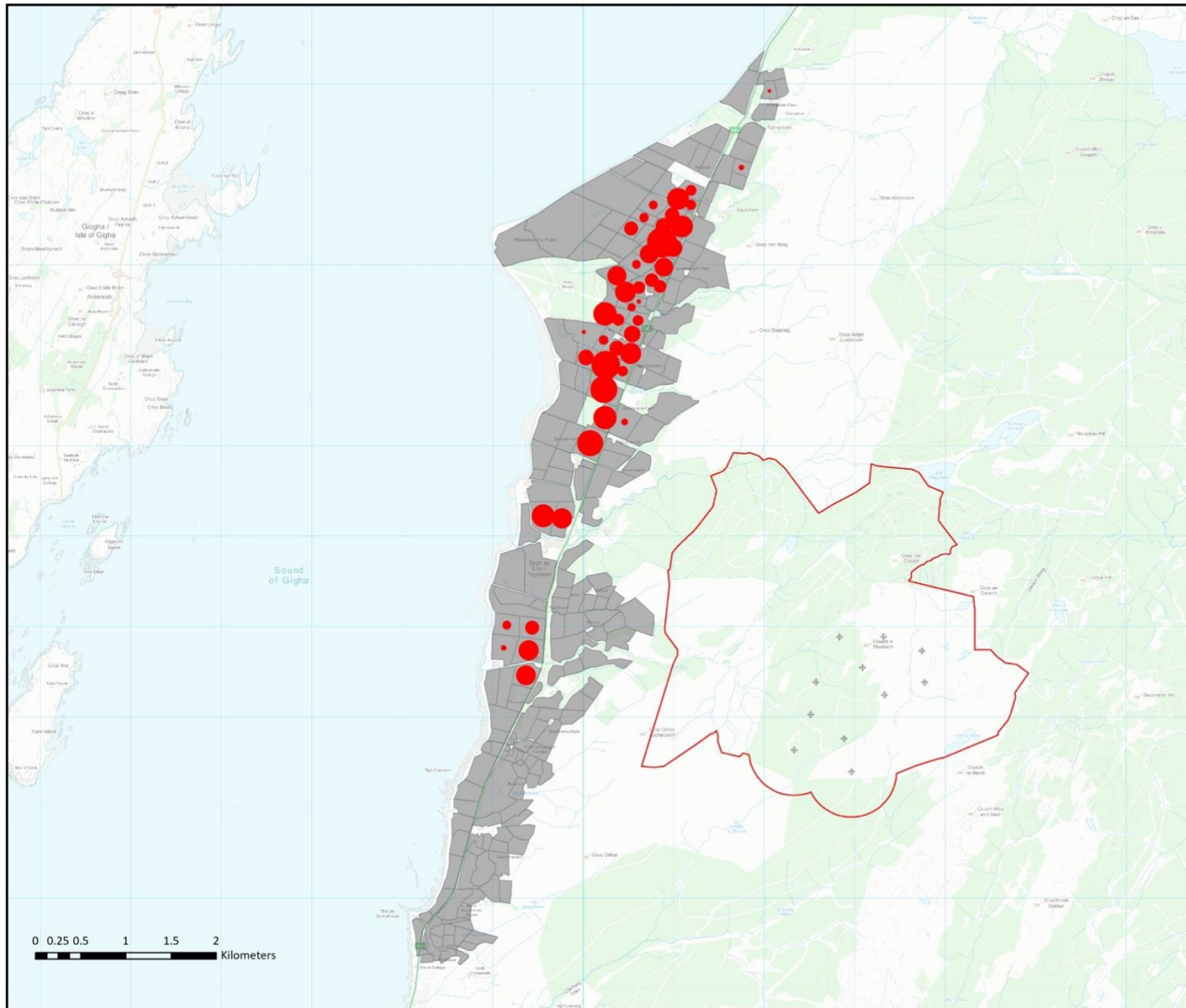
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**WINTERING BIRDS
2022-23**

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**Killalea Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 3

**Wider Field Peak Counts:
Greenland White-
fronted Goose**

KEY:

Field peak counts

- 1
- 10
- 100

■ Wider waterfowl survey area

□ Winter walkover survey area

⊕ Indicative turbines



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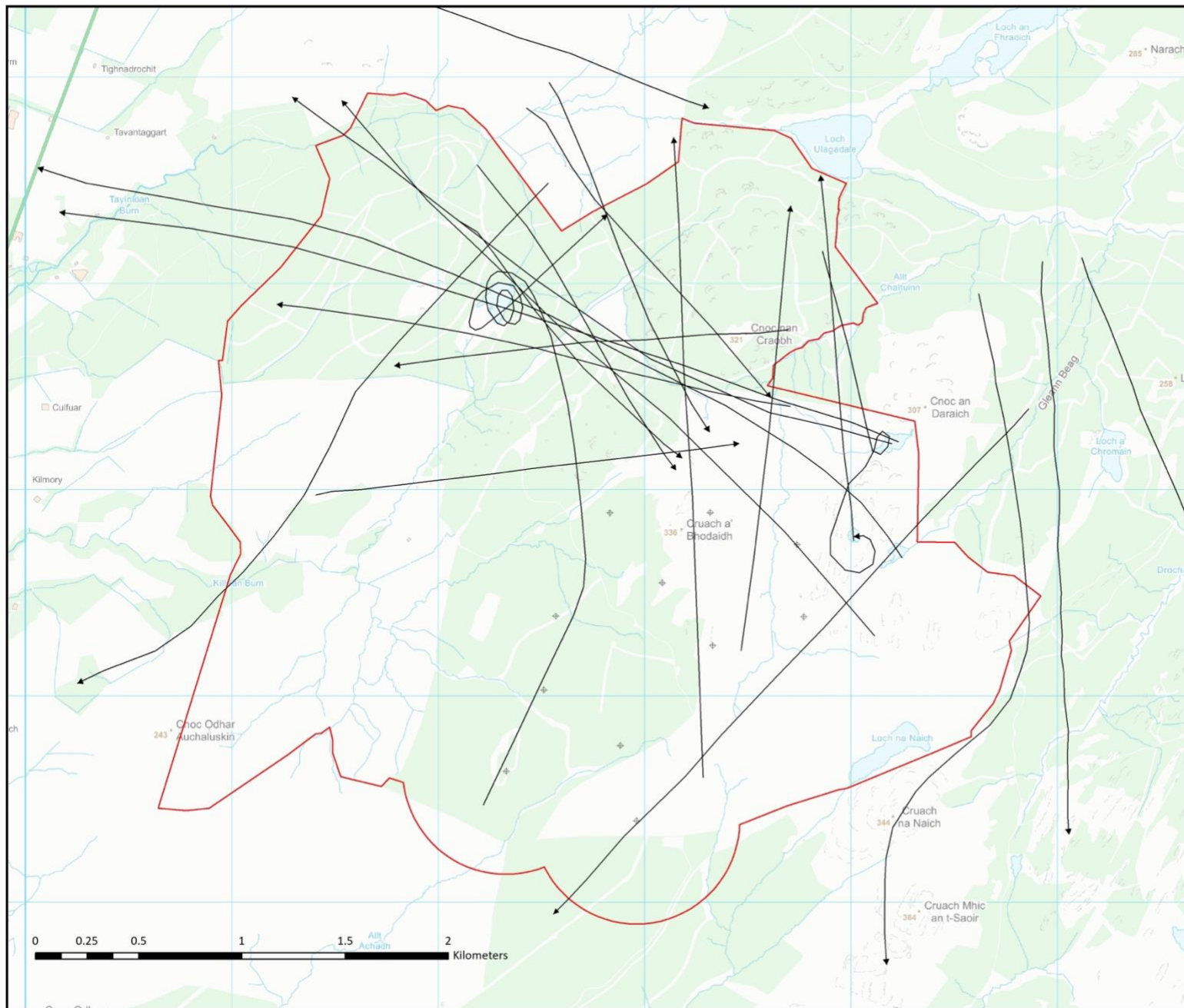
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**WINTERING BIRDS
2021-22**

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0 0.25 0.5 1 1.5 2 Kilometers



**Killalea Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 4
**VP Survey Flight Lines::
Greenland White-
fronted Goose**

- KEY:**
- Flight lines
 - Winter walkover survey area
 - ⊕ Indicative turbines



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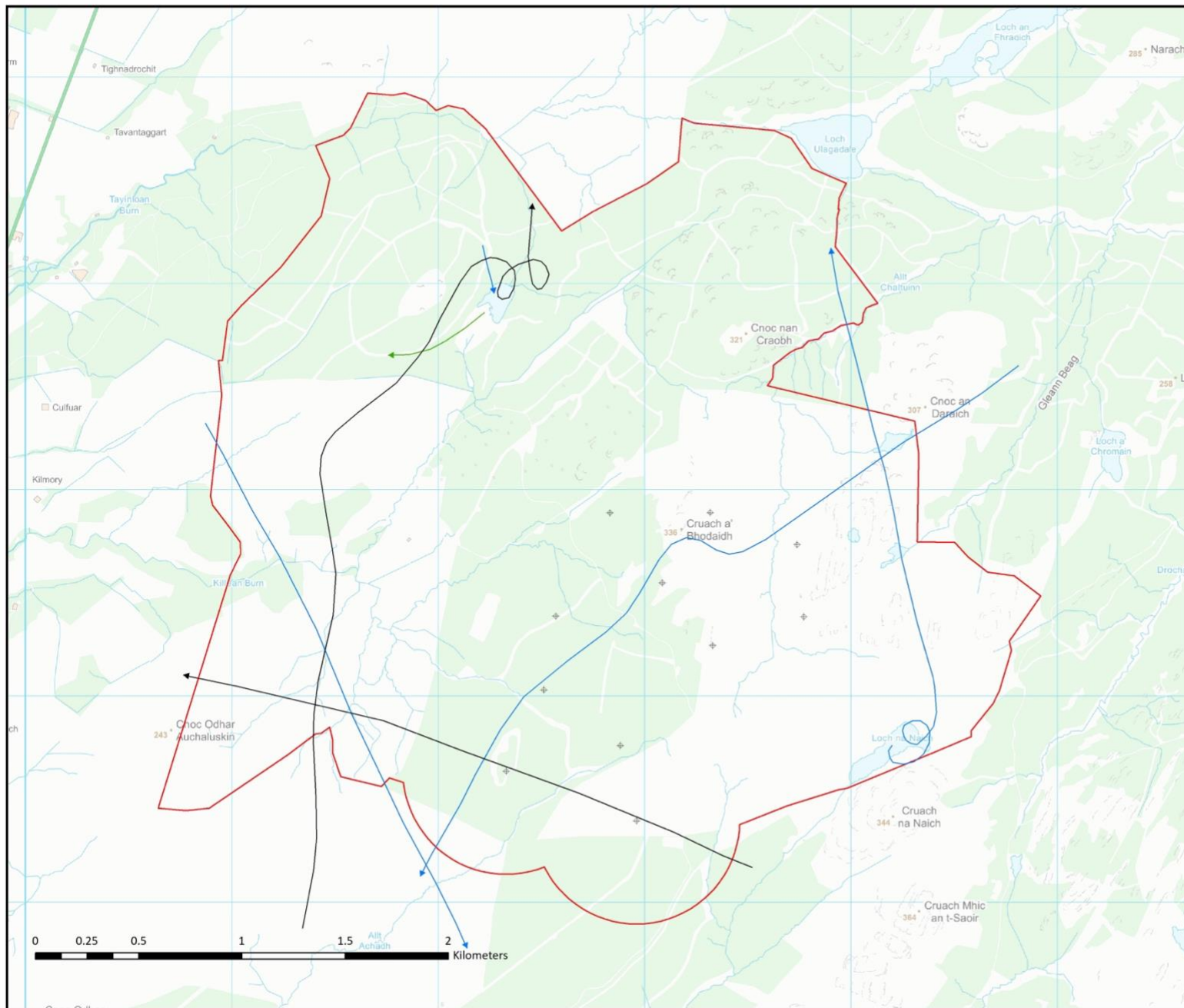
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**WINTERING BIRDS
2021-22**

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**Killalea Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 5

**VP Survey Flight Lines:
Whooper Swan,
Greylag Goose and Teal**

- KEY:**
- Teal
 - Whooper Swan
 - Greylag Goose
 - Winter walkover survey area
 - ⊕ Indicative turbines



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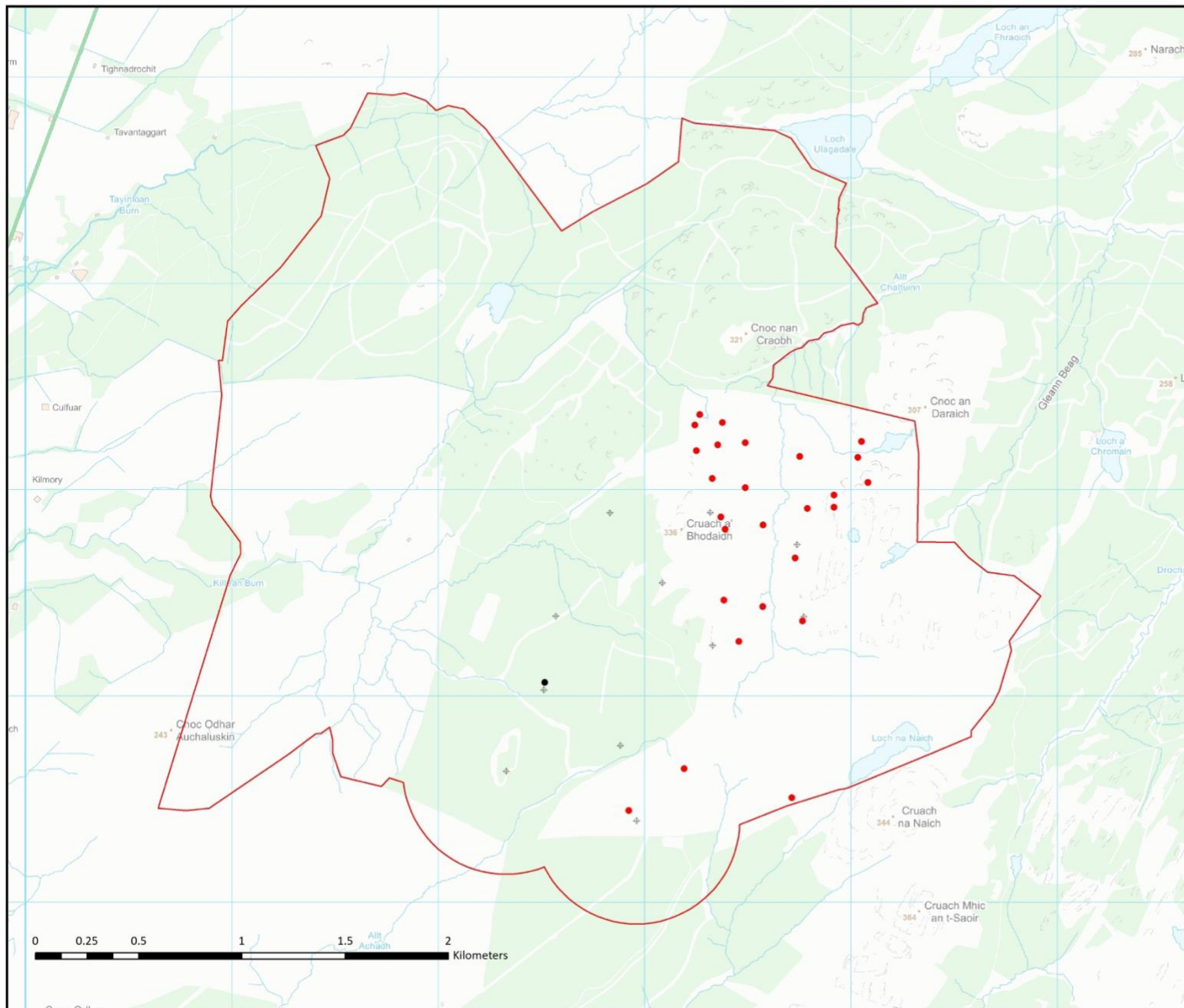
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**WINTERING BIRDS
2021-22**

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**Killalea Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 6

**Walkover survey:
Red Grouse and
Black Grouse**

KEY:

Species

- Black Grouse
- Red Grouse
- Winter walkover survey area
- ⊕ Indicative turbines



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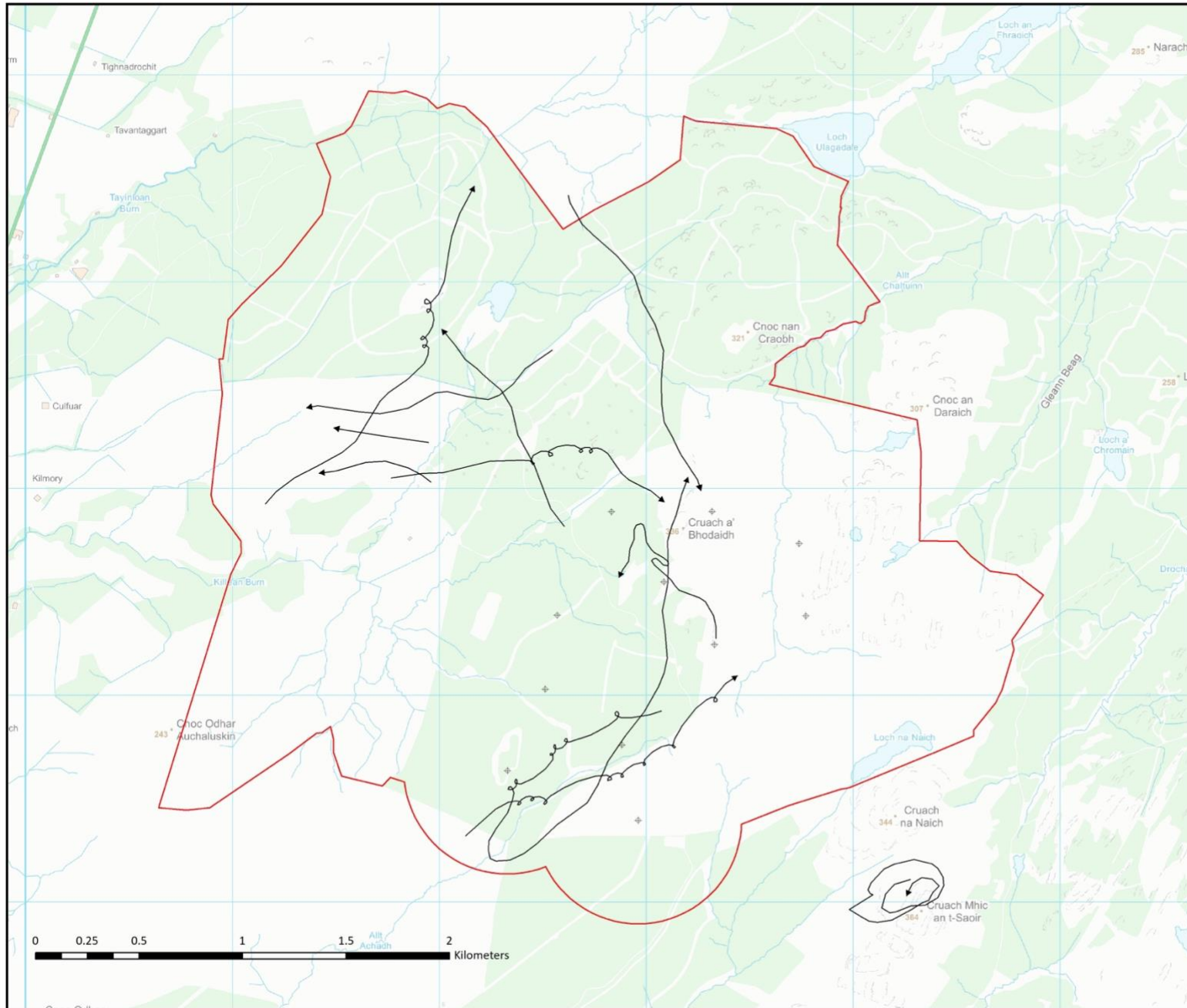
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PROJECT NUMBER: KL2021-1

SCALE - 1:17,500 @ A3

**WINTERING BIRDS
2021-22**

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**Killeen Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 7

**VP Survey Flight Lines:
Hen Harrier**

KEY:

Flight lines

- Flight lines
- Winter walkover survey area
- + Indicative turbines



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LABOUR CODE: N/A

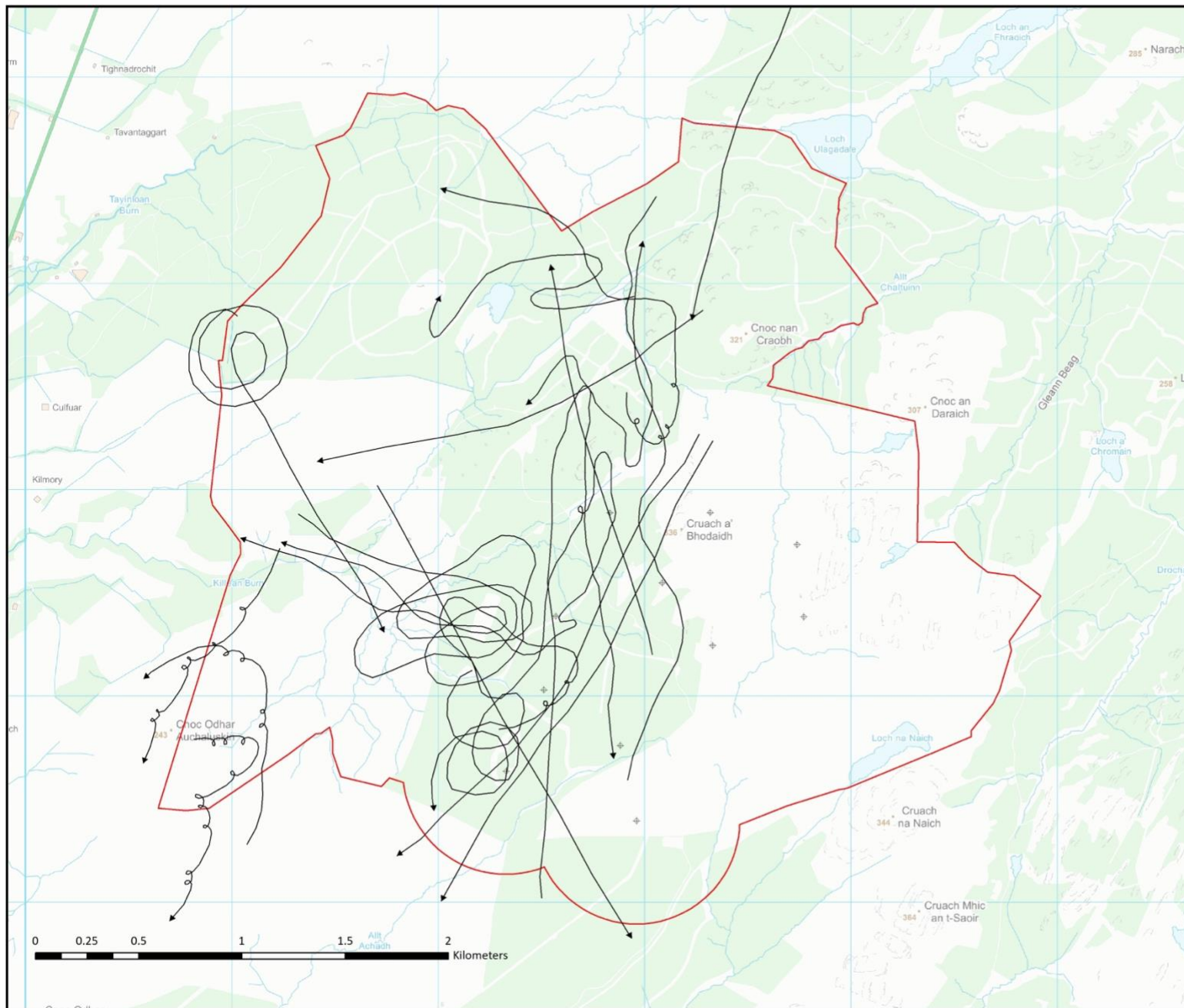
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**WINTERING BIRDS
2021-22**

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**Killen Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 8

**VP Survey Flight Lines:
Golden Eagle**

KEY:

Flight lines

- Flight lines
- Winter walkover survey area
- + Indicative turbines



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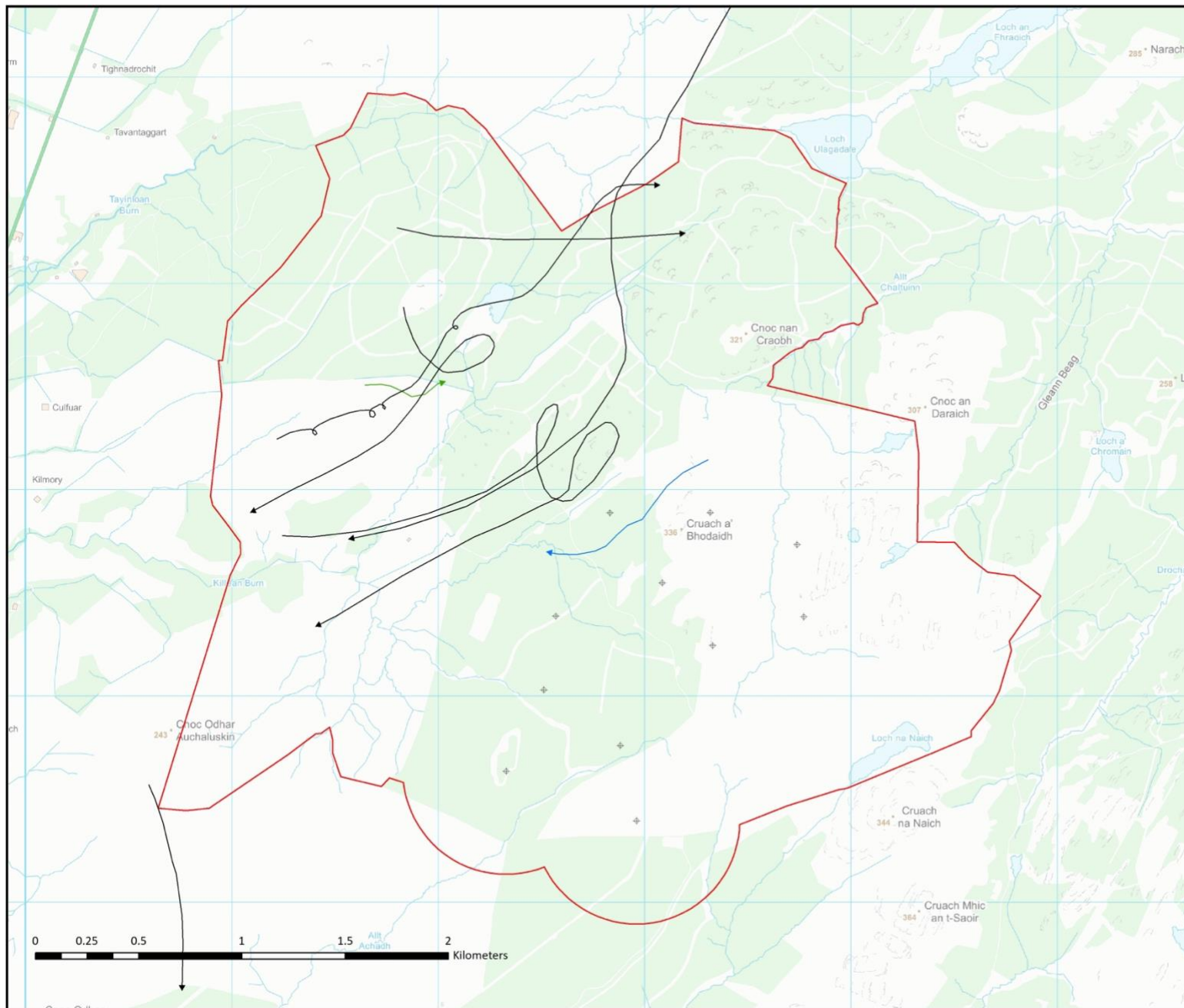
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PROJECT NUMBER	KL2021-1
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SCALE - 1:17,500 @ A3

**WINTERING BIRDS
2021-22**

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**Killeen Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 9

**VP Survey Flight Lines:
Other key raptors**

- KEY:**
- White-tailed Eagle
 - Merlin
 - Long-eared Owl
 - Winter walkover survey area
 - Indicative turbines



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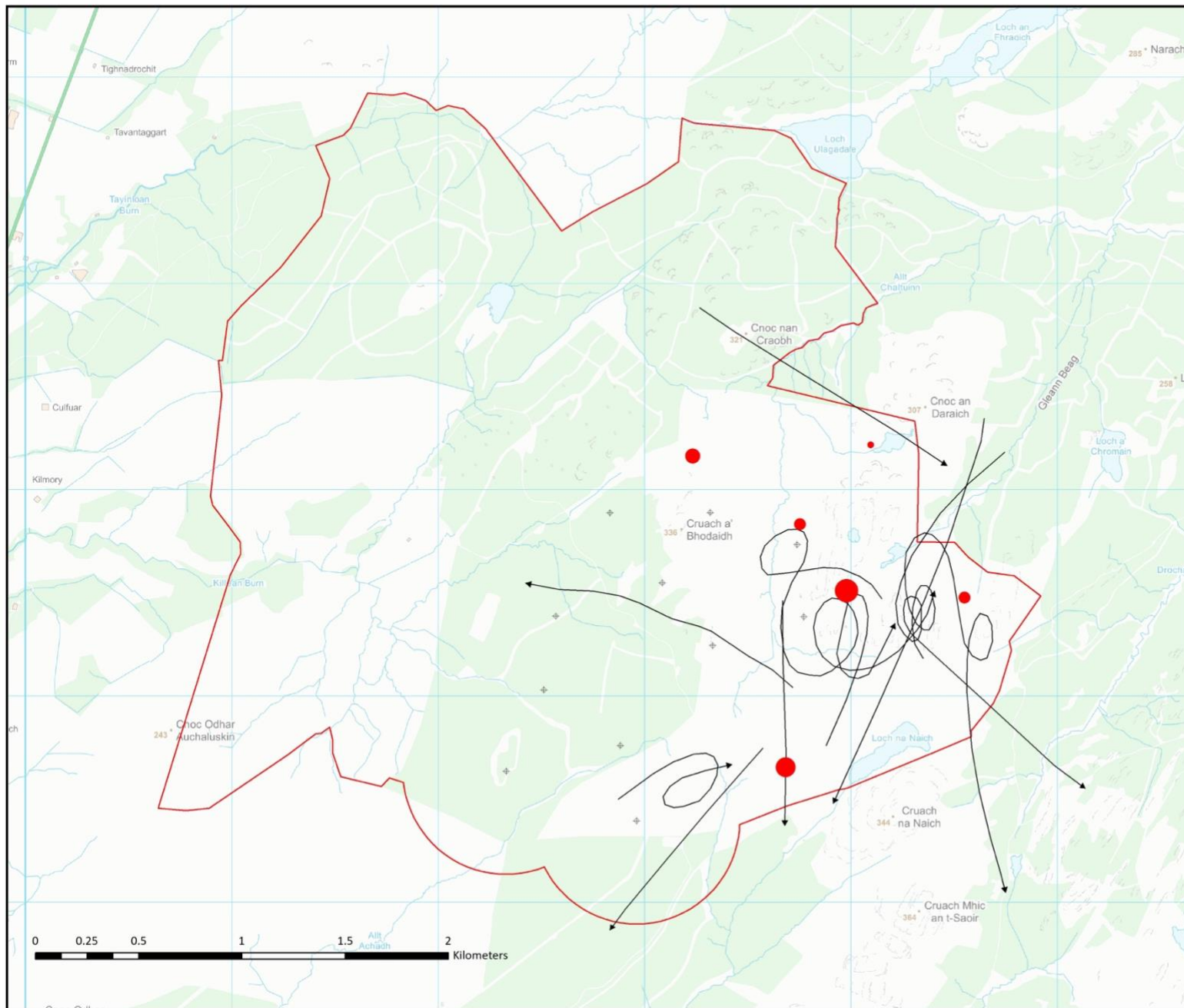
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PROJECT NUMBER:	KL2021-1
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**WINTERING BIRDS
2021-22**

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**Killlean Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 10

**VP Survey Flight Lines:
Golden Plover**

- KEY:**
- Flock**
- 1
 - 5
 - 10
- Flight lines**
- Flight lines
 - Winter walkover survey area
 - + Indicative turbines



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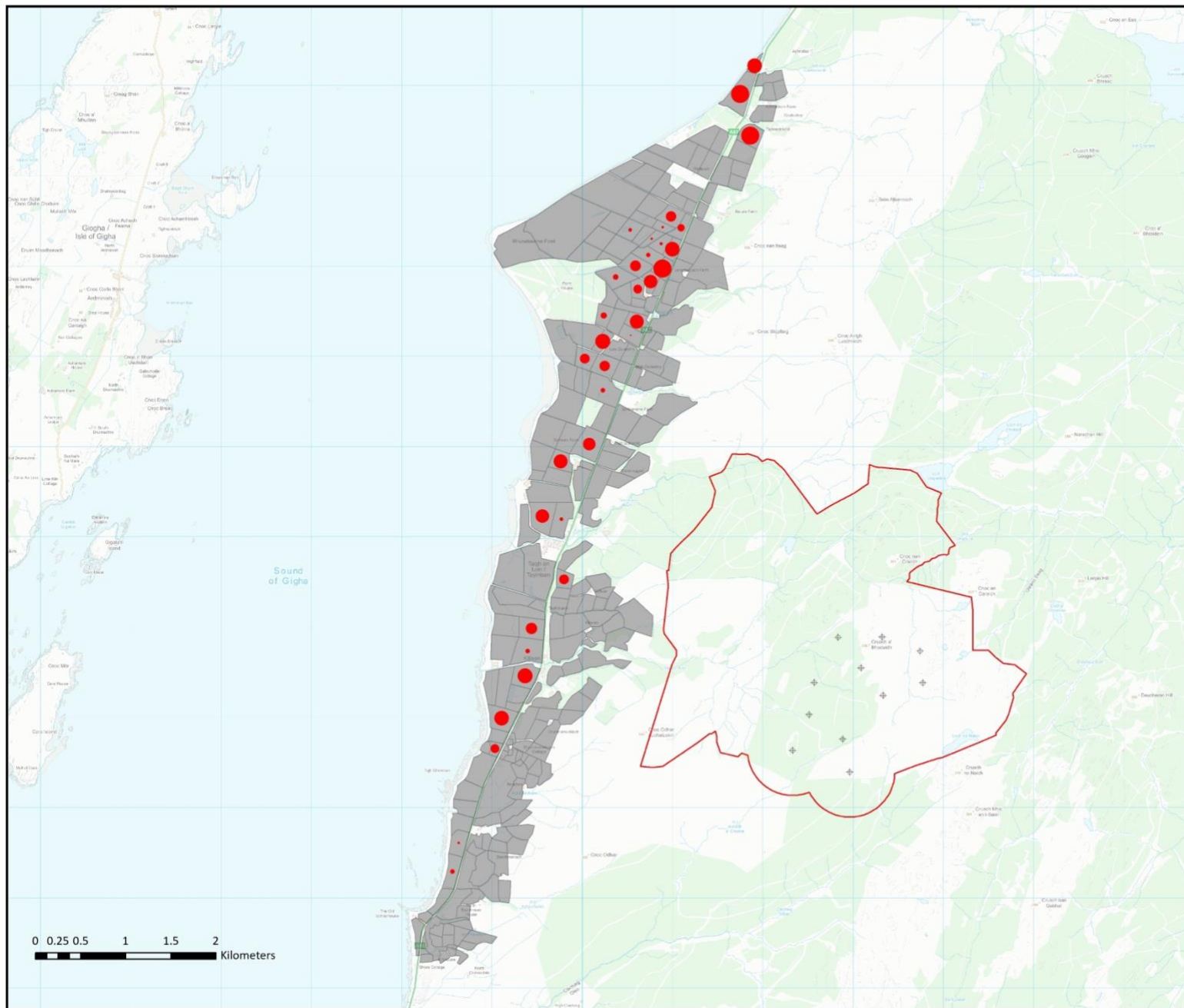
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PROJECT NUMBER: KL2021-1

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**WINTERING BIRDS
2021-22**

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**Killalea Wind Farm: Winter
Bird Surveys 2021-22**

FIGURE 11

**Wider Field Peak Counts:
Greylag Goose**

KEY:

Field peak counts

- 1
- 10
- 100

- Wider waterfowl survey area
- Winter walkover survey area
- ⊕ Indicative turbines



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1. LAYOUT DATE:	N/A	2. LAYOUT NO.:	N/A
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PROJECT NUMBER:	KL2021-1
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SCALE - 1:40,013 @ A3

WINTERING BIRDS 2021-22

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0 0.25 0.5 1 1.5 2 Kilometers

APPENDIX 1. VANTAGE POINT SURVEY DATA

Survey Information

Date	Vantage Point No	Start time	End time	Weather
28/09/2021	2	14:30	17:30	3-8/8 cloud, 1-4 SW wind, excellent vis, light rain showers
28/09/2021	2	18:00	19:30	8/8 cloud, 2-3 SW - WSW wind, excellent vis, light rain shower
29/09/2021	1	06:50	09:50	4-8/8 cloud, 3-4 WNW wind, excellent vis, light rain showers
29/09/2021	1	10:20	11:50	2-8/8 cloud, 4-5 WNW wind, excellent vis, rain showers
15/10/2021	1	14:00	17:00	cloud 2/8, wind 0, 10C, vis very good
15/10/2021	1	17:30	19:00	cloud 8/8, wind 0, 7C, vis very good
16/10/2021	2	07:15	10:15	cloud 8/8, wind 0, 7C, vis very good
16/10/2021	2	10:45	12:15	cloud 8/8, wind SE 1, 8C, vis very good
26/10/2021	1	07:45	10:45	8/8 cloud, 5 SW wind, ok - very good vis, brief period of light rain
26/10/2021	1	11:15	12:45	8/8 cloud, 5 SW wind, ok - very good vis, light rain shower
26/10/2021	2	13:20	16:20	8/8 cloud, 5 SW wind, very good vis, brief light rain shower early on
26/10/2021	2	16:50	18:20	8/8 cloud, 4-5 SW wind, very good vis
09/11/2021	2	07:00	10:00	6-8/8 cloud, 1-2 WSW wind, very good vis
09/11/2021	2	10:30	12:00	6-8/8 cloud, 2-3 WSW wind, very good vis
09/11/2021	1	12:40	15:40	7-8/8 cloud, 4 WSW wind, very good - good vis, light shower towards end of VP
09/11/2021	1	16:10	17:10	3-7/8 cloud, 4-3 WSW wind, very good vis
11/11/2021	1	07:00	08:30	2-4/8 cloud, 2-3 S wind, excellent vis
23/11/2021	2	11:45	13:15	cloud 5/8, wind WNW 3, 9C, vis very good
23/11/2021	2	13:45	16:45	cloud 6/8, wind NW 3, 9c, vis very good
25/11/2021	1	07:35	10:35	cloud 3/8, wind NNW 3, 5C, vis excellent
25/11/2021	1	11:05	12:35	cloud 8/8, wind NNW 3, 5C, vis excellent
06/12/2021	2	11:45	14:45	7-8/8 cloud, 2-3 W wind, very good - good vis, rain and hail showers
06/12/2021	2	15:15	16:45	8/8 cloud, 3-4 W wind, very good vis, very light rain at start of VP then fine
07/12/2021	1	07:40	09:10	8/8 cloud, 4-7 ESE wind, very good vis, fine then steady rain
09/12/2021	1	10:30	13:30	4-5/8 cloud, 3-4 SW-S wind, very good vis
20/12/2021	1	11:50	13:20	cloud 8/8, wind SE 2, 5C, vis good
20/12/2021	1	13:50	16:50	cloud 8/8, wind SE 2, 5C, vis good
22/12/2021	2	07:50	09:50	cloud 8/8, wind SSE 3, 3C, vis very good, sunrise 08:52
22/12/2021	2	10:20	12:50	cloud 8/8, wind SSE 3, 34C, vis very good
10/01/2022	2	11:30	13:00	8/8 cloud, 3 SSW wind, good-very good vis
11/01/2022	2	07:45	10:45	2-7/8 cloud, 2-3 SW wind, excellent vis
11/01/2022	1	12:15	15:15	4-6/8 cloud, 4-5 SW wind, excellent vis
11/01/2022	1	15:45	17:15	5-7/8 cloud, 4 SW wind, excellent vis
24/01/2022	2	12:40	14:40	cloud 6/8, wind S 1, 7C, vis very good
24/01/2022	2	15:10	17:40	cloud 5/8, wind S 1, 7C, vis very good
25/01/2022	1	07:30	10:30	cloud 8/8, wind SSW 2, 5C, vis very good
25/01/2022	1	11:00	12:30	cloud 8/8, wind SSW 2, 5C, vis very good
07/02/2022	2	14:40	16:10	8/8 cloud, 4-5 SW wind, very good vis
07/02/2022	2	16:40	17:40	8/8 cloud, 4 SW wind, very good vis
08/02/2022	1	07:00	10:00	8/8 cloud, 4 W-WSW wind, very good vis, light rain showers
08/02/2022	1	10:45	12:15	6-8/8 cloud, 4-5 WSW wind, very good vis
08/02/2022	2	13:10	14:40	7-8/8 cloud, 5 WSW wind, very good vis
18/02/2022	1	13:30	15:30	cloud 8/8, wind NW 5, 2C, vis very good (poor in wintry showers)
18/02/2022	1	16:00	18:30	cloud 7/8, wind NW 5, 2C, vis very good, sunset 17:34
20/02/2022	2	06:35	09:35	cloud 8/8, wind WSW 5, 9C, vis good
20/02/2022	2	10:05	11:35	cloud 7/8, wind WSW 4, 9C, vis good
07/03/2022	1	14:10	15:40	3-6/8 cloud, 5 SSE wind, excellent vis
07/03/2022	1	16:10	19:10	4-7/8 cloud, 5 SSE wind, excellent vis
08/03/2022	2	09:40	12:40	4-8/8 cloud, 5-6 SSE wind, excellent vis
10/03/2022	2	05:50	07:20	8/8 cloud, 4 S wind, good - ok vis, drizzle
21/03/2022	2	14:30	16:30	cloud 5/8, wind SSE 3, 10C, vis very good
21/03/2022	2	17:00	19:30	cloud 1/8, wind SSE 3, 8C, vis very good
23/03/2022	1	05:30	08:30	cloud 1/8, wind SE 2, 7C, vis very good

Key Species Data

VP	Date	Time	Species	Count	Direction of flight	Flight height (m)	Activity	Time bird observed (sec)	Notes
2	28/09/2021	14:37	GP	8	SE	105		100	
2	28/09/2021	17:20	EA	1	NNW	105		110	adult
1	29/09/2021	08:38	GP	5	NW	80		90	
1	29/09/2021	11:13	EA	1	SE	170		130	adult
1	15/10/2021	14:59	NW	4	SSE	400	migrating	160	
1	15/10/2021	15:02	ML	1	SW	23	hunt	50	male
1	15/10/2021	15:39	NW	3	S	350	migrating	150	ads
1	15/10/2021	15:52	NW	2	SSE	325	migrating	170	ads
1	15/10/2021	15:58	WS	13	SSE	85	migrating	160	
1	15/10/2021	16:58	NW	4	SW	250	migrating	200	ads
1	15/10/2021	17:32	PG	7	ENE	250	migrating	170	
2	16/10/2021	07:50	NW	4	NNE	85		310	ads, thought about landing on loch
2	16/10/2021	08:15	GP	23	ENE	55		50	lost behind trees
2	16/10/2021	08:55	NW	2	NNE	175		130	ads, appeared to be dropping towards Loch Ulagadale
2	16/10/2021	10:05	EA	1	WSW	23		140	ad
2	26/10/2021	14:25	GP	21	S	200		100	
2	09/11/2021	07:35	NW	9	SW	95	left roost	190	
2	09/11/2021	07:38	NW	95	WNW	50	left roost	100	flew in direction of fields by ferry road in Tayinloon. Possibly off loch at NE of side, but loch not viewable from VP2
2	09/11/2021	09:28	HH	1	WNW	6		35	sub ad male
2	09/11/2021	10:53	HH	1	WNW	8		30	ringtail
2	09/11/2021	11:27	EA	1	SW	70		420	adult
2	09/11/2021	11:33	EA	1	SW	70		240	2nd adult
1	09/11/2021	13:00	EA	1					to SE of site
1	09/11/2021	13:28	EA	1					2nd EA joined lone bird to SE of site
1	09/11/2021	14:40	EA	2					still to SE of site in vicinity of Cruach Mhic an t-Saoir
1	09/11/2021	16:28	NW	160	ESE	80	roost	210	dropped from view, some probably onto Loch Ulagadale
1	09/11/2021	16:33	NW	85	SSE	20	roost	170	split from flock above & roosted on Loch Luireach
1	11/11/2021	07:29	NW	1	NNW	25	left roost	55	flew from loch and appeared to drop at Loch Ulagadale
1	11/11/2021	07:32	NW	120	NW	50	left roost	300	including bird with white primaries seen in Tayinloch fields on Monday
1	11/11/2021	07:35	NW	2	WNW	40	left roost	240	left flock of 9 CG
1	11/11/2021	08:10	GP	14	SW	200		165	
1	11/11/2021	08:12	NW	2	N	300		190	
2	23/11/2021	12:04	HH	1	ENE	28	hunt	190	juv
2	23/11/2021	12:53	HH	1	WSW	30	hunt	350	juv, prob same as 1
2	23/11/2021	13:46	GP	9	SW	100		70	
2	23/11/2021	16:14	HH	1	SSE	18	hunt/roost	110	male
2	23/11/2021	16:44	NW	24	ENE	45	roost	80	
2	23/11/2021	16:52	LE	1	E	3	hunt	25	
1	25/11/2021	08:17	HH	1	NNW	7	hunt	120	juv
1	25/11/2021	08:41	GP	10	NNE	20	roost	80	landed
1	25/11/2021	11:13	WS	2	WSW	100		260	ads
1	25/11/2021	12:01	EA	2	SW	40	hunt	290	ad and imm
1	25/11/2021	12:14	EA	1	SSE	53	hunt	370	imm, same as 7
1	25/11/2021	12:30	EA	1	SSW	40	hunt	240	ad
2	06/12/2021	12:31	EA	1	N	190		480	sub-adult
2	06/12/2021	14:21	WS	4	SSE	10		15	adults, landed
1	07/12/2021	08:31	WS	3	circle	20	left roost	260	adults
2	11/01/2022	09:31	EA	1					juv, circled up to north of site, north of Loch Ulagadale
2	11/01/2022	09:50	EA	1	SSW	28		190	juv, same as above, mobbed by RN, landed in tree
2	11/01/2022	10:05	EA	1	SSW	23		240	flew from tree
1	11/01/2022	12:52	EA	2	circle	68		660	adults
1	11/01/2022	13:31	EA	1		33		270	adult
2	24/01/2022	14:39	HH	1	SW	5	hunt	80	male
2	24/01/2022	15:21	HH	1	ENE	24	hunt	140	male
2	24/01/2022	17:37	T	6	WSW	4		30	in thermal
1	25/01/2022	09:54	GP	58	NNW	50	flushed	210	
1	25/01/2022	10:08	GP	36	SW	70		120	
2	07/02/2022	15:17	HH	1	NW	17		140	subadult male
2	07/02/2022	17:43	NW	40	SE	60	roost	120	
2	07/02/2022	17:43	NW	45	SE	60	roost	120	
2	07/02/2022	17:44	NW	12	SE	70	roost	120	
2	07/02/2022	17:44	NW	23	SE	70	roost	120	
2	07/02/2022	17:45	NW	45	SE	60	roost	120	
1	08/02/2022	07:17	NW	70	WNW	75	left roost	130	against dark background.
1	08/02/2022	07:22	NW	110	NW	85	left roost	150	came from direction of Loch na Naich but not seen to lift off loch
1	08/02/2022	08:24	GJ	2	WNW	165		260	
1	08/02/2022	12:10	HH	1		21		300	until VP end, ringtail
1	18/02/2022	14:54	EA	1	NNE	35	hunt	160	ad
1	18/02/2022	16:22	EA	1	NNE	50	Hunt	250	ad
1	18/02/2022	16:36	GP	6	NW	50		280	
2	20/02/2022	08:24	EA	2	ESE	85	hunt	1980	ad pair hanging in then wind, female missing central tail feather
2	20/02/2022	10:21	EA	1	NE	48	soar/display	1140	ad female, same as 7, carrying a stick, brief sky-dance
1	07/03/2022	18:37	NW	150					approach site
2	10/03/2022	06:48	NW	28	WSW	80	left roost	60	probably from north of site?
2	21/03/2022	15:05	EA	1	E	65	soar	160	ad
2	21/03/2022	17:17	GJ	7	NNE	50		270	
1	23/03/2022	09:55	PG	17	ENE	75	migrating	130	
1	23/03/2022	10:05	HH	1	NE	53	hunt	120	ad male