

# **TECHNICAL APPENDIX 8.7: KILLEAN WIND FARM HABITATS REGULATION APPRAISAL REPORT**

**June 2024**

## TECHNICAL APPENDIX 8.7: KILLEAN WIND FARM HABITATS REGULATIONS APPRAISAL REPORT

### INTRODUCTION

1. This technical appendix provides the information required under the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2004 (as amended), specifically related to avian nature conservation issues raised by the Proposed Development. The information provided here is to support the competent authority in establishing, firstly, whether the construction, operation and decommissioning of the Proposed Development, either alone or in combination with other plans or projects, is likely to have a significant effect on European sites, having had regard to the qualifying interests and the conservation objectives. This first stage analysis is completed without reference to mitigation.
2. Where a plan or project is not directly connected with or necessary to the management of the European site, and where it cannot be excluded, based on objective information, that the plan or project will have a significant effect, the competent authority is duty bound to complete an Appropriate Assessment to determine whether the likely significant effect would have an adverse effect on the integrity of the European site(s). The integrity of the European Sites is considered regarding the best scientific knowledge and with regards to the conservation objectives of the European Sites, specifically the species for which the sites were designated and the habitat upon which they depend. This technical appendix should be read in conjunction with the accompanying chapter and figures.
3. This Technical Appendix provides information on the existing baseline for the designated populations (that could be affected by the Proposed Development) and an assessment of the Proposed Development's effects on those populations alone and in combination with other plans and projects in the area. The field studies, evaluation and assessment of the effects of the proposed wind farm on the area's bird populations have been reported fully in Chapter 8: Ornithology in Volume 1 of the Environmental Impact Assessment (EIA) Report. The information presented in this report draws on that work but focuses on the key species that are qualifying features of the Kintyre Goose Roosts Special Protection Area (SPA)/Ramsar site.

### OBJECTIVES

4. The purpose of this Technical Appendix is:
  - To assess the potential for Likely Significant Effects (LSE) upon the European site(s) from the construction and operation of the Proposed Development, either alone or in combination with other plans or projects and in the absence of any mitigation (this assessment is known as the screening stage); and
  - If any Likely Significant Effects are identified through the screening stage, to consider whether the Proposed Development has the potential to have an adverse effect on the integrity of the European site(s), having had regard to their conservation objectives and the mitigation measures proposed.

### PARAMETERS FOR THE HRA

5. The assessment presented here is based on the Proposed Development as described in Chapter 3: Project Description in Volume 1 of the EIA Report. Specific parameters relevant to this assessment include using a 155 m rotor diameter turbine, with a rotor height of 25-180 m.

6. Blade rotational speeds would be, on average, about 7.5 revolutions per minute. The Proposed Development will include concrete bases for the 9 wind turbine foundations, the wind turbines themselves and associated electrical transformers, electrical sub-station and control buildings, and on-site infrastructure (underground cabling, access tracks, off-site road improvements, watercourse crossings and crane hardstandings). A complete description of the Proposed Development for the purposes of the EIA Regulations is provided in Volume 1 Chapter 3 of the EIA Report.
7. All of the on-site cabling will be underground. Operation and minor wind farm maintenance will occur throughout the year, with additional annual servicing.

## CONSULTATION

8. NatureScot has advised in scoping that the Proposed Development has the potential to impact on Greenland white-fronted goose, the sole qualifying feature of the Kintyre Goose Roosts SPA/Ramsar site, so a Habitats Regulations Appraisal (HRA) will be needed. This Technical Appendix provides that appraisal. Greenland white-fronted goose is the only SPA qualifying species for which the Proposed Development lies within the SPA connectivity range.

## BASELINE DATA

9. A comprehensive range of bird surveys have been undertaken at the site between September 2021 and August 2023. This has included surveys over two breeding seasons (2022 and 2023) and two winter periods (2021-22 and 2022-23). These surveys comprised:
  - year-round vantage point surveys to quantify bird flight activity;
  - breeding bird walkover mapping survey;
  - species-specific breeding bird surveys;
  - autumn/winter walkover surveys; and
  - autumn/winter waterfowl feeding surveys.
10. Full details of the surveys, dates and weather conditions are given in Technical Appendices 8.1-8.4.

## SPA SPECIES' BASELINE CONDITIONS

11. Only one SPA species was recorded during the baseline surveys within the potential disturbance zone:
  - Greenland white-fronted goose.
12. That same species was the only SPA species recorded at risk of collision (i.e. flying through the site at rotor height).

## STAGE ONE HABITATS REGULATIONS APPRAISAL – SCREENING (LIKELY SIGNIFICANT EFFECTS TESTS)

13. In this section, any SPA that could be affected by the Proposed Development is considered in terms of its qualifying features to determine whether any Likely Significant Effects (LSE) under the Habitats Regulations could occur. SPAs that could be affected by the Proposed Development are identified and the designated species that could be affected.
14. The initial assessment for the LSE test was based on whether the Proposed Development falls within the core connectivity range of each qualifying species of each SPA (as set out in SNH 2016) and whether there was any possible pathway to a significant impact. Each SPA is considered in turn.
15. The potential connectivity of each of these SPAs to the Proposed Development is summarised in the EIA Report Table 8.5. This lists the qualifying features for each SPA, the distance from the site at its closest point and an initial assessment of whether the site falls within the core range of each (SNH 2016). As set out in this guidance, *“In most cases, the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests”*, so this has been used for this assessment (though with consideration of the maximum ranges too).

### KINTYRE GOOSE ROOSTS SPA/RAMSAR

16. The Kintyre Goose Roosts SPA/Ramsar site lies 540 m north of the Proposed Development site boundary and 2.2 km from the closest proposed turbine. It is designated (under Article 4.2) for its wintering population of Greenland white-fronted geese (which roost on the upland lochs at night and forage on the surrounding farmland up to 5-8 km from the roost, SNH 2016). The SPA citation cites a population of 2,300 Greenland white-fronted geese (8% of the international population). Numbers have been fairly stable since then (hence its condition being ‘favourable maintained’). The SPA/Ramsar site comprises a series of hill lochs: Loch Garasdale, Loch an Fhraoich, Loch Lussa, Tanga Loch and Black Loch (Figure 8.7.1).

**Table 1: Kintyre Goose Roosts SPA: Determining Potential for Likely Significant Effects (LSE)**

<i>Qualifying Interest</i>	<i>Summary Condition</i>	<i>Likely Significant Effect</i>
Greenland White-fronted Goose	Favourable maintained. No negative pressures.	Collision risk Disturbance during construction Disturbance/barrier effect during operation

### SOUND OF GIGHA SPA SPA

17. The Sound of Gigha SPA lies 600 m west of the Proposed Development (beyond the western end of the site access track). It is designated for its wintering populations of great northern diver (2004/05-07/08 winter peak mean of 505, 20% of GB), Slavonian grebe (2008/09-12/13 winter peak mean of 37, 3.4% of GB), red-breasted merganser (2004/05-07/08 winter peak mean of 117, 2.4% of GB), and eider (2004/05-07/08 winter peak mean of 1,295, 2.2% of GB).
18. There are no qualifying species for which the SPA could have any connectivity with the Proposed Development.



# KILLEAN WIND FARM: HABITATS REGULATIONS

## FIGURE 8.7.1

### SPA/RAMSAR SITES WITHIN 20KM

© CROWN COPYRIGHT. ALL RIGHTS RESERVED.  
2024 LICENCE NUMBER 0100031673.

#### Legend

- Proposed Turbines
- Ramsar Site
- Special Protection Area (SPA)
- Site Boundary
- Site Buffer 5km
- Site Buffer 20km



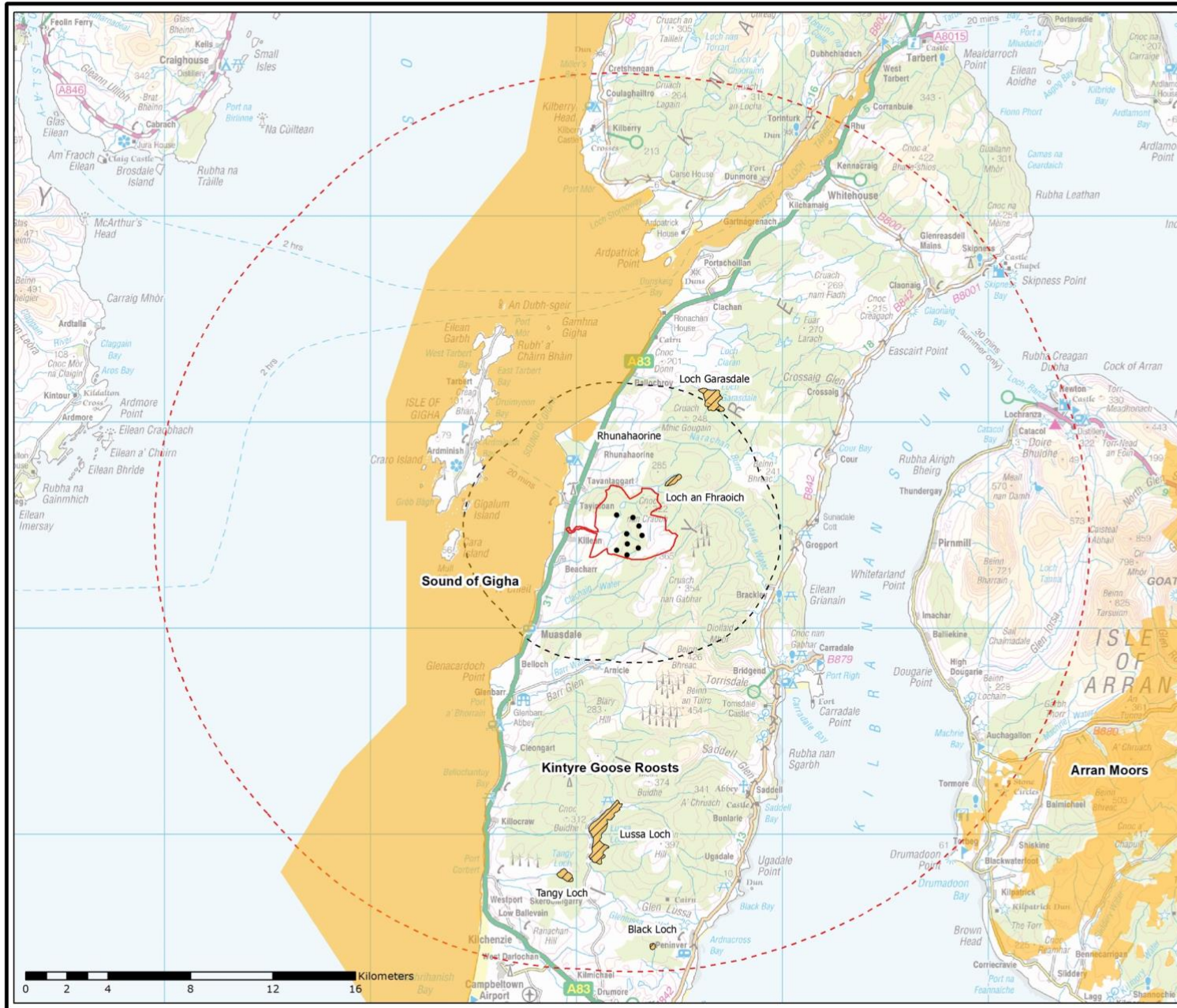
LAYOUT NO. NA | LAYOUT NO. PCS0kh049

PROJECT NUMBER  
**EC-SP-D008-7-1**

SCALE - 1:180,000 @ A3

HRA REPORT  
2024

THIS DRAWING IS THE PROPERTY OF RENEWABLE ENERGY SYSTEMS LTD. AND NO REPRODUCTION MAY BE MADE IN WHOLE OR IN PART WITHOUT PERMISSION



## ARRAN MOORS SPA

19. The Arran Moors SPA site lies 19 km south-east of the Proposed Development. It is designated for its breeding hen harrier population of European importance (21 breeding females between 1994 and 1998, 4% of GB). The Proposed Development lies outside the connectivity distance from this SPA (core range 2 km, maximum range 10 km, SNH 2016), so would not affect it.

## POTENTIAL IMPACTS ON GREENLAND WHITE-FRONTED GEESE

20. The potential impacts on Greenland white-fronted geese were identified as the following. Each is considered in turn:
  - Disturbance of feeding and roosting birds during construction
  - Habitat loss from construction
  - Disturbance of roosting birds during operation
  - Collision risk during operation.
  - Disruption to flight lines during operation (barrier effect).

## DISTURBANCE RISK – CONSTRUCTION

21. Greenland white-fronted goose feeding flocks were regularly seen in the fields to the west and north-west of the Proposed Development, and some of these fields are within the potential impact zone during construction. This has been taken as a precautionary 500 m buffer from the Proposed Development infrastructure. A peak count of 164 Greenland white-fronted geese was recorded in this zone. A Likely Significant Effect from construction disturbance could not be excluded and this was taken forward for Appropriate Assessment.
22. Additionally, there were occasional records of up to 155 Greenland white-fronted geese roosting on the small lochs in the north-eastern part of the survey area. These are located 850 m from the nearest proposed wind turbine at their closest point (Loch Luireach), so any disturbance during construction would result in no Likely Significant Effect.
23. Given the distance between the Kintyre Goose Roosts SPA and the nearest wind farm infrastructure (2.2 km), LSE can also be ruled out for any construction disturbance into the SPA.

## HABITAT LOSS – CONSTRUCTION

24. There would be a direct loss of Greenland white-fronted goose feeding habitat from the construction of wind farm infrastructure. This would, though, be very limited in its spatial extent, restricted to the western end of the Proposed Development. Here, there would be a very small loss of agricultural grassland (approximately 0.2 ha.) for the access track turning circle to accommodate long loads.
25. Given that this direct loss of land would be such a small area in the context of the birds' foraging area and its location immediately adjacent to the main A83, it was concluded that this would not result in any LSE.

## DISTURBANCE RISK – OPERATION

26. Disturbance of geese during operation is likely to be restricted to the zone around the wind turbines rather than the whole site infrastructure, so a precautionary 500 m buffer around the turbines was used to define the potential impact zone. No Greenland white-fronted geese were recorded on the ground (either roosting or feeding) within this zone. Therefore, there would be no Likely Significant Effect from operational disturbance.
27. Given the distance between the Kintyre Goose Roosts SPA and the nearest wind farm infrastructure (2.2 km), LSE can also be ruled out for any disturbance into the SPA during operation.

## COLLISION RISK

28. Collision risk modelling was carried out for Greenland white-fronted geese using the NatureScot standard model (Band *et al.* 2007). The direct flight model was applied as their flights were essentially direct ones through the site. Further modelling details are given in Chapter 8, paragraphs 8.4.20 and 8.6.57, and Technical Appendix 8.5.
29. The collision risk predictions from the model for Greenland white-fronted geese are summarised in Table 5, applying the NS-recommended precautionary 99.8% avoidance rate (SNH 2017). The predicted collision risk of 0.26 geese per year based on the 2012-22 data and 0.16 based on the 2022-23 data gives an overall predicted risk of 0.21 goose collisions per year. A Likely Significant Effect from collision risk could not be excluded and this was taken forward for Appropriate Assessment for the Kintyre Goose Roost SPA/Ramsar site.

**Table 2: Collision Risk Modelling Predictions**

Species	Precautionary Predicted Number of Collisions per Year (NS avoidance rate)	
	2021-22	2022-23
Greenland White-fronted Goose	0.26	0.16

## BARRIER EFFECT

30. The Proposed Development lies within a Greenland white-fronted goose flight corridor, but only a short distance would be required to divert around the wind farm if it did pose a barrier to the goose flight movements. It would not block any flight route into important feeding areas or access to the birds' roosts. Any barrier effect would, at most, require only a short detour around the wind farm. As a result, it was concluded that a barrier effect would result in no Likely Significant Effect on the Kintyre Goose Roosts SPA Greenland white-fronted goose population.

## CONCLUSIONS OF PHASE ONE HRA SCREENING

31. Likely Significant Effects could not be excluded for the Kintyre Goose Roosts SPA/Ramsar Greenland white-fronted goose population for:
  - disturbance during the construction to feeding fields, and
  - collision risk from the operational wind turbines.

32. This was, therefore, taken forward for Appropriate Assessment under the second stage of the HRA assessment process.



## STAGE TWO HABITATS REGULATIONS APPRAISAL – SHADOW APPROPRIATE ASSESSMENT

33. The purpose of this section of the report is to inform the Competent Authority's Habitats Regulations Assessment, to provide them with the information needed to determine whether the Proposed Development would threaten the ecological integrity of any SPA. In this case, the Competent Authority would be the Scottish Government.
34. As set out in the Stage 1 report above, Likely Significant Effects could not be excluded for the Kintyre Goose Roosts SPA/Ramsar Greenland white-fronted goose population for:
  - disturbance during the construction to feeding fields, and
  - collision risk.
35. This shadow Appropriate Assessment report, therefore, addresses this site and examines whether the Proposed Development might result in any adverse effect on the integrity of the SPA/Ramsar site. SPA/Ramsar site population trends are presented using data kindly provided by NatureScot, and with reference to annual peak counts from the BTO WeBS/Goose and Swan Monitoring Programme (Woodward *et al.* 2024).

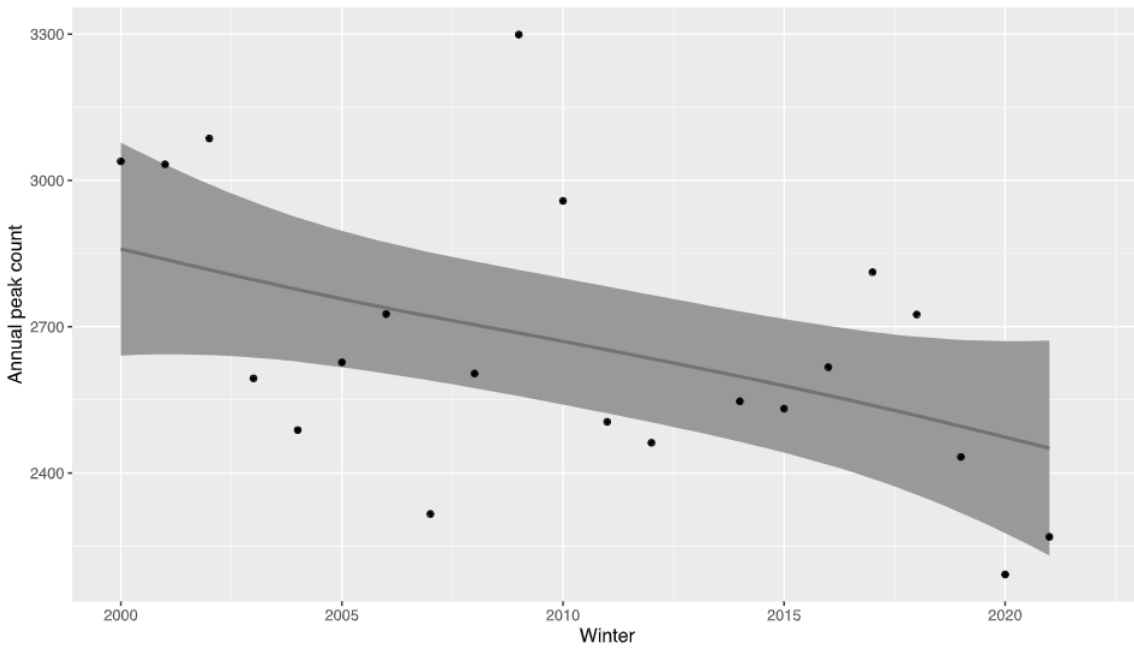
### KINTYRE GOOSE ROOSTS SPA/RAMSAR

36. Kintyre Goose Roosts SPA has been classified by NatureScot as being in a 'Favourable Maintained' condition, based on an assessment made in 2014<sup>1</sup>. Monitoring data show that the population increased from its citation level of 2,300 to just over 3,000 during 2000/01 – 2003/04 but that subsequently there has been a decrease, with the last two winters dropping just below the citation level (2,190 and 2,270). The annual peak counts for the SPA are shown in Figure 8.7.2.
37. The SPA supports geese feeding in two main areas, one closer to the proposed development (in the coastal fields around Tayinloan) and one more distant to the south at Machrihanish. The population changes in each area have been different, with a marked decline at Tayinloan (Figure 8.7.3) but an increase at Machrihanish (Figure 8.7.4).

---

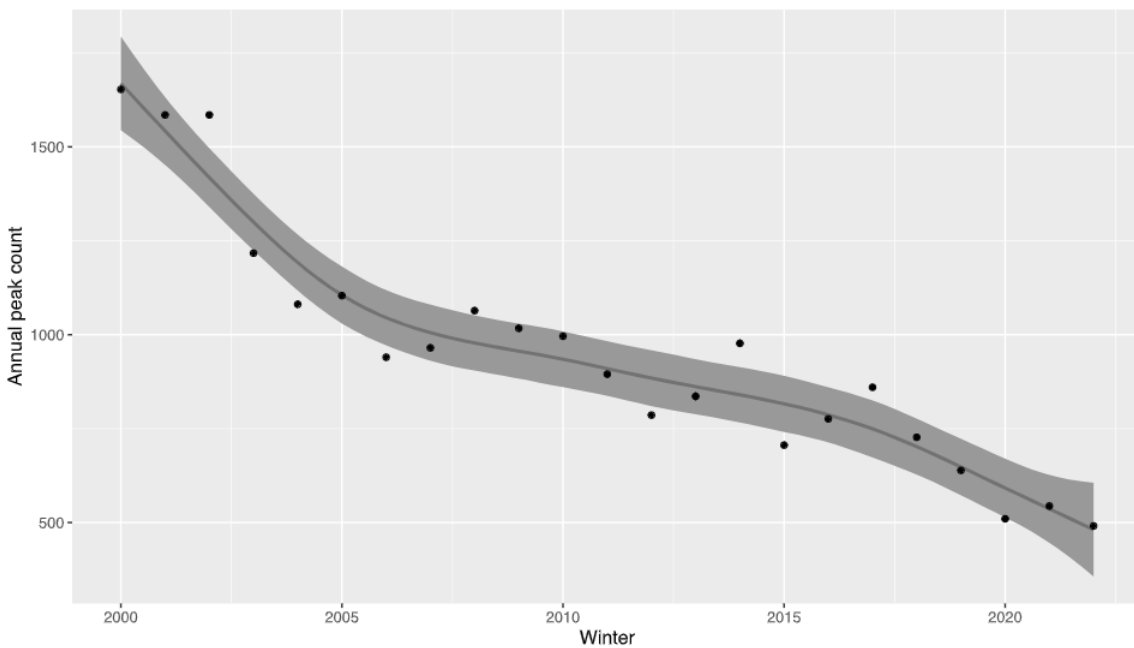
<sup>1</sup> <https://sitelink.nature.scot/site/8518> Accessed 25/5/24.

**Figure 8.7.2. Kintyre Goost Roosts SPA annual peak counts, 2000/01 – 2022/23**



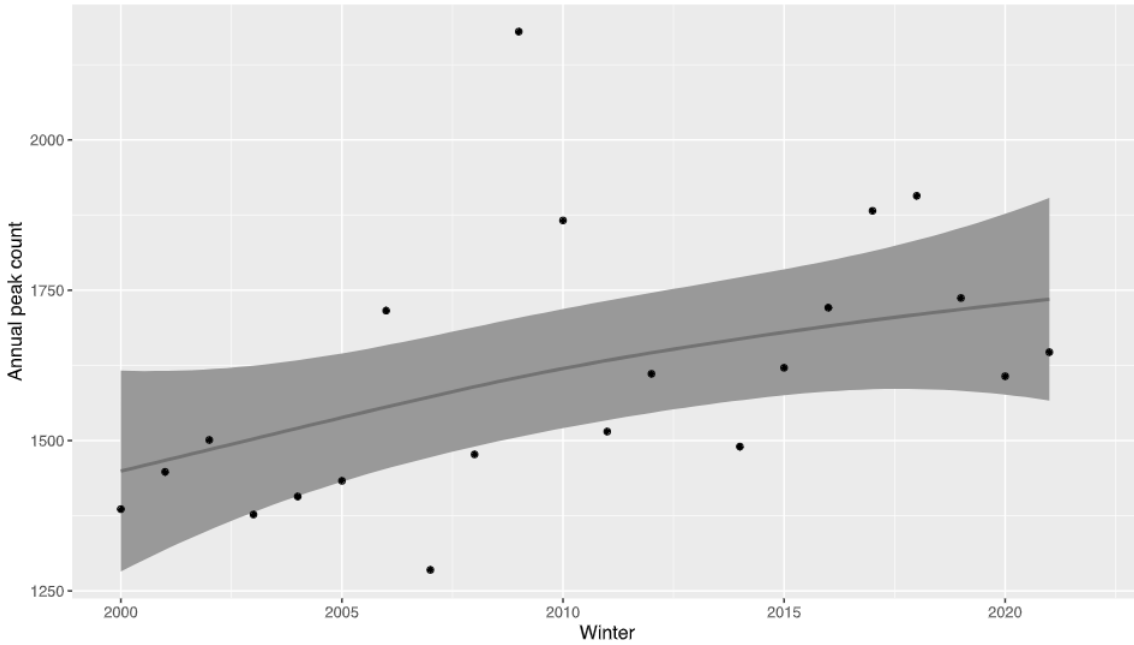
*Note: the line shows the General Additive Model (GAM) line of best fit with standard error.*

**Figure 8.7.3. Kintyre Goost Roosts SPA: Tayinloan Area annual peak counts, 2000/01 – 2022/23**



*Note: the line shows the General Additive Model (GAM) line of best fit with standard error.*

**Figure 8.7.4. Kintyre Goost Roosts SPA: Machrihanish Area annual peak counts, 2000/01 – 2022/23**

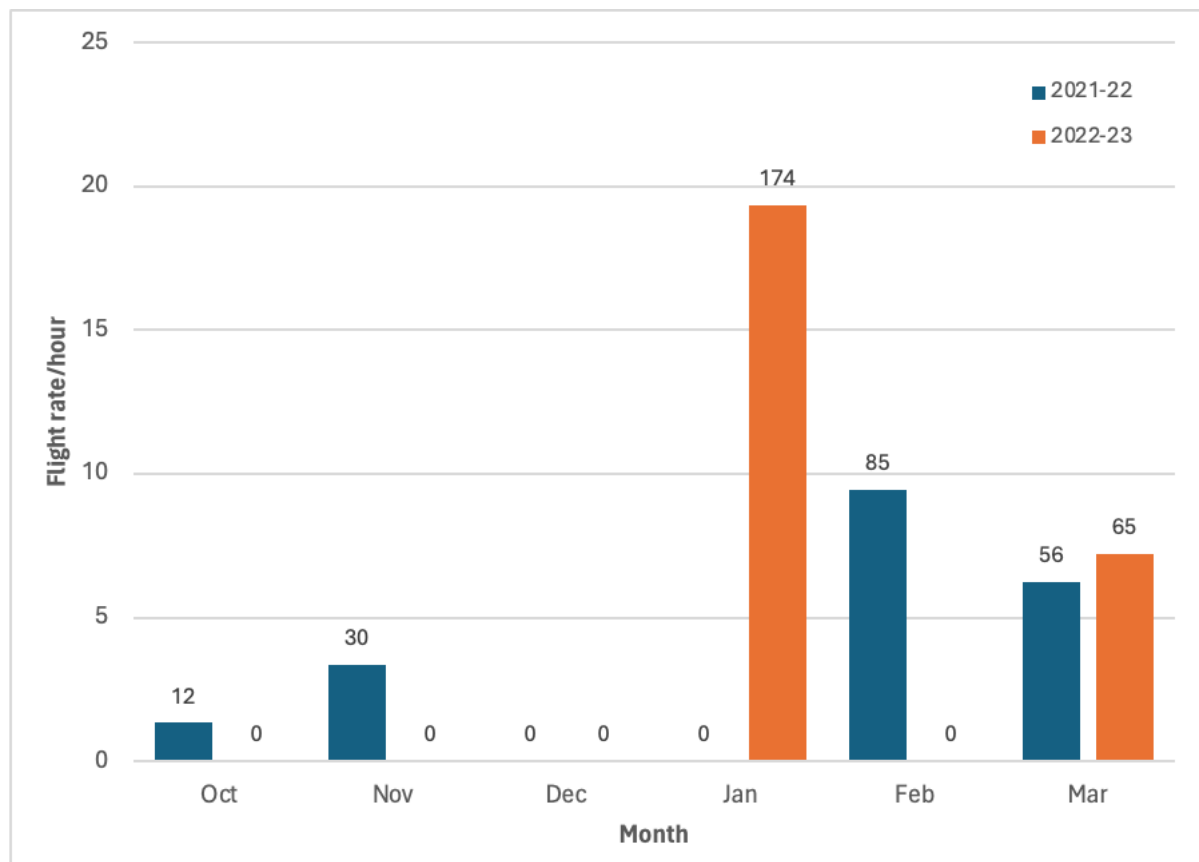


*Note: the line shows the General Additive Model (GAM) line of best fit with standard error.*

## COLLISION RISK

38. Greenland white-fronted goose flights were observed mainly to the north of the proposed wind turbine locations, with the current site designed to avoid the main goose flight corridor. Observed flight rates are summarised in Figure 8.7.5.

**Figure 8.7.5. Greenland white-fronted goose flight rates through the collision risk zone at rotor height, 2021-22 and 2022-23. Numbers = total flights observed in each month.**



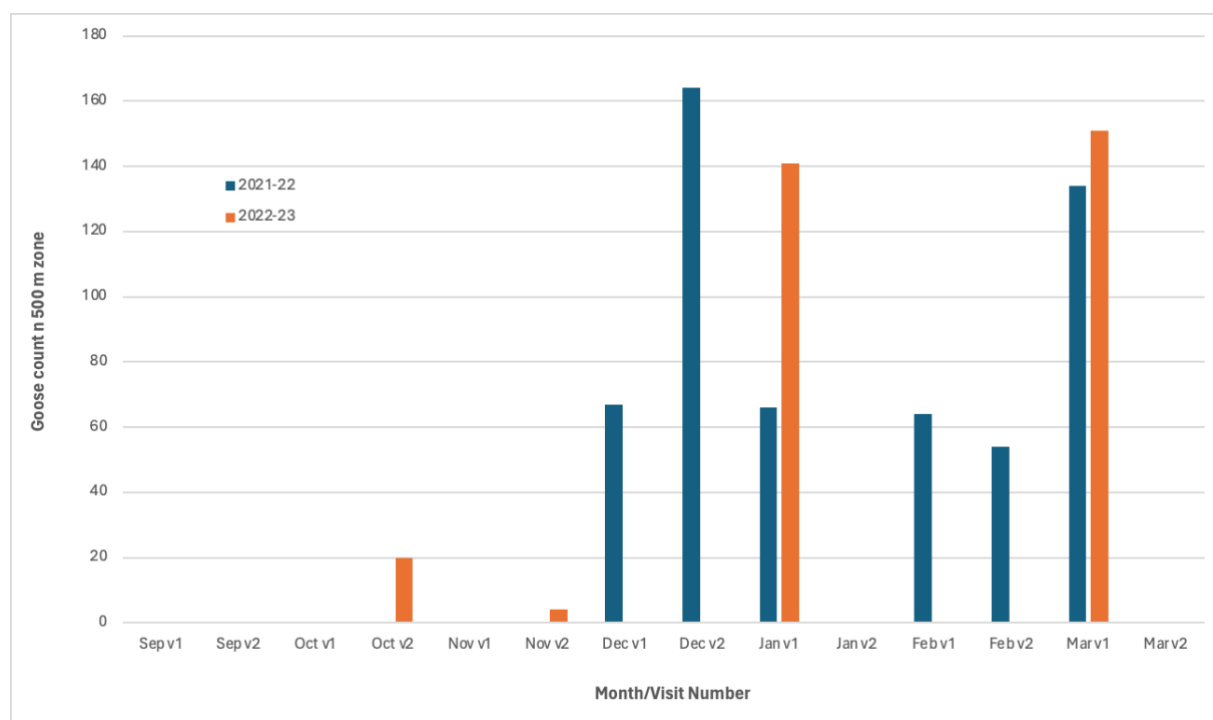
39. The collision risk predictions from the model for Greenland white-fronted geese were summarised in Table 2 above, applying the NS-recommended precautionary 99.8% avoidance rate (SNH 2018) gave a predicted collision risk of 0.26 geese per year based on the 2012-22 data and 0.16 based on the 2022-23 data, which combined gives an overall predicted risk of 0.21 goose collisions per year.
40. The predicted collision risk has been expressed as a percentage increase in the baseline mortality of the SPA Greenland white-fronted goose population. The five-year mean peak count for the SPA (provided by NS) is 2,511.
41. Evidence from existing wind farms would suggest that the actual number of goose collisions would be less than the model predictions. Two studies at wind farms in the UK both reported empirical avoidance rates of 99.99% for pink-footed geese (only single dead geese being recorded at both sites over four years of surveys at each, Percival *et al.* 2020a, Percival *et al.* 2020b). A study in Denmark also reported a higher avoidance rate of 99.9% (Drachman *et al.* 2020).
42. Applying the NS precautionary avoidance rate, 0.21 Greenland white-fronted goose collisions/year were predicted. This number would be negligible in the context of the background population mortality, given the background annual mortality rate of 21% (Fox 2003). This would increase the background mortality of the SPA population by only 0.04%.
43. Furthermore, the actual number of collisions is likely to be less, given the results of the post-construction monitoring set out above. Applying a more realistic 99.99% avoidance would reduce the risk to only 0.01 collisions per year. This provides additional confidence that collision risk would not result in an adverse effect on the integrity of the Kintyre Goose Roosts SPA.

44. In conclusion, the collision risk would be only a negligible magnitude effect that would not result in any adverse effect on the integrity of the Kintyre Goose Roosts SPA population.

## DISTURBANCE – CONSTRUCTION (FEEDING FIELDS)

45. A precautionary 500 m buffer from the Proposed Development infrastructure has been used to define the potential disturbance zone during construction. Greenland white-fronted goose feeding flocks were regularly seen in the fields to the west of the Proposed Development, and some of these fields are within the potential impact zone during construction (where a new track would be constructed to facilitate large load access into the site). The numbers recorded in that zone during each survey are shown in Figure 6.
46. Eighteen flocks were recorded on the ground within this zone over the two baseline winters. The peak count within the zone was 164, with a mean of 31. Geese were present on nine of the 28 surveys (32%). All records were of birds feeding on agriculturally-improved grassland, apart from one group of 20 seen roosting in marshy grassland. Figure 8.7.6 summarises the count totals within the 500 m zone on each survey visit, showing the variability in the numbers present.

**Figure 8.7.6. Greenland white-fronted goose totals within the 500m zone around the Proposed Development.**



47. The total area of goose feeding fields within the 500 m zone was 0.40 km<sup>2</sup>, the equivalent of about 4.1% of the Tayinloan feeding fields. There would only be a short-term loss of this area through the construction period. As an additional mitigation measure, there would be no construction works on land to the west of the A83 during October-March. Therefore, this would result in no adverse effect on the integrity of the Kintyre Goose Roosts SPA.

## OVERALL CONCLUSIONS

48. Standardised modelling predicted Greenland white-fronted goose collision risk to be of negligible magnitude (0.21 collisions per year, equivalent to an increase of only 0.04% over the baseline mortality). Collision risk would result in no adverse effect on the integrity of the Kintyre Goose Roosts SPA.
49. Disturbance during construction could potentially affect Greenland white-fronted goose feeding fields, which are ecologically linked to the Kintyre Goose Roosts SPA. However, with the proposed mitigation in place, this temporary loss of a very small proportion of the range would have no adverse effect on the integrity of the Kintyre Goose Roosts SPA.
50. Therefore, the Proposed Development would have no adverse effect on the integrity of the Kintyre Goose Roosts SPA, or any other SPA.

## REFERENCES

- Band, W., M. Madders, and D. P. Whitfield. 2007. Developing field and analytical methods to assess avian collision risk at wind farms. Page 15pp in M. Lucas, de, G. F. E. Janss, and M. Ferrer, editors. Birds and Wind Farms. Quercus, Madrid.
- Drachmann, J., Waagner, S. and Neilsen, H.H. 2020. Klim Wind Farm Monitoring of Bird Collisions. Report to Vattenfall Vindkraft A/S.  
[https://group.vattenfall.com/contentassets/36627206e80942949cf3f5e1ab2a7601/klim-vindmollepark\\_monitering-af-kollisioner\\_endelig-rapport\\_resume\\_160120.pdf](https://group.vattenfall.com/contentassets/36627206e80942949cf3f5e1ab2a7601/klim-vindmollepark_monitering-af-kollisioner_endelig-rapport_resume_160120.pdf)
- Fox, A.D. 2003: The Greenland White-fronted Goose *Anser albifrons flavirostris*. The annual cycle of a migratory herbivore on the European continental fringe. Doctor's dissertation (DSc). National Environmental Research Institute, Denmark. 440 pp.
- Percival, S.M., Percival, T. and Lowe, T. 2020a. Goole Fields Wind Farm, East Yorkshire: Post-Construction Phase Bird Surveys Autumn/Winter 2015-16 to 2017-18 and 2019-20. Ecology Consulting report to RWE Renewables UK Ltd.
- Percival, S.M., Percival, T., Hoit, M., Langdon, K. and Lowe, T. 2020b. Jack's Lane Wind Farm And Goose Refuge: Pink-Footed Goose Post-Construction Monitoring 2019-20 (Year 5). Ecology Consulting report to Jack's Lane Energy Ltd.
- Scottish Natural Heritage. 2016. Assessing Connectivity with Special Protection Areas (SPAs) - Version 3. SNH Guidance.
- Scottish Natural Heritage 2017. Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. SNH.
- Scottish Natural Heritage. 2018. Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas. SNH Guidance.
- Woodward, I.D., Calbrade, N.A., Birtles, G.A., Feather, A., Peck, K., Wotton, S.R., Shaw, J.M., Balmer, D.E. and Frost, T.M. 2024. Waterbirds in the UK 2022/23: The Wetland Bird Survey and Goose & Swan Monitoring Programme. BTO, RSPB, JNCC and NatureScot. British Trust for Ornithology, Thetford.