Chapter 9
Ornithology

SCOTTISHPOWER RENEWABLES

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Chapter 9
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9.1 Executive Summary

1. This Chapter considers the potential effects of the proposed Development on ornithology. It details the methods used to establish the bird species and populations present, together with the process used to determine their Nature Conservation Importance. The ways in which birds might be affected (directly or indirectly) by the construction and operation of the proposed Development are explained and an assessment is made with regards the significance of these effects.

2. The assessment is structured around the consideration of potential effects, including cumulative effects, of: construction and operation of the proposed Development upon those ornithological receptors identified during survey work.

3. Desk-based studies and field surveys were carried out in and around the proposed Development over respective 'study areas' to establish baseline conditions and the species and populations present.

4. It was possible to 'scope out' the effects on a number of species of high Nature Conservation Importance by virtue of their ecology, absence, distance from the proposed Development, small numbers, low levels of activity and the nature and location of this activity.

5. Four bird species were included in the assessment, red-throated diver, Greenland white-fronted geese, hen harrier and black grouse. Three species, red-throated diver, Greenland white-fronted geese and hen harrier were considered of high Nature Conservation Importance due to their listing as Annex I (Birds Directive) and Schedule 1 (Wildlife and Countryside Act 1981, as amended by the Nature Conservation (Scotland) Act 2004) and one species of moderate Nature Conservation Importance – black grouse.

6. Habitat loss arising from the construction of tracks, borrow pits and turbine bases is unlikely to result in adverse impacts upon any bird species. Any impacts are likely to be negligible and not significant. Population reductions due to habitat loss, displacement and/or collision mortality are also likely to be minimal. Any impacts are likely to be negligible and not significant for all bird species.

7. The contribution of adverse effects accrued by the proposed Development to regional populations would be undetectable and so cumulative effects of the proposed Development with existing and planned windfarm developments in the region are judged as being unlikely to have a significant effect on existing bird populations. Overall, it is concluded that construction and operation of the proposed Development would not have a significant effect on birds under the terms of the EIA Regulations.

8. Information is presented to allow the Scottish Ministers to conduct an assessment of potential effects of the proposed Development on the integrity of the Kintyre Goose Roosts Special Protection Area (SPA). This information demonstrates that the proposed Development would not have an adverse effect on the integrity of the SPA.

9.2 Introduction

9. This Chapter considers the potential effects of the proposed Development on birds. Potential effects on other flora and fauna are presented in **Chapter 8 Ecology**. The ornithology impact assessment was undertaken by Natural Research (Projects) Limited (NRP).

10. Particular attention has been paid to species of high or moderate ornithological importance (target species). These include species with national or international protection under the Wildlife and Countryside Act (1981, and later amendments) and the EU Birds Directive (79/409/EEC).

11. This Chapter is supported by an Appendix which contains details of the ornithological surveys (**Appendix 9.1**) and collision risk calculations (**Appendix 9.2**). Confidential data is provided as Confidential Annex (**Appendix 9.3**).

12. The Chapter describes the methods used to establish the bird interest within and surrounding the Site, together with the process used to determine the Nature Conservation Importance of the species and populations present. The ways in which birds might be affected by the proposed Development are explained and the magnitude of the probable effects considered. Finally, the significance of any identified effects is assessed.

13. This Chapter also provides information necessary for the competent authority to undertake an Appropriate Assessment in respect of the potential effects of the proposed Development on the Kintyre Goose Roosts Special Protection Area (SPA).

9.3 Approach to assessment and methods

9.3.1 Study Area

14. During collection of baseline ornithological data, bird populations were surveyed up to a maximum of 6 kilometres (km) from the Site (**Appendix 9.1: Figure 1**). Full details of the study areas pertaining to particular survey methods, or surveys targeted at particular species, are given in **Appendix 9.1**.

15. The study area for the assessment of collision risk is the 'flight activity survey area' or 'FASA' which refers to a polygon around the outermost turbines plus an additional 500 m strip around that polygon (**Appendix 9.1: Figure 1**).

16. The study area for the assessment of effects on bird populations is the Argyll West and Islands Natural Heritage Zone (NHZ 14), as defined by SNH (2002).

17. Additionally, for Greenland white-fronted geese (hereafter, 'GWF geese'), information is also presented to allow the competent authority to undertake an Appropriate Assessment in respect of the qualifying interest of the Kintyre Goose Roosts Special Protection Area (SPA). Hence, the study area for assessment of effects on this species under the Habitats Regulations is the SPA.

9.3.2 Data sources and guidance

18. The following guidance and information sources have been consulted while undertaking this assessment:

- SNH Guidance: Avoidance rates for wintering species of geese in Scotland at onshore windfarms;
- SNH Guidance: Assessing the cumulative impact of onshore wind energy developments;
- SNH Guidance: Assessing connectivity with Special Protection Areas (SPAs);
- SNH Information and Guidance Note: Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model;
- SNH Guidance: Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas;
- SNH Guidance: Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities; and
- SNH SiteLink web pages (https://sitelink.nature.scot/home) (online information on designated sites).
- SNH Natural heritage considerations for solar photovoltaic installations; and
- BRE Biodiversity guidance for solar developments.

19. The following legislation has been taken into account when undertaking the assessment:

- Directive 2009/147/EC of the European Parliament and of the Council on the Conservation of wild birds (the Birds Directive);
- the Wildlife and Countryside Act 1981 (as amended) (WCA);

- the Conservation (Natural Habitats &c) Regulations 1994 (as amended in Scotland); ('The Habitats Regulations');
- the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- the Nature Conservation (Scotland) Act 2004 (as amended).

9.3.3 Effects Assessed in Full

20. Ornithological interests may be affected during construction and operation or if any parts of the proposed Development are decommissioned and removed from the Site. On this basis, the following potential effects on birds have been assessed in full:

- direct habitat loss, both temporary during the construction phase and permanent during the operational phase, due to land-take by turbine foundations, solar arrays, access tracks and associated infrastructure;
- indirect habitat loss due to the displacement of birds as a result of construction and maintenance activities, or due to the presence of the operating equipment close to nesting or feeding sites or habitual flight routes;
- collision with rotating turbine blades during the operational phase (i.e. killing or injury of birds); and
- cumulative effects arising from any of the above in the operational phase.

9.3.4 Effects Scoped Out

21. On the basis of the desk based and field survey work undertaken, the professional judgement of the ornithology team, experience from other relevant projects and policy guidance and standards, the following topic areas have been scoped out of the assessment:

- Effects arising from habitat modification during construction and operation. No major changes to the current land management regime of the Site are anticipated as a result of the proposed Development. Although some limited tree felling will be undertaken, its effects on bird populations will be minimal, in the context of historical land management within the Site and its surrounds. Therefore, bird populations will be unaffected by habitat modification.
- Effects on the following bird populations: black-throated diver, whooper swan, greylag goose, golden eagle, white-tailed eagle, osprey, goshawk, peregrine, merlin, all owl species, all wader species and all passerine species. Baseline field studies and consultations revealed very infrequent use of the Site by certain species of high and moderate Nature Conservation Importance (see **Table 9.1**). Although these species, or species groups, were recorded, their reliance on habitats and airspace in the vicinity of the proposed Development is so low that there is no potential for an adverse effect on regional or national populations as a result of construction or operational activities (see **section 9.8.3: Baseline Bird Populations**).
- Effects on all bird species classified as low Nature Conservation Importance.

9.3.5 Assessment Methodology

Field Survey Methodology

22. Bird survey work has been undertaken in the wider area since December 2012. However, due to ornithological constraints identified in 2013 the proposed Development was reduced in size requiring reciprocal changes to the survey area and associated buffers and the number of vantage points required to provide adequate coverage. Furthermore, data gathered during the period December 2012 to December 2013 may have been considered too 'old' and, as such, the results are not presented here.

23. Baseline field surveys reported here were carried out between January 2014 and August 2019. A detailed methodology for all surveys is provided in **Appendix 9.1** and is briefly summarised here.

- Moorland Bird Surveys (four visits, April to June 2014, 2015 and 2016; within Site and 500 m buffer);
- Scarce Breeding Bird surveys (January to August 2014; February to August 2015; February to July 2016; April to August 2018 and April 2019 to August 2019; within Site and buffer extending up to 6 km depending on species);
- Black grouse surveys (April and May 2014, 2015 and 2016; within Site and 1.5 km buffer);
- Flight activity (vantage point) surveys (January 2014 to November 2016 and April 2019 to August 2019; within FASA);
- Goose focal watches (January 2014 to April 2014; October 2014 to March 2015; October 2015 to April 2016; November 2016 to April 2017 and October 2017 to April 2018; within Site and buffer extending up to 2 km); and
- Winter walkovers (January 2014 to March 2014; October 2014 to March 2015; September 2015 to March 2016; January to March 2018; within Site and 500 m buffer).

Assessment Process

24. The assessment follows the process set out in the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the EIA Regulations') and Scottish Government guidance on the implementation of the Birds and Habitats Directives. The process of evaluating the effects of the proposed Development on birds ensures that the consenting authority has sufficient information to determine whether the proposed Development (either alone or in combination with other plans or projects) is likely to have a significant effect on bird interests.

25. The assessment determines the potential effects of the proposed Development and considers the likelihood of their occurrence. Effect is defined as change in the assemblage of bird species present as a result of the proposed Development. Change can occur either during or beyond the life of the proposed Development. Where the response of a population has varying degrees of likelihood, the probability of these differing outcomes is considered. Note that effects can be adverse, neutral or beneficial.

26. Effects are evaluated against the existing baseline conditions, i.e. without the proposed Development present. The evaluation assumes that there are no existing significant adverse effects on the population, range or distribution of a species; and no significant interference with the flight paths of migratory birds.

27. Where there is a potential effect on a bird population that forms part of the qualifying interest of an internationally or nationally designated site (or where such designation is proposed), i.e. Ramsar sites, SPAs and Sites of Special Scientific Interest (SSSIs) or a site that would meet the criteria for international or national designation, so far as possible, effects are judged against whether the proposed Development could significantly affect the site population and its distribution.

28. Where bird populations are not protected by such a designation (i.e. where the population does not meet the criteria for designation), then judgement is made against a more general expectation that the proposed Development would not have a significant adverse effect on the species' overall population, range or distribution; and that it would not interfere significantly with the flight paths of migratory birds.

Evaluating Effects

29. In assessing whether an effect is significant or not, three factors are considered:

- the Nature Conservation Importance of the species involved;
- the magnitude of the likely effect; and
- the conservation status of the species.

Nature Conservation Importance

30. The Nature Conservation Importance of each bird species potentially affected by the proposed Development is defined according to **Table 9.1**.

Importance	Definition
High	Species listed in Annex 1 of the EU Birds Directive. Breeding species listed on Schedule 1 of the WCA, 1981.
Moderate	Species on the Birds of Conservation Concern (BOCC) 'Red' list or IUCN 'Red list' – 'Near Threatened' (http://www.iucnredlist.org). Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed Development. Species not listed above but present in regionally important numbers (>1 % regional population).
Low	All other species not covered above.

Table 9.1: Nature Conservation Importance

Magnitude of Effect

31. Magnitude is determined following consideration of the spatial and temporal nature of each potential effect. There are five levels of spatial magnitude (**Table 9.2**) and four levels of temporal magnitude (**Table 9.3).** In the case of non-designated sites,

spatial magnitude is assessed in respect of populations within an appropriate ecological unit; in the present case, the appropriate unit is taken to be the Argyll West and Islands Natural Heritage Zone (NHZ 14), as defined by SNH.

Magnitude	Definition
Very High	Total / near total loss of a bird population due to mortality or displacement. Total / near total loss of productivity in a bird population due to disturbance. Guide: >80 % of regional population affected.
High	Major reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 21-80 % of regional population affected.
Moderate	Partial reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 6-20 % of regional population affected.
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 1-5 % of the regional population affected.
Negligible	Very slight reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the “no change” situation. Guide: <1 % of regional population affected.

Table 9.2: Levels of Spatial Magnitude of Effect

Magnitude	Definition
Permanent	Impacts continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g. the replacement of mature trees by young trees which need >25 years to reach maturity, or restoration of ground after removal of a development. Such exceptions can be termed very long term effects).
Long-term	Approximately 15 - 25 years or longer (refer to above).
Medium-term	Approximately 5 - 15 years.
Short-term	Up to approximately 5 years.

Table 9.3: Levels of Temporal Magnitude of Effect

32. The magnitude of an effect can be influenced by when it occurs. For example, operations undertaken in daylight hours may have little temporal overlap with the occupancy of birds’ night-time roosts; and seasonality in a bird population’s occupancy of a site may mean that effects are unlikely during certain periods of the year.

33. A population’s behavioural sensitivity may also be considered when assessing the magnitude of effects. Behavioural sensitivity may be judged as being high, moderate or low according to the species' ecological function and behaviour. Behavioural sensitivity can differ even between similar species and, for a particular species, some populations and individuals may be more sensitive than others, and sensitivity may change over time, e.g. species are often more sensitive during the breeding season.

34. Importantly, where such information exists from monitoring studies, data on the responses of individual birds and bird populations to windfarms and similar developments are taken into account, along with knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by birds being recruited from other populations elsewhere).

Conservation Status

35. Where the available data allows, the conservation status of each potentially affected population is considered within the NHZ. For this purpose, conservation status is taken to mean the sum of the influences acting on a population which may affect its long term distribution and abundance. Conservation status is considered to be favourable where:

- a species appears to be maintaining itself on a long term basis as a viable component of its habitats;
- the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and
- there is (and will probably continue to be) sufficient habitat to maintain the species population on a long term basis.

Determining Significance

36. Following the classification of each species’ Nature Conservation Importance and consideration of the magnitude of each effect, professional judgement is used to make a reasoned assessment of the likely effect on the conservation status of each potentially affected species.

37. In accordance with the EIA Regulations, each likely effect is evaluated and classified as either significant or not significant. The significance levels of effect on bird populations are described in **Table 9.4**. Detectable changes in the conservation status of regional populations of Nature Conservation Importance are automatically considered to be significant impacts under the EIA Regulations (i.e. no distinction is made between effects of “major” or “moderate” significance). Non-significant effects include all those which are likely to result in barely detectable (minor) or non-detectable (negligible) changes in the conservation status of regional (and therefore national) bird populations. If a potential effect is determined to be significant, measures to avoid, reduce or remedy the effect are suggested wherever possible.

Importance	Definition
Major	Detectable changes in regional populations of Nature Conservation Importance that would have severe effects on conservation status.
Moderate	Detectable changes in regional populations of Nature Conservation Importance that would likely affect their conservation status.
Minor	Small or barely detectable changes that would be unlikely to affect the conservation status of regional populations of Nature Conservation Importance.
Negligible	No or non-detectable changes in the conservation status of regional populations of Nature Conservation Importance.

Table 9.4: Significance Levels of Effect

9.4 Baseline

38. This section lists the designated sites of potential relevance to the assessment, briefly outlines habitat conditions as they may affect bird populations and summarises baseline bird populations and bird flight activity in the vicinity of the proposed Development’s infrastructure.

9.4.1 Site Designations

39. The Site is not covered by any statutory nature conservation designations. There are three SPAs within 20 km of the site: Kintyre Goose Roosts SPA, Knapdale Lochs SPA and Arran Moors SPA (**Appendix 9.1: Figure 20**).

40. The Kintyre Goose Roosts SPA, at its closest point, lies approximately 5 km south west of the proposed Development and is designated for its non-breeding population of GWF geese. The Kintyre Goose Roosts SPA was established to safeguard GWF geese over-wintering on the Kintyre peninsula. The geographical extent of the SPA comprises five hill lochs (Loch Garasdale, Loch an Fhraoich, Lussa Loch, Tangy Loch and Black Loch (north)) together with an area of grassland and heath at Rhunahaorine Point. These areas are also designated as Sites of Special Scientific Interest (SSSI) under the WCA 1981.

41. The SPA components of Loch an Fhraoich, Loch Garasdale and Rhunahaorine Point support Greenland white-fronted geese from Kintyre’s northern flock. Birds feeding at Rhunahaorine Point either roost there or fly up to these hill lochs, to Loch Ulagadale and perhaps to others.

42. The other birds from the northern flock feed at Clachan, and tend to roost on the hill lochs to the east and south east of here, particularly Loch Tamalabh in recent years (NRP, unpublished data). Although Rhunahaorine Point birds and Clachan birds are usually defined as two discrete flocks, there is likely to be some interchange and hence, the Clachan flock are taken to form part of the qualifying interest of the SPA.

43. The Knapdale Lochs SPA, at its nearest point, is approximately 10 km to the north west of the proposed Development and is designated for its breeding black-throated diver population. Due to its distance from the proposed Development there is considered to be no prospect of any effect on the qualifying interest of this SPA as a result of the proposed Development. It is considered, therefore, that there will be no detrimental effects on the respective SSSI designation which spatially overlaps that of the SPA. Potential effects on this SPA and SSSI are not considered further in this Chapter.

44. The Arran Moors SPA, at its nearest point, is approximately 16 km to the south east of the proposed Development and is designated for its breeding hen harrier population. Due to its distance from the proposed Development and the intervening marine habitat there is considered to be no prospect of any effect on the qualifying interest of this SPA as a result of the proposed Development, and effects on this SPA are not considered further in this Chapter.

45. The Arran Moors SSSI and the Arran Northern Mountains SSSI, which underpin the Arran Moors SPA, also cite breeding bird assemblage as a qualifying interest (species include: red-throated diver, golden eagle, peregrine, raven, short-eared owl, dunlin, golden plover and ptarmigan) but none of the birds of these sites are considered vulnerable to the potential effects arising from the proposed Development (for the reasons outlined above in respect of the Arran Moors SPA) so these SSSIs are not considered further in this Chapter.

9.4.2 Ornithological Habitats

Habitats within 2 km of the infrastructure of the proposed Development are mainly conifer plantation, at various stages of development: post-thicket / pole stage, first and second rotation pre-thicket and clear-fell. Otherwise, there is a large discrete area of heath / bog habitat and some smaller areas of pasture at the periphery. There are also a number of areas of open water, within and adjacent to the Site, and numerous small watercourses.

9.4.3 Baseline Bird Populations

Divers

Black-throated Diver

46. Black-throated divers were recorded on twelve occasions during baseline surveys. Two flights were recorded during GVP watches to quantify flight activity; a flight by five adults in June 2016 and a flight by three adults in July 2016. These flights were most probably made by failed breeding birds and did not pass into the FASA Four further flights were recorded during the course of other surveys; one in June 2014 and three in June 2016. The remaining six records were of birds feeding or resting on three separate waterbodies. Given the absence of flight records by this species within the FASA over the course of baseline surveys and the species' low reliance on the water bodies in the vicinity of the proposed Development, a detailed assessment of potential effects on this species arising from the proposed Development is not required under the EIA Regulations. Hence, black-throated diver despite their high Nature Conservation Importance (**Table 9.1**) is not considered further in this Chapter.

Red-throated Diver

47. Red-throated divers were recorded regularly during all breeding seasons of baseline surveys. In 2014 and 2016, at least one pair of red-throated diver attempted to breed within 2 km of the proposed Development. In 2015, two pairs attempted to breed. In 2018, at least four pairs attempted to breed and in 2019 at least three pairs of red-throated diver attempted to breed within 2 km of the proposed Development. However, during all baseline surveys no successful breeding attempts were recorded.

48. Baseline flight activity surveys recorded 61 flights by red-throated divers. Of these flights, 13 passed within the FASA for a total duration of 1,924 seconds of flight and of this time, 1,364 seconds was at 30-150 m agl (i.e. potential collision risk height).

Wildfowl

Whooper Swan

49. Whooper swans were recorded in flight on thirteen occasions during baseline surveys. A single flight, of 60 birds, was recorded during GVP watches to quantify flight activity in the non-breeding season. A further twelve flights by whooper swans were recorded during FVP watches or recorded incidentally; however, none of these flights passed within the FASA. Given the absence of flight records by this species within the FASA over all baseline non-breeding seasons, a detailed assessment of potential effects on this species arising from the Development is not required under the EIA Regulations. Hence, whooper swans despite their high Nature Conservation Importance (**Table 9.1**) are not considered further in this Chapter.

Greenland White-fronted Goose

50. Baseline surveys recorded GWF geese using lochs within the Site and within 2 km of the Site for roosting during the winter months. There was a preference for roosting on Loch Tamalabh with infrequent roosting on Loch Chorra-riabhaich, Loch nan Gad, Lochan a' Chreimh and Dubh Loch. Commuting flightpaths were similar during all baseline years with the majority of movement recorded to the south west of the Site with flights between roosting lochs and foraging fields following the low-lying topography between Creag Loisgte Talatoll and Cruach Achaidh Ghlais. During the baseline surveys GWF geese were recorded feeding within the Site, at Loch Chorra-riabhaich, Dubh Loch and the unnamed lochans at NR819557.

51. During baseline flight activity surveys 144 flights were recorded; however only two passed within the FASA, both of which were not at collision risk height.

Greylag Goose

52. Seven flights by a total of 30 greylag geese were recorded during GVP watches in the non-breeding season. Of these, three flights by a total of 21 birds were within the FASA at 30-150 m agl. Although the birds recorded are likely to have been Icelandic breeding birds wintering in the UK, and hence specially protected as a migratory species under the Birds Directive, their low recorded use of airspace in the vicinity of the proposed Development is clear and the resulting risk to the regional population as a result of collision is deemed to be so low as to not require further consideration here.

Barnacle Goose

53. A single flight by 55 barnacle geese was recorded during a GVP watch in May 2019 which did not pass within the FASA. This was the only record of this species, and barnacle geese are not considered further in this Chapter.

Scarce Breeding Raptors and Owls

Golden Eagle

54. Golden eagles were recorded occasionally throughout the baseline survey period. There is an active golden eagle breeding territory centred approximately 5 km from the proposed Development; however, none of the sightings made during baseline surveys was confirmed as being one of the adult birds occupying this territory. The Site is located on the periphery of this eagle territory and the majority of habitat within the Site is considered by Austin *et al*. (2015) as containing virtually no or very little prey for golden eagles.

55. In 2014, GVP watches recorded fourteen golden eagle flights; however, only six flights passed within the FASA for a total duration of 417 seconds, of which 119 seconds were at collision risk height. In 2015, four flights were recorded, three of which passed within the FASA for a total duration of 531 seconds, of which 464 seconds were at collision risk height. In 2016, eleven flights were recorded, of which seven passed within the FASA for a total duration of 2,831 seconds, of which 2,341 seconds were at collision risk height. In 2019, five flights were recorded, none of which passed within the FASA. An analysis of the baseline flight activity data would predict very low risk of collision mortality. Golden eagles at risk of collision with turbines at the proposed Development are assumed to be non-breeding birds, comprising sub-adult birds and non-breeding adults, known as floaters (Hunt, 1998). Given this, and the fact that the area within and surrounding the proposed Development appears little used by golden eagles due to sub-optimal habitats and distance from the territory centre, an effect on the regional population as a result of the proposed Development is judged to be so unlikely as to not require further consideration. Therefore, a detailed assessment of potential effects on this species arising from the Development is not required under the EIA Regulations. Hence, golden eagles despite their high Nature Conservation Importance (**Table 9.1**) are not considered further in this Chapter.

White-tailed Eagle

56. White-tailed eagles were recorded infrequently. A single flight was recorded during GVP watches in the 2019 breeding season and the entire flight duration was above collision risk height. Two further white-tailed eagle observations were recorded incidentally, in April 2014 and June 2015. All records of white-tailed eagle involved immature birds which are known to wander widely. In addition, the proposed Development is beyond the foraging range of white-tailed eagles from known breeding sites. An analysis of the baseline flight activity data would predict no risk of collision mortality. Given this, and the fact that the area within and surrounding the proposed Development appears little used by white-tailed eagles, an effect on the regional population as a result of the proposed Development is judged to be so unlikely as to not require further consideration in this Chapter.

Hen Harrier

57. Hen harriers were recorded frequently in each non-breeding and breeding season. Evidence of breeding was observed in 2014, 2015, 2018 and 2019. In 2014 a single breeding site was located, successfully fledging two young. In 2015, no breeding site was located; however, a pair was observed carrying nesting material on 13 May 2015. In 2018 no breeding site was located; however, the pair was seen copulating in suitable breeding habitat. In 2015 and 2018 breeding attempts were categorised as 'probable' using the criteria in Hardey *et al*. (2013). In 2019 a single breeding site was located, successfully fledging one young. There was no evidence of breeding in 2016 despite searches in potential breeding habitat within 2 km of the Site.

58. During baseline GVP watches 79 flights by hen harrier were recorded passing within the FASA. A total duration of 8,866 seconds of flight activity was recorded. Of this duration 7,152 seconds of flight was below 30 m in height, i.e. not at risk of collision. The remaining 1,714 seconds of flight were recorded at heights of between 30 and 150 m.

Goshawk

59. Goshawk was recorded on four occasions during baseline surveys, and three of the records were made during the non-breeding season. No flights passed within the FASA. No evidence of breeding by goshawk was obtained, despite searches in potential breeding habitat within 2 km of the Site. Given this, and the absence of flight activity within the FASA, there is deemed to be no prospect of the proposed Development affecting the regional goshawk population and this species is not considered further in this Chapter.

Osprey

60. Ospreys were recorded on fourteen occasions. In the 2014 breeding season, GVP watches recorded four osprey flights, all of which were outside the FASA; in the 2015 breeding season, GVP watches recorded one osprey flight which passed through the FASA, and in the 2019 breeding season, one osprey flight was recorded during GVP watches, outside the FASA. Ospreys were also recorded incidentally on eight occasions during other surveys. No osprey breeding records were obtained in the vicinity of the proposed Development during baseline survey and there are no historical records of breeding in this area. Given this, and the very low level of flight activity within or close to the FASA, there is deemed to be no prospect of the proposed Development affecting the regional osprey population and this species is not considered further in this Chapter.

Peregrine

61. Peregrine was recorded on eight occasions. In the 2015 breeding season, GVP watches recorded two peregrine flights, both of which were inside the FASA; during the 2016/17 non-breeding season peregrine was recorded once from GVPs; and in the 2019 breeding season GVP watches recorded one peregrine. Peregrine was recorded incidentally on four occasions during the course of other surveys. No peregrine breeding records were obtained in the vicinity of the proposed Development during baseline survey and there are no historical records of breeding in this area. Given this, and the very low level of flight activity within or close to the FASA, there is deemed to be no prospect of the proposed Development affecting the regional peregrine population and this species is not considered further in this Chapter.

Merlin

62. Merlin was recorded twice during baseline surveys, and both records were made during the non-breeding season. No evidence of breeding by merlin was obtained, despite searches in potential breeding habitat within 2 km of the Site. Hence, merlin is not considered further in this Chapter.

Short-eared Owl

63. Short-eared owls were recorded on fifteen occasions during baseline surveys. Three flights were recorded during GVP watches, with one in the 2015 breeding season and two in the 2016 breeding season; although two flights were within 500 m of the turbine locations the entire 64 seconds of flight time was at less than 10 m above the ground. No evidence of breeding by short-eared owls was recorded and because of this and the apparent low use of the Site and its surrounds by this species, short-eared owls are not considered further in this Chapter.

Barn Owl

64. Barn owl nested at one location, within but on the periphery of the Site. Habitats within the Site are largely unsuitable for foraging by barn owl and, therefore, unlikely to attract birds from this breeding location; barn owls tend to select favourable foraging habitats within a few hundred metres of their nesting site (Bunn *et al*. 1982). Hence, since barn owls have virtually no potential to suffer effects as a result of the Development they are not considered further in this Chapter.

Black Grouse

65. Targeted surveys for 'lekking' (displaying) birds in April and May 2014, located a maximum of four males displaying at three different locations within 1.5 km of the proposed Development. Two leks were of single birds, so called 'singletons', and there was one lek of two birds. In April and May 2015, targeted surveys recorded a maximum of five lekking males within 1.5 km of the proposed Development: all records were of singletons. In April and May 2016, targeted surveys recorded a maximum of four lekking males at one location within 1.5 km of the proposed Development: other records included two singletons and two males together which were most likely the males involved in the lek of four later in the season. Black grouse were recorded on seven occasions within the FASA during GVP watches but all flights were below 30 m in height and not at risk of collision with turbine blades.

Waders

Golden Plover

66. In 2015, GVP watches recorded golden plovers on nine occasions during the non-breeding season. During the 2016 non-breeding season golden plover were recorded in flight on 21 occasions; however, nine of these records were made on the same day by the same birds settling to roost. In 2019, golden plover were recorded in flight on six occasions during April; these were most probably birds on their northward migration.

67. Non-breeding golden plovers were recorded only occasionally within the Site and were absent after April. An analysis of the baseline flight activity data would predict very low risk of collision mortality within the context of the national wintering population (around 170,000 individuals according to Frost *et al*. (2018)). Therefore, a detailed assessment of potential effects on this species arising from the proposed Development is not required under the EIA Regulations. Hence, golden plovers despite their high Nature Conservation Importance (**Table 9.1**) are not considered further in this Chapter.

Other Waders

68. Curlew was recorded infrequently during baseline surveys, with a total of 15 flights recorded during GVP watches. A pair nested successfully in 2019 and a pair was holding territory in 2015. Lapwing was recorded infrequently and no flights were recorded during GVP watches. A pair nested in 2015 and an additional pair was holding territory but no further breeding records were made during baseline surveys. Woodcock and snipe were recorded infrequently during winter transects and jack snipe was recorded once.

69. The Site and its surrounds provide an insignificant resource for regional wader populations in both the breeding and non-breeding seasons. In light of the lack of baseline records of wader species, this group are not considered further in this Chapter.

Other Species

70. A number of passerine species of conservation importance were recorded during winter transect surveys in both non-breeding seasons: dunnock, song thrush, crossbill and reed bunting. In all cases, the numbers recorded were small relative to the likely regional non-breeding populations. In addition, these wintering passerine species are not considered to be sensitive to the potential effects of developments incorporating wind turbines, in the uplands. Skylark, cuckoo, grasshopper warbler were the only passerine of conservation importance recorded during the breeding seasons, and are also not considered sensitive to the effects of wind turbines. Hence, effects on all passerine species are not considered further in this Chapter.

71. Other species recorded during the baseline survey period were grey heron, little grebe, mallard, teal, goldeneye, buzzard, sparrowhawk, kestrel, snipe and raven. These species are either of low Nature Conservation Importance or were recorded in such low numbers that effects on regional populations are considered implausible; hence, none are considered further in this Chapter.

9.5 Assessment of Effects

72. The assessment of effects is based upon the proposed Development description outlined in **Chapter 3 Proposed Development** and is structured as follows:

- construction effects of the proposed Development;
- operational effects of the proposed Development
- effects due to the removal or replacement of components that reach the end of their operational life; and
- cumulative effects of the proposed Development.

73. Potential effects are evaluated in respect of regularly occurring species of high and moderate Nature Conservation Importance, whose regional populations could be potentially affected by the proposed Development (**Table 9.5**). Consideration has been given to the criteria in **Table 9.1** when assigning the Nature Conservation Importance of potentially affected species.

Importance	Species
High	Red-throated diver; Greenland white-fronted goose; hen harrier.
Moderate	Black grouse.
Low	All other species.

Table 9.5: Nature Conservation Importance of Potentially Affected Species

9.5.1 Embedded Mitigation

74. The following considerations relating to ornithological interests were incorporated into the proposed Development design:

- All waterbodies used by GWF goose were buffered by at least 500 m; and
- A predominantly south east-north west flight corridor for GWF goose movements from waterbodies within the south west of the Site was maintained by locating wind turbines further north and east.

9.5.2 Construction Effects

Protected Birds

75. The assessment has been undertaken under the assumption that a Bird Protection Plan (BPP), devised in consultation with SNH, would be in place prior to the onset of construction activities. The BPP would describe survey methods for the identification of sites used by protected birds and will detail protocols for the prevention, or minimisation, of disturbance to birds as a result of activities associated with the proposed Development. The BPP would be overseen by the Ecological Clerk of Works.

76. The BPP would describe surveys to locate the nests or other key sites (e.g. roosts) of birds listed in Schedules 1 and 1A of the WCA 1981, in advance of construction works progressing within the Site. In the event that an active nest or roost of a Schedule 1 or Schedule 1A species is discovered within distances given by Whitfield *et al.* (2008) (or within a 500 m radius of the nest for Schedule 1 species not listed), a disturbance risk assessment will be prepared under the BPP and any measures considered necessary to safeguard the breeding attempt or roost (e.g., exclusion zones or restrictions on timing of works), would be submitted to SNH for agreement before recommencing work. Similarly, although the species is not listed on Schedule 1, surveys to locate black grouse lek sites would be undertaken and appropriate measures to safeguard relevant lek sites would be agreed with SNH and included within the BPP.

77. The BPP would also detail the measures necessary to ensure disturbance to GWF geese is avoided.

9.5.3 Predicted Effects

Habitat Loss

78. Full details of habitat loss are discussed in **Chapter 8 Ecology**. In summary, habitat loss as a result of construction of the proposed Development would amount to up to 43.97 ha which comprises blanket bog and modified bog. A further 23.03 ha of forestry would be felled for the proposed Development. There is an abundance of similar habitats within the Site, and these are not considered to be of critical value to potentially affected species (**Table 9.5**). Further, the effect of this habitat loss is spatially negligible in relation to the home range requirements of all potentially affected species. Hence, there will be no change in the conservation status of potentially affected species as a result of habitat loss and the effects of direct habitat loss on all ornithological interests are deemed negligible and not significant under the EIA Regulations.

Displacement

79. The construction activities of the proposed Development, including the felling of the forest areas, construction of the Site access tracks, solar arrays, turbine hard-standings and erection of the turbines is expected to last a total of 22 months. The number of bird breeding seasons potentially disrupted by construction activities would depend on the month in which construction works begin and the components of the proposed Development. For the purposes of this assessment a worst case scenario is assumed: i.e. that construction work would start during a bird breeding season and, for any given species, breeding would be potentially affected for up to two seasons. Breeding could also be affected along the main access route used by construction traffic to access the turbines and solar arrays.

80. The impacts on birds most likely to occur during the construction phase are those of indirect habitat loss due to displacement of birds through disturbance by activity of people and machines in the vicinity of the proposed Development. It is likely that noise and visual disturbance associated with construction activities could temporarily displace some of the breeding and foraging bird's present, dependent on their behavioural sensitivity to human activities. Birds that are disturbed at breeding sites are vulnerable to a variety of potential effects on breeding performance, including the chilling or predation of exposed eggs/chicks, damage to or loss of eggs/chicks caused by panicked adults and the premature fledging of the young. Birds disturbed when foraging during the breeding season may also feed less efficiently and thereby breed less successfully. These impacts may lead to a short-term reduction in the productivity of bird populations.

81. Disturbance effects on breeding birds would be confined to areas in the locality of the turbine layout and associated infrastructure, with different species varying in their sensitivity. Larger bird species, those higher up the food chain e.g. most raptors, or those that feed in flocks in the open tend to be more susceptible to disturbance than small birds living in structurally complex or closed habitats (e.g. woodlands) (Hill *et al.,* 1997).

82. Disturbance effects due to any part of the proposed Development being decommissioned and removed from the Site would last for a shorter time and be of lower intensity than during construction; so effects would be similar in nature but of lower magnitude, both temporally and spatially, during decommissioning. Therefore, the magnitude of decommissioning effects on all species is considered to be negligible. Even in the case of species of highest Nature Conservation Importance these effects are judged not significant under the terms of the EIA Regulations.

Red-throated Diver

83. Any breeding attempts by red-throated diver within the vicinity of proposed construction activities would be identified during pre-construction surveys detailed in the BPP for the Site. The BPP would then detail appropriate measures to avoid disturbance to the breeding attempt in compliance with legislation. All drilling and blasting at borrow pits which are located at distances less than 1 km from red-throated diver breeding sites would take place outside the breeding season (April-August), unless checked and confirmed by the ECoW that such activities can progress.

84. A maximum of four breeding sites were recorded in any one year of baseline surveys within 2 km of the proposed Development. Three of these breeding sites are located at distances greater than 1 km from any proposed construction activities and therefore disturbance to these sites is considered extremely unlikely.

85. One breeding site, used in 2016, 2018 and 2019, is located within 500 m of a proposed turbine and associated track. Therefore, red-throated divers may be displaced from breeding at this site due to the effects of construction activities. Turbine 8 and associated tracks within 500 m of the breeding site would be constructed outside the breeding season and an artificial raft would be deployed pre-construction and before the start of the breeding season. Deployment of the raft to the north east of the loch would provide a potential breeding site at a distance greater than 500 m from proposed construction activities.

86. Furthermore, it is assumed that if red-throated divers choose not to use the raft, during the construction phase, and nest at a distance that would trigger the BPP then these birds would be tolerant of the construction activities. As such, there is no requirement for the BPP to extend into the construction period as there is no disturbance to mitigate.

87. There is evidence that breeding red-throated divers have been observed to abandon nests as a result of anthropogenic disturbance, albeit not windfarm related (Bergman & Derksen, 1977; Gomersall, 1986; McGuiness *et al*., 2015). However, in a breeding study on Shetland by Gomersall *et al*. (1984), although no systematic investigation was made of the effects of disturbance, some nests were found very close to roads, peat-cuttings and other areas of human activity, suggesting that birds may learn to be tolerant of some human activity.

88. In summary, measures set out in the BPP coupled with the deployment of an artificial raft, the possible tolerance of construction activities by breeding red-throated divers and the distances at which nesting attempts have occurred in the past, mean that displacement from suitable breeding sites is unlikely during construction. Any short-term negative effects on breeding success at these locations are not considered to be sufficient to affect regional productivity (as productivity is effectively zero within 2 km of the proposed Development) and hence the trajectory of the regional population and hence its conservation status would be unaffected. Given the above, construction effects on red-throated divers are predicted to be negligible and not significant under the EIA Regulations.

Greenland White-fronted Goose

89. GWF geese were recorded regularly feeding in the fields around Druimnaleck, Strathnafanaig and Achavallich. Evidence of roosting was recorded on Lochan Tamalabh, Loch Chorra-riabhaich, Loch nan Gad, Lochan a' Chreimh and Dubh Loch. Evidence of night-time feeding was recorded at Loch Chorra-riabhaich, Dubh Loch and the unnamed lochan at NR819557 (**Appendix 9.1**).

90. White-fronted geese are not considered to be especially sensitive to disturbance, although no published studies examining their response to construction-type activities are known. Research on the responses of other goose species to disturbance has been published; however, most studies focus on disturbance as a result of hunting activities or evaluate effects on feeding rather than roosting birds. Further, many of the populations studied have, unlike white-fronted geese, been subject to hunting pressure so were likely to have been more sensitive to disturbance (e.g. Madsen, 1985). Nevertheless, as an example of the effects of vehicular traffic on goose behaviour, research on pink-footed geese has shown that feeding flocks moderate their distribution in relation to roads, with avoidance distances in the region of 100 – 200 m recorded in several studies, and an effect on feeding distribution recorded at up to 500 m in one study (Madsen, 1985).

91. Similar analysis of pink-footed geese feeding on sugar beet in Norfolk showed that geese avoided areas of a high risk of disturbance (Gill *et al*., 1996). Studies in central Scotland showed that both pink-footed geese and greylag geese significantly decreased their use of fields near buildings. However, it was unclear if this decrease was the result of the visual impact of the buildings or the increase in human activity around buildings (Urquhart, 2002). Studies of red-breasted geese in Romania showed that the geese avoid areas around towns and farm buildings (Sutherland & Crockford, 1993) and bean geese in Scotland used fields that were significantly further (ca. 350m) from buildings and roads (ca. 370m) than unused fields (Smith *et al*., 1995).

92. As it is generally considered that GWF geese are less sensitive to disturbance than other goose species it would be reasonable to assume that disturbance distances at the higher end of those cited in the above mentioned studies would be suitably precautionary.

93. Loch Chorra-riabhaich, Dubh Loch and the unnamed lochan are located at distances greater than 500 m from the nearest elements of the proposed Development. Hence there is considered to be very little prospect of construction activities having an effect on roosting behaviour.

94. The proposed solar area (SA2) is located immediately adjacent to regularly used GWF goose feeding fields. However, construction of this element of the proposed Development will take place during months when GWF geese are not present, i.e. construction will take place between mid-April to mid-October.

95. Therefore, with BPP protocols in place to avoid disturbance through the construction phase and assuming other disturbance sources would be at a similar intensity to those recorded throughout the baseline survey period, it is considered highly unlikely that roosting or feeding GWF geese would be displaced and effects on the conservation status of the regional population are deemed to be negligible and not significant under the EIA Regulations.

Hen Harrier

96. Any breeding attempts by hen harrier within the vicinity of proposed construction activities would be identified during pre-construction surveys detailed in the BPP for the site. The BPP would then detail appropriate measures to avoid construction disturbance to the breeding attempt in compliance with legislation.

97. Hen harriers were recorded breeding in 2014, 2015, 2018 and 2019. Of these breeding records, those made in 2015, 2018 and 2019 are considered to be the same breeding territory. Therefore, one hen harrier breeding territory was identified within 2 km of the infrastructure of the proposed Development during baseline surveys.

98. Evidence from a number of windfarms shows that hen harriers will nest much closer to construction activities than the distances likely to be involved here. For example, hen harriers began nesting adjacent to the Cruach Mhor windfarm in the year of construction, with nests as close as 300 m from construction activity (Robson, 2012), and habitat adjacent to the Paul's Hill Windfarm supported nesting hen harriers within 200 m of construction activities (Robinson & Lye, 2012). Hence, on this evidence, it is unlikely that a nesting attempt would be affected, particularly given the apparent variability in nesting locations in recent years.

99. If hen harriers attempt to breed, construction activities may displace foraging birds from suitable habitats. Breeding hen harriers are central place foragers meaning, in simple terms, that they spend more time foraging close to the nest than further away (Arroyo *et al*., 2006, Arroyo *et al.,* 2014**).** For males, the bulk of foraging occurs within around 2 km of the nest and extends to around 8 km^2 and for females, foraging is focussed within around 1 km of the nest and the range size is around half that of males. Males and females do travel further than these distances to exploit good foraging habitats, but most prey will generally be caught within 2 km of the nest.

100. Evidence from other windfarms, shows that hen harriers nesting adjacent to construction activities, where their core foraging range may have included areas affected by construction displacement, are able to breed successfully (Robson, 2012; Robinson & Lye, 2012; Haworth & Fielding, in prep). What is less clear is the effect on breeding success, and whether displacement from foraging areas results in reduced productivity in populations of affected birds. Nevertheless, even in the absence of this information, effects on breeding success during the construction phase will be short-term and, based on evidence from several sites, unlikely to result in demographic changes that will have an effect on the conservation status of the regional population.

101. For example, even assuming breeding failure at this territory for both the two breeding seasons affected by construction, the resultant short-term reduction in regional breeding success would have virtually no effect on the overall trajectory of the hen harrier population in NHZ 14 (Fielding *et al*., 2011).

102. Hen harriers were also present in the non-breeding season. Less use was made of the Site in the non-breeding period, which is unsurprising given what is known about the ecology and winter movements of Scottish-breeding hen harriers (Etheridge & Summers, 2006; Forrester *et al.,* 2007). Hen harriers breeding in most areas of Scotland tend to migrate away from their upland breeding territories in the non-breeding season, so birds present in the Site over the autumn and winter months may have been transient individuals on route to and from breeding areas, with the Site forming a small part of their total wintering range. As a result, foraging displacement from the area around construction activities would have little impact on this non-breeding component of the hen harrier population which would compensate for any losses in foraging habitats by exploiting other abundant areas of suitable wintering habitat elsewhere in the region or beyond.

103. In summary, with measures set out in the BPP coupled with the apparent tolerance of construction activities by nesting hen harriers and the distances at which nesting attempts have occurred in the past, mean that displacement from suitable nesting sites is unlikely during construction. Construction activities would probably displace foraging hen harriers from adjacent areas in the breeding season. However, the effects of this short-term loss in suitable foraging habitat would likely be compensated by birds exploiting suitable habitats elsewhere in their foraging range. Any short-term negative effects on breeding success at these locations are not considered to be sufficient to affect regional productivity and hence the trajectory of the regional population and hence its conservation status would be unaffected. Given the above, construction effects on hen harriers are predicted to be negligible and not significant under the EIA Regulations.

Black Grouse

104. Black grouse are considered vulnerable to disturbance at lek sites; with a review by Ruddock & Whitfield (2007) concluding that birds might be affected at distances of up to 750 m in response to humans on foot. However, as black grouse leks can be approached at much closer distances from vehicles this is relevant to the consideration of construction disturbance caused by vehicle movements. For example, black grouse at the Clyde Windfarm continued to display despite the presence of nearby machinery and males at one windfarm in Austria continued to maintain their lek at 200 m from construction activities (Zeiler & Grünschachner-Berger, 2009).

105. Furthermore, Zwart *et al*. (2015) analysed data on counts and location of black grouse at leks before and after construction of several windfarms in Scotland and found that the abundance of black grouse was not affected by wind energy developments over the course of the study. Interestingly, this finding was against a background of black grouse declines in the regions of the study sites.

106. The above examples demonstrate that some black grouse populations may be resilient to some forms of construction disturbance. Nevertheless, black grouse will be considered in the BPP for the Site and pre-construction surveys in the lekking period will identify the locations of larger and, hence, demographically more important leks (*sensu* Geary *et al*. 2011) that may be vulnerable to the effects of construction disturbance. Therefore, if leks of more than two males are located close enough to planned construction activities that an effect is considered likely, procedures would be adopted to minimise the potential for

disturbance to these birds, e.g. restrictions on the daily timing of some construction activities during the peak black grouse lekking period (mid-March to June).

107. The population of black grouse displaying in the wider area is highly mobile and dispersed' which is illustrated by the variety of locations used by single displaying males during baseline surveys rather than a single focal lek site (**Technical Appendix 9.1; Figures 15a, 15b and 15c**).

108. Baseline surveys recorded multiple single displaying black grouse at locations which would be vulnerable to construction disturbance. This would trigger BPP timing restrictions if more than two males were to be recorded. If, however, only single males were present and construction activities were not restricted, their displacement, should it occur, would likely result in these birds relocating and continuing to display elsewhere. Lek sites can be used year after year but black grouse may use alternative lek sites in different years, within the same year or even the same day (Watson & Moss, 2008). This is shown by the annual variation in lek site use recorded locally with many areas apparently supporting habitat and topography that is suitable for lekking.

109. Suitable feeding and nesting habitat for black grouse occurs close to construction infrastructure. In terms of potential nesting habitat, which comprises tall, dense vegetation like heather and rushes, there is no shortage of this habitat in the vicinity of the footprint of the proposed Development well away from potential sources of construction disturbance. Although the best nesting habitat may be rather localised, it is likely to be found away from the hill tops where construction work associated with the proposed Development will be focussed. For example, taller and denser stands of heather will develop on the lower slopes and hill sides as a result of better drainage and more sheltered conditions. Many areas of potentially suitable black grouse feeding habitat exist in the area and any short-term displacement that might occur as a result of construction is unlikely to result in losses in foraging opportunities that might affect survival rates in the local black grouse population

110. In summary, any short-term displacement from suitable nesting and feeding areas is unlikely to affect productivity or survival in the local population. The BPP would ensure that potentially vulnerable black grouse leks of more than two birds are identified and safeguarded during the construction phase. If single lekking males are displaced, they are likely to relocate and lek at an alternative location. In the unlikely event that some single lekking males were lost during the construction phase, this fundamentally short-term effect would be of negligible spatial magnitude. Overall, construction effects on the regional conservation status of black grouse, a species of moderate Nature Conservation Importance, are considered to be negligible and not significant under the EIA Regulations.

9.5.4 Proposed Mitigation

111. As no effects are deemed significant, no additional mitigation is proposed. Measures set out in the BPP would reduce disturbance to important black grouse leks and would ensure that disturbance to sites used by other protected species is avoided. Disturbance to feeding and roosting GWF geese would be avoided through the adoption of a set of protocols to be agreed with SNH and set out in the BPP.

112. Enhancement measures to improve habitats, particularly the maintenance and re-wetting of modified peat areas, which form part of the Habitat Management Plan for the proposed Development, would provide benefits for black grouse lekking, breeding and feeding. Compensation planting for felled forestry would also see some areas of native broadleaf tree planting and restructuring of forest edges which would also provide benefits.

9.5.5 Operational Effects - Displacement

113. The presence and operation of wind turbines and solar arrays could potentially displace birds from nesting and foraging areas. Existing information (e.g. de Lucas *et al.,* 2007; Douglas *et al.,* 2011; Haworth & Fielding, 2012) and reviews of effects (e.g. Madders & Whitfield, 2006; Hötker *et al.,* 2006; Gove *et al*., 2013; Harrison *et al*., 2016) suggest that most birds are affected only slightly, if at all, although these effects require further study. For example, breeding birds have not been found to be completely displaced at distances greater than 300 m from a turbine (e.g. Gill *et al*., 1996; Percival, 1998; Hötker *et al*., 2006) although other studies suggest partial displacement effects at greater distances (Pearce-Higgins *et al.,* 2009). However, wind turbines might displace birds from much larger areas if they act as a barrier to bird movements, or if availability of suitable habitat is restricted. In addition, displacement effects may vary over time, as birds habituate to the operation of turbines or site-faithful individuals are lost from the population.

114. The evidence suggests that impacts vary between species and sites (see discussion for raptors; Madders & Whitfield, 2006). There is potential for some disruption of feeding and nesting due to increased human activity for maintenance purposes. However, this would be relatively infrequent, involve low levels of disturbance and would be restricted to areas of the Site accessible by tracks. Therefore, the overriding source of disturbance and displacement of birds during the operational period is considered to be the turbines operating (Pearce-Higgins *et al*., 2009). Displacement effects caused by the solar arrays on all species are predicted to be negligible and not significant under the EIA Regulations.

Red-throated Diver

115. A maximum of four breeding sites were recorded in any one year of baseline surveys within 2 km of the proposed Development. Three of these breeding sites are located at distances greater than 1 km from any proposed turbine or associated tracks and, therefore, disturbance to these sites is considered extremely unlikely during operation.

116. One breeding site, used in 2016, 2018 and 2019, is located within 500 m of a proposed turbine and associated track. Therefore, red-throated divers may be displaced from breeding at this site due to the effects of operational activities.

117. There have been a small number of studies on the displacement effects of windfarms on red-throated diver. Humphreys *et al*. (2017) evaluated three studies of displacement effects on red-throated divers and came to the conclusion that there is some evidence for the abandonment of breeding sites following windfarm construction. A study at Burgar Hill, Orkney showed that numbers decreased after construction, but it was suggested by the authors of the study that these negative effects were likely due to preventable increases in human-related disturbance associated with the windfarm, rather than to the wind turbines themselves. Indeed, as reported after windfarm construction, one or two pairs still breed each year very close to a row of six wind turbines. The authors of the study reported that while red-throated divers were present on the breeding loch in the early morning while wind turbines were operational, they left the site when people arrived on-site, indicating that their response was more likely to be to human disturbance rather than wind turbines.

118. At Carraig Gheal windfarm in Argyll, a reduction in flight lines within the turbine area suggested evidence of avoidance of turbines. Although red-throated divers nested in both years of study at one lochan just under 1 km from the nearest turbine location, a second lochan within 500 m of the nearest turbine that was recorded as occupied in 2010 (pre-construction) was not occupied in 2014 (during operation).

119. Studies of red-throated divers breeding on the island of Smøla, Norway, were carried before and after construction of a large windfarm in two stages from 2001 to 2005. Before turbine construction began, three red-throated diver nest sites were within what became the windfarm area; all three nest sites were abandoned in the year in which construction occurred and were not reoccupied up until at least 2007 (Halley & Hopshaug, 2007). However, it is unclear whether these sites were abandoned due to the windfarm itself or due to increased human disturbance as a result of construction of new roads into this part of the island (Halley & Hopshaug, 2007).

120. Therefore, evidence suggests that disturbance associated with increased human access and activities during the operational period of a windfarm may pose the greater risk than the wind turbines themselves. Locally, diver monitoring surveys at Cour windfarm in 2016 (Haworth Conservation, 2016) recorded red-throated diver presence on three lochs within 500 m of a wind turbine. It is, therefore, likely that red-throated divers would not be displaced from potential nest sites due to the presence of operational wind turbines.

121. In summary, breeding red-throated divers possibly show a tolerance of operational turbines and the distances at which nesting attempts have occurred in the past, mean that disturbance from suitable breeding sites is unlikely during operation. Any negative effects on breeding success at these locations are not considered to be sufficient to affect regional productivity (as productivity is effectively zero within 2 km of the proposed Development) and hence the trajectory of the regional population and hence its conservation status will be unaffected. Given the above, operational effects on red-throated divers are predicted to be negligible and not significant under the EIA Regulations.

122. However, due to uncertainty surrounding how breeding red-throated divers may react to operational activities undertaken by staff, in this situation a precautionary approach has been adopted. It is, therefore, considered that one breeding territory could be lost from the breeding population due to increases in human-related disturbance associated with the proposed Development. Measures to mitigate the loss of one breeding territory include a program of deploying artificial diver rafts on suitable waterbodies within 2 km of the proposed Development to help increase the number of breeding birds and improve productivity.

123. Given the mitigation above, operational effects on red-throated divers are predicted to be negligible and not significant under the EIA Regulations.

Greenland White-fronted Goose

124. Roosting GWF geese would be, at minimum, 500 m from the nearest operational turbine. At this distance, any displacement effect is considered unlikely on distance grounds alone. Further, the species is not considered to be especially vulnerable to disturbance compared to some 'grey goose' species. For example, even pink-footed geese, which are considered sensitive to disturbance, are known to feed at distances of as little as 200 m from operational turbines (Larsen & Madsen, 2000). Effects of disturbance on the roosting behaviour of grey geese have been little studied and no quantified studies are known; however, although the sensitivity of geese to disturbance when roosting will probably be greater than when feeding, at the distances relevant to the proposed Development, no adverse effect is predicted.

125. Displacement of flights as birds commute between roosting lochs and feeding fields to the west, relating to so-called barrier effects, may occur if turbines were situated on the regular flight path of commuting birds, and if the geese showed an avoidance response to turbines. However, data gathered over the course of baseline surveys and the incorporation of a flight corridor into the proposed Development's design, show that regular flight paths to and from the roosting lochs do not take birds over the proposed wind turbine area. These observations are as would be predicted, based simply on consideration of the locations of their roosting and feeding sites, topography and typical flight behaviour. Hence, a barrier effect by the turbines in displacing habitual flight routes is not predicted.

126. Overall, the operation of the proposed Development is not predicted to affect the roosting behaviour of GWF geese and, due to the flight paths taken by the geese between the roosts and regular feeding areas, their habitual movements would be unaffected by the presence of operational turbines. Hence, the judgement of this assessment is that effects on the regional conservation status of GWF geese, a species of high Nature Conservation Importance, as a result of the operation of the proposed Development would be negligible and not significant under the EIA Regulations.

Hen Harrier

127. Evidence from a number of windfarms in Scotland shows that hen harriers will continue to nest in close proximity to operational windfarms, with nests located within a few hundred metres of turbines. Even if the probability of nesting in the immediate vicinity of turbines was reduced due to displacement, and this is considered unlikely based on historic nesting locations in and around the Site, the availability of ample potentially suitable nesting habitat within the breeding territory, means there is little prospect of the proposed Development preventing nesting. Further, hen harrier nesting requirements are normally best met in more sheltered, sloping areas where taller vegetation, in particular heather, can develop and the turbines are located on the higher ground where vegetation is generally shorter and less suitable for nesting.

128. There is evidence that foraging hen harriers can be displaced from the vicinity of operational turbines. Three studies, which have observed and analysed hen harrier flight activity at Scottish windfarms, concluded that hen harriers use of habitats within 100-200 m of turbines was probably reduced, but that the windfarm footprint itself continued to be used for foraging. In some instances, use of the windfarm footprint was seen to be increased, although this was likely to have been as a result of increased prey densities following construction, resulting from habitat changes, e.g. permanent removal of forests in a stage unsuitable for hen harriers (Robson, 2012).

129. Although evidence from other sites supports the judgement that hen harriers will not be displaced from the breeding territory, this effect is fundamentally of less importance to the maintenance of the regional population than the potential effects on key demographic parameters, which could be altered to the extent that the species' conservation status is affected. Of principal concern here is how displacement effects might affect breeding success, due for example to a reduction in foraging efficiency and lower nest provisioning rates. Haworth & Fielding (in prep.) describe a population model for hen harriers using data from a variety of sources. This shows that, for a population with a fledging rate per successful nest at the minimum mean size recorded for UK hen harriers (2.37), a population would decline in the absence of immigration from other populations, only when 57.8 % of nests failed completely. In NHZ 14, hen harriers are in favourable conservation status with an estimated 100-150 breeding pairs (Wilson *et al*., 2015) and a relatively high breeding success (Fielding *et al*., 2011). Hence, according to this model and using an unrealistically pessimistic figure for breeding success in the region, complete failure in approximately 55-85 nests would be required to cause the population trajectory to go into decline.

130. Hence, even the consequences of a worst case scenario (nest failure) and employing precautionary data for the regional population (low nesting success and 100 pairs) there is little likelihood that the regional population trajectory would be affected, i.e. for the failure of this nest to tip the population into a negative trajectory would require the persistent failure of over 50 nests in the region assuming the unrealistically low fledging rate.

131. Crucially, based on the balance of evidence both locally and from elsewhere and taking account of future dynamics of habitat within and surrounding the breeding location, neither abandonment from nor permanent breeding failure is predicted as a consequence of the proposed Development. Therefore, and with an estimated NHZ population of 100-150 territories (Wilson *et al*., 2015) the magnitude of the spatial effect is classed as negligible.

132. Hen harriers were also recorded in the non-breeding season when their use of the Site was relatively low. Given that the potential foraging range of individual hen harriers in the non-breeding season is very large relative to the area from which they may potentially be displaced by the turbines at the proposed Development, it is considered highly unlikely that any loss in foraging area would result in reduced survival in this component of the population. Hence, the operational phase of the proposed Development is predicted to have no effect on the conservation status of non-breeding hen harriers in the NHZ.

133. Despite the high Nature Conservation Importance of this species and given the predicted magnitude of displacement effects in the context of the species' favourable conservation status regionally, a reasonable conclusion is that operational effects on hen harrier conservation status due to displacement would be negligible. These effects are not significant under the EIA Regulations.

Black Grouse

134. As discussed in relation to construction, lekking black grouse are considered to be susceptible to disturbance but there is evidence to suggest that they can habituate to predictable disturbance sources like winter sports infrastructure (e.g. Arlettaz *et al*., 2013) and disturbance associated with operational windfarms (Stolte, 2009 and 2010 in RWE 2011). Surveys conducted at the Drumderg Windfarm in Perthshire, have shown that lekking black grouse numbers have increased both immediately adjacent to and within the windfarm since it became operational (Stolte, 2009 and 2010 in RWE 2011). During construction years, numbers within the windfarm declined but have since increased and are now four times higher than they were prior to construction. In apparent contrast, the loss of a black grouse lek from the vicinity of an Austrian windfarm has been attributed to the presence of the turbines (Zeile & Grünschachner-Berger, 2009). However, an equally plausible explanation is that the decline of lekking males (because these occurred over a very wide area well away from the turbines) was caused by the large increase in the number of recreational visitors (and thus increased disturbance) and hunters (who in Austria shot birds on the leks), due to improved access along windfarm tracks.

135. Hence, the balance of available evidence suggests that operational turbines *per se* may not dissuade black grouse from lekking in their vicinity. Nevertheless, there is still a possibility that noise and visual disturbance due to operation of the turbines may displace black grouse from critical nesting and feeding areas and from preferred lek sites. Lekking birds are likely to be most susceptible to disturbance in calm, still conditions when sound is most easily propagated, i.e. when there is insufficient wind to operate the turbine rotors. During operation, turbine noise is predictable, relatively constant and to an extent attenuated by ambient wind noise. Therefore, it is likely that lekking black grouse may well habituate to their presence.

136. Taking account of disturbance distances suggested by Ruddock & Whitfield (2007), other sources of operational disturbance at the proposed Development, e.g. occasional vehicle movements, should be restricted to leks of two or more birds within around 500 m of tracks and turbines. Again, only leks of two or more birds are considered to be susceptible. It is possible that birds would continue to display at or near these locations since habitats adjacent to tracks and tracks themselves are sometimes used for lekking. In addition, vehicle movements on tracks adjacent to lekking males should be relatively infrequent during the peak daily lekking period within around two hours of sunrise. However, even if displacement were to occur, the likelihood of these birds continuing to display elsewhere is high given the mobility of black grouse leks generally (Watson & Moss, 2008), and as shown by recent records from this area (**Appendix 9.1; Figures15a, 15b, 15c and 16**).

137. Displacement of the local black grouse population from nesting and feeding areas could occur during the operational phase, due simply to the presence of turbines or, for example, because of occasional vehicle movements along tracks and the presence of maintenance staff near turbines. Again, there is little evidence to show that turbines or relatively infrequent operational activities will displace nesting and feeding birds from critical habitats in their vicinity.

138. Birds away from lek sites have been shown to be relatively tolerant of low to moderate levels of disturbance based on flushing distances and, even under high disturbance pressure, survival and breeding success are apparently unaffected (Baines & Richardson, 2007). Also, the flushing distances of incubating female black grouse are very low (Ruddock & Whitfield 2007)

and assuming disturbance effects will be relatively short-lived (e.g. vehicle movements) nesting birds are unlikely to suffer prolonged disturbance at close proximity.

139. Suitable habitat in the vicinity of turbines and tracks is unlikely to be exposed to such high disturbance levels that feeding birds would be excluded and even if some displacement in the immediate vicinity of infrastructure were to occur, there are ample suitable feeding opportunities elsewhere within the likely foraging range of all recorded display locations.

140. In summary, the only recorded lek site, holding more than a single male, that may potentially be vulnerable to operational effects is the one on the northern slopes of Cruach nam Fiadh, holding a maximum of four males in 2016. Since the location is greater than 300 m from the nearest proposed turbine locations, the presence of turbines themselves are not likely to affect its continued use. The lek site is very close to a track, but black grouse will lek on forestry tracks so its persistence here is also considered to be possible. Regardless, were these birds to be displaced it is likely that they would move to display elsewhere within their range and not be lost to the population. Displacement effects on nesting and feeding birds as a result of the operation of the proposed Development are likely to be minimal, and any areas that were avoided could be compensated for due to the wide availability of suitable habitat within the local black grouse range. Therefore, the spatial magnitude of any displacement effect is deemed to be negligible (across all components of the regional population – estimated to be at least 218 lekking males in 2010 (Robinson, 2011)), with a temporal magnitude effect considered to be short-term (even though the presence of the turbines will be present in the long-term) for this species of moderate Nature Conservation Importance. Hence, as there is likely to be little prospect of a discernible effect on the regional population and its conservation status, operational effects on black grouse are deemed long-term negligible and not significant under the EIA Regulations

9.5.6 Operational effects - Collision Risk

141. Birds that are not displaced would be potentially vulnerable to collision with the turbines. The level of collision with wind turbines is presumed to be dependent on the amount of flight activity over the proposed Development and the ability of birds to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed or fatally injured. This may in turn affect the maintenance of bird populations.

142. Flight activity by red-throated diver and hen harrier was recorded within the 500 m buffer of the proposed turbine layout at heights that put them at risk of collision with turbine blades (see **Technical Appendix 9.1**). Collision risk assessments were calculated for these species.

Red-throated Diver

143. The speed used in the collision risk calculations was 18 m / sec for red-throated divers. Collision risks have been calculated assuming 99.5% avoidance (SNH, 2010 update 2018). Full details of the calculations are shown in **Technical Appendix 9.2**.

144. On the basis of applying an accepted avoidance rate of 99.5% for red-throated divers, this equates to one bird colliding with a turbine approximately every 180 years.

145. The red-throated diver population numbers between 46-132 breeding pairs in NHZ14 (Wilson *et al*., 2015). The potential loss of one red-throated diver every 180 years is of negligible magnitude and the overall effect at the scale of the NHZ would be negligible. This effect is considered not significant in terms of the EIA Regulations and the population would maintain favourable conservation status.

Greenland White-fronted Goose

146. Two flights by GWF geese passed within 500 m of the proposed turbine locations during baseline surveys. Both flights were at heights that would not put them at risk of collision. Therefore, no collision risk calculation could be made. A reasonable conclusion is that operational effects on GWF goose conservation status due to collision will be negligible. These effects are not significant under the EIA Regulations.

Hen Harrier

147. The speed used in the collision risk calculations was 13 m / sec for hen harriers. Collision risks have been calculated assuming 99 % avoidance (SNH, 2010 update 2018). Full details of the calculations are shown in **Technical Appendix 9.2**.

148. On the basis of applying an accepted avoidance rate of 99 % for hen harriers, this equates to one bird colliding with a turbine approximately every 22 years.

149. The hen harrier population numbers between 100-150 breeding pairs in NHZ14 (Wilson *et al*., 2015). The potential loss of one hen harrier every 22 years is of negligible magnitude and the overall effect at the scale of the NHZ would be negligible. This effect is considered not significant in terms of the EIA Regulations and the population would maintain favourable conservation status.

Black Grouse

150. Seven flights by black grouse passed within 500 m of the proposed turbine locations during baseline surveys. However, all flights were at heights that would not put them at risk of collision. Therefore, no collision risk calculation could be made. A reasonable conclusion is that operational effects on black grouse conservation status due to collision would be negligible. These effects are not significant under the EIA Regulations.

9.5.7 Proposed Mitigation

151. Measures to mitigate the loss of one red-throated diver breeding territory include a program of deploying artificial diver rafts on suitable waterbodies within 2 km of the proposed Development to help increase the number of breeding red-throated divers and improve productivity.

152. As no other effects are deemed significant, no additional mitigation is proposed.

9.5.8 Cumulative Effects

153. The EIA Regulations require the cumulative effects of the proposed Development with other relevant projects or plans to be assessed. SNH guidance (SNH, 2012) on assessing cumulative effects has been followed. In considering cumulative effects, it is necessary to identify any effects that are minor (or greater) in isolation (**Table 9.4**) but that may be major cumulatively.

154. "Target" species were taken to be those species of high Nature Conservation Importance (**Tables 9.1** and **9.5**) for which there was some indication of a potential effect as a result of the proposed Development, which may be exacerbated cumulatively. However, no significant effects of the proposed Development were identified, and all effects on all bird species were deemed to be of negligible significance (**Table 9.4**). As such, the predicted in-isolation effects of the proposed Development are considered to have no potential to contribute to cumulative effects and are, therefore, negligible across all species.

155. In conclusion, for all bird species, the cumulative effects of the proposed Development in-combination with other projects in the NHZ are likely to be negligible and deemed to be not significant under the terms of the EIA Regulations.

Proposed Mitigation

156. As no cumulative effects are deemed to be significant, no mitigation is proposed.

9.6 Proposed Monitoring

157. Monitoring of the location and breeding performance of red-throated divers within 2 km of the proposed Development would be commissioned, and would continue prior to, during, and after construction to enable a 'before and after' assessment to be made.

158. Monitoring of the number and locations of lekking black grouse within 1.5 km of the proposed Development would be commissioned and would be undertaken in years 1-5, 10, 15 and 20 of the operational phase of the proposed Development.

159. A report detailing the monitoring work would be published on an annual basis and made publicly available. Monitoring would be undertaken in line with best practice guidance, SNH Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms (2009).

9.7 Summary and Statement of Effects

160. **Table 9.6** below summarises the predicted significant effects of the Development on ornithological interests.

	Predicted effect	Significance	Proposed mitigation	Residual effect
Construction				
All species	Land take	Negligible	None	Negligible
	Disturbance	Negligible*	None	Negligible
Operation				
Red-throated diver	Disturbance	Minor	Deployment of artificial diver rafts on suitable waterbodies within 2 km of the proposed Development.	Negligible
	Collision risk	Negligible	None	Negligible
All other species	Disturbance	Negligible	None	Negligible
	Collision risk	Negligible	None	Negligible
Decommissioning				
All species	Disturbance	Negligible	None	Negligible
Cumulative				
All species	None	Negligible	None	Negligible
*Assessment undertaken on the basis that a BPP will be in place.				

Table 9.6: Summary of Effects

161. The likely effects of the proposed Development were evaluated in accordance with the methods described in **section 9.7** and the significance of each potential effect stated under **Sections 9.11 to 9.14**.

162. It is concluded that the likely effects of the proposed Development on all bird species are not significant under the terms of the EIA Regulations.

9.8 Potential Effects on Kintyre Goose Roosts SPA

9.8.1 The Need For and Form of an Assessment

163. Whilst the Habitats Regulations provides that an assessment of the possible effects of a proposed Development on a SPA is the responsibility of the competent authority, this Section provides a summary examination of the relevant issues pertaining to the potential effect of the proposed Development.

164. There are two European Directives that are relevant, namely Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive) and Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive). The Wildlife and Countryside Act 1981 transposed many parts of the Birds Directive into domestic legislation. The Habitats Directive was transposed through The Habitats Regulations. Guidance for the implementation of the Directives in Scotland is provided in Scottish Executive Circular No. 6/1995 (revised June 2000).

165. Article 3 of the Birds Directive identifies how the maintenance of bird populations should be achieved and of relevance here is Article 3(2)(a), which is the "creation of protected areas". Article 4 deals with these protected areas (SPAs) with parts (1) and (2) specifying the species that require special protection (including species listed in Annex I). Article 4 (4) refers to the measures that need to be taken to protect the birds within and outwith SPAs, so that in the first sentence Member States are required to take appropriate steps to avoid pollution or any disturbances affecting the birds of SPAs, in so far as these would be significant with regard to the objectives of Article 4. The second sentence requires Member States to strive also to avoid pollution or deterioration of habitats outwith SPAs. However, Article 7 of the Habitats Directive replaces the first sentence of Article 4.4 of the Birds Directive with Articles 6(2) to 6(4) of the Habitats Directive as follows: "*Obligations arising under Article 6 (2), (3) and (4) of this Directive shall replace any obligations arising under the first sentence of Article 4 (4) of Directive 79/409/EEC in respect to areas classified pursuant to Article 4 (1)…*"

166. Article 6 of the Habitats Directive refers to conservation measures and assessment procedures for plans or projects affecting Natura 2000 sites (including SPAs), and the steps for assessment are outlined in Article 6 (2) and (3). Part IV of the Habitats Regulations transposes these steps into domestic legislation, with Regulations 48 and 49 being relevant.

167. Regulation 48 of the Habitats Regulations refers to three assessment steps: the outcome of the first two deciding whether or not the third needs to be implemented. The three steps, set out below as questions, are:

Step 1: Is the proposal directly connected with or necessary to the management of the site?
Step 2: Is the proposal, alone or in combination, likely to have a significant effect on the site? If a significant effect is likely, then an appropriate assessment is necessary; and
Step 3: Can it be ascertained that the proposal will not adversely affect the integrity of any of the SPA, either by itself or in combination with other plans or projects?

168. It is important to note that step 2 only applies to the qualifying species of the SPA and the decision is informed by the SPA's conservation objectives. The European Court of Justice (ECJ) ruling of 7 September 2004 (C-127/02) on the Waddenzee mechanical cockle fishery clarified that Article 6 (3) of the Habitats Directive should be interpreted as meaning that any plan or project (other than those directly concerned with the management of the SPA) should be subject to step 3 if under step 2 "*it cannot be excluded, on the basis of objective information, that it will not have a significant effect on that site, either individually or in combination with other plans or projects*". Further, if a plan or project "*is likely to undermine the site's conservation objectives it must be considered likely to have a significant effect. The assessment of risk must be made in light of, amongst others, the characteristics and specific environmental conditions of the site concerned*." Under step 3 there is an onus on demonstrating that there will be no adverse effect on integrity, in light of best scientific knowledge, and the 2004 ECJ ruling has clarified that the consenting authority can only consent a plan or project if it is confident that a plan or project will not adversely affect site integrity. That is, when there is no reasonable scientific doubt as to the absence of such effects.

169. With respect to the proposed Development, which does not lie within the boundary of the SPA, the revised Scottish Executive Circular (6/1995) states that in order to determine their implications for the interest protected *within* the Natura 2000 site, the need for considering the assessment steps referred to by Regulation 48 of the Habitats Regulations also potentially extends to

plans or projects *outwith* the boundary of the site. Hence, it is a proposal's potential effect on the SPA's interest which is relevant, rather than its location with respect to the SPA boundary *per se*. Thus the assessment steps need to be considered for the proposed Development, even though it lies at a distance of ca.5.5 km from the SPA boundary.

Step 1. The construction and operation of the proposed Development are not directly connected with or necessary for the conservation management of the Kintyre Goose Roosts SPA, and therefore the next step needs to be considered.

Step 2. Greenland whited-fronted geese (*Anser albifrons flavirostris*) are the qualifying interest of the SPA relevant to the consideration of the proposed Development. Due to the proximity of the proposed Development to roosting sites and feeding fields used by the qualifying species and the likely potential for disturbance to the species during construction and operation, it is considered that there is a likelihood of significant effects.

170. The Site's conservation objectives (relevant to both Steps 2 and 3 of an assessment) are designed to achieve the obligations set out in Article 6.2 of the Habitats Directive (which applies to SPAs) by using the components of favourable conservation status for species as set out within Article 1(i) of the Habitats Directive. This approach is recommended by the EC in their Guidance on Managing Natura 2000 Sites, Section 2.3.2. The conservation objectives for SPAs are the same as for other Natura sites in Scotland in having an overarching conservation objective to avoid deterioration of the habitats of the qualifying interest, or significant disturbance to the qualifying interest, thus ensuring that the integrity of the site (SPA) is maintained. The component conservation objectives which encapsulate the maintenance of site (SPA) integrity in the long-term, are as follows:

1. ensure for the qualifying species that there is no significant disturbance;
2. ensure for the qualifying species that the structure, function and supporting processes of habitats supporting the species are maintained in the long term;
3. ensure for the qualifying species that the distribution and extent of habitats supporting the species are maintained in the long term;
4. ensure for the qualifying species that the distribution of the species within the site is maintained in the long term; and
5. ensure for the qualifying species that the population of the species is maintained as a viable component of the site.

Step 3. As noted earlier, under Step 2 of the assessment process, it was considered reasonable to conclude that it was likely that the proposed Development would have a significant effect on the site's interest. Since this section is designed to provide the competent authority with the necessary information to undertake an assessment under the Habitats Regulations, subsequent sections therefore assume that, under Step 3, an appropriate assessment requires implementation, and hence subsequent sections place the proposed Development's potential effects on site integrity under detailed scientific scrutiny, utilising evidence gathered from the proposed Development site, and with explicit reference to the relevant conservation objectives of the Kintyre Goose Roosts SPA.

171. As a first step in this detailed consideration, however, it is necessary to establish the nature of the Greenland white-fronted goose 'interest' of the SPA as this determines the scope of an assessment.

9.8.2 Kintyre Goose Roosts SPA

172. The Kintyre Goose Roosts SPA qualifies under Article 4 (1) of the EC Birds Directive as it regularly supports wintering populations of European importance of the Annex 1 species white-fronted goose, according to stage 1.1 of the SPA selection guidelines. At the time of designation, the SPA supported a five year mean peak of 2,300 birds or 8 % of the world population (data from 1991/92 – 1995/96). Site condition monitoring, undertaken by SNH, indicates that the Kintyre Goose Roosts SPA is in favourable conservation status as of April 2014 (https://sitelink.nature.scot/home).

173. There are two main populations of GWF goose in Kintyre, one which feeds on improved agricultural land around Rhunahaorine Point with significant roosts on Rhunahaorine Point, Loch an Fhraoich and Loch Garasdale; and another which feeds on improved agricultural land in the Machrihanish area with significant roosts on Lussa Loch, Tangy Loch and Black Loch.

174. In the 2017/18 non-breeding period, the maximum count of GWF geese in these two Kintyre populations was 2,478 birds. The maximum count of GWF geese from the northern Clachan flock was 161 birds made in November 2017(Fox *et al*., 2018).

9.8.3 Assessment of Effects on Conservation Objectives

175. The information presented in this Chapter and associated appendices suggests that displacement from roosting/feeding areas and collision mortality are the potential adverse effects which could result from the proposed Development, and such effects, under either step 2 or step 3, are relevant to conservation objective 1 ("*Ensure for the qualifying species that there is no significant disturbance*") and 5 ("*Ensure for the qualifying species that the population of the species is maintained as a viable component of the site*") listed above. Were these effects of a large enough magnitude, either through displacement of roosting/feeding geese from the SPA or through direct collision mortality, then objective 4 ("Ensure for the qualifying species that the distribution of the species within the site is maintained in the long term") may also be impinged upon. The other two conservation objectives (2 and 3) are therefore not relevant for consideration of any potentially adverse impact on the SPA interest as a consequence of the proposed Development, since the proposed Development will not potentially compromise these objectives.

176. On this basis, the information presented subsequently first considers the potential effect of disturbance as result of the construction, operation of the proposed Development on conservation objective 1 and then considers the potential effect of collision mortality on conservation objective 5. Secondary consideration of objective 4, insofar as potential effects of displacement by disturbance and increased mortality, should be conditional on the outcome of assessment against conservation objectives 1 and 5.

<u>Conservation objective 1 - Ensure for the qualifying species that there is no significant disturbance</u>

177. Any effects of disturbance during construction would be successfully counteracted by restricting construction activities to those hours when geese are absent from roosting sites (approximately one hour before dusk to one hour after dawn) during the months of October through to April inclusive. This constraint would apply to any construction activity, including vehicle movements, within 500 m of roost sites. SNH has agreed a similar protocol with Forestry and Land Scotland (formerly FCS) (in relation to forestry operations) and with SPR in relation to construction work for the Beinn an Tuirc Windfarm Phase 2 and Phase 3. Additionally, protocols to cover blasting for rock extraction would also be included, i.e. blasting for rock extraction would not be conducted at a borrow pits within 2 km of roost sites during the period when geese could be present, as given above. In the presence of such temporal constraints on construction activity there would be no significant disturbance to GWF geese during construction, and hence the conservation objective would be maintained.

178. Due to the distance of the proposed Development to roosting/feeding sites and the nature of routine operation and maintenance activities, operational disturbance would be at a level which would not cause significant disturbance. An exception may occur if maintenance activities replicate those during construction (e.g. replacement of a turbine) and in such cases the temporal restrictions which would be enacted during the construction phase would also apply. Due to the nature and typical seasonal and diurnal timing of recreational activities, i.e. mostly during daylight hours in the summer, there should be no significant disturbance due to unintentionally increased access provisions, but as a precautionary measure, restrictions on unauthorised vehicular access would be maintained. In the presence of relevant counteractive measures, therefore, there would be no significant disturbance to GWF geese during operation, should the proposed Development be consented, and hence the conservation objective would be maintained.

<u>Conservation objective 5 - Ensure for the qualifying species that the population of the species is maintained as a viable component of the site</u>

179. The proposed Development may cause direct mortality to GWF geese as a result of collision with rotating turbine blades. Due to the proximity of the proposed Development to roosting/feeding sites, GWF geese killed through turbine collisions must be considered part of the SPA population, as determining beyond doubt that they were not would be almost impossible. As a result, there is potential for the integrity of the SPA to be compromised as a result of direct mortality to the qualifying interest.

180. Flight activity surveys conducted between October and April during baseline surveys, and amounting to over 375 hours of observation time, recorded only two flights by GWF geese, of two and twelve birds, which passed through airspace within 500 m of turbine locations. Hence, it is clear that some potential for collision by GWF geese with turbines at the proposed Development does exist.

181. However, both the recorded flights were at heights that did not put the geese at risk of collision with turbine blades and a modelled prediction of mortality equates to zero. Assuming a worst case that both flights were at collision risk height, then any modelled mortality would be barely detectable at a regional, SPA and SPA component level. Given that background annual mortality within the SPA population will account for the deaths of around 10 % of the population annually, i.e. probably in excess of 200 birds (Trinder, 2010), there is no realistic prospect of collision mortality affecting the trajectory of the SPA population. Hence, without recourse to further analyses it is considered beyond scientific doubt that collision mortality would not adversely affect the qualifying interest at this Site and that the conservation objective of maintaining the GWF goose population as a viable component of the site would not be compromised by the proposed Development.

Conservation objective 4 - Ensure for the qualifying species that the distribution of the species within the site is maintained in the long term

182. It follows from the conclusions arrived at in respect of conservation objectives 1 and 5 above, that the distribution of the species within the SPA will be unaffected by the proposed Development and, therefore, conservation objective 4 would not be impinged upon.

183. In evaluating the impact of the proposed Development in isolation, therefore, there is no prospect that the proposed Development could affect the integrity of the SPA.

9.8.4 In Combination Effects

184. As noted above, it is necessary that the competent authority considers, within the assessment steps, the potential effect of the proposed Development alone or "in combination" with other projects.

185. However, as noted above, there is no prospect of significant disturbance/displacement effects upon the GWF goose population and collision mortality is zero. As such, the predicted in-isolation effects of the proposed Development are considered to have no potential to contribute to in-combination effects. Therefore, there is no prospect that the proposed Development could affect the integrity of the SPA.

9.8.5 Conclusion

186. In conclusion, none of the SPA's conservation objectives would be compromised by the proposed Development alone, or in combination with other developments, and the Sheirdrim Renewable Energy Development would, therefore, not affect the integrity of the SPA.

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