



Chapter 9

Ornithology

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Chapter 9

Ornithology

9.1 Introduction

1. This Chapter of the Hollandmey Renewable Energy Development (RED) (hereafter the proposed Development) Environmental Impact Assessment (EIA) Report considers the potential effects of the proposed Development on birds. Potential effects on other flora and fauna are presented in **Chapter 8: Ecology and Biodiversity**. The ornithology impact assessment was undertaken by Natural Research (Projects) Limited (NRP).
2. Particular attention has been paid to species of ‘High’ or ‘Moderate’ ornithological importance (target species) (levels of importance are defined in **Section 9.4.5**). These include species with national or international protection under the Wildlife and Countryside Act (WCA) and the European Union (EU) Birds Directive (79/409/EEC).
3. This Chapter is supported by technical appendices which contains details of the ornithological surveys (**Technical Appendix 9.1: Ornithology Technical Report**), collision risk calculations (**Technical Appendix 9.2: Ornithology Collision Risk Modelling**) and a confidential appendix (**Technical Appendix 9.3: Confidential Ornithology**).
4. 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.
5. 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 Caithness and Sutherland Peatlands Special Protection Area (SPA) and Caithness Lochs SPA.

9.2 Legislation, Policy and Guidance

9.2.1.1 Data Sources and Guidance

6. The following guidance and information sources have been consulted while undertaking this assessment:
 - SNH Guidance (2013): Avoidance rates for wintering species of geese in Scotland at onshore windfarms;
 - SNH Guidance (2018): Assessing the cumulative impact of onshore wind farms on birds;
 - SNH Guidance (2016): Assessing connectivity with Special Protection Areas (SPAs);
 - SNH Information and Guidance Note (2018): Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model;
 - SNH Guidance (2018): Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas;
 - SNH Guidance (2017): Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities;
 - SNH Guidance (2017): Natural heritage considerations for solar photovoltaic installations;
 - NatureScot SiteLink web pages (<https://sitelink.nature.scot/home>) (online information on designated sites); and
 - BRE (2014) Biodiversity guidance for solar developments.
7. 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 (WCA);
 - The Electricity Act (1989);

- 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).

8. The following planning policy has been taken into consideration when undertaking the assessment:

- Scottish Planning Policy (SPP) 2014;;
- Scottish Government Planning Advice Note 60: Planning for Natural Heritage 2008;
- the Highland-wide Local Development Plan 2012;
- the Highland Council ‘Onshore Wind Energy Supplementary Guidance’ 2016; and,
- the Caithness and Sutherland Local Development Plan (CASPlan) 2018.

9.3 Consultation

9. Scoping consultations from the Royal Society for the Protection of Birds (RSPB) and NatureScot formerly Scottish Natural Heritage (SNH) are given in **Table 9.1**.

Table 9.1: Consultation

Consultee	Response	Action
NatureScot Scoping Response August 2020	<i>“We are broadly content with the approach to the ornithology surveys which appears to follow our guidance. We are unable to comment further at this stage without seeing the viewshed map and the full survey results in the EIA report.”</i>	The viewshed map and survey results are contained in Technical Appendix 9.1 to the EIA Report. Surveys were planned according to NatureScot guidance taking into consideration the qualifying interests of the nearby SPAs and other local bird populations.
RSPB Scoping Response August 2020	<i>“The EIA Report must include sufficient information to inform an Appropriate Assessment under the Conservation of Habitats and Species Regulations 2017.”</i>	Sufficient information has been provided along with a shadow Habitats Regulations Appraisal to inform an Appropriate Assessment.
	<i>“We note that Phillips Mains Mire Site of Special Scientific Interest (SSSI) is sited within the proposed development boundary. Although this site is not designated for its ornithological interest, the blanket bog on the site supports many bird species and the mire is used in winter by greylag geese and may also be used for foraging and as a roost by the much rarer and specially protected species, Greenland white-fronted geese (GWFG).”</i>	Greylag goose and Greenland white-fronted goose are both specially protected species due to their inclusion as qualifying species for the Caithness Lochs SPA and will be considered where necessary in the assessment.
	<i>“...we are concerned that the survey boundaries indicated on Figure 8.1 do not cover the entire site boundary, including the access track from the road. If any tracks, borrow pits or other infrastructure is to be placed in areas not surveyed, a proper assessment of impacts will not be possible.”</i>	We are confident that a proper assessment of impacts of all infrastructure is possible and has been carried out.
	<i>“We also note that the area of the initial walkover surveys conducted in 2017 within 500m of the application boundary and the goose and swan surveys undertaken in the winter of 2017-18 have not been presented on any figure.”</i>	These are presented in the Technical Appendix 9.1 .

Consultee	Response	Action
	"Maps should be provided showing the Migratory Flight Activity watch points. The search areas for raptors (where access permission was granted) have also not be illustrated and it is not clear what survey boundaries were used for wintering goose surveys. This information should be provided in the full EIA report."	These are presented in the Technical Appendix 9.1 .
	"We are disappointed that the Phillips Mains Mire SSSI is not fully included within the survey boundaries. Local bird watchers have suggested that the Mey flock of GWFG may use Phillips Mains during periods of bad weather or particularly high levels of disturbance, however, we do not know how much (if any) time this species spends on the mire. We hope that the specific goose roost and foraging watches included this SSSI area. Including the entire SSSI for wader surveys would have also been prudent."	The Phillips Mains Mire SSSI is over 500 m from the nearest turbine location, so requires less coverage in accordance with the SNH Guidance. Surveys did cover the area where at all possible, however there were restrictions due in no small part to health and safety concerns given that the area is a mire and in the main unstable for walking.
	"It is also unclear how night-migrating birds have been considered and the EIAR should address this"	This has been addressed as necessary.
	"We recommend that information is provided within the EIA report to demonstrate that the survey data are adequate, robust and accurate including: <ul style="list-style-type: none"> • Full information on the VP work undertaken, including dates, times and weather conditions • Maps showing VP locations that also denote viewsheds (we note Figure 9 of the scoping report does not include these). • Maps showing raptor foraging areas • Worked example(s) of collision risk calculations • Provision of raw data in order independent verification of collision risk calculations" 	Surveys were planned and carried out according to SNH guidance taking into consideration the qualifying interests of the nearby SPAs and other local bird populations. These data are provided in the Technical Appendices 9.1 to 9.3 .
	"The EIA should consider all the components of the proposal including, turbines, anemometer masts, solar panels, access roads (including the route on public roads to get the turbines on site), on site tracks, borrow pits, drainage, grid connection, substation and temporary construction buildings/storage compounds. It should also assess the impacts of all phases of the project including site selection, design, construction, operation and maintenance."	The EIA will consider these elements.
	"Disturbance, displacement, loss of suitable habitat (breeding, wintering and foraging) and collision risk should be assessed for all species, both during construction and operation. This should not only include impacts from the wind turbines but also new tracks and infrastructure as well as any existing road widening or upgrades."	These effects will be assessed for the species for which assessment is required dependent on the data from surveys. All infrastructure elements will be included as necessary.
	"The potential barrier effects of this proposal should be addressed in the EIA, for the proposed windfarm alone, and as part of the cumulative assessment, particularly with regards to geese, swans, gulls and divers."	These effects have been assessed for the species for which assessment is required dependent on the data from surveys.

Consultee	Response	Action
	"Finally, the potential impact on hen harrier behaviour of habitat change arising from the felling and future restocking of forestry or restoration in the area occupied by the turbines should be addressed in the EIA."	The effects of habitat alteration have been assessed as necessary.
	"The cumulative assessment should take account of all existing and proposed wind energy schemes that could impact on the SPAs in question. The in-combination effect of other relevant plans or projects such as overhead power lines and new woodland planting, should also be considered"	Should a cumulative assessment be required this will include the effects on relevant SPAs and include other projects where necessary.
	"Habitat Management Plan (HMP) should be prepared as part of the EIA and submitted with the application, including any proposals for mitigation and enhancement in relation to important habitats and species; as well as details of post-construction monitoring for collision mortality and breeding birds, particularly those which are features of the nearby SPAs."	A HMP will be considered, along with any mitigation or enhancement if required. Post-construction monitoring options will not be outlined in any detail.
	We would welcome early discussions on the opportunities in the area as the site has potential for significant benefits to biodiversity through forest to bog restoration. Peatland restoration would be particularly beneficial in any areas adjacent to the Phillips Mains Mire SSSI, other open peatland habitat and adjacent fields with wader populations such as curlew, lapwing, redshank and oystercatcher.	Forest to bog restoration on the Site is proposed in Technical Appendix 8.6: Draft Habitat Management Plan .
	Any required compensatory planting scheme should be included in the Habitat Management Plan and should be carefully planned within a suitable area with regards to habitats and species, for example, avoiding deep peat and wader hotspots. Bird surveys should be undertaken early in the planning stages of the scheme to ensure birds of open habitats will not be affected.	The compensatory planting requirement has been calculated in Technical Appendix 15.1 Forestry .
The Highland Council (THC) Scoping Response September 2020	"The presence of protected species such as Schedule 1 Birds or European Protected Species must be included and considered as part of the planning application process, not as an issue which can be considered at a later stage". Please refer to the comments of SNH and RSPB in this respect."	Protected bird species are fully considered in the assessment, and the comments of NatureScot and RSPB (detailed below) are referenced and considered.
	"An assessment of the impacts to birds through collision, disturbance and displacement from foraging / breeding / roosting habitat will be required for both the proposed development site and cumulatively with other proposals. The EIAR should be clear on the survey methods and any deviations from guidance on ornithology matters."	This assessment is completed in this Chapter including a cumulative assessment where necessary. Survey methods are detailed in Technical Appendix 9.1 and outlined in this Chapter.

9.4 Assessment Methodology

9.4.1 Study Area

- During collection of baseline ornithological data, bird populations were surveyed up to a maximum of 2 kilometres (km) from the Site (See **Figure 9.1** and **Figure 9.2**). Full details of the study areas pertaining to particular survey methods, or surveys targeted at particular species, are given in **Technical Appendix 9.1**.

12. The study area for the assessment of collision risk is the 'flight activity survey area' or 'FA' which refers to a buffer around the outermost turbines plus an additional 500 m strip around that buffer (See **Figure 9.3**).
13. The study area for the assessment of effects on bird populations is the Orkney and North Caithness Natural Heritage Zone (NHZ 2), as defined by NatureScot (formerly Scottish Natural Heritage (SNH)) (2002).
14. Additionally, for greylag goose, golden plover and hen harrier, information is also presented to allow the competent authority to undertake an Appropriate Assessment in respect of the qualifying interest of the Caithness Lochs SPA and Caithness and Sutherland Peatlands SPA. Hence, the study area for assessment of effects on this species under the Habitats Regulations is these two SPAs.

9.4.2 Field Survey Methodology

15. Baseline field surveys reported here were carried out between June 2017 and August 2021. A detailed methodology for all surveys is provided in **Technical Appendix 9.1** and is briefly summarised below:

- Moorland Bird Surveys (four visits, April to July 2018 and April to August 2021; within Site and 500 m buffer);
- Scarce Breeding Bird surveys (April to July 2018, April to August 2019 and April to August 2021; within Site and buffer extending up to 2 km depending on species);
- flight activity (vantage point) surveys (April 2018 to March 2020; within Flight Activity Assessment Area (FA));
- Migration Watch Point (MWP) surveys (March 2018 to May 2018, September 2018 to November 2018, March 2019 to May 2019 and September 2019 to November 2019; from a single vantage point);
- goose and swan feeding distribution surveys (October 2017 to April 2018; October 2018 to April 2019 and October 2019 to March 2020; within Site and buffer extending to 500 m and also a number of other areas further afield)
- hen harrier winter roost watches (October 2018 to March 2019 and October 2019 and March 2020); and
- winter walkovers (October 2019 to March 2020; within the Site and 500 m buffer).

9.4.3 Assessment Process

16. 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.
17. 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.
18. 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.
19. 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 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.
20. 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.

9.4.4 Evaluating Effects

21. In assessing significance of effect, 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.

9.4.5 Nature Conservation Importance

22. The Nature Conservation Importance of each bird species potentially affected by the proposed Development is defined according to **Table 9.2**.

Table 9.2: Nature Conservation Importance

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'. 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.

9.4.6 Magnitude of Effect

23. Magnitude is determined following consideration of the spatial and temporal nature of each potential effect. There are five levels of spatial magnitude (**Table 9.3**) and four levels of temporal magnitude (**Table 9.4**). 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 NHZ 2.

Table 9.3: Levels of Spatial Magnitude of Effect

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 9.4: Levels of Temporal 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

Magnitude	Definition
	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.

24. 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.
25. 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.
26. 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).

9.4.7 Conservation Status

27. Where the available data allows, the conservation status of each potentially affected population is considered within NHZ 2. 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.

9.4.8 Determining Significance

28. 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.
29. 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 9.5**. 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). **'Not 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.

Table 9.5: Significance Levels of Effect

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.

Importance	Definition
'Negligible'	No or non-detectable changes in the conservation status of regional populations of Nature Conservation Importance.

9.5 Baseline

30. 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.

9.5.1 Site Designations

31. The Site is not covered by any statutory nature conservation designations. There are three SPAs within 20 km of the Site: The Caithness and Sutherland Peatlands SPA, The Caithness Lochs SPA and the North Caithness Cliffs SPA (See **Figure 9.4**).
32. The Site is adjacent to a component (Stroupster Peatlands SSSI) of the Caithness and Sutherland Peatlands SPA. The Caithness and Sutherland Peatlands SPA is classified for its breeding populations of black-throated diver (*Gavia arctica*), red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), wigeon (*Anas penelope*), golden eagle (*Aquila chrysaetos*), hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*), short-eared owl (*Asio flammeus*), golden plover (*Pluvialis apricaria*), wood sandpiper (*Tringa glareola*), greenshank (*Tringa nebularia*) and dunlin (*Calidris alpina*).
33. Loch of Mey SSSI which is a constituent of The Caithness Lochs SPA and Ramsar site is located 1.7 km from the Site, and Loch of Heilen SSSI, also part of the Caithness Lochs SPA, is 1.7 km from the application boundary. The Caithness Lochs SPA is classified for its wintering populations of whooper swan (*Cygnus cygnus*), Greenland white-fronted goose (*Anser albifrons flavirostris*) and greylag goose (*Anser anser*).
34. Dunnet Head SSSI which is a component of The North Caithness Cliffs SPA is located 7.2 km from the Site. The North Caithness Cliffs SPA is classified for its breeding populations of peregrine (*Falco peregrinus*), common guillemot (*Uria aalge*), northern fulmar (*Fulmaris glacialis*), black-legged kittiwake (*Rissa tridactyla*), razorbill (*Alca torda*) and Atlantic puffin (*Fratercula arctica*). All these species, aside from peregrine, are exclusively coastal species and the proposed Development is outside of the core foraging range of peregrine. For these reasons there is considered to be no prospect of any effect on the qualifying interests of this SPA as a result of the proposed Development, and effects on this SPA are not considered further in this Chapter.

9.5.2 Ornithological Habitats

35. Habitats within 2 km of the infrastructure of the proposed Development are conifer plantation, at various stages of development, areas of heath / bog habitat and some smaller areas of pasture and arable fields. There is also a small area of bog pools to the north-east of the proposed Development (Phillips Mains Mire SSSI) and a number of small watercourses.

9.5.3 Baseline Bird Populations

9.5.3.1 Wildfowl Greylag Goose

36. Many sightings of greylag geese were recorded. Flocks occurred feeding in the wider area and also made use of fields within the study area. They were seen on Loch of Mey during the non-breeding season. They also occurred in the breeding season, and they were noted as using Phillips Mains mire as an occasional roost in August. Their presence was recorded during surveys in every month of the year.
37. During baseline Generic Vantage Point (GVP) watches 56 flights involving 1,770 birds and during Migration Watch Point (MWP) watches 13 flights involving 533 birds were recorded at least partially within the FA.

Pink-footed Goose

38. Numerous flocks of pink-footed goose (*Anser brachyrhynchus*) were recorded foraging in the wider area and in fields within the study area. Flock sizes ranged from one to 1,300 birds, during January, February, March, April, September, October, November and December with a mean flock size of 193 birds.

39. During baseline GVP watches six flights involving 151 birds and during MWP watches 15 flights involving 1,051 birds were recorded at least partially within the FA. Given the very low level of flight activity, and the fact that the area within and surrounding the proposed Development appears little used by pink-footed goose, this species, despite its **'Moderate'** Nature Conservation Importance is not considered further in this Chapter.

Greenland White-fronted Goose

40. Eight flocks of Greenland white-fronted goose were recorded during the months of January, February, March and November. Flocks of between two and 160 were recorded feeding in the wider area, but no flights passed over the FA. Given that no flight activity was recorded within the proposed Development and the habitat onsite is unsuitable for use by Greenland white-fronted geese, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

Whooper Swan

41. Flocks of between one individual and 130 whooper swans were recorded during the non-breeding season in January, February, March, April, October, November and December. Birds were seen on Loch of Mey, Loch Heilan, St John's Loch and the Burn of Ham and feeding in fields in the wider area.

42. During baseline GVP watches four flights involving 21 birds and during MWP watches 2 flights involving 8 birds were recorded at least partially within the FA. Given the very low level of flight activity, and the fact that the area within and surrounding the proposed Development appears little used by whooper swan, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

9.5.3.2 Cranes Common Crane

43. Common Crane (*Grus grus*) was recorded in flight on two occasions during the survey period once during a GVP and once during other surveys. There were also incidental records of a single bird feeding within 500 m of the proposed turbines near Scoolary. Given the very low level of flight activity, and the fact that the area within and surrounding the proposed Development appears little used by common crane, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

9.5.3.3 Waders Golden Plover

44. One golden plover territory was recorded within 500 m of the proposed turbines.

45. During baseline GVP watches ten golden plover flights were recorded within the FA involving 282 birds and during MWP surveys seven flights involving 524 birds were recorded within the FA, the majority of flights being in the far north or east of the FA in the Hollandmey and Scoolary areas.

Curlew

46. A maximum of two curlew (*Numenius arquata*) territories were recorded within 500 m of the proposed turbines.

47. During baseline GVP watches 45 curlew flights were recorded within the FA involving 56 birds and during MWP surveys four flights involving five birds were recorded within the FA, the majority of flights being in the far north and far east of the FA in the Hollandmey and Scoolary areas.

Dunlin

48. One dunlin flight involving 20 birds was recorded during GVP surveys and four dunlin flights involving 225 birds were recorded during MWP surveys, none of these flights passed within 500 m of the proposed turbines. There was no indication that dunlin was breeding within the study area and as no flights were recorded over the study area this species is not considered further in this Chapter.

Lapwing

49. A maximum of three lapwing (*Vanellus vanellus*) territories were recorded within the 500 m buffer of the proposed turbine locations. Lapwing is a species of **'Moderate'** conservation concern (due to its red-listed BoCC status). However, due to the low densities within the study area this species is not considered further in this Chapter.

Other Waders

50. A maximum of two oystercatcher (*Haematopus ostralegus*) and one ringed plover (*Charadrius hiaticula*) territories were recorded within the study area, snipe (*Gallinago gallinago*), woodcock (*Scolopax rusticola*) and jack snipe (*Lymnocyptes minimus*) were recorded during walkovers in the non-breeding season. Given the **'Low'** conservation importance of these species and the low densities they are found in within the study area they will not be considered further in this Chapter.

9.5.3.4 Skuas Great Skua

51. There was no evidence of breeding by great skua (*Stercorarius skua*) within 2 km of the Site.

52. During baseline GVP watches eight great skua flights were recorded within 500 m of the proposed turbines. Given the very low level of flight activity, and the fact that the area within and surrounding the proposed Development appears little used by great skua, this species of **'Low'** Nature Conservation Importance is not considered further in this Chapter.

Arctic Skua

53. There was no evidence of breeding by arctic skua (*Stercorarius parasiticus*) within 2 km of the Site.

54. During baseline GVP watches a single arctic skua flight was recorded within 500 m of the proposed turbines. Given the very low level of light activity, and the fact that the area within and surrounding the proposed Development appears little used by arctic skua, this species, despite its **'Moderate'** Nature Conservation Importance is not considered further in this Chapter.

9.5.3.5 Raptors Hen Harrier

55. There was no evidence of breeding by hen harrier within 2 km of the Site and the majority of birds using the area were recorded during the non-breeding period. Roosting birds (or birds exhibiting pre-roosting behaviour) were observed within the study area on six occasions during the non-breeding period.

56. During baseline GVP watches 17 flights by hen harrier were recorded passing within the FA. A total duration of 1,952 seconds of flight activity was recorded. Of this duration 959 seconds of flight was below 10 m in height, i.e. not at risk of collision. The remaining 993 seconds of flight were recorded at heights of between 10 m and 150 m.

Red Kite

57. There was no evidence of breeding by red kite (*Milvus milvus*) within 2 km of the Site.

58. During baseline GVP watches a single red kite flight was recorded within 500 m of the proposed turbine locations for a duration of 25 seconds. Given the very low level of light activity, and the fact that the area within and surrounding the proposed Development appears little used by red kite, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

Short-eared Owl

59. Short-eared owl was recorded on three occasions within the study area during the breeding season, however, there was no evidence of breeding by short-eared owl within 2 km of the Site and no flight activity was noted from GVPs.

60. Given that there was no flight activity recorded from GVPs, and the fact that the area within and surrounding the proposed Development appears little used by short-eared owl, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

Merlin

61. There was no evidence of breeding by merlin within 2 km of the Site.

62. During baseline GVP watches a single merlin flight was recorded within 500 m of the proposed turbines for a duration of 74 seconds. Given the very low level of flight activity, and the fact that the area within and surrounding the proposed Development appears little used by merlin, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

Peregrine

63. There was no evidence of breeding by peregrine within 2 km of the Site.
64. Peregrine was recorded on two occasions within the study area in the non-breeding period with no flight activity recorded from GVP watches. Given that there was no flight activity recorded from GVPs, and the fact that the area within and surrounding the proposed Development appears little used by short-eared owl, this species, despite its **'High'** Nature Conservation Importance is not considered further in this Chapter.

9.5.3.6 Other Species

65. A number of passerine species were recorded during the breeding and non-breeding seasons. In all cases, the numbers recorded were small relative to the likely regional populations. In addition, passerine species are not considered to be sensitive to the potential effects of developments incorporating wind turbines. Hence, effects on all passerine species are not considered further in this Chapter.
66. Other species recorded during the baseline survey period included grey heron, 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, or beyond the study area of the proposed Development, that effects on regional populations are considered implausible; hence, none are considered further in this Chapter.

9.5.4 Summary of Sensitive Receptors

9.5.4.1 Icelandic Greylag Goose

67. Icelandic greylag geese are large migratory geese which breed in Iceland and return to Scotland in September to overwinter. There is also a large resident native population which breed in Scotland. Therefore, assessing the abundance of the Iceland population during the non-breeding season is very difficult. The most recent census suggests an overwinter population of 5,478 birds for Icelandic greylag geese and of 1,000 birds for resident British greylag geese in Caithness (Brides *et al.*, 2020). They most commonly feed during the day in agricultural fields and roost on large waterbodies at night.
68. Icelandic greylag goose is a species of **'High'** Nature Conservation Importance due to being a qualifying feature of the Caithness Lochs SPA and Ramsar site, for the non-breeding population and Caithness and Sutherland Peatlands Ramsar site for the breeding population. The overwintering population for Caithness Lochs SPA and Ramsar was assessed as Favourable Maintained in 2015 and the breeding population of Caithness and Sutherland Peatlands Ramsar as Favourable Maintained in 2018.

9.5.4.2 Golden Plover

69. Golden plover is a medium sized wading bird which breed in northern latitudes, many moving north to Iceland and Greenland to breed from over-wintering areas. In Scotland they breed in open, upland areas in low densities (between April and July) and many move through and congregate in upland areas in migration periods (from September to November and March to April) and during the winter months.
70. Golden plover is listed on Annex 1 of the Birds Directive and is a qualifying interest of the Caithness and Sutherland Peatlands SPA and is therefore a species of **'High'** Nature Conservation Importance. The golden plover breeding population numbers a minimum of 1,474 breeding pairs in NHZ 2 (Wilson *et al.*, 2015). The condition of the SPA population was assessed as Favourable Recovered in 2015 and the SPA citation states the population was 1,064 pairs between 1993 and 1994.

9.5.4.3 Curlew

71. Curlews are large wading birds which breed in open, upland areas in low densities moving to coastal areas outside the breeding season (from July onwards, returning in March).
72. Curlew is a Red-listed Bird of Conservation Concern. Curlew is also listed on IUCN 'Red list – 'Near Threatened' (IUCN, 2019), and is therefore a species of **'Moderate'** Nature Conservation Importance. The curlew breeding population numbers a minimum of 3,233 breeding pairs in NHZ 2 (Wilson *et al.*, 2015). The Scottish population is considered to be in decline.

9.5.4.4 Hen Harrier

73. Hen harriers are medium-sized birds of prey that feed mainly on small birds and mammals. Nearly all hen harriers nest on the ground in dense vegetation, favouring stands of tall heather. Most birds breeding in Scotland are partial migrants, breeding in

the uplands and then wintering further south and west in more lowland and coastal areas. The numbers breeding in a given area can vary between years depending on vole abundance.

74. Hen harrier is listed on Annex 1 of the Birds Directive and Schedule 1 of the WCA and is a red-listed Bird of Conservation Concern. It is a qualifying interest of the Caithness and Sutherland Peatlands SPA and is therefore a species of **'High'** Nature Conservation Importance. The hen harrier population numbers a minimum of 105 breeding pairs in NHZ 2 (Wilson *et al.*, 2015). The condition of the SPA population was assessed as Favourable Maintained in 2016 and the SPA citation states the population was 14 pairs between 1993 and 1997.

9.6 Assessment of Effects

75. 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.

76. 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 9.6**). Consideration has been given to the criteria in **Table 9.2** when assigning the Nature Conservation Importance of potentially affected species.

Table 9.6: Nature Conservation Importance of Potentially Affected Species

Importance	Species
'High'	Greylag goose, golden plover, hen harrier
'Moderate'	Curlew
'Low'	All other species

9.6.2 Effects Scoped Out

77. 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 would be undertaken, its effects on bird populations would be minimal, in the context of historical land management within the Site and its surrounds. Therefore, bird populations would be unaffected by habitat modification.
 - Effects on the following bird populations: pink-footed goose, Greenland white-fronted goose, whooper swan, dunlin, lapwing, great skua, arctic skua, common crane, red kite, short-eared owl, merlin, peregrine 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 9.2**). 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 9.5.3**).
 - Effects on all bird species classified as **'Low'** Nature Conservation Importance.

9.6.2.1 Upgrading of Existing Road Network

78. Any upgrading of the existing road network (if required) would be limited in extent and located in areas of low ornithological value. Furthermore, due to works being temporary in nature there is no potential for significant effects on bird populations. Consequently, there is considered to be no potential for any adverse effect on regional populations of species of 'Medium' or 'High' Nature Conservation Importance as a result of the offsite highway works, including cumulative effects. Additionally, a Breeding Bird Protection Plan would be implemented to ensure any breeding birds are safeguarded, and if necessary, works would be undertaken outwith the breeding season to ensure no significant effects on ornithological receptors. Any construction effects would be short-term temporal magnitude and negligible spatial magnitude and not significant. No operational effects are predicted. Therefore, the effects of upgrading the existing road network are scoped out of the assessment and not considered further in this Chapter.

9.6.3 Protected Birds

79. The assessment has been undertaken under the assumption that a Bird Protection Plan (BPP), to be devised in consultation with NatureScot, would be in place prior to the onset of construction activities. The BPP will 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.

80. The BPP will 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 NatureScot for agreement before recommencing work.

9.6.4 Construction Effects

9.6.4.1 Habitat Loss

81. Full details of habitat loss are discussed in **Chapter 8: Ecology and Biodiversity**. In summary, habitat loss as a result of construction of the proposed Development would amount to up to 1157 ha which comprises blanket bog and modified bog. A further 24.107 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 9.6**). Further, the effect of this habitat loss is spatially 'Negligible' in relation to the home range requirements of all potentially affected species. Hence, there would 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.

9.6.4.2 Displacement

82. 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 array.

83. 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 birds 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.

84. Disturbance effects on breeding birds would be confined to areas in the locality of the turbine layout, solar array 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).

85. 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.

9.6.4.3 Icelandic Greylag Goose

86. Research on the responses of 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 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).

87. Similar analysis of pink-footed geese feeding on sugar beet in Norfolk showed that geese avoided areas with 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. 350 m) from buildings and roads (ca. 370 m) than unused fields (Smith et al., 1995). Therefore, 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.

88. Loch Heilen is located at a distance 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.

89. The proposed solar array is located adjacent to regularly used goose feeding fields. However, construction of this element of the proposed Development would take place during months when geese are not present, i.e. construction would take place between mid-April to mid-October.

90. Therefore, it is considered highly 'Unlikely' that roosting or feeding Icelandic greylag 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.

9.6.4.4 Golden Plover

91. Any breeding attempts by golden plover within the vicinity of proposed construction activities would be identified during pre-construction surveys detailed in the BPP for the proposed Development. The BPP will detail appropriate measures to avoid construction disturbance to the breeding attempt in compliance with legislation.

92. One golden plover territory was located approximately 250 m from the nearest proposed turbine location and so may be sufficiently close to planned construction activities that breeding could be disturbed in the 'Short-term'. Golden plover is a common and widespread breeder regionally and consequently there should be no spatial effect. Similarly, non-breeding (passage) records of this species were sufficiently low that construction should have no influence on the small numbers of migratory golden plovers that may rely on areas surrounding the proposed Development. Therefore, the 'Short-term' effect of construction disturbance to golden plover would not have a measurable effect on abundance, survival or productivity at the NHZ scale, and is deemed to be 'Not Significant' under the terms of the EIA Regulations.

9.6.4.5 Curlew

93. Any breeding attempts by curlew within the vicinity of proposed construction activities would be identified during pre-construction surveys detailed in the BPP for the proposed Development. The BPP will detail appropriate measures to avoid construction disturbance to the breeding attempt in compliance with legislation.

94. Two curlew territories were located with the closest being approximately 95 m from the nearest proposed turbine location and so may be sufficiently close to planned construction activities that breeding could be affected in the **'Short-term'** Curlew is a common and widespread breeder regionally and consequently there should be no spatial effect. Therefore, the **'Short-term'** effect of construction disturbance to curlew would not have a measurable effect on abundance, survival or productivity at the NHZ scale, and is deemed to be **'Not Significant'** under the terms of the EIA Regulations.

9.6.4.6 Hen Harrier - breeding

95. 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 proposed Development. The BPP will detail appropriate measures to avoid construction disturbance to the breeding attempt in compliance with legislation.

96. Evidence from a number of windfarms shows that hen harriers will nest close to construction activities. 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. 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 km² 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.

97. In summary, given that no nesting attempts were recorded during baseline surveys, with measures set out in the BPP coupled with the apparent tolerance of construction activities by nesting hen harriers, displacement from suitable nesting sites is **'Unlikely'** during construction. Construction activities may be **'Likely'** to 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, particularly as an abundance of suitable foraging habitat is found in this part of Caithness. Any **'Short-term'** negative effects on breeding success 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.

9.6.4.7 Hen Harrier – winter roosts

98. Two areas (**Technical Appendix 9.3; Confidential Figure 9.3.1**) were identified as having been used as winter roost sites by hen harrier during the winter 2018/19. No roost sites were identified during the winter 2019/20. The roost locations appear to be used sporadically, within years and between years, by a small number of birds: a maximum of two individuals seen on any one day.

99. If harriers were disturbed by construction activities from the roost area nearest the proposed Development there is other suitable habitat in the wider area which they currently use, further from the proposed Development. There are other known roost locations within a few kilometres of the Site. This illustrates the nearby habitat is suitable to provide alternative roost locations should the birds be disturbed during the construction period.

100. If construction activities displaced roosting hen harriers during the non-breeding season, this would occur for at most no more than two non-breeding seasons (dependent on the month which construction commenced). This temporally short-term negative effect would affect a small number of birds. These displaced birds would **'Likely'** remain in the wider area and be able to find other suitable roost locations, so any impact on their survival and productivity would be minimal.

101. In summary, at worst, **'Short-term'** displacement from roosting sites during construction for hen harrier would affect a very small proportion of the regional wintering population (low spatial magnitude) for at most two non-breeding seasons (short-term temporal magnitude). Construction effects on hen harrier are predicted to be at worst **'Negligible'** and **'Not Significant'** under the EIA regulations.

9.6.4.8 Proposed Mitigation

102. As all construction and decommissioning effects are deemed **'Not Significant'**, no additional mitigation is proposed. Measures set out in the BPP would ensure that disturbance to sites used by protected species is avoided.

9.6.4.9 Residual Construction and Decommissioning Effects

103. As no mitigation is proposed the residual effects of construction and decommissioning on all bird species are **'Negligible'** and **'Not Significant'** under the EIA Regulations.

9.6.5 Operational Effects

9.6.5.1 Displacement

104. The presence and operation of wind turbines and solar array 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; Hötter *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; Hötter *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.

105. 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). Due to the solar array being located within habitat that is intrinsically unsuitable for breeding and foraging species of Nature Conservation Importance any displacement effects caused by the solar array on all species are predicted to be **'Negligible'** and **'Not Significant'** under the EIA Regulations.

9.6.5.2 Icelandic Greylag Goose

106. Roosting Icelandic greylag geese would be at distances greater than 2 km from the nearest operational turbine. At this distance, any displacement effect is considered **'Unlikely'** on distance grounds alone. For example, 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 would probably be greater than when feeding, at the distances relevant to the proposed Development, no adverse effect is predicted.

107. Displacement of flights as birds commute between Loch Heilen and feeding fields, 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 do not show a clear regular flight path to and from Loch Heilen as flights are more randomly dispersed in the landscape. 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. Once constructed, the solar array would have an overall height of around 2.5 m – 3 m above ground level. As greylag geese fly between Loch Heilen and feeding fields no barrier effect is predicted.

108. Overall, the operation of the proposed Development is not predicted to affect the roosting behaviour of Icelandic greylag 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 and the solar array. Hence, the judgement of this assessment is that effects on the regional conservation status of Icelandic greylag 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.

9.6.5.3 Golden Plover

109. Adverse displacement effects on breeding golden plovers due to disturbance from wind turbines have been presented by Pearce-Higgins *et al.* (2009), but not confirmed by several more detailed site-specific studies (Powergen Renewables, 2002; Percival, 2005; Fielding & Haworth, 2010; Douglas *et al.*, 2011). Regardless of the potential dispute over whether windfarms have any potential adverse displacement effect on breeding golden plover through disturbance, in the context of the proposed Development and the known distribution of breeding golden plover in its vicinity, only one pair of breeding golden plover could be adversely influenced by the proposed Development through a displacement effect. Therefore, the loss of one pair of golden

plover due to operational disturbance would not have a measurable effect on abundance, survival or productivity at the NHZ scale, and is deemed to be **'Not Significant'** under the terms of the EIA Regulations.

9.6.5.4 Curlew

110. Studies of curlew disturbance at operating windfarms are contradictory in conclusion, with some reports of post-construction declines at some windfarm sites (e.g. Williams & Young 1997, Young 1999) but others noting that such declines are part of wider regional trends and that (for example) repowering of one site (Caton Moor Windfarm in Lancashire) resulted in curlews breeding closer to turbines than previously (Whitfield *et al.*, 2010). Studies across several sites have either concluded that displacement effects are minimal or non-existent (Hötter *et al.*, 2006; Thomas, 1999) or that some displacement can occur up to 800 m from turbines, with around 40% reduction in density at 600 m from turbines (Pearce-Higgins *et al.*, 2009). The 800 m value seems somewhat excessive based on what would be expected from estimates of disturbance distances in other species reacting to the greater potential effect of direct human disturbance (cf. an operating turbine) (Whitfield *et al.*, 2008) and may be a consequence of not employing a Before-After-Control-Impact study protocol. On balance, it seems most **'Likely'** that breeding curlews are not adversely affected by operational windfarms through displacement (Whitfield *et al.*, 2010).

111. Nevertheless, even accepting the highly precautionary possibility that curlews could be displaced within 600 m of an operational turbine, only two pairs of curlews may potentially be displaced due to the operation of the proposed Development. A more **'Likely'** scenario is that no pairs of curlews would be displaced by the operational Development. Hence, the judgement of this assessment is that effects on the regional conservation status of curlew, a species of **'Moderate'** Nature Conservation Importance, as a result of the operation of the proposed Development would be **'Negligible'** and **'Not Significant'** under the EIA Regulations.

9.6.5.5 Hen Harrier - Breeding

112. 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 (Haworth & Fielding, in prep). Even if the probability of nesting in the immediate vicinity of turbines was reduced due to displacement, and this is considered **'Unlikely'** based on the results of baseline surveys in and around the Site, the availability of ample potentially suitable nesting habitat means there is little prospect of the proposed Development preventing nesting.

113. 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).

114. 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 NHZ 2.

115. 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.

9.6.5.6 Hen Harrier – Winter Roosts

116. The wintering population of harriers in NHZ 2 is unknown. It likely consists of some birds originating from the region supplemented by birds from several other regions. It is also likely that the population is not stable within a single winter, because as revealed by recent satellite telemetry wintering birds are mobile and may not settle for many months in any single locale. In this respect they would be similar to other raptors during dispersal, such as the golden eagle. Consequently, during a winter, harriers may utilise roosts and foraging habitats across several locales or even several regions. Due to this mobility, winter roost counts, even if coordinated across a region, would probably not give an accurate or precise estimate of the number of wintering birds, because birds may move between roosts within a region and between regions. Such movement is evident from the variation in use/non-use of the roost sites in question.

117. The 'importance' of any roost site is therefore difficult to judge by comparing a count at that roost against a set 'wintering population estimate', although at least some idea of numbers is of course useful, may be indicative and provides context. A roost site's importance is better judged by the frequency and level of use, which has been established through the survey and results presented in **Technical Appendix 9.1**. In a system where birds are free to move between roosts and those roosts are not defended, then birds will congregate and stay at a roost when it is consistently of higher quality. Clearly such a consistent congregation is not a feature of the roost sites in the vicinity of the proposal.

118. Therefore, operation of the proposed Development would possibly displace some roosting hen harriers from immediate adjacent areas. However, the effects of this permanent loss in suitable roosting habitat would **'Likely'** be compensated by birds exploiting suitable habitats elsewhere in their over-wintering range. Any permanent negative effects are at worst sufficient to affect a small proportion of the regional population (low spatial magnitude) but more likely will only affect the larger over-wintering regional population and hence the regional population and its conservation status would be unaffected (negligible spatial magnitude). As such, despite the **'High'** Nature Conservation Importance of the species operational displacement effects on hen harriers are predicted to be **'Negligible'** and **'Not Significant'** under the EIA Regulations.

9.6.5.7 Proposed Mitigation

119. As all operational displacement effects are deemed 'Not Significant', no additional mitigation is proposed.

9.6.5.8 Collision Risk

120. Birds that are not displaced would be potentially vulnerable to collision with 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.

121. Flight activity by Icelandic greylag goose, golden plover, curlew 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 (see **Technical Appendix 9.2**).

122. Photovoltaic solar panels are designed to absorb as much light as possible (including moonlight) and are coated with an anti-reflective film for this reason. In addition, the grid-like panel design means reflection is fragmented, a principle applied to windows to reduce collision events (Sheppard & Phillips, 2015). Furthermore, the solar panels would be spaced between 5 m and 7 m apart between rows further fragmenting the limited reflected light. Therefore, for all species no effects due to light (e.g. glare or light on moonlit nights) or collision with the solar array are predicted.

9.6.5.9 Icelandic Greylag Goose

123. On the basis of applying an accepted avoidance rate of 99.8% for greylag goose, this equates to 0.75 birds potentially colliding with a turbine every year the proposed Development is operational.

124. The wintering population numbers 5,478 individuals in NHZ 2 (Brides *et al.*, 2020). The potential loss of one greylag goose every 1.3 years is of **'Negligible'** spatial magnitude for the NHZ 2 population. Therefore, effects from collision mortality are predicted to be of **'Negligible'** significance at the scale of the NHZ and **'Not Significant'** under the EIA Regulations.

9.6.5.10 Golden Plover

125. On the basis of applying a highly precautionary avoidance rate of 98% for golden plover, this equates to 1.12 birds colliding with a turbine every year the proposed Development is operational.

126. The breeding population numbers a minimum of 1,474 breeding pairs in NHZ 2 (Wilson *et al.*, 2015). The potential loss of one golden plover every year is of **'Negligible'** spatial magnitude for the NHZ 2 population. Therefore, effects from collision mortality are predicted to be of **'Negligible'** significance at the scale of the NHZ and **'Not Significant'** under the EIA Regulations.

9.6.5.11 Curlew

127. On the basis of applying a highly precautionary avoidance rate of 98% for curlew, this equates to 0.18 birds colliding with a turbine every year the proposed Development is operational.

128. The breeding population numbers a minimum of 3,233 breeding pairs in NHZ 2 (Wilson *et al.*, 2015). The potential loss of one curlew every 5.7 years is of **'Negligible'** spatial magnitude for the NHZ 2 population. Therefore, effects from collision mortality are predicted to be of **'Negligible'** significance at the scale of the NHZ and **'Not Significant'** under the EIA Regulations.

9.6.5.12 Hen Harrier

129. On the basis of applying an accepted avoidance rate of 99 % for hen harrier, this equates to 0.0025 birds colliding with a turbine every year the proposed Development is operational.

130. The breeding population numbers a minimum of 105 breeding pairs in NHZ 2 (Wilson *et al.*, 2015). The potential loss of one hen harrier every 40.8 years is of **'Negligible'** spatial magnitude for the NHZ 2 population. Therefore, effects from collision mortality are predicted to be of **'Negligible'** significance at the scale of the NHZ and **'Not Significant'** under the EIA Regulations.

9.6.5.13 Proposed Mitigation

As all collision risk effects are deemed **'Not Significant'**, no additional mitigation is proposed.

9.6.5.14 Residual Operational Effects

131. As no mitigation is proposed for displacement or collision risk the residual operational effects on all bird species are **'Negligible'** and **'Not Significant'** under the EIA Regulations.

9.6.6 Cumulative Effects

132. The EIA Regulations require the cumulative effects of the proposed Development with other relevant projects or plans to be assessed. NatureScot guidance (SNH, 2018) on assessing cumulative effects on birds has been followed. In considering cumulative effects, it is necessary to identify any effects that are **'Minor'** (or greater) in isolation (**Table 9.5**) but that may be **'Major'** cumulatively.

133. 'Target' species were taken to be those species of **'High'** Nature Conservation Importance (**Tables 9.2** and **9.6**) 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 9.5**). 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.

134. In conclusion, for all bird species, the cumulative effects of the proposed Development in-combination with other projects in NHZ 2 are **'Likely'** to be **'Negligible'** and deemed to be **'Not Significant'** under the terms of the EIA Regulations.

9.6.6.1 Proposed Mitigation

135. As all cumulative effects are deemed to be **'Not Significant'**, no mitigation is proposed.

9.6.6.2 Residual Cumulative Effects

136. As no mitigation is proposed the residual cumulative effects on all bird species are **'Negligible'** and **'Not Significant'** under the EIA Regulations.

9.6.7 Enhancement Measures

137. Although not provided as a mitigation measure for ornithology, the Habitat Management Plan (HMP), details of which are provided in **Technical Appendix 8.6: Draft Habitat Management Plan**, would have additional benefits for many bird species. The change from a monoculture coniferous plantation woodland to a more natural peatland bog system will enhance the area for notable scarce breeding bird species such as hen harrier, curlew and golden plover; as well as improving conditions for wintering hen harrier and geese. The objectives for the HMP will effectively create new opportunities for a wider range of avian species of conservation interest.

138. It is important that these additional benefits are acknowledged, as the change from forestry to bog habitat, and the restoration of peatland, would, over time, have benefits in terms of general biodiversity. The diversity of flora and fauna would improve, and the area is likely to become ecologically richer.

9.7 Summary and Statement of Effects

139. 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 could be affected (directly or indirectly) by the construction and operation of the proposed Development are explained, and an assessment is made with regards to the significance of these effects.

140. 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.

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

142. 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 Site, small numbers, low levels of activity and the nature and location of this activity.

143. Four bird species were included in the assessment: greylag goose, hen harrier, golden plover and curlew. Greylag goose, hen harrier and golden plover were considered to be of **'High'** Nature Conservation Importance either as being listed on Schedule 1 (Wildlife and Countryside Act 1981, as amended by the Nature Conservation (Scotland) Act 2004), Annex I of the Birds Directive or as a Qualifying Interest of the Caithness and Sutherland Peatlands SPA, Caithness Lochs SPA or East Caithness Cliffs SPA. Curlew was considered to be of moderate Nature Conservation Importance due to its inclusion as a species on the Birds of Conservation Concern (BOCC) 'Red' list and the IUCN 'Red list' as 'Near Threatened'.

144. **Table 9.7** below summarises the predicted effects of the proposed Development on ornithological interests.

Table 9.7: Summary of Effects

	Predicted effect	Significance	Proposed mitigation	Residual effect
Construction				
All species	Land-take	'Negligible'	None	'Negligible'
	Disturbance	'Negligible' *	None	'Negligible'
Operation				
All 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 would be in place.				

145. The likely effects of the proposed Development were evaluated in accordance with the methods and the significance of each potential effect described in **Section 9.4**.

146. 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 Special Protection Areas (SPAs)

9.8.1 The Need for and Form of an Assessment

147. Whilst the Habitats Regulations provides that an assessment of the possible effects of a proposed Development on an 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.
148. 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 WCA 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).
149. 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)."*
150. 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.
151. 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?
152. 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 would 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 would not adversely affect site integrity. That is, when there is no reasonable scientific doubt as to the absence of such effects.

¹ Environmental Impact Assessment (EIA) use some of the same terms as appear in Habitats Regulation Appraisals but the tests are very different. The outcome of determining likely significant effect is the trigger for whether an appropriate assessment is required.

153. With respect to the proposed Development, which does not lie within the boundary of an 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 an SPA. 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, since the SPA's qualifying interests may use the proposed Development (or the airspace above the proposed Development) due to the distance between the proposed Development and the SPAs, in the context of the ranging behaviours of at least some species for which the SPAs are classified.
154. The SPA'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 European Commission 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.
155. 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 interest¹. 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 onsite integrity under detailed scientific scrutiny, utilising evidence gathered from the Site, and with explicit reference to the relevant conservation objectives of the SPAs.
- ### 9.8.2 Caithness Lochs SPA
- #### 9.8.2.1 Qualifying Interests
156. A first stage is to establish the nature of the qualifying interests of the Caithness Lochs SPA, as this determines the scope of the assessment.
157. The Caithness Lochs SPA qualifies under Article 4 (1) of the EU Birds Directive as it regularly supports, in winter, internationally important numbers of Annex 1 species whooper swan and Greenland white-fronted goose. The site also qualifies under Article 4 (2) by supporting an internationally important wintering population of greylag goose. It was classified as an SPA in 1999.
158. The most recent site condition monitoring (2015 for whooper swan and greylag goose, 2016 for Greenland white-fronted goose) suggests that the SPA populations are considered as Favourable Maintained for whooper swan and greylag goose, and Favourable Declining for Greenland white-fronted goose.
159. All three qualifying species are only present during the winter months as they migrate away to breed, with them being present between October and April (Forrester *et al.*, 2007).
160. Core foraging ranges from SPAs for whooper swan is less than 5 km, Greenland white-fronted goose is 5-8 km and for greylag goose is 15-20 km (SNH, 2016). Therefore, as the Site is approximately 1.5 km from the nearest component loch of the

Caithness Lochs SPA whooper swan, Greenland white-fronted goose and greylag goose could, therefore potentially forage within the vicinity of the proposed Development.

161. Although it is possible that birds recorded during the winter in and around the site were not part of the Caithness Lochs SPA interests, to ensure a robust assessment and provide a thorough exposition of all information to the competent authority (Scottish Ministers) it is assumed that all non-breeding season records involved the SPA interests.

9.8.2.2 Consideration of Effects on the Caithness Lochs SPA

162. On examination of the steps outlined above it is apparent that given the information presented in this Chapter and in **Technical Appendix 9.1** and **Technical Appendix 9.2**, that greylag goose is the only qualifying species of the Caithness Lochs SPA with sufficient use of the proposed Development to warrant further consideration. Furthermore, disturbance during the construction period and collision mortality during operation are the only potentially adverse effects which could result from the proposed Development. Under either Step 2 or Step 3, construction disturbance is relevant to conservation objective 1 (*“ensure for the qualifying species no significant disturbance to the species”*) and collision mortality is relevant to conservation objective 5 (*“ensure for the qualifying species that the population of the species is maintained as a viable component of the site”*). Were these effects of a large enough magnitude, either through disturbance 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 are therefore not relevant for consideration of any potentially adverse effect on the qualifying interest for the Caithness Lochs SPA as a consequence of the proposed Development, since the proposed Development will not potentially compromise these objectives.

163. On this basis, the information presented subsequently first considers the potential effect of disturbance as result of the construction and 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.

164. The construction and operation of the proposed Development would not be directly connected with or necessary for the conservation management of the Caithness Lochs SPA therefore the next step needs to be considered.

165. Due to the proposed Development’s proximity to Loch Heilen and Loch of Mey, which are used by greylag goose, and the potential for collision mortality to greylag goose during operation it is considered that there is a likelihood of significant effects. Non-breeding greylag goose use both Loch Heilen and Loch of Mey with up to 54 recorded on Loch Heilen and up to 200 using Loch of Mey. Patterson *et al.* (2012) found a peak of 621 greylag geese roosting at Loch Heilen and a peak of 260 roosting at Loch of Mey in the winter of 2011/2012. Through potential ‘connectivity’ under Step 2 it is thus conceivable that the proposed Development could have a significant effect on the SPA (under a potential effect of disturbance during the construction period under conservation objective 1).

166. However, as all of the infrastructure for the proposed Development is beyond 2 km from Loch Stemster and Loch of Mey, any potential for disturbance would be avoided.

167. The maximum number of greylag geese seen using the Loch Heilen was 54 and using Loch of Mey was 200 from a population estimated as 5,478 in 2019 (Brides *et al.*, 2020). Therefore, potential short-term disturbance during the construction of the proposed Development on this small part of the population would be low at worst and therefore would not have a significant effect on the maintenance of the population of this qualifying species of the Caithness Lochs SPA.

168. Therefore, conservation objective 1 (*“Ensure for the qualifying species no significant disturbance of the species”*) would not be compromised for greylag goose.

169. Non-breeding greylag goose was recorded flying over the Site in small numbers. Through potential ‘connectivity’ under Step 2 it is thus conceivable that the proposed Development could have a significant effect on the SPA (under a potential effect of collision mortality under conservation objective 5). Therefore, to provide information relating to Step 3 a collision risk model was run and the results are presented in **Technical Appendix 9.2**.

170. Flight activity data on greylag goose was collected during two non-breeding seasons (2018/19 and 2019/20) for the Site and its surrounds during GVP watches and during MWP watches (refer to **Technical Appendix 9.1** and **Technical Appendix 9.2** for details).

171. The Predictable Flight Method (PFM) of the Collision Risk Model (CRM) (Band *et al.*, 2007) was used to estimate predicted collision mortality for greylag goose during the non-breeding season. Parameters and values in the modelling process are shown in **Technical Appendix 9.2**.

172. The predicted estimate of collision mortality for overwintering greylag goose according to the precautionary run of the Band CRM was 0.75 strikes per year (**Technical Appendix 9.2**).

173. The modelled mortality would be barely detectable at a regional, SPA and SPA component level. Whilst there is an absence of knowledge of numbers of the SPA interest that are shot each year, 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 SPA and that the conservation objective of maintaining the greylag goose population as a viable component of the site would not be compromised by the proposed Development.

174. Therefore, conservation objective 5 (*“Ensure for the qualifying species that the population of the species is maintained as a viable component of the site”*) will not be compromised for greylag goose.

175. 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.

9.8.2.3 Summary

176. It is reasonable to conclude that the construction and operation of the proposed Development in isolation would not have an adverse effect on the integrity of the Caithness Lochs SPA in view of that site’s conservation objectives.

9.8.2.4 In Combination Effects

177. 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.

178. However, as noted above, there is no prospect of significant disturbance effects upon the greylag goose population and collision mortality is so low it would not be detectable against a background of natural mortality and shooting pressure. 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.

9.8.2.5 Conclusion

In conclusion, none of the SPA’s conservation objectives would be compromised by the proposed Development alone, or in combination with other plans or projects, and the Hollandmey Renewable Energy Development would, therefore, not affect the integrity of the SPA.

9.8.3 Caithness and Sutherland Peatlands SPA

9.8.3.1 Qualifying Interests

179. The Caithness and Sutherland Peatlands SPA qualifies under Article 4 (1) of the EC Birds Directive as it regularly supports, internationally important breeding populations of Annex 1 species: red-throated diver, black-throated diver, hen harrier, golden eagle, merlin, golden plover, wood sandpiper, short-eared owl and dunlin. The site also qualifies under Article 4 (2) by supporting an internationally important breeding population of common scoter, greenshank and wigeon. It was classified as an SPA in 1999.

180. The most recent site condition monitoring suggests that the SPA populations are considered as Favourable Maintained for red-throated diver (condition assessed in 2006), black-throated diver (2018), hen harrier (2016), golden eagle (2016), merlin (2004), wood sandpiper (2004), dunlin (2015), greenshank (2015) and wigeon (2018); Favourable Recovered for golden plover (2015); Unfavourable Declining for common scoter (2013) and not assessed for short-eared owl.

181. Hen harrier, golden eagle and merlin are present all year round whilst the other species are present in the spring and summer months (between March/April and July /August) as they move away after breeding (Forrester et al., 2007).

182. Core foraging ranges from SPAs are for:

- red-throated diver (less than 8 km);
- black-throated diver (less than 10 km);
- hen harrier (2 km);
- golden eagle (6 km);
- merlin (5 km);
- short-eared owl (2 km);
- dunlin (500 m);
- greenshank (2 km);
- golden plover (3 km); and,
- common scoter, wood sandpiper and wigeon have no detail on core ranges (SNH, 2016).

183. Therefore, as the proposed Development is immediately adjacent to the nearest component of the Caithness and Sutherland Peatlands SPA, qualifying species could potentially forage within the vicinity of the Site.

184. Although it is possible that birds recorded during surveys in and around the Site were not part of the Caithness and Sutherland Peatlands SPA interests, to ensure a robust assessment and provide a thorough exposition of all information to the competent authority it is assumed that all records involved the SPA interests.

9.8.3.2 Consideration of Effects on the Caithness and Sutherland Peatlands SPA

185. It is apparent that given the information presented in this Chapter and in **Technical Appendix 9.1** and **Technical Appendix 9.2** that hen harrier and golden plover are the only qualifying species of the Caithness and Sutherland Peatlands SPA with sufficient use of the proposed Development to warrant further consideration.

186. The Caithness and Sutherland Peatlands SPA population of golden plover is very large (1,064 pairs in 1994, with a Natural Heritage Zone (NHZ) 2 population assessed at 1,474 pairs in 2009 (Wilson *et al.*, 2015) and the Caithness and Sutherland Peatlands SPA population's condition was assessed as Favourable Recovering in 2015. During one of the survey years, one golden plover territory was located within the survey buffers of the proposed Development, whilst none were present in the second year of survey. As there appears to be only intermittent use of the proposed Development during the breeding season by a very small number of golden plover which may form part of the Caithness and Sutherland Peatlands SPA populations, there is no possibility that any of the conservation objectives would be compromised for this qualifying species due to the proposed Development.

187. The SPA population of hen harrier was cited as 14 pairs in 1997, with 105 pairs in NHZ 2 in 2011 (Wilson *et al.*, 2015), this species was noted as Favourable Maintaining in the latest condition assessment for the Caithness and Sutherland Peatlands SPA.

188. Disturbance during the construction and operation period and collision mortality during operation are the potentially adverse effects which could result from the proposed Development.

189. There is no possibility that breeding hen harrier would be disturbed due to construction activities because no nesting attempts were recorded within 2 km of the proposed Development.

190. Disturbance of foraging hen harrier during the construction period is possible as this species was recorded foraging within the survey buffers of the proposed Development. However, as the construction period would be short-term (two years) and the area of the proposed Development which might comprise part of the core foraging ranges of these species is small, when compared to the SPA area (1453.71 km²), there is no possibility that the long-term maintenance of the qualifying species would be compromised.

191. The foraging range of hen harrier may be occupied by the proposed Development, and they may show some localised avoidance of around 100 m – 200 m from the operating turbines. However, this species is known to forage within 500 m of operating turbines. In addition, the area of the 500 m buffer around the proposed turbine locations is 6.51 km², none of which

overlaps the Caithness and Sutherland Peatlands SPA (which has an area of over 1,453 km²) (**Figure 9.4**). Therefore, operational disturbance would not have any discernible long-term impact on the conservation objective 1 (“ensure for the qualifying species no significant disturbance to the species”) of the Caithness and Sutherland Peatlands SPA. This conclusion also follows for conservation objective 4 (“ensure for the qualifying species that distribution of the species within the site is maintained in the long-term”) and objective 5 (“ensure for the qualifying species that the population of the species is maintained as a viable component of the site”).

192. The other two conservation objectives are 2 “ensure the structure, function and supporting processes of habitats supporting the qualifying species are maintained in the long-term” and 3 “ensure the distribution and extents of habitats supporting the qualifying species are maintained in the long-term” are not relevant for consideration of any potentially adverse effect on the qualifying interest for the Caithness and Sutherland Peatlands SPA as a consequence of the proposed Development, since the proposed Development is beyond the boundary of the Caithness and Sutherland Peatlands SPA and would have no or *de minimus* effect on the habitats and supporting processes so would not potentially compromise these objectives.

193. The data from flight activity surveys over the proposed Development indicate there could be potential for collision mortality during operation of the proposed turbines for hen harrier. Therefore, to provide information to inform the assessment, collision modelling was completed for this qualifying species.

194. Flight activity data was collected over two years (between April 2018 and March 2020) for the proposed Development and its surroundings during generic VP watches (refer to **Technical Appendix 9.1** and **Technical Appendix 9.2** for details). Total observation effort during this period amounted to 288 hours (144 hours during the non-breeding period and 144 hours in the breeding period).

195. The Unpredictable Flight Method (UFM) of the Collision Risk Model (CRM) (Band et al., 2007) was used to estimate predicted collision mortality for hen harrier during each year. Parameters and values in the modelling process are shown in **Technical Appendix 9.2**.

196. The predicted estimate of collision mortality for hen harrier according to the precautionary run of the Band CRM was 0.025 birds colliding per year (1 bird every 40.8 years), (**Technical Appendix 9.2**).

197. Hen harrier productivity in Caithness (where 2 pairs with home ranges were monitored during 2019) was 2.0 juveniles fledged per successful pair and for the whole of Highland Region in 2019 productivity was 2.6 fledged from 12 successful nests (Challis *et al.*, 2020).

198. Haworth & Fielding (2012) 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. Hence, according to this model, complete failure in approximately 8 nests would be required to cause the population trajectory to go into decline. As the collision risk is far less than one bird per year it seems highly unlikely that operational collision for hen harriers would have any discernible long-term effect on the conservation objectives of the Caithness and Sutherland Peatlands SPA.

9.8.3.3 Summary

199. It is reasonable to conclude that the construction and operation of the proposed Development in isolation would not have an adverse effect on the integrity of the Caithness and Sutherland Peatlands SPA in view of that site's conservation objectives.

9.8.3.4 In Combination Effects

200. 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.

201. However, as noted above, there is no prospect of significant disturbance effects upon the golden plover and hen harrier populations. Collision risk to hen harrier is so low (1 bird every 40.8 years) it would be impossible to separate the effects of collision mortality from environmental and demographic processes that are subject to stochastic variability. 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.

9.8.3.5 Conclusion

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

9.9 References

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