

Chapter 9 Ornithology

Introduction

9.1 This chapter considers the likely effects of the proposed Glenmuckloch to Glenglass Reinforcement Project (hereafter referred to as the 'GGRP') on ornithological interests. It details the methods used to establish the existing ornithological interests within the study area, together with the process used to determine the Nature Conservation Importance (NCI) of the bird populations present. It explains the ways in which ornithological interests may be affected by the GGRP and assesses the likely effects and their significance.

9.2 The assessment reported in this chapter is based on the description of the GGRP as detailed in **Chapter 4: Project Description** and complements the assessment of Ecological effects discussed in **Chapter 8: Ecology**. Planning policies of relevance to this assessment are discussed in **Chapter 5: Planning Policy Context**.

9.3 Additionally, this chapter sets out information to allow the Scottish Ministers to undertake an appropriate assessment of the effects of the GGRP on the Muirkirk and North Lowther Special Protection Area (SPA) under the Conservation of Habitats and Species Regulations 2017 ('the Habitats Regulations').

9.4 The assessment reported in this chapter was undertaken by Natural Research (Projects) Limited.

Scope of the Assessment

9.5 In line with NatureScot guidance (SNH, 2018)¹ the potential for significant effects has been assessed for species which are considered to be of high or moderate NCI (see **Table 9.3**) and for which a population is known to be present, or is potentially present, in the vicinity of the GGRP, and thus could potentially be affected.

9.6 On the basis of the desk based and field survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects, policy guidance and standards, and feedback received from consultees, certain potential effects have been 'scoped in' / 'scoped out' of the detailed assessment reported in this chapter. **Table 9.1** summarises the potential effects which have been 'scoped in' and 'scoped out' of the detailed assessment reported in this chapter, with further details provided below.

Table 9.1: Effects Scoped In and Scoped Out of the detailed assessment reported in this chapter

Potential Effects Scoped In to Detailed Assessment	Potential Effects Scoped Out of Detailed Assessment
<ul style="list-style-type: none"> Short-term/temporary construction effects of reduction in breeding or wintering bird populations due to construction disturbance as a result of displacement from suitable foraging habitats (peregrine, barn owl, black grouse, curlew, lapwing). Long-term/permanent operational effects of reduction in breeding or wintering bird populations due to collision mortality (peregrine, black grouse, curlew). Cumulative effects (construction and operational) of the likely residual effects which are assessed as minor significance or above, and therefore may be increased cumulatively with other developments in the relevant study area. 	<ul style="list-style-type: none"> Effects arising from habitat loss and/or modification during construction and operation of the GGRP. Long-term operational effects arising from disturbance and/or displacement from critical habitats for feeding, breeding, wintering or roosting during construction and operation of the GGRP. Effects arising from electrocution during operation of the GGRP. Effects arising due to the GGRP acting as a barrier to movement during operation. Effects arising from maintenance of the GGRP during operation. Effects arising from the construction and operation of the Glenmuckloch Substation. Effects on the qualifying interests of the Muirkirk and North Lowther Uplands SPA (breeding short-eared owl, merlin,

¹ SNH. (2018). Guidance: Assessing significance of impacts from onshore wind farms outwith designated areas. SNH Battleby, UK.

Potential Effects Scoped In to Detailed Assessment	Potential Effects Scoped Out of Detailed Assessment
	<p>peregrine and golden plover and breeding and non-breeding hen harrier) due to loss of foraging habitat and collision risk.</p> <ul style="list-style-type: none"> Effects on the notified features of the Muirkirk Uplands SSSI and North Lowther Uplands SSSI due to loss of foraging habitat and collision risk. Effects on all bird populations of species of high and moderate NCI other than peregrine, barn owl, black grouse, curlew and lapwing. Effects on all species considered to be of low Nature Conservation Importance.

Potential Effects Scoped In

Disturbance and Displacement from Foraging Habitats

9.7 Disturbance of breeding attempts, disturbance of winter roosts, and displacement of foraging birds from suitable habitats may occur as a result of construction of GGRP. Indirect habitat loss is most likely to be caused by displacement of breeding birds through temporary disturbance by activity associated with people and machines in the vicinity of the GGRP during construction. The potential for displacement from suitable foraging habitats resulting in short-term/temporary reduction in breeding or wintering bird populations of peregrine, barn owl, black grouse, curlew and lapwing during construction of GGRP is considered further in the assessment reported in this chapter.

Collision Mortality

9.8 The potential risk of collision is greatest in situations where particular factors exist or combine to create the risk, such as: migratory flyways; situations where large numbers of birds fly in times of poor visibility or at night; and areas where a food resource is exceptional and hence bird activity levels are elevated.

9.9 There is a potential risk of collision with the conductors and earth wire. The risk of collision is considered to be dependent on a number of factors including the amount of flight activity over the OHL and bird species behaviour. In addition, the risk is considered to vary between species depending on the ability of birds to detect and manoeuvre around the conductors and earth wires. Finally, the position of the OHL in the landscape and habitats, and the configuration of the lines will also affect the risk of collision by birds. For the purposes of the assessment reported in this chapter, birds that collide are assumed to be killed or fatally injured. Collisions with the OHL may occur within a risk window which encompasses the heights of the conductors and earth wires of the OHL. Within this risk window, the actual risk of collision is far smaller than the defined risk window due to the conductors and earth wire only physically occupying a very small proportion of the total area in the risk window. Birds can fly unharmed between the conductors within the risk window.

9.10 The potential for collision mortality of peregrine, barn owl, black grouse, curlew and lapwing during operation of GGRP is considered further in the assessment reported in this chapter.

Cumulative effects

9.11 The potential for cumulative effects (construction or operational) of the likely effects which are assessed as minor significance or above, and therefore may be increased cumulatively with other developments in the relevant study area, is considered further in the assessment reported in this chapter.

Potential Effects Scoped Out

Loss of Habitat and Habitat Modification

9.12 Direct loss of critical habitats due to the land-take for infrastructure (steel towers, access tracks, underground cables, wayleave corridor and ancillary structures); and habitat modification due to changes in land management (including forestry felling for the wayleave and windthrow areas) and hydrology may occur. This may be temporary during the construction phase and long-term during the operation phase.

9.13 The extent of the effect of direct loss of habitat depends on the territory and range size of the species and the availability, and ability of the species to make use of alternative habitat within that territory or range.

9.14 Birds would also be affected by the restructuring of forest habitats. Forest restructuring would favour species which prefer forest edges such as warblers and flycatchers and open ground such as meadow pipits and skylarks, however this may negatively affect some woodland specialist species including woodpeckers and crossbills.

9.15 Both temporary and permanent habitat loss are predicted as a result of the GGRP. Permanent loss would occur from the construction of new permanent access tracks and within the footprint of new steel lattice towers, as well as ancillary infrastructure. Temporary, short-term habitat loss would occur at tower bases and from the construction of new temporary access tracks that would be reinstated after construction. Habitat loss or modification is considered to result in a low magnitude, short-term, temporary reversible impact on passerines, raptors, wildfowl, waders and black grouse in all locations other than the footprint of towers, and ancillary infrastructure including new permanent access tracks. Given the small areas of habitat affected when considered with the ranges of all these species the effect of habitat loss on these groups is assessed to be negligible and not significant. Hence, effects of the habitat loss due to the construction and operation of the GGRP is not considered further in the assessment reported in this chapter.

Disturbance and displacement from critical feeding, breeding, wintering or roosting habitats

9.16 There is a potential for destruction or damage of nests if site clearance and construction activities occur within the breeding season (typically April to August for most species). However, as all bird nests are protected under the Wildlife and Countryside Act 1981, any destruction would be an offence. Similarly, under Schedule 1A of the Wildlife and Countryside Act 1981 it is an offence to disturb certain roosting birds.

9.17 The extent to which disturbance and displacement may occur and the implications for birds are likely to vary depending on the behavioural sensitivity of the species to human disturbance, the nature of the construction activity and the intervening topography which may influence the avoidance distance a species adopts. 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 may feed less efficiently and thereby breed or over-winter less successfully. These impacts may lead to a short-term reduction in the productivity of bird populations. Disturbance effects on birds will be confined to areas in the locality of construction of the proposed steel towers and associated ancillary 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 (e.g. geese) tend to be more susceptible to disturbance than small birds living in structurally complex or closed habitats (e.g. woodlands) (Hill *et al.*, 1997)².

9.18 Should construction of the GGRP occur during the breeding season then a Bird Protection Plan (BPP) would be enforced. A BPP would detail protocols for the prevention, or minimisation, of disturbance to birds as a result of activities associated with the construction of the GGRP and would be overseen by the Ecological Clerk of Works (ECoW) (see Embedded Protection Measures). As such, through a combination of timing of works and implementation of a BPP, disturbance during construction to breeding and roosting birds is considered to result in a low magnitude, short-term, reversible impact on passerines, raptors, wildfowl, waders and black grouse in all locations. Therefore, the effect of disturbance on these groups is assessed to be negligible and not significant. Hence, disturbance due to the construction of the GGRP is not considered further in the assessment reported in this chapter.

9.19 Relatively little published information is available on the displacement of birds by OHLs. A study of the impact of wind farm infrastructure on birds in the UK looked at the avoidance of turbines, tracks and transmission lines for a sample of upland species including raptors, waders and passerines (Pearce-Higgins *et al.*, 2009)³. Compared with wind turbines, birds showed a smaller degree of avoidance of tracks and no consistent avoidance of transmission lines. Altemüller & Reich (1997)⁴ also studied the influence of high-tension power lines on breeding birds and found no evidence that the presence of the power line had any effect on breeding lapwing and Eurasian curlew. Transmission lines may have some limited effects in reducing the density of breeding birds or limiting the use of areas close to OHLs by foraging birds such as wintering geese. However, no studies have been found that suggest wide scale impacts from displacement effects that might affect any species at a population scale. At worst, long-term displacement from foraging areas during operation would affect a very small proportion of regional populations (low spatial magnitude). Displacement effects on all species are predicted to be at worst negligible and not significant. Hence, displacement due to the operation of the GGRP is not considered further in the assessment reported in this chapter.

Electrocution Mortality

9.20 A large amount of research on the risk of electrocution to birds has been undertaken and it has been understood within the industry for many years how to design poles / towers which minimise or remove the risk of electrocution (e.g., APLIC, 2006⁵; Ferrer, 2012⁶). In general, electrocution of birds can occur on structures with phase conductors separated by less than the wrist-to-wrist or head-to-foot (flesh-to-flesh) distances of a bird; distance between earthed hardware and energised phase conductors that is less than the flesh-to-flesh distance of a bird. The recommended minimum horizontal distance is stated as 1.5m for the wrist-to-wrist measurement of a bird and 1m for head-to-foot measurement (APLIC, 2006)⁵.

9.21 Electrocution risk can be discounted due to the design of the steel lattice towers. The L7(c) steel lattice towers proposed for the GGRP have conductors which are at least 3.75m apart vertically and are separated by more than 2m vertically from any part of the tower itself.

9.22 Peregrine is the largest bird of the current avifauna in the wider area surrounding the GGRP which is known to be prone to electrocution in other countries, if towers are not appropriately designed and deployed. The dimensions of the L7(c) steel towers to be used for the new 132kV OHL forming part of the GGRP are greater than the dimensions recommended by APLIC which take into account this species, thus are deemed to be avian-friendly.

9.23 Whilst this does not mean that electrocution of birds perched on the steel tower structures proposed for the GGRP is impossible, the risk of a significant number of mortality events of birds as a result of electrocution is considered to be negligible, therefore electrocution is not considered further in the assessment reported in this chapter.

Barrier Effects

9.24 A barrier effect would occur where the vertical configuration of wires and towers creates an actual or perceived barrier which bird species may not cross, or at the very least would need to habituate to crossing.

9.25 The proposed alignment and tower configuration would mean that the GGRP would not present a significant barrier to ornithological features, as the vertical configuration would be at a height typically c. 27m to 33m above ground level (depending on local topography). Such a barrier would have no discernible effect on a bird's ability to continue to fly over or under the new OHL and would be of no consequence in the context of daily energy budgets. Therefore, the effects arising due to GGRP acting as a barrier are considered to be of negligible significance and are not considered further in the assessment reported in this chapter.

Disturbance during operational maintenance

9.26 Maintenance activities associated with the OHLs and the wayleave corridor during operation of the GGRP may disturb breeding birds. However, such activities are infrequent and highly unlikely to be a notable source of disruption. All maintenance activities would be undertaken in line with SPEN's duties in terms of Schedule 9 of the Electricity Act 1989, and wider commitments to protect flora and fauna. For example, if planned maintenance works need to take place during the breeding bird season or adjacent to known protected species, surveys would be undertaken prior to works commencing to determine appropriate mitigation to avoid

² Hill, D.A., Hockin, D., Price D., Tucker G., Morris, R. & Treweek, J. (1997). Bird disturbance: improving the quality of disturbance research. *Journal of Applied Ecology* 34, pp 275-288

³ Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. and Bullman, R. (2009). The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology* 46, 1323–1331.

⁴ Altemüller, M. & Reich, M. (1997). Influence of high-tension power lines on breeding meadow birds (in German with English summary). *Vogel und Umwelt* 9 (Sonderheft): 111-127.

⁵ Avian Power Line Interaction Committee (APLIC). (2006). Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C and Sacramento, CA.

⁶ Ferrer, M. (2012). *Birds and Powerlines*. ENDESA S.A. and Fundacion MIGRES, Sevilla

disturbance. Thus, any potential for disturbance displacement resulting from maintenance activities associated with the operation of the GGRP is considered to be negligible, and this is not considered further in the assessment reported in this chapter.

Effects on the qualifying interests of the Muirkirk and North Lowther Uplands SPA, the Muirkirk Uplands SSSI and North Lowther Uplands SSSI

9.27 None of the qualifying species of the Muirkirk and North Lowther Uplands SPA (breeding short-eared owl, merlin, peregrine and golden plover and breeding and non-breeding hen harrier) are known to breed within the accepted connectivity distances to the GGRP. As much of the foraging habitat in proximity to the GGRP is inherently unsuitable, any potential displacement of foraging birds would be minimal in the context of the large foraging ranges of these species. Thus, any potential for displacement of foraging birds is considered to be negligible.

9.28 Baseline field studies recorded no or very infrequent use of the survey 'buffers' by SPA qualifying species. Hence, their reliance on the airspace in the vicinity of the Proposed Development was clearly extremely low, and the Proposed Development will have negligible effects on relevant populations of these species. Consequently, there is considered to be no potential for any adverse effect due to collision.

9.29 The Muirkirk and North Lowther Uplands SPA spatially overlaps the Muirkirk Uplands Site of Special Scientific Interest (SSSI), designated for breeding non-breeding hen harrier and breeding short-eared owl and the North Lowther Uplands SSSI, designated for breeding hen harrier. Both SSSIs are also designated for their breeding bird assemblage. As noted above, and in paragraphs 9.176 onward, it has been concluded that no significant effects on the qualifying interests are predicted. Therefore, there is considered to be no potential for adverse effects on the Muirkirk Uplands SSSI or the North Lowther Uplands SSSI and will have negligible effects on the relevant populations of these species.

Effects on all other bird populations of species of high and moderate NCI

9.30 Baseline field studies recorded very infrequent use of the survey 'buffers' by species of high and moderate NCI (**Table 9.3**) other than peregrine, barn owl, black grouse, curlew and lapwing. Although these species were present, their reliance on habitats and airspace in the vicinity of the connection 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. Effects of the GGRP on these species are therefore considered to be negligible and are not considered further in the assessment reported in this chapter.

Effects on all species considered to be of low Nature Conservation Importance

9.31 Species that were not considered to be of high or moderate NCI (**Table 9.3**) are found in numbers either regionally or nationally that any effects on their populations are considered to be negligible and are not considered further in this assessment.

Assessment Methodology

Legislation and Guidance

Legislation

9.32 The assessment reported in this chapter has been carried out in accordance with the following legislation:

- The Wildlife and Countryside Act 1981⁷ ('WCA');
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('EIA Regulations');
- Environmental Impact Assessment Directive 2011/92/EU;
- The Conservation of Habitats and Species Regulations 2017 ('the Habitats Regulations');
- The Nature Conservation (Scotland) Act 2004; and
- The Council Directive on the Conservation of Wild Birds 2009/147/EC (The EU 'Birds Directive').

⁷ References to all legislation relate to legislation as amended and in force at the time of writing of this chapter.

⁸ SNH. (2016). Guidance: Assessment and mitigation of impacts of power lines and guyed meteorological masts on birds. SNH. Battleby, UK.

Guidance

9.33 The assessment reported in this chapter has been carried out in accordance with the following documents:

- Scottish Natural Heritage (SNH) Guidance: Assessment and Mitigation of Impacts of Power Lines and Guyed Meteorological Masts on Birds (SNH, 2016)⁸.
- SNH Guidance: Assessing Connectivity with Special Protection Areas (SPAs) (SNH, 2016)⁹;
- SNH Guidance: Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms (SNH, 2017)¹⁰; and
- SNH Guidance: Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas (SNH, 2018)¹.

Consultation

9.34 In undertaking the assessment, consideration has been given to the scoping responses and other consultation as detailed in **Table 9.2**.

Table 9.2: Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
NatureScot April 2018	Advice on scope of survey work.	Advised that "One year of survey would appear adequate, unless ... the survey turns up anything surprising". Advised that the connectivity with the Muirkirk and North Lowther Uplands Special Protection Area (SPA) should be addressed. Confirmed that there were no records of SPA qualifying species breeding within 2km for the period 1994-2002 with the exception of two peregrine nests. Noted that whilst there are no breeding records for hen harrier and merlin in the North Lowther Uplands after 1999, it is understood that one or two pairs have bred in the last few years.	One year of survey work completed. All effects on the Muirkirk and North Lowther Uplands SPA have been scoped out of the assessment (the location of the SPA is shown on Figure 9.2).
NatureScot March 2019	Advice on adequacy of completed survey work	Advised that "the single year of survey will be adequate to inform your environmental assessment". Advised that reasonable mitigation should be included to ensure that effects on curlew and other species are in place to minimise disturbance during construction, and if appropriate, limit ongoing impact.	The potential effects on curlew as set out in Table 9.1 have been included within the assessment reported in this chapter.
RSPB Scotland February 2020	Consultation Response	Advised that research globally has shown that bird interactions with overhead lines are almost all negative and therefore suggested that a precautionary approach is best adopted. Advised that there is a black grouse lek in proximity to the GGRP and that as this species is susceptible to collision a precautionary approach should be adopted and therefore the effects on this lek,	Noted. Additional survey work on this black grouse lek carried out in April and May 2021. A precautionary

⁹ SNH. (2016). Guidance: Assessing Connectivity with Special Protection Areas (SPAs). SNH Battleby, UK

¹⁰ SNH. (2017). Guidance: Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH Battleby, UK

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken	Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		including those of the construction phase should be considered as part of the EIA.	approach has been taken when completing the assessment of effects of the GGRP on this species.			Advised that the proposal lies the same distance (1.7km) from the North Lowther Uplands SSSI, the boundary of which is coincident with the SPA boundary in this area. The SSSI features include the assemblage of breeding birds, and breeding hen harrier. We advise that provision of rationale for the SPA interest, as discussed above, will also address any impacts on the SSSI bird interest.	Noted.
		Advised that the proposed development passes through a Habitat Management Area which was agreed to as part of the planning consent for the 'Sanquhar Six' wind farm. The aim of the Habitat Management Plan is to improve the area for black grouse. If successful then the population of black grouse will increase, and the development has the potential to put that population at risk through disturbance, direct loss of habitat and collision risk.	As above.			Advised that NatureScot had agreed the scope of surveys was sufficient but that in hindsight potential impacts on wintering species (hen harrier and wintering waterfowl of the Nith Valley) should be considered. Advised that potential 'hotspots' for waterfowl collision should be investigated.	A response was provided by NRP in January 2022 along with a telephone conversation between NRP and NatureScot. Topics discussed included black grouse sensitivities, Nith river corridor and wildfowl sensitivities, curlew territories and other wader sensitivities within 500m of the proposed route, the lack of flight activity surveys and obtaining sensitive winter hen harrier data.
		Advised that as curlew is a threatened and declining species there is a risk that breeding curlew will be displaced, at least during the construction phase. It is probable that curlew are at particular risk from collision due to their tendency to carry out display flights during the breeding season at power line height.	The potential effects on curlew have been included within the assessment reported in this chapter.			Advised that potential impacts on the SPA should be considered.	
		Advised that RSPB Scotland believes that the effects on ornithological features at this site should remain scoped into assessment as part of the EIA. RSPB Scotland broadly agrees with the mitigation measures to phase construction and mark lines, but these need to be explored in much greater detail.	The potential effects on black grouse and curlew were scoped into the assessment reported in this chapter, and mitigation measures have been included.			Advised that potential impacts and any mitigation suggested should be detailed for the species noted (particularly peregrine, barn owl, black grouse, curlew) in relation to the proposal.	A detailed desk study was undertaken to investigate numbers and movements of waterfowl species in proximity to the GGRP.
NatureScot March 2020	Consultation Response	Advised that due to the proximity of the Muirkirk and North Lowther Uplands SPA rationale should be provided on why the GGRP would not be likely to have a significant effect on the qualifying features of the SPA, or why it would have no adverse effect on site integrity. Advised that this should in particular consider the potential for collision risk to qualifying bird species from overhead lines once constructed. Advised that that the breeding peregrine record is not considered to be part of the SPA population. Advised that the cumulative wind farm collision risk total for non-breeding hen harrier of the SPA is not considered to constitute an adverse effect on integrity in relation to this feature. Advised that unless there was evidence of a wintering roost close to the GGRP they would consider that the additional collision risk is likely to be 'relatively trivial'. Advised that information be sought from RSPB Scotland and local RSG on wintering hen harrier roost records close to the proposed transmission line route, and that this be taken into consideration in relation to any SPA-related assessment.	All qualifying species of the SPA have been considered within the EIA including collision risk where appropriate. Further information on roosting hen harriers within the study area was obtained from RSPB Scotland and additional survey work completed in February and March 2022.				Wintering hen harrier information was obtained from RSPB Scotland and roost surveys were undertaken in February and March 2022.
				NatureScot January 2022	Consultation Response	Asked NRP to provide the methodology detail and information data of all the ornithological surveys that have been done and completed for the project.	All survey information provided to NatureScot.
				NatureScot January 2022	Consultation Response	Stated that following the provision of the GGRP Environmental Survey Data report prepared by LUC November 2021 and discussions regarding ornithology with NRP, NatureScot are satisfied that: <ul style="list-style-type: none">■ black grouse numbers are relatively low within the area, and that the data obtained is adequate to inform the assessment;■ a comprehensive desk study has been undertaken regarding waterfowl flight activity, and flight activity is	NatureScot will be consulted when developing species protection plans for black grouse and waders.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		<p>likely to be low, and flight activity surveys are not necessary in this instance; and</p> <ul style="list-style-type: none"> wader survey work conducted is adequate to assess wader sensitivity along the route. <p>Requested that NatureScot are consulted when developing the species protection plans for particular species such as black grouse and waders.</p>	

- Dumfries and Galloway Raptor Study Group (DGRSG); current and historical survey records on various scarce breeding raptors and owls;
- British Trust for Ornithology (BTO), Wetland Bird Survey data; and
- Scottish Ornithologists Club (SOC) online bird reports for Ayrshire and Dumfries and Galloway (<https://www.the-soc.org.uk/about-us/online-scottish-bird-report>).

Field Survey

9.39 Baseline field surveys were carried out between April and July 2018 with additional black grouse surveys in April and May 2021 and hen harrier roost surveys between February and March 2022. A detailed methodology for all surveys is provided in **Appendix 9.1: Ornithology Technical Report** and is summarised below.

9.40 As noted above, the area surveyed encompassed all potential route options which were being considered at that time, and thus once the ornithological survey buffers were applied a large survey area was required as shown on **Figure 9.1**. The study and reporting areas were the 2km survey boundary for hen harrier, merlin, peregrine and short-eared owl, the 1km survey boundary for goshawk and barn owl and the 500m survey boundary for breeding waders as shown in **Figure 9.3**.

Scarce Raptors and Owls

9.41 Targeted surveys to provide information to determine the presence, distribution and nest locations of certain key raptor and owl species were undertaken during April to July 2018. This included 102 hours of surveys to determine raptor breeding status within the 2km survey buffer and barn owl breeding status within the 1km survey buffer (**Figure 9.3**). To avoid unnecessary disturbance of these protected species this aspect of the work was undertaken by the licenced observers in close liaison with the DGRSG and RSPB Scotland.

9.42 Priority was given to the species considered most likely to breed in the area on the basis of the collated desk-based data: goshawk, hen harrier, peregrine, merlin, barn owl and short-eared owl. Survey methods in Hardey *et al.* (2013)¹⁵ were followed, whereby habitats considered suitable for possible breeding were searched for signs and watched over for activity which might indicate use of the area.

9.43 In January 2021 data became available from RSPB Scotland of a satellite-tracked hen harrier that had been recorded roosting at two locations within the study area between October 2019 and March 2020. To identify any regular communal roosts weekly vantage point surveys were carried out between 4 February and 29 March 2022 at one of these locations as well as monthly ground searches of suitable habitat for signs of roosting hen harriers (**Appendix 9.2: Confidential Ornithology, Confidential Figure 9.7**). One of these locations was within the footprint of the recently constructed Sandy Knowe wind farm and unsuitable as a hen harrier roost.

9.44 Roost surveys were carried out following guidance found in Gilbert *et al.* (1998)¹⁶ for a two-hour period covering the period 1.5 hours before sunset to 0.5 hours after sunset with the location and activity of all hen harriers mapped onto enlarged 1:25,000 scale OS maps.

Black grouse

9.45 Twenty-four hours of targeted surveys were undertaken for displaying black grouse within the 1.5km survey buffer during 2018 with a further 4.5 hours completed in 2021 due to access issues during the first round of surveys (**Figure 9.3**). The methods employed were based on those described in Gilbert *et al.* (1998)¹⁶. Surveys were undertaken during the early morning in calm, dry weather with good visibility. Observers walked quietly and listened and scanned the areas considered suitable for black grouse.

Study Area

9.35 The areas which were surveyed encompassed all potential route options which were being considered at that time (i.e., in 2018) and thus once the ornithological survey buffers were applied, a large survey area was required (as shown on **Figure 9.1**¹¹). The study areas are based on the final route of the OHL and its associated infrastructure forming the GGRP. Further details on the surveys are provided below.

9.36 The study area was defined with reference to the location of the route of the GGRP and the access tracks, and encompasses a series of buffers of generally up to 2km radius, with buffer size reflecting NatureScot guidance (SNH, 2016⁸; SNH, 2017¹⁰) and dependent on the sensitivity of key species to potential effects associated with developments (**Figure 9.3 & Appendix 9.1: Ornithology Technical Report**). The Study Areas are defined as follows:

- the 'GGRP' refers to the route of the OHL and ancillary infrastructure, including access tracks.
- 'breeding bird study area' refers to the GGRP plus an additional 500m buffer;
- 'black grouse study area' refers to the GGRP plus an additional 1.5km buffer; and
- 'scarce bird study area' refers to the GGRP plus an additional 2km buffer depending on the focal species (1km for barn owl) and the presence of contiguous suitable habitat outside of the core survey area.

9.37 The current land use of the study area and the wider survey area includes upland moorland, rough grassland, forestry, agricultural land and waterbodies.

Desk Based Research and Data Sources

9.38 A desk-based study was undertaken to collate existing bird records/data. Distribution and abundance data were collected from published sources and consultees including:

- SNH Sitelink (online information about designated sites);
- UK Biodiversity Action Plan (BAP);
- The Birds of Conservation Concern (BoCC) (Eaton *et al.*, 2015)¹²;
- International Union for the Conservation of Nature (IUCN, 2021)¹³ Red list of threatened species;
- Scottish Biodiversity List (Scottish Biodiversity Forum, 2013)¹⁴;
- National Biodiversity Network (NBN) Gateway website (<https://data.nbn.org.uk/>);
- RSPB Scotland; current and historical survey records on various scarce breeding birds;

¹¹ As illustrated on **Figure 9.1**, a large proportion of the southern part of the survey area was already scheduled for the ornithological survey work required by the Sandy Knowe Wind Farm grid connection. This work was carried out by MBEC ornithologists during 2018, and therefore to prevent unnecessary disturbance to birds and repetition of survey effort, the survey area required for the GGRP was split between MBEC and NRP, with all relevant data shared between the two specialist ornithology companies.

¹² Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015). Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* 108, 708-746

¹³ International Union for the Conservation of Nature. (2021). The IUCN Red list of threatened species version 2021-3 www.iucnredlist.org

¹⁴ Scottish Biodiversity Forum. (2013). Scottish Biodiversity List. Available at www2.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL

¹⁵ Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors, a field guide to survey and monitoring*. The Stationery Office, Edinburgh.

¹⁶ Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird monitoring methods*. RSPB Sandy, Bedfordshire.

Breeding waders

9.46 Breeding waders (including curlew, oystercatcher and lapwing) were surveyed using standard four visit methods (Brown & Shepherd, 1993)¹⁷ during April to July 2018. In total around 158 hours of walkover surveys were undertaken to determine these species' presence and distribution within the study area.

9.47 The surveys aimed to cover the ground systematically with a constant search effort. All suitable ground within the 500m survey boundary was approached closely. Surveyors paused at regular intervals to scan and listen for calling and singing birds. Careful attention was given to recording behaviour indicative of breeding and care was taken to avoid counting the same individual more than once. Population estimates were derived by comparing the summary maps for the four visits.

Assessing Significance

9.48 The process of evaluating the effects of the GGRP on birds seeks to ensure that the Scottish Ministers have sufficient information in relation to the likely significant effects of construction and operation of the GGRP on bird interests.

9.49 Effects are evaluated against the existing baseline conditions, i.e., without the GGRP. The evaluation assumes that there are no existing (baseline) significant adverse effects on the population, range or distribution of a species.

9.50 In assessing the effects, emphasis is given to the national and regional populations of the species. Regional populations are those occurring within the host Natural Heritage Zone (NHZ) as defined by NatureScot (SNH, 2000)¹⁸.

9.51 For the purposes of this assessment, an effect is defined as a change in the assemblage of the bird species present, as a result of the construction or operation of the GGRP. Effects can be adverse, neutral or beneficial. A judgement is then made as to whether or not they are significant in the context of the EIA Regulations. Subsequently, mitigation measures are identified if required, and the likely residual effects are considered.

9.52 In assessing whether an effect is significant, three factors are taken into account which determine the sensitivity of the species to each potential effect and the magnitude of the changes which could be brought about by the potential effects on the population of each species:

- The NCI of the species involved;
- The magnitude of likely effects (spatial and temporal); and
- The conservation status of the species.

9.53 Following the classification of each species' Nature Conservation Importance and consideration of the magnitude of each effect and behavioural sensitivity, professional judgement has been used to make a reasoned assessment of the likely effect on the conservation status of each potentially affected species.

Determining the Magnitude of Change and Sensitivity of Receptors

Methods Used to Evaluate Nature Conservation Importance

9.54 The NCI of each species potentially affected by the GGRP is defined according to **Table 9.3**.

Table 9.3: 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. Species listed on Schedule 1A and A1 of the WCA. Species cited in the qualifying features for international designated sites or notified features of national designated sites within 20km of the GGRP.

¹⁷ Brown, A.F. & Shepherd, K.B. (1993). A method for censusing upland breeding waders. Bird study 40: 3 pp189-195.

Importance	Definition
Moderate	Species cited on the BoCC 'Red list' (Eaton et al., 2015) or the IUCN 'Red list – Near Threatened' (IUCN, 2018). 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 GGRP. Species present in regionally important numbers (>1% regional population).
Low	All other species not falling within the categories mentioned above.

9.55 Species listed in Local BAPs (LBAPs) will be considered moderately important only if the GGRP study area supports at least 1% of the regional population.

Magnitude

9.56 The magnitude of change has been determined by consideration of the spatial and temporal nature of each effect. There are five levels of spatial magnitude (**Table 9.4**) and four levels of temporal magnitude (**Table 9.5**). For the majority of species which are included in the assessment where the species considered is not connected to a designated site, the spatial magnitude is assessed in respect of regional populations within the Western Southern Uplands and Inner Solway Natural Heritage Zone (NHZ 19) as defined by NatureScot (SNH, 2000)¹⁸.

Table 9.4: Levels of Spatial Magnitude

Magnitude	Definition
Very High	Total/near loss of a bird population due to mortality or displacement. Total/near 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, 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, 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, displacement or disturbance. Guide: 1-5% of regional population affected.
Negligible	Very slight reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Guide: <1% of regional population affected.

Table 9.5: Levels of Temporal Magnitude

Magnitude	Definition
Permanent	Effects 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

¹⁸ SNH. (2000). Natural Heritage Zones. SNH Battleby, UK.

Magnitude	Definition
	replacement of mature trees by young trees which need >25 years to reach maturity). Such exceptions can be termed very long 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.

9.57 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. Using professional judgement this is taken into account when defining the magnitude of the effects on the species.

9.58 A populations' behavioural sensitivity may also be considered when assessing the magnitude of effects and the species' overall sensitivity to them. Behavioural sensitivity may be judged as being high, moderate or low according to a species' ecological function and behaviour. Behavioural sensitivity can differ even between similar species and, for 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. Using professional judgement this is also taken into account when defining the magnitude of the effects on the species.

Determining Conservation Status

9.59 Where the data allows, the conservation status of each potentially affected population is considered within the region. For these purposes 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.

Significance

9.60 In accordance with EIA Regulations each effect is evaluated and classified as either significant (major or moderate) or not significant (minor or none). The significance levels of effects on bird populations are described in **Table 9.6**. Effects resulting in detectable changes in the conservation status of regional populations of NCI are automatically considered to be significant effects for the purposes of the EIA Regulations (i.e., no distinction between effects of 'major' or 'moderate' significance). Non-significant effects include all those which are likely to result in small to barely detectable (minor) or non-detectable (i.e. no) changes in conservation status of regional (and therefore national) populations.

9.61 If an effect is determined to be significant adverse, measures to mitigate the effect are proposed wherever possible, and the residual effect is evaluated.

Table 9.6: Significance Criteria

Significance of Effects	Description
Major	Detectable changes in regional populations of NCI that would have a severe impact on conservation status.
Moderate	Detectable changes in regional populations of NCI that would have an impact on their conservation status.
Minor	Small or barely discernible changes in regional populations that would be unlikely to have an impact on the conservation status of regional populations of NCI.

Significance of Effects	Description
None	No or non-detectable changes in the conservation status of regional populations of NCI.

Collision Risk

9.62 There are no defined methods for modelling an estimation of collision risk for birds and OHLs. Thus, to inform the assessment, a description of the risk of collision (as opposed to a modelled estimation of collision risk) of species potentially affected by the GGRP is provided.

9.63 This collision risk description is informed by information on the species' morphology (such as wing load) and flight behaviour (e.g., flight heights expected due to hunting patterns; agility) gathered from the published information and through professional experience, along with empirical data gathered through the field surveys of the study area. Professional judgement based on morphological, behavioural and empirical data is then used to incorporate this information into assigning a level for these factors (see **Table 9.7** and **Table 9.8**) which is then used to provide a risk of collision for each species due to the GGRP. These are presented as very low, low, moderate or high (**Table 9.9**).

9.64 The description of the risk of collision for each species was used to inform the assessment of effects of the GGRP where the conservation status of the species can be incorporated.

9.65 **Table 9.7** describes how susceptibility to collision was determined for each species in three classes. Susceptibility to collision is based on morphological and behavioural characteristics of the species.

Table 9.7: Susceptibility to Collision

Susceptibility to collision	Description of morphological and behavioural factors (Bevanger, 1998) (not all factors apply to all species)
High	High wing load low manoeuvrability Fast flight Large amount of time spent in flight Water birds, diving birds and 'poor' flying species
Medium	Medium wing load and manoeuvrability
Low	Low wing load and high manoeuvrability Slow flying Aerial predators, thermal soarers and marine soarers

9.66 **Table 9.8** describes the three-way classification of flight characteristics of the species by way of activity, flight height and degree of concentration and regularity of flight traffic. These have been used to classify the significance of flight features for each species affected by Project.

Table 9.8: Significance of flight features

Significance of flight features	Description of flight features (not all factors fit all species)
High	High number of flights High number of birds Regularly used flight routes High proportion of flights at risk height
Medium	Medium number of flights Medium number of birds

Significance of flight features	Description of flight features (not all factors fit all species)
	Some pattern to flight routes Medium proportion of flights at risk height
Low	Low number of flights Low number of birds No regular flight routes Low proportion of flights at risk height

9.67 The classifications of species' susceptibility to collision assessed in line with criteria in **Table 9.7** and the significance of flight features of species' flight activity (empirically observed or documented) assessed in line with criteria in **Table 9.8** were used to define the risk of collision based on the matrix presented in **Table 9.9**. **Table 9.9** was used to derive a 4-way Risk of Collision outcome (very low, low, moderate or high).

9.68 For example, a species with a low susceptibility to collision (**Table 9.7**) and displaying a low level of recorded flight features (**Table 9.8**) would be defined as having a very low risk of collision with the GGRP, in line with **Table 9.9**. Conversely, a species with a high susceptibility to collision (**Table 9.7**) and a high level of recorded flight features (**Table 9.8**) would be defined as having a high risk of collision with the GGRP (**Table 9.9**).

Table 9.9: Risk of Collision

Significance of flight features	Susceptibility to collision		
	High	Medium	Low
High	High	Moderate	Low
Medium	Moderate	Moderate	Low
Low	Low	Low	Very low

Cumulative Assessment

9.69 Cumulative changes involve the same impacts and potential effects for individual site-based construction and operational changes, but on an accumulated basis across several projects i.e., the addition of the effects of the GGRP to those determined or assessed for other projects.

9.70 The assessment of cumulative effects is limited to species of high or moderate NCI for which there is a likely effect as a result of the connection being assessed, that may be exacerbated cumulatively with other projects as regards influencing the species' conservation status, therefore only effects assessed as minor or above are included in the cumulative assessment.

Assessment Limitations

9.71 The available information on bird populations at the NHZ and regional level is limited, and available information on the results of monitoring, mitigation and enhancement work at other existing and proposed developments (which could be useful in informing the assessment of both the GGRP in isolation and cumulatively with other developments), is sparse. Therefore, as is standard with these assessments, use is necessarily made of the available literature and professional judgement to inform the assessment.

¹⁹ Available at <https://archive.ceda.ac.uk/>.

²⁰ Fielding, A.H. & Haworth, P.F. (2014). Golden eagles in the south of Scotland: an overview. Scottish Natural Heritage Commissioned Report No. 626.

Future Baseline in the Absence of the Development

9.72 Provided the existing land-management of the area continues as at present, changes in the bird population during the medium to long term are likely to be typical of those associated with areas of open moorland, open rough grazing, enclosed farmland, waterbodies, and commercial plantation forest.

Implications of Climate Change

9.73 The UK Climate Projections CP18¹⁹ for temperature and precipitation by 2080 (the perceived lifetime of the GGRP) suggests that the Solway River Basin (which encompasses the Dumfries and Galloway region) will become hotter and drier in the summer (June to August) and warmer and wetter in the winter (December to February). Some studies have suggested that rainfall in south-west Scotland may be increasing (Haworth & Fielding, 2014)²⁰.

9.74 Temperatures within the Solway River Basin are projected to increase, with projected increases in summer temperatures greatest. The central estimate of increase in winter mean temperature is 2.4°C; the central estimate of increase in summer mean temperature is 3.4°C.

9.75 Winter rainfall is projected to increase and summer rainfall is most likely to decrease. The central estimate of change in winter mean precipitation is 15%; the central estimate of change in summer mean precipitation is -19%.

9.76 If the overwinter and spring weather conditions are suitable for adults to reach breeding condition, then for many species the main period of concern will be the months in spring and early summer when they nest and the chicks require feeding. Low cloud and rainfall can adversely affect the foraging activities of birds which forage in flight such as raptors and insectivorous birds and impact their ability to breed or feed chicks. Furthermore, the availability of invertebrates as food for chicks of species such as gamebirds (e.g., black grouse) and waders may be impacted by the alteration in the rainfall. For ground nesting species (e.g., waders and gamebirds) eggs and chicks could be subject to chilling due to rainfall. The nests of other species such as raptors, which often nest in exposed locations, could also be susceptible to chilling. Dry conditions in summer may benefit breeding success by improving conditions for the chicks, as long as the temperatures do not go too high.

9.77 Based on historical data for species such as black grouse, it has been concluded that these species already appear to have been subject to reductions in their range which may be linked to climatic factors.

Infrastructure Location Allowance

9.78 The survey areas covered the 50m infrastructure location allowance (ILA). There are no ornithological constraints to applying the ILA as required during the pre-construction phase, subject to the findings of the pre-construction surveys.

Embedded Protection Measures

9.79 To conform with the WCA, surveys within a 500m buffer to locate nests of birds listed in Schedule 1 of the WCA and Annex 1 of the Birds Directive would be undertaken prior to forestry and construction operations during the breeding period as part of a Birds Protection Plan (BPP) which would be overseen by an Ecological Clerk of Works (ECoW), further details are given in **Appendix 3.3: Schedule of Mitigation**. If it is judged that these activities are likely to disturb breeding attempts, then appropriate exclusion zones (Ruddock & Whitfield, 2007)²¹ or other protection measures would be agreed with NatureScot prior to recommencing works. Standard forestry guidance would be followed in the case of tree felling operations. Further detail on the BPP is provided below.

Summary of Existing Conditions

Designated Sites

9.80 The proposed GGRP does not intersect any site that is designated at international or national levels for ornithological interests. The nearest internationally designated ornithological site is the Muirkirk and North Lowther Uplands SPA, which at its closest is situated around 1.7km northeast of the closest component of the GGRP. The Muirkirk and North Lowther Uplands SPA spatially

²¹ Ruddock, M & Whitfield, D.P. (2007). A review of Disturbance Distances in Selected Bird Species. Report to SNH

overlaps two sites of national importance, the Muirkirk Uplands Site of Special Scientific Interest (SSSI) and the North Lowther Uplands SSSI.

Desk study

9.81 Information provided by RSPB Scotland and the DGRSG highlighted that goshawk and peregrine are known to use habitats in the area in the vicinity of the GGRP for nesting; both these species are protected under Schedule 1 of the WCA. A number of other species of NCI are known to use habitats in the vicinity of the GGRP, including black grouse and breeding waders e.g., curlew and lapwing.

Field Survey Results

9.82 This section summarises the bird populations and flight activity within and surrounding the GGRP, based on surveys undertaken in the period April to July 2018 with further black grouse surveys taking place in April and May 2021 and hen harrier roost surveys in February and March 2022. The survey methods and detailed results are described in **Appendix 9.1: Ornithology Technical Report** and **Appendix 9.2: Confidential Ornithology**.

Scarce Raptors and Owls

9.83 Hen harrier, peregrine and barn owl were recorded during the field surveys. All of these species are species of high NCI. All of these species are also listed in Annex 1 and Schedule 1, apart from barn owl which is listed in Schedule 1 only. Results for all nest locations of all these species are provided in the **Appendix 9.2: Confidential Ornithology** with other additional observations shown in **Figure 9.6**

9.84 Due to hen harrier only being recorded once during the breeding period and there being no evidence of breeding in the study area (**Appendix 9.1: Ornithology Technical Report**) there is no possibility that any potential effects will be significant under the EIA Regulations therefore breeding hen harrier is not considered further in the assessment reported in this chapter.

9.85 Although one satellite-tagged hen harrier was recorded roosting within the study area, this bird was recorded roosting over 1km from the proposed line route, which is greater than the 500m disturbance distance given in Ruddock & Whitfield (2007)²¹. Surveys in February and March 2022 did not record the presence of any roosting hen harriers in this area. As there are no known regular or communal hen harrier winter roost sites in the study area or in close proximity to the study area, there is no possibility that any potential effects will be significant under the EIA Regulations therefore wintering hen harrier is not considered further in the assessment reported in this chapter.

9.86 Results from surveys and historical data provided by RSPB Scotland and the DGRSG of breeding goshawk did not include any pairs nesting within the study area and so there is no possibility that any potential effects will be significant under the EIA Regulations therefore this species is not considered further in the assessment reported in this chapter.

9.87 Buzzard, sparrowhawk and kestrel were also recorded and are present all year and breed in the study area. As species of low NCI, these are not considered further in the assessment reported in this chapter.

9.88 From the data presented above and in **Appendix 9.2: Confidential Ornithology** peregrine and barn owl were recorded in the study area and were recorded with sufficient frequency to be considered further in the assessment.

9.89 One pair of peregrines bred within the study area during the survey period. In the consultation response dated 16 March 2020, NatureScot confirmed these birds are not considered to be part of the Muirkirk and North Lowther Uplands SPA population.

9.90 One barn owl nest was found within 1km of the GGRP.

Black grouse

9.91 Black grouse is a red listed BoCC and BAP species of moderate NCI.

9.92 Two single lekking males and a female were recorded within the study area in 2021 (**Figure 9.4**) and therefore this species is considered further in the assessment reported in this chapter.

Waders

9.93 Curlew, snipe, lapwing and common sandpiper were recorded (**Figure 9.5**). Curlew (IUCN Near Threatened, red listed BoCC, BAP), and lapwing (red listed BoCC, BAP) are species of moderate NCI and are therefore considered further in the assessment reported in this chapter. Snipe and common sandpiper are of low NCI and are not considered further in the assessment reported in this chapter.

Information on Species considered further in the Assessment

9.94 **Table 9.10** sets out the species included within the detailed assessment reported in this chapter, and the NCI (or 'sensitivity') of the species (in accordance with **Table 9.3**).

Table 9.10: Nature Conservation Importance of Potentially Affected Species

Nature Conservation Importance	Species	Effects assessed during developments stage	
		Construction	Operation
High	Peregrine	✓	✓
	Barn owl	✓	
Moderate	Black grouse	✓	✓
	Curlew	✓	✓
	Lapwing	✓	

Peregrine (*Falco peregrinus*)

9.95 Peregrine is listed on Annex 1 of the Birds Directive and on Schedule 1 of the WCA and therefore is a species of high NCI. It is a scarce but widespread resident breeder in Scotland. It breeds in the survey area of the GGRP.

9.96 Peregrine mainly nest on crags and buildings, and they occur in open areas with secure nest sites and plentiful avian prey (Forrester *et al.*, 2007)²². During the breeding season peregrine foraging ranges from the nest site are recorded as a core of 2km and a maximum recorded distance of 18km (SNH, 2016)⁹.

9.97 The NHZ 19 population was estimated at 34 in 2014 (Wilson *et al.*, 2015)²³. The peregrine population monitored in Dumfries and Galloway in 2019 was 54 occupied ranges with productivity of 1.8 young fledged per successful pair (Challis *et al.*, 2020)²⁴. The population is at a minimum maintaining itself so is in favourable conservation status.

Barn owl (*Tyto alba*)

9.98 Barn owl is listed on Schedule 1 of the WCA and thus is a species of high NCI. It is a resident breeding bird in Scotland with highest numbers in the south and west. It breeds in the survey area of the GGRP.

9.99 Barn owls are found mainly at lower altitudes up to 300m, and nest in large, dark cavities in trees, rock faces, and built structures hunting over areas of rough grassland including field margins, ditches, roadside verges, tracks and forest edges, with good numbers of small mammals. Their foraging range when breeding is up to 1km from the nest and up to 3km to 5km when not breeding (Hardey *et al.*, 2013)¹⁵. They are nocturnal but can be active around dusk and dawn. Barn owls usually nest in Scotland between April and August (Forrester *et al.*, 2007)²².

²² Forrester, R.W., Andrews, I.J., McInerney, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy, D.S. (eds). (2007). The Birds of Scotland. The Scottish Ornithologists Club, Aberlady

²³ Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504. pp72. Available from: www.swbsg.org

²⁴ Challis, A., Wilson, M.W., Schönberg, N., Eaton, M.A., Stevenson, A. & Stirling-Aird, P. (2020). Scottish Raptor Monitoring Scheme Report 2019. BTO Scotland, Stirling.

9.100 The barn owl population estimate for Dumfries and Galloway in 2004 of 400 was based on 165 sites monitored (Forrester *et al.* 2007)²². The population monitored in in Dumfries and Galloway in 2019 was 84 pairs and productivity was 3.0 young fledged per successful pair (Challis *et al.*, 2020)²⁴. The population is considered to be expanding and is in a favourable conservation status.

Black grouse (*Lyrurus Tetrix*)

9.101 Black grouse is a red-listed BoCC and listed on Annex 2B of the EU Birds Directive and therefore is a species of moderate NCI. This declining species is found across much of Scotland away from the coast and inhabited areas.

9.102 The black grouse is resident in upland areas preferring a mix of habitats including moorland and young woodland and woodland edges. They feed on the shoots and buds of larch, birch and heather as well as a range of berries.

9.103 Black grouse form communal display sites called leks where males display to females. The NHZ 19 population was estimated at 121 lekking males in 2005 (Wilson *et al.*, 2015)²³. Warren & Hesford (2020)²⁵ show that 61 males were recorded during 2019 in Dumfries and Galloway (see their Table 2). However, these data do not represent a complete survey of Dumfries and Galloway as only fifteen 5x5km squares were surveyed. Due to continued declines, particularly in Southern Scotland the population conservation status is assumed to be unfavourable.

Curlew (*Numenius arquata*)

9.104 Curlew is a red-listed BoCC and listed as Near-threatened by the IUCN 'Red list', therefore is a species of moderate NCI. It is a widespread breeding resident in Scotland. It breeds in the survey area of the GGRP.

9.105 The curlew is a wading bird which breeds inland preferring rush pastures with some enclosed heather moorland and unimproved grassland, moving to the coast in winter. They return inland from February and nest in April then leave for the coast from July (Forrester *et al.*, 2007)²².

9.106 The most recent estimate of the NHZ 19 population of curlew was 4,284 (Wilson *et al.*, 2015)²³. The curlew population in Scotland and the UK is in decline (BTO *et al.*, 2018)²⁶ with loss of habitat suggested as the main cause, and the species is now considered one of the most important bird conservation issues for the UK (Woodward *et al.*, 2018)²⁷. Therefore, the population conservation status is assumed to be unfavourable.

Lapwing (*Vanellus vanellus*)

9.107 Lapwing is a red listed BoCC therefore is a species of moderate NCI. It is a common and widespread breeding resident in Scotland. It breeds in the study area of the GGRP.

9.108 Lapwing is a wading bird which breeds on all types of short sward grassland from river valleys to uplands, ploughed fields and spring-sown crops, with chicks requiring short sward vegetation with wet areas. In winter they move to lower ground and estuaries returning inland in late February (Forrester *et al.*, 2007)²².

9.109 The lapwing population in the UK is in decline (BTO *et al.* 2018)²⁶ with habitat loss and changes in agricultural practice suggested as the main causes (Woodward *et al.*, 2018)²⁷. Therefore, the population conservation status is assumed to be unfavourable.

Information on species' flight behaviour and morphology

9.110 Peregrine, barn owl and black grouse are present in the study area all year round. Lapwing and curlew are present in the study area during the breeding period of April to August only; thereby the collision risk is limited to these months.

²⁵ Warren, P. & Hesford, N. (2020). Scottish Black Grouse Study Groups: Lek Count Summary 2019. Game and Wildlife Conservation Trust. County Durham.

²⁶ BTO/JNCC/RSPB Breeding Bird Survey trends <https://www.bto.org/our-science/projects/bbs/latest-results/population-trends>

²⁷ Woodward, I.D., Massimino, D., Hammond, M.J., Harris, S.J., Leech, D.I., Noble, D.G., Walker, R.H., Barimore, C., Dadam, D., Eglington, S.M., Marchant, J.H., Sullivan, M.J.P., Baillie, S.R. & Robinson, R.A. (2018). *BirdTrends 2018: trends in numbers, breeding success and survival for UK breeding birds. Research Report 708. BTO, Theford.* www.bto.org/birdtrends

²⁸ Bevanger, K. (1998). Biological and conservation aspects of bird mortality caused by electricity power lines: a review. *Biological Conservation* 86, 67-76.

²⁹ Rayner, J.M.V. (1988). Form and function in avian flight. In: Johnston, R.F. (Ed.), *Current Ornithology*, Vol. 5. Plenum, New York, pp. 1-66.

³⁰ Janss, G.F.E. (2000). Avian mortality from power lines: a morphologic approach of a species-specific mortality. *Biological Conservation* 95, 353-359.

9.111 Bevanger (1998)²⁸ used information on bird morphology with relation to size and wing proportions ('load' and 'aspect') (citing Rayner, 1988)²⁹ to consider aerodynamic performance of species and classify their flight efficiency. Wing loading is a measurement that relates the mass of the bird to the total wing area, whilst aspect is the ratio of its span to its mean chord. Thus, a bird with a low wing loading has a larger wing area relative to its mass, as compared to a bird with a high wing loading; and a long, narrow wing has a high aspect ratio, whereas a short, wide wing has a low aspect ratio.

9.112 Other characteristics are also related to manoeuvrability, such as tail length: a lot of forest species have long tails e.g., blackbirds and sparrowhawks as do species which fly slowly to hunt e.g., hen harrier, red kite.

9.113 Grouse species (*Galliformes*) are considered in Bevanger (1998)²⁸ to have high wing load, medium aspect wings and low manoeuvrability, and are classified as 'poor flyers' and having higher susceptibility to collision with OHLs. This group is widely recorded as collision victims of OHLs in the literature (Bevanger, 1998²⁸, Janss, 2000³⁰; Haas *et al.*, 2003³¹; Jenkins *et al.*, 2010³²; Ferrer, 2012⁶; APLIC, 2012³³; EU, 2018³⁴ etc.). The table used by EU (2018)³⁴ is consistent with this wide body of literature and classifies grouse sensitivities to collision as II - III (between "regionally or locally high casualties but with no significant impact on the overall species population" and "casualties are a major mortality factor, threatening a species with extinction, regionally or at a larger scale").

9.114 Collision risk in wader species is considered by Bevanger (1998)²⁸ to vary due to differences in wing-loading and wing aspect between family groups. Species belonging to the *Scolopacidae* family are found as collision victims in nearly every investigation related to birds and powerlines. However, species belonging to the *Charadriidae* family appear less prone to collision. Lapwing and curlew both belong in the *Charadriidae* family and are considered by Bevanger (1998)²⁸ to have medium wing load and medium aspect wings and are classified as having lower susceptibility to collision with OHLs than *Scolopacidae* species. EU (2018)³⁴ classifies waders (*Charadriidae* and *Scolopacidae*) as II-III (between "regionally or locally high casualties but with no significant impact on the overall species population" and "casualties are a major mortality factor, threatening a species with extinction, regionally or at a larger scale"), however the *Charadriidae* family are probably at the lower end of this estimate.

9.115 Raptor species are generally considered to be at lower risk of collision with OHLs. Bevanger (1998)²⁸ classifies hawks as having low wing load and low aspect, they also have long tails; these facts are consistent with their high manoeuvrability and low susceptibility to collision. In Bevanger (1998)²⁸ kites and harriers have low wing-loading and medium aspect, they also have long tails and hence are classified with low susceptibility to collision; whilst species such as falcons and eagles have low to medium wing loads and low aspects, so are classified as slightly more susceptible. Raptor foraging flight behaviours illustrate they are in general highly manoeuvrable and agile in flight hence can more easily avoid the conductors ((Bevanger, 1998²⁸, Janss, 2000³⁰; Haas *et al.*, 2003³¹; Ferrer, 2012⁶; Luzenski *et al.*, 2016³⁵). However, some species may be at risk of collision due to their foraging strategy (Bevanger, 1998)²⁸. EU (2018)³⁴ classifies raptors (*Accipiteriformes* and *Falconiformes*) as I-II (between "casualties reported but no apparent threat for the bird population" and "regionally or locally high casualties but with no significant impact on the overall species population").

9.116 Bevanger (1998)²⁸ classified owls (*Strigiformes*) as low susceptibility to collision due to the species having low wing load and a low wing aspect. Barn owl, of the family *Tytonidae*, appear less prone to collision than typical owls of the *Strigidae* family (Bevanger, 1998)²⁸. EU (2018)³⁴ classifies owls as II ("regionally or locally high casualties but with no significant impact on the overall species population").

Embedded Protection Measures

9.117 The assessment has been undertaken in the knowledge that a Bird Protection Plan (BPP), devised in consultation with NatureScot, would be in place prior to the commencement of construction activities. The BPP would describe the survey methods for the identification of sites used by protected birds and would detail protocols for the prevention, or minimisation, of disturbance to birds

³¹ Haas, D., M. Nipkow, G. Fiedler, Schneider, R., Haas, W. & Schürenberg, B. (2005). Protecting birds from powerlines. *Nature and environment* 140. Report by NABU – German Society for Nature Conservation, BirdLife in Germany for the Convention on the Conservation of European Wildlife and Habitats (Bern convention). Council of Europe Publishing.

³² Jenkins, A.R., Smallicie, J.J. & Diamond, M. (2010). Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. *Bird Conservation International*, 20: 263-278.

³³ Avian Power Line Interaction Committee (APLIC). (2012). Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

³⁴ EU. (2018). Guidance on Energy Transmission Infrastructure and EU nature legislation EU, Luxembourg PDF ISBN 978-92-79-92943-4 doi:10.2779/827210

³⁵ Luzenski, J., Claudia E. Rocca, C.E., Harness, R.E., Cummings, J.L., Austin, D.D., Landon, M.A. & Dwyer, J.F. (2016) Collision avoidance by migrating raptors encountering a new electric power transmission line. *The Condor*, 118(2):402-410.

as a result of activities associated with the GGRP. The implementation and compliance with BPP would be overseen by the ECoW. Further details of the BPP are given in **Appendix 3.3**.

9.118 The BPP would describe the surveys to locate the nests or other key sites (e.g., roosts) of birds listed in Schedules 1 and 1A of the WCA, in advance of construction works progressing. In the event that an active nest or roost of a Schedule 1 or Schedule 1A species is discovered within distances given by Ruddock & Whitfield (2007)²¹ (or within a 500m radius of the nest for Schedule 1 species not listed), a disturbance risk assessment would be prepared under the BPP. 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, and thereafter implemented, before recommencing work. Similarly, although the species is not listed on Schedule 1, surveys to locate black grouse lek sites would be undertaken and appropriate measures to safeguard relevant lek sites would be agreed with NatureScot and included within the BPP. Standard forestry guidance would be followed in the case of tree felling operations.

Assessment of Effects

9.119 The assessment of effects is based on the project description as outlined in **Chapter 4: Project Description**. Unless otherwise stated, potential effects identified are considered to be negative.

9.120 The primary, direct effects considered are construction disturbance of foraging for peregrine, barn owl, black grouse, curlew and lapwing; and risk of collision during operation for peregrine, black grouse and curlew with all other effects and species scoped out (**Table 9.1**). It follows that if primary, direct effects are not significant any secondary, indirect effects will also be not significant.

Existing Conditions

Scarce Raptors and Owls

9.121 Peregrine bred within the survey area during the survey period with this location being occupied since 2012 (DGRSG). One barn owl nest site was located in the survey area within the survey period.

Black grouse

9.122 Two male black grouse were recorded displaying within the survey area during the survey period with a female also present in the same area.

Waders

9.123 Six curlew territories and one lapwing territory were located within the survey area during the survey period.

Construction Effects

Scarce Raptors and Owls

9.124 All nests of raptor and owl species listed on Schedule 1 and Annex 1 would be identified and protected from disturbance during the construction period (see **Embedded Protection Measures** section above). This includes the nests within the survey area which were active during the survey period, and which are likely to still be in use during the construction period.

9.125 Displacement of foraging birds from suitable habitats may occur for peregrine and the extent to which displacement may occur and the implications of this will vary depending on the nature of the construction activity and the intervening topography, which may influence the avoidance distance a species adopts. However, this species has a large foraging range with a core range of 2km with a maximum of 18km recorded (SNH, 2016)⁹. Therefore, it is considered that sufficient habitat exists beyond any potential construction disturbance zone around construction activities to support this species.

9.126 Barn owl foraging range when breeding is up to 1km, and up to 3km to 5km when not breeding. They forage mainly during the night although some activity may occur at dusk and dawn, so the overlap between their main daily foraging period and

construction activities will be minimal. Furthermore, barn owl is also very tolerant of human activities and so potential for disturbance during construction is intrinsically low.

9.127 **Nature Conservation Importance:** peregrine and barn owl are classified as high NCI (**Table 9.3**).

9.128 **Conservation Status:** peregrine and barn owl are in favourable conservation status.

9.129 **Spatial and Temporal Magnitude:**

- Peregrine: initially assigned as low spatial magnitude for population based on NHZ estimates of 34 pairs in 2014, against the guide proportions in **Table 9.4**. As the nest would be protected from disturbance through the BPP, and this species utilises a large foraging range, the level of spatial magnitude would be reduced to negligible when this is taken into account. The temporal magnitude would be short-term for a construction period of 16 months (**Table 9.5**).
- Barn owl: the Dumfries and Galloway population estimate was 400 birds in 2004 and the population is considered to be expanding so although there is no NHZ estimate the spatial magnitude has been assessed as negligible (**Table 9.4**), especially as the nest would be protected from construction disturbance through the BPP. Barn owls forage during the night i.e., the period when construction is unlikely to occur, so their behaviour alone would ensure the spatial magnitude for construction disturbance is negligible, in addition to the short-term temporal construction period (16 months) (**Table 9.5**).

9.130 The short-term effects of construction disturbance on peregrine and barn owl resulting from displacement are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

Black Grouse

9.131 All lek sites of black grouse would be identified and protected from disturbance during the construction period (see **Embedded Protection Measures** section above). This includes lek sites which were identified during the survey period and during scoping. Minimum disturbance distance of 500m (Ruddock & Whitfield, 2007)²¹ from any lekking birds would be employed.

9.132 Black grouse foraging ranges during the breeding season are 1.5km for males and 0.5km for females (SNH, 2016)⁹. There is an abundance of similar habitat that exists in the wider area, and it is considered that sufficient habitat exists beyond any potential construction disturbance zone around construction activities to support this species.

9.133 **Nature Conservation Importance:** black grouse is classified as moderate NCI (**Table 9.3**)

9.134 **Conservation Status:** black grouse is considered to be in unfavourable conservation status.

9.135 **Spatial and Temporal Magnitude:** The NHZ population is estimated between 61 - 121 pairs and therefore the spatial magnitude can be considered as negligible (**Table 9.4**) particularly as any lek or nest site would be protected from construction disturbance. The temporal magnitude would be short-term for a period of 16 months (**Table 9.5**)

9.136 The short-term effects of construction disturbance on black grouse resulting from displacement are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

Waders

9.137 All nests of species listed on Annex 1 and other bird species of NCI would be identified and protected from disturbance during the construction period (see **Embedded Protection Measures** section above). With this in place the direct disturbance of breeding birds would be avoided.

9.138 Foraging curlew and lapwing may be displaced but the extent to which this may occur and the implications of this would vary depending on the nature of the construction activity and the intervening topography, which may influence the avoidance distance the species adopt. Both species will only be present during the breeding season effectively March to July for these species, and any potential disturbance would be limited to those months only. Both curlew and lapwing often feed outside the breeding territory (Cramp & Simmons, 1983)³⁶ and use a wide variety of habitats which are available in the wider area. Construction activities in foraging areas (away from the breeding area) may displace foraging curlew and lapwing, however if displaced during the construction period from the small areas around construction activities they would find other local foraging areas to utilise.

³⁶ Cramp, S. & Simmons, K.E.L, 1983. Handbook of the birds of Europe, the Middle East and North Africa: the birds of the Western Palearctic vol.3; waders to gulls. Oxford university Press, Oxford, UK.

9.139 Nature Conservation Importance: curlew and lapwing are classified as moderate NCI (Table 9.3).

9.140 Conservation Status: both curlew and lapwing are considered to be in unfavourable conservation status.

9.141 Spatial and Temporal Magnitude: Nests of curlew and lapwing would be protected from disturbance within the construction period as required under the WCA (noted in Embedded Protection Measures above). Due to the very low numbers of curlew and lapwing present in the survey area relative to the regional populations of these species, the spatial magnitude of construction disturbance effects would be negligible. The temporal magnitude is short-term for a construction period of 16 months.

9.142 The short-term effects of construction disturbance on lapwing and curlew resulting from displacement are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

Summary of assessment of significance for construction effects

9.143 The short-term effects of construction disturbance on peregrine, barn owl, black grouse, lapwing and curlew resulting from displacement are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

Proposed Mitigation

9.144 No additional mitigation is proposed during the construction phase.

Residual Construction Effects

9.145 The residual short-term effects of construction on peregrine, barn owl, black grouse, lapwing and curlew resulting from displacement are likely to be **none** and therefore **not significant** in the context of the EIA Regulations.

Cumulative Construction Effects

Cumulative Effects during Construction

9.146 No significant residual effects of construction disturbance resulting from the GGRP were identified in isolation, and all effects on all bird species were assessed as likely to be **none** (Table 9.6). As such, the likely in-isolation effects of the GGRP are considered to have no potential to contribute to cumulative effects.

Proposed Mitigation

9.147 No additional mitigation is proposed.

Residual Cumulative Effects during Construction

9.148 The residual cumulative effects of construction disturbance resulting from the GGRP are predicted to be **none** and therefore **not significant** in the context of the EIA Regulations.

Operational Effects due to collision mortality

Scarce Raptors and Owls

9.149 Due to morphological and behavioural factors peregrine are classed as having medium susceptibility to collision (Medium: Table 9.7). As peregrine nested within the survey area, flight activity can be attributed to foraging flights moving from the nest site to foraging areas, or territorial behaviour. However, due to peregrine's foraging strategy no activity hotspots are predicted along the OHL route. Therefore, the significance of flight features is predicted to be low (Low: Table 9.8).

9.150 Due to morphological and behavioural factors barn owl are classed as having low susceptibility to collision (Low: Table 9.7). As barn owl nested within the study area, flight activity can be attributed to foraging flights moving from the nest site to foraging areas, or territorial behaviour. However, due to barn owl's foraging strategy, and their propensity to forage close to the ground, no activity hotspots are predicted along the OHL route. Therefore, the significance of flight features is predicted to be low (Low: Table 9.8).

9.151 Nature Conservation Importance: peregrine is classified as high NCI (Table 9.3).

9.152 Conservation Status: peregrine is in favourable conservation status.

9.153 Spatial and Temporal Magnitude: peregrine – the breeding population based on NHZ estimates was 34 pairs in 2014. This is an expanding population therefore the current population will be larger, and an assessment based on this figure is therefore precautionary. Against the guide proportions in Table 9.4. for a moderate spatial magnitude effect to occur four birds would have to be killed due to collision with the GGRP each year. The collision risk is evaluated as Low (Low level of flight features and Medium susceptibility to collision) (Low: Table 9.9); therefore, the spatial magnitude of operational effects due to collision mortality has been assessed as negligible. Temporal magnitude will be long-term.

9.154 The long-term operational effects on peregrine due to collision mortality are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

Black grouse

9.155 Due to morphological and behavioural factors black grouse are classed as having high susceptibility to collision (High: Table 9.7). As black grouse were recorded within the survey area, albeit in very small numbers, flight activity can be attributed to foraging flights and moving from territories to lek areas. Therefore, due to the low population size, the low number of expected flights and no regular flight routes the significance of flight features along the majority of the GGRP route is predicted to be low (Low: Table 9.8). However, localised hotspots of flight activity are likely to occur around lek sites where the expected number of flights could increase with some pattern to flight routes. Therefore, the significance of flight features within 500m of lek sites is predicted to be moderate (Moderate: Table 9.8).

9.156 Nature Conservation Importance – black grouse is classified as moderate NCI (Table 9.3).

9.157 Conservation Status – black grouse is considered to be in unfavourable conservation status.

9.158 Spatial and Temporal Magnitude – The NHZ population is estimated between 61 - 121 pairs however as the population is declining an assessment based on the lower estimate is considered precautionary. Against the guide proportions in Table 9.4. for a moderate spatial magnitude effect to occur seven birds would have to be killed due to collision with the GGRP each year. The collision risk is evaluated as Low (Low level of flight features and High susceptibility to collision) (Low: Table 9.9); therefore, the spatial magnitude of operational effects due to collision mortality has been assessed as negligible along the majority of the GGRP route. However, localised effects within the immediate vicinity of lek sites may occur. Here collision risk is evaluated as moderate (Medium level of flight features and High susceptibility to collision) (Moderate: Table 9.9); therefore, the spatial magnitude of operational effects due to collision mortality in close proximity to lek sites has been assessed as minor. Temporal magnitude will be long-term.

9.159 The long-term operational effects on black grouse due to collision mortality are likely to be, at worst, **minor**, and therefore **not significant** in terms of the EIA Regulations.

Waders

9.160 Due to morphological and behavioural factors curlew are classed as having medium susceptibility to collision (Medium: Table 9.7). As curlew were recorded within the survey area flight activity can be attributed to foraging flights and territorial behaviour. Therefore, due to the low population size present in the survey area, the low number of expected flights and no regular flight routes the significance of flight features is predicted to be low (Low: Table 9.8).

9.161 Nature Conservation Importance: curlew is classified as moderate NCI (Table 9.3).

9.162 Conservation Status: curlew is considered to be in unfavourable conservation status.

9.163 Spatial and Temporal Magnitude: The NHZ population of curlew is estimated between 3,851 – 4,717 pairs however as the population is declining an assessment based on the lower estimate is considered precautionary. Against the guide proportions in Table 9.4. for a moderate spatial magnitude effect to occur over 450 birds would have to be killed due to collision with the GGRP each year. The collision risk is evaluated as Low (Low level of flight features and High susceptibility to collision) (Low: Table 9.9); therefore, the spatial magnitude of operational effects has been assessed as negligible. Temporal magnitude will be long-term.

9.164 The long-term operational effects on curlew due to collision mortality are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

Summary of assessment of significance for operational effects

9.165 The long-term operational effects on peregrine and curlew due to collision mortality are likely to be **none** and therefore **not significant** in terms of the EIA Regulations.

9.166 The long-term operational effects on black grouse due to collision mortality are likely to be, at worst, **minor**, and therefore **not significant** in terms of the EIA Regulations.

Proposed Mitigation

9.167 No additional mitigation is proposed for peregrine or curlew during the operational phase.

9.168 Line marking remains the most common and practical form of wire collision mitigation worldwide, and research shows that it can reduce bird collisions by 50-94% (evidence reviewed in Prinsen *et al.*, 2012³⁷). Therefore, it is proposed that line marking along the length of OHL extending either side of the known black grouse lek site would be undertaken. Line marking is proposed, between towers 11 to 16, extending either side of the known black grouse lek site for the duration of the operational period of the GGRP. Markers would be spaced at 5m intervals and maintained for the duration of the operational period.

Residual Operational Effects

9.169 The residual long-term effects of operation on peregrine, black grouse and curlew due to collision mortality are likely to be **none** and therefore **not significant** in the context of the EIA Regulations.

Cumulative Operational Effects

Predicted Cumulative Effects during Operation

9.170 No significant residual effects of the GGRP were identified, and all effects on all bird species were assessed as likely to be **none** (Table 9.6). As such, the likely in-isolation effects of the GGRP are considered to have no potential to contribute to cumulative effects.

Proposed Mitigation

9.171 No additional mitigation is proposed.

Residual Cumulative Effects during Operation

9.172 The residual cumulative effects of operation are assessed as likely to be **none** and therefore **not significant** in the context of the EIA Regulations.

Interrelationship between Effects

9.173 There are interrelationships between the likely effects assessed in this chapter and those discussed in **Chapter 8: Ecology**. Many of the effects identified in the ecology chapter, relating primarily to habitat loss and disturbance, are of importance to ornithological features, and have informed the assessment of effects on ornithology.

Further Survey Requirements and Monitoring

9.174 No further survey or monitoring is required other than the requirements of the BBP as set out above.

Summary of Significant Effects

9.175 The construction effects resulting from displacement and operational effects due to collision mortality arising from the GGRP, including cumulative effects, are assessed as likely to be **not significant** in the context of the EIA Regulations.

Consideration of a Likely Significant Effect on the Muirkirk and North Lowther Uplands SPA

The Need For and Form of an Assessment

9.176 Whilst the Habitats Regulations provide that an assessment of the likely effects of a proposed development on a SPA is the responsibility of the competent authority, this Section provides a summary examination of the relevant issues to enable the competent authority to undertake the appropriate assessment in respect of the Muirkirk and North Lowther SPA. In particular, it provides relevant information pertaining to the likely effect of the GGRP on the Muirkirk and North Lowther Uplands SPA, classified for its breeding population of merlin, peregrine, short-eared owl, golden plover and hen harrier and wintering population of hen harrier.

9.177 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 Habitat Regulations are expressly applied to Scotland for the assessment of effects of electricity projects³⁸ on a European site. Post-Brexit Guidance by the Scottish Government (EU Exit: The Habitats Regulations in Scotland, December 2020) confirms the continuing relevance of the Habitats Regulations and related guidance.

9.178 Regulation 63 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?

9.179 It is important to note that step 2 only applies to the qualifying species of the SPA and the decision is informed by the SPA's conservation objectives. The European Court of Justice (ECJ) ruling of 7 September 2004 (C-127/02) on the Waddenzee mechanical cockle fishery clarified that Article 6 (3) of the Habitats Directive should be interpreted as meaning that any plan or project (other than those directly concerned with the management of the SPA) should be subject to step 3 if under step 2 "it cannot be excluded, on the basis of objective information, that it will not have a significant effect on that site, either individually or in combination with other plans or projects". Further, if a plan or project "is likely to undermine the site's conservation objectives it must be considered likely to have a significant effect. The assessment of risk must be made in light of, amongst others, the characteristics and specific environmental conditions of the site concerned." Under step 3 there is an onus on demonstrating that there will be no adverse effect on integrity, in light of best scientific knowledge. The consenting authority can only consent a plan or project if it is confident that a plan or project will not adversely affect site integrity. That is, when there is no reasonable scientific doubt as to the absence of such effects. The requirements associated with the appropriate assessment process have been clarified in the judgement of the European Court of Justice in case known as People Over Wind (C-323/17 5). This judgement provided an explanation regarding the correct approach to avoidance or reduction measures (i.e., mitigation measures) in the context of the Habitats Regulations. Additionally, the European Court of Justice in the case known as Holohan (C-461/176) further clarified (amongst others) the correct approach to consideration of habitats and species associated with a European site for the purposes of assessment of effects on conservation objectives of that site.

9.180 The need for considering the assessment steps referred to by the Habitats Regulations extends to plans or projects outwith the boundary of the relevant European site. 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 GGRP, even though it lies at a distance of ca.1.7km from the SPA boundary.

9.181 Given that the separation distance between the GGRP and the Muirkirk and North Lowther Uplands SPA is greater than the maximum disturbance free distances given for all the SPA qualifying species (Ruddock & Whitfield, 2007)²¹ then consideration of the BPP and any other embedded measures (see **Embedded Protection Measures** section above) are not relevant for the purposes of reaching a conclusion regarding the likely effect on the SPA.

³⁷ Prinsen, H.A.M., Smallie, J.J., Boere, G.C. & Pires, N. (Compilers). (2012). Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region. AEW Conservation Guidelines No. 14, CMS Technical Series No. 29, AEW Technical Series No. 50, CMS Raptors MOU Technical Series No. 3, Bonn, Germany.

³⁸ Including amongst others projects subject to consent in terms of section 37 of the Electricity Act 1989 and deemed planning permission in terms of section 57 of the Town and Country Planning (Scotland) Act 1997.

The Assessment in respect of GGRP

9.182 Steps referred to in paragraph 9.178 above have been considered in respect of GGRP, as follows:

- **Step 1.** The construction and operation of the GGRP are not directly connected with or necessary for the conservation management of the Muirkirk and North Lowther Uplands SPA, and therefore the next step needs to be considered.
- **Step 2.** Breeding merlin (*Falco columbarius*), peregrine (*Falco peregrinus*), short-eared owl (*Asio flammeus*) and golden plover (*Pluvialis apricaria*) and breeding and winter hen harrier (*Circus cyaneus*) are the qualifying interests of the SPA. NatureScot guidance (SNH, 2016)⁹ helps identify 'connectivity' between development proposals and Special Protection Areas. The reported connectivity distances given are 2km for hen harrier, peregrine and short-eared owl, 3km for golden plover and 5km for merlin.
 - Whilst the nearest element of the GGRP lies ca. 1.7km from the SPA boundary, no qualifying interests have bred within the reported connectivity distance from the GGRP.
 - Foraging hen harrier, merlin, peregrine, short-eared owl and golden plover rarely use the GGRP route corridor, as the habitat is inherently unsuitable. Nevertheless, during construction and operation of GGRP foraging birds would be potentially displaced from localised areas along the GGRP route corridor. However, these species have large foraging ranges relative to the scale of any displacement. Moreover, there is no evidence to suggest that the localised areas around the GGRP route corridor are critical to the performance of these species (i.e. foraging habitat does not appear to be limiting for the territories in question, and there is no reason to believe that the potential displacement area provides unusually profitable foraging opportunities). During the non-breeding period, when foraging birds are not constrained by nest site location, it is considered reasonable to assume they would accommodate any displacement by more intensively exploiting less disturbed areas. By definition, and through NatureScot's active pursuance of habitat management initiatives within the SPA, the SPA encompasses the most suitable territory for the maintenance of the qualifying species and as such it is expected that the majority of activity will take place there.

Conclusion

9.183 An assessment of the GGRP under the terms of Habitats Regulations is the responsibility of the competent authority. However, and with due regard to this stipulation, it is the overall judgement of this assessment that it is beyond scientific doubt that the GGRP is not likely to have a significant effect on the Muirkirk and North Lowther Uplands SPA, either individually or in combination with other plans or projects. As such, a Habitats Regulations Appraisal is not required. It follows, therefore, that there will be no detrimental effects on the respective SSSI designations which spatially overlap those of the SPA.