Updated Ornithology Impact Assessment for Alternative 15 Turbine Layout

Contents

Ornithology

Introduction

1. This report updates the Ornithological Impact Assessment (OIA) for the Torfichen Wind Farm Section 36 application by Renewable Energy Systems, for an alternative site layout that is being suggested by consultees. This would delete three turbines (T1-3 – see Figure 1) from the proposal. The lower number of turbines would reduce the ornithological impacts of the development, and the purpose of this document is to quantify that reduction.

2. The specific objective of the report is to describe the potential ornithological effects of the alternative scheme, including direct, indirect and cumulative effects, and compare them with the current proposal.

3. The assessment has been carried out by Dr Steve Percival of Ecology Consulting, who undertook the original assessment, using the same methodology as previously.

4. The report is supported by a set of figures and the following Technical Appendices that supported the original EIA report:

   - Technical Appendix 9.1: Breeding Bird Survey 2021;
   - Technical Appendix 9.2: Breeding Bird Survey 2022;
   - Technical Appendix 9.3: Wintering Bird Survey 2021-22;
   - Technical Appendix 9.4: Wintering Bird Survey 2022-23; and

5. Additionally, the following Technical Appendices have been updated to demonstrate the potential impacts of the alternative layout:

   - Technical Appendix 9.5 Update: Collision Risk Modelling Calculations;
   - Technical Appendix 9.6 Update: Draft Breeding Bird Protection Plan.
   - Technical Appendix 9.7 Update: Shadow Habitats Regulations Assessment (HRA).

Methodology

Scope of Assessment

6. The assessment methodology followed the same approach as used for the 2023 EIA Report, ensuring direct comparability of the results.

7. The key issues for the assessment of potential ornithological effects relating

to onshore wind farms include the following, based on NatureScot (NS; formerly Scottish National Heritage (SNH)) guidance (SNH, 2018a):

- direct loss of bird habitat through construction of wind farm infrastructure;
- disturbance of birds during construction and operation (including displacement of flight activity through barrier effects);
- mortality of birds through collision with wind turbine blades or towers during operation; and
- cumulative effects of wind farm operational disturbance and collision mortality, on the national and Natural Heritage Zone (NHZ) populations of key target species.

8. Key target species for the assessment have been identified following SNH 2018a guidance using the following criteria:

- species listed on Annex 1 of the EU Birds Directive;
- species listed on Schedule 1 of the 1981 Wildlife & Countryside Act;
- species identified by NatureScot (SNH 2018a) as 'Priority bird species for assessment when considering the development of onshore wind farms in Scotland'. These include (a) species that are widespread across Scotland which utilise habitats or have flight behaviours that may be adversely affected by a wind farm, and (b) as 'restricted range' species; and
- red-listed species on the Birds of Conservation Concern list (Stanbury et al. 2021).

9. The ornithological assessment update has, therefore, given particular consideration to all species recorded during the baseline surveys at the site that meet any of these criteria.

10. The baseline characterization and assessment methodologies for this update are the same as that used for the original layout – see 2023 EIA Report Chapter 9.

11. The assessment update also takes into account and applies the tests given in NS guidance on the assessment of effects of wind farms in the wider countryside (SNH 2018a), as previously. This guidance lists a range of priority 'species potentially at risk of impact', of which the following were recorded during the baseline surveys: whooper swan, barnacle goose, pink-footed goose, greylag goose, hen harrier, goshawk, red kite, osprey, merlin, peregrine, golden plover, lapwing, dunlin, curlew, herring gull and short-eared owl. The potential effects of the Proposed Development on each of these have been specifically considered and assessed below.

NatureScot Key Species Potentially at Risk

12. NatureScot (SNH 2018a) has identified a range of key species as being at potential risk of impact from wind farms. These species form the key focus of the ornithological impact assessment in the following section. In total four such species potentially at risk of impact were found breeding within the potential disturbance zone around the site (see Figure 9.2), these include:

- greylag goose (one pair, compared with 9 for the original layout);
- lapwing (up to 12 pairs, compared with 24 for the original layout); and
- curlew (up to 57 pairs, compared with 62 for the original layout).

13. A single pair of golden plover had been within the potential disturbance zone of the original layout – these birds were, however, outside the zone for the reduced layout.

14. Additional key species recorded breeding outside this zone but within 2 km of the site included osprey, goshawk, black grouse and short-eared owl.

15. Other key species recorded during the breeding season but without any evidence of breeding within 2 km of the site included red kite, marsh harrier, hen harrier, merlin, peregrine and herring gull.

16. Key species recorded using the potential disturbance zone outside the breeding season included pink-footed goose, black grouse, red kite, hen harrier, goshawk, golden plover, lapwing, curlew, herring gull, peregrine, merlin and short-eared owl.

17. Key species recorded at risk of collision (i.e. flying through the wind farm at rotor height) included whooper swan, pink-footed goose, greylag goose,

barnacle goose, red kite, osprey, hen harrier, goshawk, curlew, golden plover, lapwing, herring gull, peregrine and merlin.

Construction Effects (Updated)

Direct Effects: Loss of Habitat (Direct loss or degradation of habitat through construction of the Proposed Development)

Nature of Impact

18. There will be a direct loss of habitat resulting from the construction of the Proposed Development. The main habitats within the study area are unimproved acid grassland, marsh/marshy grassland and dry modified bog.

19. The direct loss of habitat for all bird species associated with the construction of the Proposed Development would be an effect of low/negligible magnitude. The permanent land take would be limited to the wind turbine and associated foundations, access tracks, permanent crane hardstands and substation/battery storage hardstands which account collectively for about 1.3% of the total area within the site (compared with 1.7% previously). Additional temporary land take during construction would add further temporary habitat loss of about another 0.2% of the site area (compared with 0.3% previously).

20. The use of existing tracks and the careful selection of routes for the access tracks and wind turbine locations, alongside the use of proven construction techniques, would ensure that such effects on birds would be of low/negligible magnitude (even in a local context). In addition, the applicant has committed to the production and implementation of a Construction Environmental Management Plan (CEMP) to the satisfaction of NatureScot and other relevant stakeholders before construction commences and would follow Windfarm Good Construction Guidance by Scottish Renewables et al. (2019).

Ornithological Receptor Value

21. Direct habitat loss will reduce habitat availability to the species breeding and foraging on the site, including two medium value (lapwing and curlew), one low value species (greylag goose), and seven high value species recorded foraging (red kite, hen harrier, goshawk, golden plover, peregrine, merlin and short-eared owl).

Magnitude of Impact

22. This very small loss of breeding and foraging habitat will be of negligible magnitude for all of the bird species affected.

Significance of Effects

23. Ornithological effects of the direct habitat loss resulting from the construction of the Proposed Development would be of negligible magnitude and not significant.

Indirect Effects: Construction Disturbance (Noise and Visual)

24. Experience from existing UK wind farms has shown that many species are tolerant of the presence of operational wind turbines and not unduly disturbed by them. Some short-term displacement during wind farm operation of species such as curlew may occur following construction, but populations have subsequently re-established themselves (Bullen Consultants 2002). Most species that have been studied have not been significantly affected (Phillips 1994, Thomas 1999, Gill 2004, Devereux et al. 2008, Percival and Percival 2011, Douglas et al. 2011). An RSPB study (Pearce-Higgins *et al*. 2009) reported partial displacement of breeding upland birds around wind turbines for a distance up to 800 m; reported significant reductions in golden plover density up to 400 m from wind turbines. The scale and pattern of displacement is similar to that reported for breeding waders in general (Hotker *et al*. 2006), with most studies reporting only small scale (0-200 m) displacement distances and a smaller number over a greater distance.

25. The indirect effect of disturbance is likely to be highest during construction owing to the increased activity on site. Pearce-Higgins et al. (2012) found that red grouse, snipe and curlew densities all declined at wind farm sites during construction, whilst densities of skylark and stonechat increased. Construction also involves the presence of work personnel on site which itself can be an important source of potential disturbance. Pearce-Higgins et al. reported decreases in curlew density during construction of 40% and snipe by 53%. Other species, such as golden plover, though have been shown to be unaffected by construction disturbance (Sansom *et al*. 2016).

26. The assessment of construction disturbance has assumed that all breeding birds within 500 m of the Proposed Development (the wind turbines plus their associated infrastructure and site tracks) could potentially be at risk of displacement, and a slightly wider zone (600 m) for wintering birds (Percival 2005, Drewitt and Langston 2006). It should be noted that only partial displacement within these zones might be expected (Pearce- Higgins et al. 2009), but it is assumed for the purposes of this assessment that all birds occurring within the zone are at risk of disturbance. For NS

priority species (SNH 2018a) consideration has also been given to the disturbance distances given in Ruddock and Whitfield (2007).

Nature of Impact

27. The estimated on-site construction period for the Proposed Development is expected to last approximately 24 months. The construction works will take place through the year, including the summer months when the weather is more favourable and ground conditions are drier.

28. Noise and visual disturbance associated with construction activities could potentially affect breeding and foraging birds in the locality of the wind turbine positions, access tracks and other infrastructure components. Birds that are disturbed at breeding sites are vulnerable to a variety of potential effects that could lead to a reduction in the productivity or survival of their populations; these include the chilling or predation of exposed eggs and chicks and damage of eggs and chicks due to panicked adults. Birds subject to disturbance outside the breeding season may also feed less efficiently or resort to less favoured roosting areas, either of which may reduce their survival prospects. The potential impact will vary between species according to each species' tolerance of disturbance from human activity and the availability of suitable alternative breeding and foraging habitat.

Ornithological Receptor Value

29. **Table 9.12** shows the peak breeding bird populations of conservation importance that were found within 500 m of the proposed wind turbine locations and with the other associated infrastructure (including access tracks) during the baseline surveys, where this distance has been used to identify the potential disturbance zone (though also giving consideration to particularly sensitive species in a wider area around that). Numbers breeding in each zone in the original application are also given for comparison.

Table 9.12. Conservation Importance of Breeding Birds in the Wind Farm Potential Disturbance Zone

Species	Peak breeding pairs <500m from wind turbines	Peak breeding pairs <500m from all infrastructure	Peak breeding pairs <500m from wind turbines (original application)	Peak breeding pairs <500m from all infrastructure (original application)	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
GREYLAG GOOSE	**1**	**1**	**9**	**9**	**LOCAL**	**LOW**
Mallard	0	0	1	2	Nil (Local)	(Low)
Red Grouse	5	5	7	7	Local	Medium
BLACK GROUSE	**2**	**2**	**2**	**2**	**LOCAL**	**MEDIUM**
Kestrel	3	3	3	4	Local	Low
Moorhen	1	1	1	1	Local	Low
Oystercatcher	3	3	4	4	Local	Low
GOLDEN PLOVER	**0**	**0**	**1**	**1**	**NIL (LOCAL)**	**(HIGH)**
LAPWING	**12**	**12**	**18**	**24**	**LOCAL**	**MEDIUM**
Snipe	16	17	19	23	Regional	Low
CURLEW	**54**	**57**	**60**	**62**	**REGIONAL**	**MEDIUM**
Redshank	0	0	2	2	Nil (Local)	Low
Woodpigeon	29	179	42	192	Local	Low
Cuckoo	0	0	1	1	Nil (Local)	Medium
SHORT-EARED OWL	**1**	**1**	**1**	**1**	**LOCAL**	**HIGH**
Skylark	250	292	298	344	Local	Medium
Tree Pipit	2	2	2	2	Local	Medium
Meadow Pipit	509	582	656	737	Local	Low
Grey Wagtail	0	0	1	1	Nil (Local)	(Low)
Wren	16	25	19	30	Local	Low
Dunnock	5	5	5	5	Local	Medium
Whinchat	3	3	3	3	Local	Low
Wheatear	12	15	16	18	Local	Low
Song Thrush	6	8	6	8	Local	Medium
Mistle Thrush	4	7	5	7	Local	Low
Sedge Warbler	1	1	1	1	Local	Low
Willow Warbler	18	29	20	32	Local	Low
Spotted Flycatcher	1	1	1	1	Local	Medium
Rook	0	65	0	65	Local	Low
Starling	1	1	1	1	Local	Medium
Siskin	8	11	8	12	Local	Low

Species	Peak breeding pairs <500m from wind turbines	Peak breeding pairs <500m from all infrastructure	Peak breeding pairs <500m from wind turbines (original application)	Peak breeding pairs <500m from all infrastructure (original application)	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
Linnet	2	4	2	4	Local	Medium
Lesser Redpoll	5	9	9	13	Local	Medium
Common Crossbill	1	2	1	2	Local	High
Reed Bunting	18	20	28	31	Local	Medium

Note: species in bold capitals are NatureScot priority species at risk from wind farm development (SNH 2018a).

30. **Table 9.13** shows the peak wintering bird populations of conservation importance that were found within 600 m of the proposed wind turbine locations and with the other associated infrastructure (including access tracks) during the baseline surveys, where this distance has been used to identify the potential disturbance zone (though also giving consideration to particularly sensitive species in a wider area around that).

Table 9.13 Conservation Importance of Wintering Birds in the Wind Farm Potential Disturbance Zone

Species	Peak count <600m from wind turbines	Peak count <600m from all infrastructure	Peak count <600m from wind turbine (original application)	Peak count <600m from all infrastructure (original application)	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
PINK-FOOTED GOOSE	**1125**	**2635**	**1125**	**2635**	**REGIONAL**	**VERY HIGH**
White-fronted Goose	0	1	0	1	Local	Medium
GREYLAG GOOSE	**18**	**62**	**58**	**66**	**LOCAL**	**LOW**
BARNACLE GOOSE	**0**	**0**	**1**	**1**	**NIL (LOCAL)**	**HIGH**
Teal	38	38	38	38	Regional	Medium
Mallard	4	4	6	6	Local	Medium
Red Grouse	92	92	93	148	Local	Medium

Species	Peak count <600m from wind turbines	Peak count <600m from all infrastructure	Peak count <600m from wind turbine (original application)	Peak count <600m from all infrastructure (original application)	Scale of Importance of Breeding Population Within Potential Disturbance Zone	Conservation Value Within Potential Disturbance Zone
BLACK GROUSE	**6**	**6**	**6**	**6**	**REGIONAL**	**MEDIUM**
Little Grebe	1	1	1	1	Local	Medium
GOSHAWK	**1**	**1**	**1**	**1**	**REGIONAL**	**HIGH**
Kestrel	6	6	7	7	Local	Low
MERLIN	**1**	**1**	**1**	**1**	**REGIONAL**	**HIGH**
GOLDEN PLOVER	**26**	**40**	**26**	**40**	**LOCAL**	**HIGH**
LAPWING	**170**	**235**	**170**	**246**	**LOCAL**	**MEDIUM**
Snipe	37	37	37	37	Local	Low
Woodcock	5	5	5	5	Local	Low
CURLEW	**8**	**14**	**39**	**39**	**LOCAL (REGIONAL)**	**MEDIUM**
Common Gull	32	320	50	320	Local	Medium
Lesser Black-backed Gull	1	47	1	47	Local	Low
Herring Gull	46	46	93	184	Local	Medium
Great Black-backed Gull	0	0	1	1	Nil (Local)	Medium
Black-headed Gull	10	100	10	100	Local	Medium
SHORT-EARED OWL	**1**	**1**	**1**	**1**	**REGIONAL**	**HIGH**

Note: species in bold capitals are NatureScot priority species at risk from wind farm development (SNH 2018a).

Effects of Construction Disturbance on NS Key Species

31. The following section assesses the construction disturbance effects on each of the NS (SNH 2018) key species that were found within the potential disturbance zone within the breeding season (**Table 9.12**) and at other times of year (**Table 9.13**).

Curlew

32. Up to 57 pairs of curlew were found within 500 m of the site infrastructure, and hence would be at risk of disturbance during construction (**Figure 9.3**).

Numbers in the potential disturbance zone during winter were low (peak 14). This species is a red-listed Scottish BAP species, so has been classed as medium value. The NHZ population is 1,400 pairs (Wilson *et al*. 2015) but RSPB and NS advised using a lower figure of 1,220 pairs given the species' ongoing decline. The numbers within the potential disturbance zone would be considered to be of regional importance.

33. This species has been shown to be affected by disturbance, particularly during construction (Pearce-Higgins *et al*. 2012), so some displacement of breeding birds during the construction phase would be expected. The numbers breeding in the potential disturbance zone represent 4.6% of the NHZ population. The worst-case disturbance effect would be a temporary low-magnitude effect on a medium-value receptor, which would be of minor significance and not significant.

Lapwing

34. Up to 12 pairs of lapwing were found within 500 m of the site infrastructure (**Figure 9.3),** and hence would be at risk of disturbance during construction. Numbers in the potential disturbance zone during winter were low (peak 235). This species is a red-listed Scottish BAP species, so has been classed as medium value. No NHZ population estimate is available (Wilson *et al*. 2015) but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during construction, though probably not the complete displacement assumed in this worst-case assessment. Even in that worst case, a temporary displacement of 12 pairs would be only of low magnitude on a medium value receptor resulting in an effect of minor significance, which would not be significant.

Greylag Goose

35. A single pair of greylag geese was found within 500 m of the site infrastructure and hence would be at risk of disturbance during construction (**Figure 9.3**). Numbers in the potential disturbance zone during winter were low (peak 62). This species is an amber-listed species of conservation concern, so has been classed as low value. No NHZ population estimate is available (Wilson et al. 2015), but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during operation, though probably not the complete displacement assumed in this worst- case assessment. Even in that worst case, this would be only of low magnitude on a low-value receptor resulting in an effect of negligible significance, which would not be significant.

Pink-footed Goose

36. There were some winter pink-footed goose flocks feeding on fields within the potential disturbance zone, with a peak count of 2,635 recorded within 600 m of the site. These birds, however, ranged over a very wide area, and these fields formed only a very small part of their feeding range. Any disturbance during construction would therefore be an effect of negligible magnitude and not significant.

Black Grouse

37. A black grouse lek of up to 7 males was found 1.1 km from the nearest wind turbine and associated infrastructure. A second smaller lek (with only 1-2 lekking males) was located within the site at its western end. There would be potential for construction disturbance to this smaller lek - design mitigation has ensured that no wind turbines are located within 500 m, but there is a small amount of access track within that zone (330-500 m from the lek). Mitigation measures during construction would be required to ensure no significant effect on this species.

Scarce raptor species

38. Several high value raptor species were observed flying over the site during the baseline surveys, including osprey, goshawk, red kite, peregrine, merlin and short-eared owl. All were, however, only seen infrequently, with no evidence of breeding within the potential impact zone of the Proposed Development or that it was important for foraging for any of them. Four additional high value species were recorded breeding in the wider 2 km area (but outside the potential impact zone of the Proposed Development): osprey (single pair in 2022), goshawk (single pair in 2022), short-eared owl (single pair in 2021) and barn owl (single pair in 2022). Whilst some displacement may occur during construction, this effect would be of negligible magnitude on all these species and not significant.

Potential Operational Effects

Operational Displacement

Nature of Impact

39. The presence and operation of wind turbines could potentially displace birds from breeding and foraging areas. Birds may avoid the operational wind turbines and the surrounding area due to the visual appearance of large vertical structures in the landscape, the mechanical noises and wind noises of the blades, or the presence of periodic maintenance vehicles and personnel. Displacement due to operational wind turbines could force birds into less suitable habitat and this might reduce their ability to survive and

reproduce. If not displaced, birds may experience reduced foraging success or reduced productivity. Displacement effects can vary over time as birds habituate to the presence of operating wind turbines or site-faithful birds are lost from the population.

40. **Table 9.12** shows the peak breeding bird populations that were found within 500 m of the proposed wind turbine locations during the baseline surveys, where this distance has been used to identify the potential distance zone (though also giving consideration to particularly sensitive species in a wider area around that).

41. **Table 9.13** shows the peak wintering bird populations that were found within 600 m of the proposed wind turbine locations during the baseline surveys, where this distance has been used to identify the potential distance zone (though also giving consideration to particularly sensitive species in a wider area around that).

Effects of Operational Disturbance on NatureScot Key Species

42. The following section assesses the operational disturbance effects on each of the NS key species that were found within the potential disturbance zone within the breeding season (**Table 9.12**) and at other times of year (**Table 9.13**).

Curlew

43. Up to 54 pairs of curlew were found within 500 m of the wind turbines (**Figure 9.3**), and hence would be at risk of disturbance during operation. This species is a red-listed Scottish BAP species, so has been classed as medium value. The NHZ population is 1,400 pairs (Wilson *et al*. 2015) but RSPB and NS advised using a lower figure of 1,220 pairs given the species' ongoing decline. The numbers within the potential operational disturbance zone would be considered to be of regional importance. The numbers breeding in the potential operational disturbance zone represent 4.4% of the NHZ population. The worst-case disturbance effect would be of low magnitude on a medium value receptor. Whilst applying the matrix set out in EIA Report **Table 9.4**, this effect would be of minor significance and not significant, as this population forms a key part of a nationally important breeding bird community and this effect would last for the lifetime of the Proposed Development, it was concluded that this effect would be significant in the absence of mitigation.

Lapwing

44. Up to 12 pairs of lapwing were found within 500 m of the wind turbines (**Figure 9.2**), and hence would be at risk of disturbance during operation. This species is a red-listed Scottish BAP species, so has been classed as

medium value. No NHZ population estimate is available (Wilson et al. 2015) but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during operation, though probably not the complete displacement assumed in this worst-case assessment. In a worst case, with complete displacement of 18 pairs, this would be an effect of low magnitude on a medium value receptor resulting in an effect of minor significance, which would not be significant, applying the matrix in EIA Report **Table 9.4**. However, for the same reasoning as set out above for curlew, it was concluded that in the absence of mitigation this would be significant given that these birds are a key component of a nationally important breeding bird community.

Pink-footed Goose

45. There were some pink-footed goose flocks in winter feeding on fields within the potential disturbance zone, with a peak count of 1,125 recorded within 600 m of the wind turbines. These birds, however, ranged over a very wide area, and these fields formed only a very small part of their feeding range. Any disturbance during operation would therefore be an effect of negligible magnitude and not significant.

Greylag Goose

46. A single pair of greylag geese was found within 500 m of the wind turbines, and hence would be at risk of disturbance during construction (**Figure 9.3**). Numbers in the potential disturbance zone during winter were low (peak 58). This species is an amber-listed species of conservation concern, so has been classed as low value. No NHZ population estimate is available (Wilson et al. 2015) but the numbers within the potential disturbance zone would be considered to be of local importance. Some disturbance of these birds is likely during operation, though probably not the complete displacement assumed in this worst-case assessment. Even in that worst case, this would be only of low magnitude on a low value receptor resulting in an effect of negligible significance, which would not be significant.

Black Grouse

47. A black grouse lek of up to 7 males was found 1.1 km from the nearest wind turbine and associated infrastructure. A second smaller lek (with only 1-2 lekking males) was located within the site at its western end. There would be potential for operational disturbance to this smaller lek as it lies within the site, but design mitigation has ensured that no wind turbines are located within 500 m of any lek. As a result, any effect would be negligible magnitude and not significant.

Scarce Raptor Species

48. Several high value raptor species were observed flying over the site during the baseline surveys, including osprey, goshawk, red kite, peregrine, merlin and short-eared owl. All were, however, only seen infrequently, with no evidence of breeding within the potential impact zone of the Proposed Development or that it was important for foraging for any of them. Four additional high value species were recorded breeding in the wider 2 km area (but outside the potential impact zone of the Proposed Development): osprey (single pair in 2022), goshawk (single pair in 2022), short-eared owl (single pair in 2021) and barn owl (single pair in 2022). Whilst some displacement may occur during operation, this would be an effect of negligible magnitude on all these species and not significant.

Direct Effects: Collision Mortality

49. There have been a number of wind farms that have caused significant bird mortalities through collision, but their characteristics are very different to those at the Proposed Development. Most notably, at Altamont Pass in California and Tarifa in southern Spain, large numbers of raptors have been killed through collision with wind turbines (Orloff and Flannery 1992, Janss 1998, Thelander *et al*. 2003). Such problems have occurred where large numbers of sensitive species occur in close proximity to very large numbers (hundreds/thousands) of wind turbines, and usually also where the wind farm area provides a particularly attractive feeding resource. At onshore wind farm sites in the UK, with similar bird densities to the site, collision rates have generally been very low and not considered to be significant (Meek *et al*. 1993, Tyler 1995, Bioscan 2001, Percival *et al*. 2009, Percival et al. 2013).

50. The collision risk zone for the Proposed Development was taken as the wind turbines plus a 500 m buffer (following NS guidance). Reference NHZ population sizes were derived from Wilson et al. (2015).

Nature of Impact

51. Birds that collide with a wind turbine blade are likely to be killed or fatally injured. Increased mortality rates from collision with wind turbines could potentially affect the maintenance of bird populations, particularly for species that are otherwise experiencing poor reproductive or survival levels due to other factors e.g. food availability. The frequency of collision with wind turbines is assumed to be dependent on the amount of flight activity across the site and the ability of birds to detect the rotating blades and take avoidance action.

52. Operational displacement and collision with wind turbines are spatially mutually exclusive (if a bird is displaced from the wind farm areas it is not at risk of collision). However, displacement effects may change temporarily as birds that were at first displaced from an area may habituate to the presence of the operating wind turbines after a period of time and become exposed to the risk of collision.

53. **Table 9.14** summarises the collision risk analysis for each species. Data is presented separately for each of the two baseline survey years (2020-21 and 2021-22). For further details, see **Technical Appendix 9.5 (Updated)**.

54. **Table 9.14** gives the number of collisions predicted per year based on the precautionary NS avoidance rate of 99% for red kite and hen harrier, 99.5% for swans and gulls, 99.8% for the three goose species and 98% for all of the other species, the percentage increase that this would represent over the baseline mortality and an assessment of the magnitude of these effects. The magnitude was predicted as low for goshawk in 2020- 21, and negligible for all the other species modelled.

Table 9.14 Collision Risk Modelling Predictions: Reduced Layout

Species	Precautionary Predicted Number of Collisions per Year (NS avoidance rate)		Percentage Increase in Baseline Mortality		Magnitude
	2021-22	2022-23	2021-22	2022-23	
Whooper Swan	0.20	0.02	0.07%	0.01%	Negligible
Pink-footed Goose	8.61	17.2	0.12%	0.25%	Negligible
Greylag Goose	0.80	0.35	0.05%	0.02%	Negligible
Barnacle Goose	0.41	0	0.01%	0%	Negligible
Osprey	0.04	0	-	-	Negligible
Goshawk	0.37	0.04	4.77%	0.57%	Low/Negligible
Red Kite	0.01	0.20	0.01%	0.28%	Negligible

Hen Harrier	0.04	0	0.34%	0%	Negligible
Golden Plover	0.67	4.04	0.05%	0.28%	Negligible
Lapwing	7.10	1.81	0.51%	0.13%	Negligible
Curlew	0.54	1.45	0.05%	0.14%	Negligible
Herring Gull	0.79	1.76	0.25%	0.55%	Negligible
Peregrine	0.02	0.07	0.09%	0.38%	Negligible
Merlin	0.02	0	0.11%	0%	Negligible

Table 9.14 Collision Risk Modelling Predictions: Original Layout

Species	Precautionary Predicted Number of Collisions per Year (NS avoidance rate)		Percentage Increase in Baseline Mortality		Magnitude
	2021-22	2022-23	2021-22	2022-23	
Whooper Swan	0.20	0.04	0.07%	0.01%	Negligible
Pink-footed Goose	8.67	19.3	0.13%	0.28%	Negligible
Greylag Goose	0.89	0.39	0.05%	0.02%	Negligible
Barnacle Goose	0.43	0	0.01%	0%	Negligible
Osprey	0.04	0	0.58%	0.06%	Negligible
Goshawk	0.49	0.04	6.28%	0.57%	Moderate/Negligible
Red Kite	0.01	0.20	0.02%	0.27%	Negligible
Hen Harrier	0.04	0	0.36%	0%	Negligible
Golden Plover	0.70	5.62	0.05%	0.39%	Negligible
Lapwing	7.92	2.03	0.57%	0.15%	Negligible
Curlew	0.63	1.52	0.05%	0.13%	Negligible
Herring Gull	0.94	2.00	0.29%	0.63%	Negligible
Peregrine	0.02	0.12	0.11%	0.61%	Negligible
Merlin	0.02	0	0.11%	0%	Negligible

55. The following section assesses the operational collision risk to each of the NS key species that were found within the collision risk zone (**Table 9.14**).

Whooper Swan

56. Only four whooper swan flocks in total were recorded flying through the collision risk zone at rotor height; one (16 birds) in October 2021, one (34) in March 2022, one (7) in November 2022 and one (3) in December 2022 (**Figure 9.4**). Whooper swan is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Collision risk was estimated at 0.11 collisions per year based on the two

winters' data (equivalent to a 0.04% increase over the baseline mortality), an effect of negligible magnitude that would not be significant.

57. There would be no threat to the regional or national population of this species, so no significant adverse effect, following the SNH 2018a guidance, would occur.

Pink-footed Goose

58. Pink-footed goose was classed as very high value as a qualifying feature of the Gladhouse Reservoir, Fala Flow, Firth of Forth and Westwater SPAs. Pink-footed geese were regularly recorded flying through the collision risk zone throughout the winter period (**Figure 9.5**). The collision risk was predicted at 12.9 per year using the two baseline winters' data. This is equivalent to a 0.19% increase over the baseline mortality, an effect of negligible magnitude that would not be significant in both the context of the NHZ population and the SPA populations. Further analysis in relation to the effects on the SPA populations is included in **Technical Appendix 9.7 (Updated)**.

Greylag Goose

59. Greylag goose flight activity over the site was lower than for the previous species but occurred year-round. Flights through the collision risk zone occurred regularly (Figure 9.6), with a predicted collision risk of 0.57 over the two years (a 0.03% increase over the baseline mortality), an effect of negligible magnitude, which would not be significant.

Barnacle Goose

60. Four flocks in total were recorded flying through the collision risk zone at rotor height, three (of 45, 57 and 160 birds) in October 2021 (part of a migratory movement of birds across the area en route to their wintering grounds on the Solway Firth), and one (a single bird) in December 2021. Barnacle Goose is listed on Annex 1 of the EU Birds Directive, so is of high value. Collision risk was estimated at 0.20 collisions per year based on the two winters' data (equivalent to a 0.01% increase over the baseline mortality), an effect of negligible magnitude that would not be significant.

61. There would be no threat to the regional or national population of this species, so no significant adverse effect, following the SNH 2018a guidance, would occur.

Osprey

62. Osprey is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Though it bred in the wider survey area, it was rarely seen within the collision risk zone, with only two

flights recorded at rotor height through the collision risk zone (**Figure 9.7**). The collision risk was predicted at 0.02 per year, equivalent to a 0.3% increase over the baseline mortality. The collision risk to this species would be of negligible magnitude and not significant.

Hen Harrier

63. Hen harrier was classed as a high-value species listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive. The information available on collision risk to hen harriers at existing wind farms is not yet comprehensive. The published literature suggests that they are not particularly vulnerable to collision and that they will forage and even nest in proximity to wind turbines under certain circumstances (Steele 2006, Madders and Whitfield 2006). Very few harrier collisions have been reported, and harrier collision rates are considerably lower than those recorded for raptors in general (Illner 2011), though there have been two hen harrier collisions documented at the Griffin Wind Farm in Perthshire.

64. Hen harriers were regularly seen flying over the site during the winter, with one bird seen during the breeding season on one occasion (**Figure 9.7**). Only a very low number of flights were recorded at rotor height through the collision risk zone, with resulting collision risks predicted at 0.02 per year using the two years' data, equivalent to a 0.18% increase over the baseline mortality. The collision risk to this species would be of negligible magnitude and not significant.

Goshawk

65. Goshawk is listed on Schedule 1 of the Wildlife and Countryside Act, so is of high value. A total of 23 flights were recorded at rotor height through the collision risk zone (**Figure 9.7**), most of which were recorded during autumn 2021 (when a family were regularly seen in the area). The resulting collision risk was predicted at 0.21 per year, equivalent to a 2.7% increase over the baseline mortality. Collision risk to this species would be of low magnitude (in the context of the small NHZ population of only 13 pairs) but would not be significant.

Red Kite

66. Red kite is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Only five red kite flights were recorded at rotor height through the collision risk zone (**Figure 9.7**), with resulting collision risks predicted at 0.10 per year, equivalent to only a 0.14% increase over the baseline mortality. The collision risk to this species would be of negligible magnitude and not significant.

Peregrine

67. Peregrine is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. A total of 16 flights were recorded through the collision zone at rotor height during the two years' baseline surveys (**Figure 9.7**). The collision risk was very low (0.05 per year, equivalent to a 0.23% increase over the baseline mortality). Collision risk to this species would therefore be of negligible magnitude and not significant.

Merlin

68. Merlin is listed on Schedule 1 of the Wildlife and Countryside Act and Annex 1 of the EU Birds Directive, so is of high value. Only four merlin flights were recorded at rotor height through the collision risk zone (**Figure 9.7**), so the collision risk was very low (0.01 collisions per year, equivalent to only a 0.05% increase over the baseline mortality). The collision risk to this species would be of negligible magnitude and not significant.

Curlew

69. Curlew were frequently observed flying through the collision risk zone (**Figure 9.8**). Collison risk to curlew (a medium value receptor) was predicted to be 0.99 per year using the two years' baseline data. This would represent a 0.10% increase over the baseline mortality for this NHZ population (using the updated NHZ population estimate of 1,220 pairs), so would be an effect of negligible magnitude and not significant.

Lapwing

70. Lapwing were seen regularly flying through the collision risk zone (**Figure 9.9**). Collison risk to lapwing (a medium value receptor) was predicted to be 4.5 per year using the two years' baseline data. This would represent a 0.32% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant. Most of this risk occurred during the winter period.

Golden Plover

71. Golden plover flocks were regularly recorded flying through the collision risk zone at rotor height during the winter VP surveys, and a single flight was observed during the breeding season (**Figure 9.10**). Collison risk to golden plover (a high value receptor) was predicted to be 2.4 per year using the two years' baseline data. This would represent a 0.16% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant.

Herring Gull

72. Herring gulls were frequently observed flying through the collision risk zone

at rotor height during the winter, with smaller numbers of flights observed during the breeding season (**Figure 9.11**). Collison risk to herring gull (a medium value receptor) was predicted to be 1.3 per year over the two baseline years. This would represent a 0.40% increase over the baseline mortality for this NHZ population, so would be an effect of negligible magnitude and not significant.

Indirect Effects: Barrier Effect

73. A further potential operational disturbance effect could be disruption to important flight lines (barrier effect). Birds may see the Proposed Development and change their route to fly around (rather than through) it.

74. This would reduce the risk of collision but could possibly have other effects, for example potentially making important feeding areas less attractive (by acting as a barrier to the birds reaching them) and (if diversions were of a sufficient scale) resulting in increased energy consumption. The distance needed to divert around the Proposed Development would be relatively small and would not be expected to act as a major barrier to movements and no important regularly used flight routes across the site have been identified. Accordingly, the ecological consequences of any such changes in flight lines would be of negligible magnitude and not significant.

Assessment of Effects on Other High-Value Species

75. Common crossbill was breeding in the coniferous plantation (with two pairs in coniferous plantations in the northern and central parts of the survey area) around the site and was also present there outside the breeding season. Though these numbers are only locally important, this species is classed as high value because it is specially protected from disturbance during the breeding season under Schedule 1 of the 1981 Wildlife and Countryside Act. In the absence of any forest felling associated with the construction of the Proposed Development in the areas where common crossbill was present, this high-value species would be unaffected, with no significant impacts.

Assessment of Effects on Other Medium-Value Species

76. A regionally important black-headed gull breeding colony was located on the southern edge of the site. It held up to 380 breeding pairs. It was avoided during the site design process such that no wind turbines are located within 500 m of the colony to reduce the possibility of any adverse effects on the colony. As a result, any effect would be of low/negligible magnitude and not significant.

77. Twelve other medium-value species were recorded breeding in the potential

impact zone of the development: red grouse, snipe, cuckoo, skylark, tree pipit, dunnock, song thrush, spotted flycatcher, starling, linnet, lesser redpoll and reed bunting. All are SBL species. None would be likely to be significantly affected by the Proposed Development, given experience from other wind farms (Meek *et al*. 1993, Phillips 1994, Thomas 1999, Percival 2005, Devereux *et al*. 2008) and their large regional and national population sizes. Effects would be of low/negligible magnitude and not significant.

78. Gladhouse Reservoir supported a range of regionally important wintering waterfowl populations, including mute swan, wigeon, teal, mallard, tufted duck, little grebe and cormorant. These species were, though, largely restricted to the reservoir and would be unaffected by the Proposed Development.

Assessment of Effects on Other Low Value Species

79. The low value species are of lesser concern, as a higher magnitude impact would be necessary in order for a significant effect to occur. As these species are generally at low density within the core survey area, such a magnitude of effect would be very unlikely and it can be safely concluded that there would not be any significant effect on any of these species.

Effects on Protected Sites

European Protected Sites

80. The potential ornithological effects of the Proposed Development on European Protected Sites are assessed in **Technical Appendix 9.7**. Possible effects on the Gladhouse Reservoir SPA, Fala Flow SPA, Westwater SPA and the Firth of Forth SPA pink-footed goose populations constituted the only possible Likely Significant Effect (LSE) of the Proposed Development (either alone or in-combination) in the context of the Habitats Regulations.

81. The Proposed Development is (at the closest point) 0.7 km from Gladhouse Reservoir SPA/Ramsar, 6.4 km from Fala Flow SPA/Ramsar, 16.5 km from the Firth of Forth SPA and 19.5 km from Westwater SPA/Ramsar.

82. There would be a collision risk to pink-footed goose populations from these SPAs, and a risk of displacement from feeding fields during construction and operation of the Proposed Development. Neither of these impacts would, however, threaten the integrity of any SPA population (see **Technical Appendix 9.7**). The conservation objective 'to maintain the population of the species as a viable component of the SPA would not be undermined. This level of additional mortality would not represent an adverse effect on the integrity of any SPA.

83. Neither cumulative disturbance nor cumulative collision risk would

represent an adverse effect on the integrity of any SPA.

Other Protected Sites

84. The Moorfoot Hills SSSI (0.4 km from the site) has several ornithological interest features, including breeding golden plover population and its breeding bird assemblage (including 9 species of wader and ring ouzel). Whilst species such as golden plover and curlew may visit the Proposed Development site to feed whilst breeding on this SSSI, any effects on these species would be of negligible magnitude and not significant.

85. Dundreich Plateau SSSI lies 4 km from the site, and its citation includes several breeding bird species such as golden plover, curlew, ring ouzel and redshank. At this distance from the site, any effect on the SSSI populations would be of negligible magnitude and not significant.

86. No significant effects would be likely to occur on the ornithological interest features of any other statutory protected sites, with no other SSSIs with any ornithological interest features within 5 km.

Mitigation

87. The Proposed Development is not likely to result in any significant ornithological effects in EIA terms, but nonetheless, the best practice measures described below would be followed throughout all of the Proposed Development, and to ensure compliance with the nature conservation legislation. Mitigation is also required to ensure that the development is compliant with the biodiversity objectives of NPF4.

88. The Applicant has committed to the production of a CEMP to the satisfaction of NatureScot and other relevant stakeholders, before construction commences, and would follow Windfarm Good Construction Guidance (Scottish Renewables et al., 2019). An outline CEMP is included as **Technical Appendix 3.1** of the EIA Report. An Ecological Clerk of Works (ECoW) will be appointed to monitor the implementation of the CEMP, the Breeding Bird Protection Plan (BBPP) and the outline Biodiversity and Enhancement Management Plan (oBEMP).

89. Mitigation will be delivered to offset habitat loss, including for the breeding waders and black grouse on site (given the potential for displacement from the Proposed Development). This will deliver the biodiversity gain required under NPF4.

90. Mitigation for these species will also include local measures to reduce the effects of the wind farm on the local populations. NatureScot (NS) has specifically requested in its response of 30 May 2025 to the original

application that this should include:

- Predator Control (curlew and black grouse)
- Marking the turbine bases in contrasting colour (black grouse)
- Specific broadleaf species and planting densities (black grouse)

Predator Control

91. NS stated in its response to the original ES that "predator control would potentially make the single biggest difference to curlew populations, particularly as the introduction of linear features into a landscape has been shown to improve the efficiency of predator foraging." A predator control programme will be implemented, to include crow traps, trapping of stoats and weasels and fox control. This would be enhanced from current levels but would be informed by the wind farm monitoring programme. If the programme indicates that increased ground-nesting nests are being lost to predation, then further predator control measures will be implemented (to be agreed with the conservation management group).

92. All predator control will be recorded and that information made available to the conservation management group to inform future management.

Turbine Base Marking

93. In order to reduce collision risk to black grouse in particular, the wind turbine bases will be painted black to increase their visibility to flying birds. A study in Norway (Stokke et al. 2020) showed that painting the lower 10 m of turbine bases reduced grouse (ptarmigan) collision risk by 48%, so the same approach will be used here,

Broad-leaved Tree Planting

94. Broad-leaved trees will be planted that will enhance black grouse habitats, as part of the Biodiversity Enhancement Management Plan (BEMP). This will include a mix of birch, rowan, willow, alder and aspen, designed as open, irregular woodland (Forestry Commission Scotland 2019, GWCT 2025 and Cole et al. 2013). It will create year-round food and cover, and support invertebrate-rich ground vegetation for chicks. The species mix will comprise:

- Birch (*Betula pubescens*) 25%;
- Rowan (*Sorbus aucuparia*) 15%;
- Hawthorn (*Crataegus monogyna*) 10%;
- Willows (*Salix cinerea*, *S caprea*, and/or *S aurita*) 15%;
- Alder (*Alnus glutinosa*) 10%;
- Aspen (*Populus tremula*) 5%; and

- Open ground (not planted) 20%.

95. Planting density will be 100-200 stems per ha. Deer fencing will be removed as soon as it is no longer required and fence marking options for 'High Exposure Sites' will be selected, as defined by Trout and Kortland (2012), to reduce grouse collision risk.

Breeding Bird Protection Plan

96. A BBPP will be required to ensure compliance with the Wildlife and Countryside Act (a) to avoid any disturbance to species specially protected under Schedule 1 of that Act and (b) to avoid any damage to active nests during construction. A draft BBPP is included within Technical Appendix 9.6 (Updated).

97. Several species specially protected from disturbance during breeding under Schedule 1 of the Wildlife and Countryside Act were recorded during the surveys, including hen harrier, merlin and common crossbill. It will be essential to ensure that no Schedule 1 species are disturbed during the breeding season, particularly during the construction phase. Therefore, a BBPP will be developed and implemented. Further surveys for hen harrier, merlin and common crossbill and any other Schedule 1 species will be undertaken to inform the BBPP at fortnightly intervals through the breeding season (March-August) during the construction period. If any nesting Schedule 1 birds were found, then potentially disturbing activities would be suspended for the breeding season within an appropriate zone (dependent on the location of the birds and the species involved, to be agreed with NS and the local authority, and following Ruddock and Whitfield 2007). The BBPP will also include measures to ensure the protection of all other nesting birds.

98. Where works affecting habitats that could be used by nesting birds take place between March and August (inclusive), they will only be carried out following an on-site check for nesting birds by an experienced ecologist. If this indicates that no nesting birds are likely to be harmed by the works, then the works will proceed. If nesting birds are found to be present, work will not take place in that area until the adult birds and young have left the nest. A protection zone will be clearly marked around the nest site to prevent accidental disturbance or damage.

99. NS advised in its response of 30 May 2025 to the original ES that buffer zones around the proximity of Turbines 7 and 9 would be appropriate to reduce indirect habitat loss through displacement from black grouse nesting/brood-rearing habitat at Yorkston Moss, particularly during construction. A 500 m caution zone will be established around these two turbines, with no potentially disturbing construction activities to take place within that zone

during the black grouse breeding season (15 March-31 July).

Off-Site Mitigation

100. The operational ornithological impacts of the Proposed Development will be mitigated (in order to deliver a net gain in line with NPF4) through a combination of the enhancements that will be delivered through onsite mitigation measures (see above), and further off-site measures. The developer is committed to ensuring that the scheme overall delivers a clear net ornithological benefit. This will include provisions of an appropriate level of funds (to be agreed with NatureScot and RSPB) for the regional conservation of black grouse and breeding waders (particularly curlew), working collaboratively, where possible, with other interested parties. There would be three components:

- **Conservation Planning** – to develop a strategy for the optimal delivery of conservation measures across the region.
- **Conservation Action** – to implement direct measures that benefit the regional curlew population, such as wetland habitat creation, peatland restoration, upland grazing management and predator control/management (following recommendations in the UK Action Plan for Curlew).
- **Monitoring** – to determine baseline curlew distribution and abundance, which will be used to identify suitable areas for conservation management, set targets and assess management progress.

Assessment of Residual Effects

101. The residual ornithological effects of the Proposed Development will be a non-significant loss of a small amount of upland moorland habitat to the elements of the proposed, and a non-significant risk of disturbance and collision.

102. Using evidence from existing wind farms it is considered unlikely that there will be any long-term impact on the integrity of the study area's ornithological features, or the conservation status of the species found here.

Assessment of Cumulative Effects

103. The potential for cumulative ornithological effects was considered following the SNH 2018b guidance on 'Assessing the Cumulative Impacts of Onshore Wind Farms on Birds', considering impacts on the favourable conservation status of key species within the relevant NHZ (in this case NHZ 20 The Border Hills, within which most of the development falls, though consideration has also been given to NHZ 16 Eastern Lowlands, which overlaps the northern

edge of the site). Given this overlap of NHZ areas, the cumulative assessment has focussed on developments within 35 km of the site boundary. This includes operational and consented developments, as well as those in the planning process (though not those in scoping as insufficient information was available to assess those). Details of the developments within this range are given in EIA Report **Chapter 6: Landscape and Visual Impact Assessment** and illustrated in **Figure 6.27**. However, only sites within 20 km are likely to have any ornithological connectivity with the site.

104. All of the potential effects of wind farms (direct habitat loss and disturbance during construction; and collision risk and disturbance during operation) have the potential to contribute to the cumulative ornithological impacts, therefore have been considered in the cumulative assessment. Consideration of the cumulative collision risk was carried out to determine whether the Proposed Development could materially contribute to a potentially significant cumulative collision risk.

105. This cumulative assessment has scoped in all species with potential ecological linkage to SPAs, and all other key NS target species with non-negligible residual impacts predicted. This included:

- Cumulative collision risk to pink-footed goose;
- Cumulative disturbance to breeding curlew; and
- Cumulative collision risk to goshawk.

106. Each of these is considered in turn below, using the information available from other developments that could contribute to the cumulative impacts, but given that full information from all developments is not available, a precautionary approach has been adopted to this cumulative assessment.

107. For all other species, the predicted residual effects of the Proposed Development, with regard to habitat loss and disturbance are so low (negligible magnitude) it was considered that these would not make any material contribution to any potentially significant cumulative impact at the NHZ level.

Pink-footed Goose Cumulative Collision Risk

108. Pink-footed goose collision risk at the Proposed Development is predicted at 12.9 per year using the two baseline winters' data, equivalent to a 0.19% increase over the baseline mortality. Collision risk at other sites has been reported at such low levels that it has not been considered in any other cumulative assessments. Taking into account both the reported cumulative risks from other sites and the likely risks from schemes where collision risk has not been reported, it is concluded that the cumulative collision risk would be of negligible magnitude and would not be significant in both the context of the NHZ population and the SPA populations.

Curlew Cumulative Disturbance Risk

109. Curlew is widespread breeding species across the upland habitats within the region, and present at the majority of wind farm sites in the NHZ.

110. There are a minimum of 27 pairs at risk of cumulative impact from operational and consented schemes (1.9% of the NHZ population of 1,400 pairs). Schemes currently in planning add at least a further 23 pairs to this number, and the Proposed Development site another 57 pairs, giving a total potential cumulative disturbance impact to at least 107 pairs. This would be a loss, in a worst case, of about 8% of the NHZ population. However, this worst case does not take into account the fact that there are habitat management measures in place or planned for most of the developments that would at least partially offset the loss through disturbance, and that the disturbance itself would be unlikely to be total for the whole 500 m buffer used in the assessment (for example, results from the Fallago Rig wind farm monitoring reported in the Dunside EIA Report showed that curlew were not completely displaced from the operational turbines at that site). The residual cumulative operational effect is therefore considered to be of low magnitude on a medium value receptor. Applying the matrix set out in EIA Report **Table 9.4**, this effect would be of minor significance and not significant.

Goshawk Cumulative Collision Risk

111. Goshawk collision risk is predicted at 0.21 per year at the Proposed Development, equivalent to a 2.7% increase over the baseline mortality. This species was also at risk of collision at several other sites, including Scawd Law (0.17 per year) and Cloich (0.005 collisions per year). There would also be benefits to this species from the habitat management plans that are being implemented at most sites. The cumulative residual risk is considered to be of low magnitude (in the context of the low numeric risk to the small NHZ population of only 13 pairs) and would not be significant.

112. Furthermore in relation to cumulative ornithological effects, the mitigation measures implemented for the Torfichen development will deliver a net ornithological gain, and hence will have a positive overall impact on the NHZ.

Summary

113. **Table 9.17** provides a summary of the effects of the Proposed Development on features of ornithological interest detailed within this chapter.

114. The conclusions of the assessment remain the same as those for the previous application – there would be no significant residual effects on ornithology from the revised scheme. In comparison with the previous scheme, there would be a reduced bird collision risk (as a result of fewer turbines), and the reduced layout footprint would also mean that the disturbance effects would also be reduced. Species with distributions concentrated at the western end of the proposed development such as lapwing and greylag goose would have higher reductions in the magnitude of these effects.

115. Overall, there are not likely to be any significant impacts on ornithology as a result of the Proposed Development. In relation to the key NS wider countryside test, the Proposed Development would not affect the favourable conservation status of any bird species of conservation importance within the NHZ, either alone or in-combination with other schemes. It would also not result in any adverse effect on the integrity of any SPA qualifying interests, nor would it result in any breach of the Habitats Regulations.

Table 9.17 Summary of the effects of the Proposed Development on features of ornithological interest

Project Phase	Summary of Effect	Value	Magnitude	Nature of Effect			Mitigation Measure	Residual Significance
				Positive/ negative	Permanent/ temporary	Reversible/ irreversible		
Construction	Habitat loss: construction of infrastructure including wind turbine foundations and access tracks	Low/ negligible	Negligible	Negative	Temporary	Reversible	Avoidance of more sensitive habitats in design process	Not significant
	Disturbance to Schedule 1 and Annex 1 breeding species	Up to high	Negligible	Negative	Temporary	Reversible	Development and implementation of BBPP, to include pre-construction survey checks; if present avoid disturbing activity in proximity with species-specific buffer zone implemented.	Not significant
	Disturbance to other breeding species	Up to medium	Negligible	Negative	Temporary	Reversible	Pre-construction survey and active nests avoided.	Not significant
	Disturbance to wintering birds	Up to very high	Negligible	Negative	Temporary	Reversible	None required	Not significant
Operation	Displacement of birds from zone around wind turbines	Up to high	Negligible	Negative	Temporary	Reversible	BEMP and additional measures to offset potential losses	Not significant
	Disturbance to Schedule 1 and Annex 1 breeding species	Up to very high	Negligible	Negative	Temporary	Reversible	None required.	Not significant
	Disturbance to other breeding species	Up to medium	Negligible	Negative	Temporary	Reversible	None required	Not significant
	Disturbance to wintering birds	Up to high	Negligible	Negative	Temporary	Reversible	None required	Not significant
	Mortality through bird collision with wind turbines	Up to very high	Low/negligible	Negative	Temporary	Reversible	None required	Not significant

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