

10 Ornithology

Introduction

- 10.1 This Chapter of the Environmental Statement (ES) has been completed by MacArthur Green Ltd. The Chapter complements the separate evaluation of potential ecological effects presented in Chapter 9: Ecology.
- 10.2 This ornithological assessment evaluates the effects of the proposed Solwaybank Wind Farm (the proposed wind farm (as described in **Chapter 4: Development Description**) on birds. The boundary of the main site (as shown on Figure 1.2) is referred to as ‘the site’ within this assessment. The assessment defines a Maximum Potential Wind Farm Boundary (here after referred to as ‘the MPWB’ - shown in Figure 10.5) around the proposed wind farm’s outer most turbines to which the appropriate survey buffers have been applied (e.g. 250 m for flight line surveys around turbines).
- 10.3 This Chapter is supported by Appendix 10.1 which contains the following Annexes:
- Annex A - Legal Protection. This appendix details the legal protection afforded to Annex 1, Schedule 1 and wild birds in general.
 - Annex B - Bird Survey Methodologies.
 - Annex C and D - Survey Effort and Results.
 - Annex E - Collision Risk Assessment.
 - Annex F - Confidential Annex. Due to the sensitive nature of this information it is contained within a confidential annex under the terms of the Environmental Information (Scotland) Regulations 2004 Regulation 10(5)(g).
- 10.4 This chapter details the methods used to establish the bird populations within the proposed wind farm and its surroundings, together with the process used to determine the Nature Conservation Importance (NCI) (paragraph 10.33) of the bird populations present. The ways in which birds might be affected (directly or indirectly) by the construction, operation and decommissioning of the proposed wind farm are explained, and the magnitude of any probable effects of the proposed wind farm, and the significance of any likely effects assessed. In addition, any cumulative effects of the proposed wind farm in combination with other operational, consented or in application wind farms are considered.
- 10.5 Potential effects on birds associated with construction, operation and decommissioning of the proposed wind farm include:
- Displacement through indirect loss of habitat if birds avoid the proposed wind farm and its surrounding area due to construction activity, turbine operation and maintenance and visitor disturbance. Displacement can also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds.
 - Direct habitat loss through construction of the proposed wind farm infrastructure.
 - Habitat modification due to change in land cover (e.g. deforestation or impacts on hydrology).

- Death or injury through collision with turbine blades and towers, met masts, or fences associated with the proposed wind farm.

Legislation and Policy Context

International Legislation, Policy and Guidance

- 10.6 The following international legislation and policy is considered as part of the assessment:
- Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive);
 - Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive); and
 - Environmental Impact Assessment Directive 85/337/EEC (as amended).

National Legislation, Policy and Guidance

- 10.7 The following national legislation and policy is considered as part of the assessment:
- The Wildlife and Countryside Act 1981 (as amended) (WCA);
 - The Nature Conservation (Scotland) Act 2004 (as amended);
 - Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011);
 - The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (The Habitats Regulations);
 - SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds (‘The Habitats and Birds Directives’). Revised Guidance Updating Scottish Office Circular No 6/1995¹;
 - The UK Biodiversity Action Plan (BAP);
 - Birds of Conservation Concern (BoCC 3²) ‘Red list’ (2009);
 - Scottish Natural Heritage (2000) Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action. SNH Guidance Note. SNH³;

¹ SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds (‘The Habitats and Birds Directives’). Revised Guidance Updating Scottish Office Circular No 6/1995.

² Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. 2009. Birds of conservation concern 3 The population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* 102: 296-341.

- Scottish Natural Heritage (2006) Assessing significance of impacts from onshore Windfarms on birds outwith designated areas⁴;
- Scottish Natural Heritage (2009) Environmental Statements and Annexes of Environmentally Sensitive Bird Information⁵;
- Scottish Natural Heritage (2005 - Revised 2010) Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities⁶;
- Scottish Natural Heritage (2005) Cumulative Effects of Windfarms. Version 2. Revised 13/04/05;
- Scottish Natural Heritage (2010) Post-construction management of wind farms on clear-felled forestry sites; reducing the collision risk for hen harrier, merlin and short-eared owl from Special Protection Areas⁷;
- Policy Advice Note PAN 58 - Environmental Impact Assessment (Scottish Executive 1999);
- Planning Circular 3 2011; the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011;
- Scottish Natural Heritage (September, 2009) Environmental Statements and Annexes of Environmentally Sensitive Bird Information: Guidance for Developers, Consultants and Consultees⁸; and
- Scottish Natural Heritage (March 2008) Natural Heritage Assessment of Small Scale Wind Energy Projects which do not require Formal Environmental Impact Assessment (EIA)⁹.

Effects Assessed in Full

10.8 Following a desk-based study into the likely usage of the site by certain bird species, the following receptor groups were identified:

- Breeding birds;

³ Scottish Natural Heritage. 2000. Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action. SNH Guidance Note. SNH

⁴ Scottish Natural Heritage. 2006. Assessing significance of impacts from onshore Windfarms on birds outwith designated areas;

⁵ Scottish Natural Heritage. September, 2009. Environmental Statements and Annexes of Environmentally Sensitive Bird Information: Guidance for Developers, Consultants and Consultees

⁶ Scottish Natural Heritage (2005 - Revised 2010) Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities

⁷ Scottish Natural Heritage 2010. Post-construction management of wind farms on clear-felled forestry sites; reducing the collision risk for hen harrier, merlin and short-eared owl from Special Protection Areas.

⁸ Scottish Natural Heritage. September, 2009. Environmental Statements and Annexes of Environmentally Sensitive Bird Information: Guidance for Developers, Consultants and Consultees

⁹ Scottish Natural Heritage. March 2008. Natural Heritage Assessment of Small Scale Wind Energy Projects which do not require Formal Environmental Impact Assessment (EIA)

- Wintering birds;
- Breeding/non-breeding birds overflying the site; and
- Migrating birds overflying the site.

10.9 The potential effects identified in paragraph 10.5 were assessed in respect of the above receptor groups.

Effects Scoped Out

10.10 Effects upon Lapwing have been scoped out. This is based on there being only three records of the species throughout the entire year of survey effort (two flight lines and a single winter walkover record). In addition, none of these records were of birds at Potential Collision Risk Height.

Issues Identified during Consultation

10.11 Formal consultation was undertaken with both Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB), with discussions also undertaken with the Dumfries and Galloway Raptor Study Group (D&G RSG). The issues identified through these consultations are detailed within Table 10.1. Additional consultation information was obtained from the previous Environmental Statement¹⁰ produced for the proposed wind farm, together with recommendations/data gaps as detailed in response to the 2009 submission and this is included in Table 10.1.

Table 10.1: Issues Identified during Consultation

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
SNH Area Officer 19/11/2010	Consulted by MacArthur Green during ornithological scoping exercise.	SNH queried the number of spring migration vantage point (VP) survey hours and requested it be reviewed to comply with standard guidance. No other comments were made.	Spring migration hours were increased, in line with SNH guidance.
D&G RSG, email 29/08/2011	Consulted by MacArthur Green during survey programme	TR advised as to the nature of the Hen Harrier winter roost in the vicinity of the proposed wind farm.	No additional action required.

¹⁰ RES, Solwaybank Environmental Statement (2009)

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
RSPB Area Manager 20/06/2011	Consulted by MacArthur Green during survey programme.	RSPB referred to the findings of the previous ES produced for the proposed wind farm, with specific reference to breeding Goshawk within the vicinity of the site. It was advised that in light of the potential loss of the previous nest site (as a consequence of felling operations), the birds may have begun nesting closer to/on site. No other comments were made.	No change to the proposed survey methods required.
RSPB Data Search 19/08/2011	Consulted by MacArthur Green during survey programme	Data search identified two Lapwing records from RSPB database.	No change to the proposed survey methods required.
SNH 2009	Response to the ES submission	SNH concluded that survey work to inform the impact assessment was not sufficient, specifically in relation to Annex/Schedule 1 birds (including Barn Owl and Goshawk); moorland birds; and woodland birds. SNH recommended the use of a precautionary buffer between turbines and nest location (in relation to concerns over nesting Goshawk mitigation).	Survey scope for this ES has been agreed with both SNH and RSPB. 500 m buffer distance has been observed within this ES.
SNH 2006	Consulted by Scott Wilson during ornithological scoping exercise for the 2009 submission.	36 hours of survey was recommended for breeding, non-breeding and spring and autumn migration seasons, to assess the site usage by migrating geese and skuas.	Survey scope for this ES has been agreed with both SNH and RSPB.
D&G RSG 2006	Consulted by Scott Wilson during ornithological scoping exercise for the 2009 submission.	Advised that the RSG held no nest data for within 5 km of the site.	

Assessment Methodology

Baseline Characterisation

Desk Study

10.12 A desk study has been undertaken to inform an assessment of the current baseline conditions on the site. The following resources have been consulted as part of this study:

- SNH - both direct consultation, and via the online resource 'Sitelink' - www.snh.gov.uk/snhi;
- RSPB - via consultation with their data records;
- D&G RSG - informal dialogue with D&G RSG members; and
- Solwaybank Wind Farm Environmental Statement 2009 (RES, 2009), the '2009 ES'.

Field Work

10.13 Ornithological field work commenced in September 2010 and was completed in August 2011 and comprised the following specific surveys which were agreed in consultation with SNH ((see Figures 10.5 and 10.6 for survey areas and Viewshed Analysis)respectively):

- Flight activity Vantage Point (VP) surveys (within 250 m buffer of the MPWB);
- Upland Breeding Birds Surveys (BBS) (500 m buffer of the MPWB (including access tracks));
- Breeding diurnal raptors surveys (2 km buffer around the MPWB (including access tracks));
- Black Grouse lek surveys (1.5 km buffer around the MWPB (including access tracks); and
- Non-breeding bird surveys (winter period) (500 m buffer around the MPWB (including access tracks)).

Method of Assessment (including Significance Criteria)

Study Area

10.14 The ornithological study area includes the site, and extends beyond into a buffer zone around the MPWB of up to 2 km. The extent of the survey area for specific surveys is detailed in paragraph 10.13. The study area for the cumulative assessment was 20 km.

Guidance and Assessment Process

10.15 The assessment method follows the process set out in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ("the EIA Regulations") and guidance on the implementation of the Birds and Habitats Directive (SERAD, 2000)¹¹.

10.16 The information provided by these assessment methods will provide adequate information to allow the competent authority to undertake an Appropriate Assessment should this be required. This will involve establishing whether the proposal (either alone or in combination with other plans or projects) is likely to have a significant effect on the integrity of the relevant Special Protection

¹¹ SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('The Habitats and Birds Directives'). Revised Guidance Updating Scottish Office Circular No 6/1995.

Area(s) (SPAs). The relevant SPAs (also classified as SSSIs) with regard to the proposed wind farm are:

- Langholm - Newcastleton Hills SPA (8 km from the site);
- Upper Solway Flats and Marshes SPA (13 km from the site); and
- Castle Loch SPA (20 km from the site).

(full details of the qualifying species listed for those SPAs can be found within Table 10.6).

10.17 In assessing the effects, emphasis is given to the international, national and regional populations of the species as appropriate (or the SPA population where relevant). Inconsequential effects are excluded.

10.18 The evaluation for wider countryside interests (interests unrelated to a SPA) involves the following process:

- identifying of the potential effects of the proposed wind farm;
- considering of the likelihood of occurrence of potential effects where appropriate;
- defining the NCI of the bird populations present;
- establishing the population's Conservation Status;
- establishing the Magnitude of the likely effects (both spatial and temporal);
- based on the above information, making a professional judgement as to whether or not the identified effect is significant with respect to the EIA Regulations;
- if a potential effect is determined to be significant, identifying measures to mitigate or compensate the effect where required;
- considering opportunities for enhancement; and
- considering residual effects after mitigation, compensation or enhancement.

10.19 For clarity, the following sections further define the methods used to evaluate Conservation Status, Magnitude of likely effects and NCI.

10.20 The method for assessing the significance of effect on the integrity of an SPA is different from that employed for wider countryside interests. This method is detailed separately in paragraphs 10.40 to 10.42 (Habitat Regulations Appraisal).

10.21 If a potential effect is found to be significant, measures to avoid, reduce or remedy the effect are proposed where appropriate.

Method Used to Evaluate Conservation Status of Bird Populations

10.22 As defined by SNH (2006¹²), the Conservation Status of a species is, 'the sum of the influences acting on it which may affect its long term distribution and abundance, within the geographical area of interest (which for the purposes of the Directive is the EU)' (SNH, 2006. Para. 14).

10.23 Conservation Status is considered favourable under the following circumstances (SNH, 2006. Para.15):

- 'Population dynamics indicate that the species is 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 probably will continue to be) a sufficiently large habitat to maintain its population on a long term basis'.

10.24 SNH (2006) states that, 'An impact should be judged as of concern where it would adversely affect the favourable conservation status of a species, or stop a recovering species from reaching favourable conservation status, at international or national level or regionally' (SNH, 2006. Para. 17).

10.25 The relevant scale for breeding species, that are not associated within an SPA, is considered to be the appropriate Natural Heritage Zone(s) (NHZ) which the wind farm falls within (SNH, 2006. Para. 20). The proposed wind farm falls within the Border Hills (NHZ 20). For wintering or migratory species, the national (for example the migratory flyway, or where appropriate the subspecies) population is often considered to be the relevant scale for determining effects on the Conservation Status, since birds from a much larger international population may pass through an area on migration or to aggregate at a particular wintering area or stopover site (SNH, 2006. Para. 21). Finally, where an SPA population may be affected by a development, this population is the relevant population for assessing effects against.

Method Used to Evaluate the Magnitude of Likely Effects

10.26 An effect is defined as a change to the abundance and distribution of a population as a result of the proposed wind farm. This change can occur during construction, operation, or after the decommissioning of the proposed wind farm.

10.27 Effects can be adverse, neutral or beneficial.

10.28 There can often be varying degrees of uncertainty over effects as a result of limited information on the population response to a predicted effect, since the extent to which a bird population size may be affected by changes in behaviour or amount of available habitat is often very difficult to predict and may vary between species according to details of their ecology. A precautionary approach is adopted where the response of a population to an effect is uncertain.

10.29 In determining the magnitude of effects, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

10.30 The sensitivity of individual species to disturbance during relevant behaviours is considered where appropriate when determining spatial and temporal magnitude of effect and has been assessed using guidance described by Bright *et al.* (2006¹³), Hill *et al.* (1997¹⁴) and Ruddock and Whitfield (2007¹⁵).

¹² Scottish Natural Heritage. 2006. Assessing significance of impacts from onshore Windfarms on birds outwith designated areas;

¹³ Bright, J. A., Langston, R. H. W., Bullman, R., Evans, R. J., Gardner, S., Pearce-Higgins, J. & Wilson, E. 2006. Bird Sensitivity Map to provide locational guidance for onshore wind farms in Scotland. Royal Society for the Protection of Birds

¹⁴ Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. 1997. Bird disturbance: improving the quality of disturbance research. *Journal of Applied Ecology* 34:275-288.

¹⁵ Ruddock, M. & Whitfield, D. P. 2007. A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage 2007

10.31 In the case of non-designated sites, magnitude is assessed in respect of an appropriate ecological unit. In the present case, the appropriate unit for breeding species is taken to be the Border Hills (NHZ 20) as defined by SNH (SNH, 2006¹⁶).

10.32 Effects are judged in terms of magnitude in space and time. There are five levels of spatial effects and four levels of temporal effects as detailed in Tables 10.2 and 10.3.

Table 10.2: Spatial Effect Magnitude

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

Table 10.3: Temporal Effect Magnitude

Temporal Magnitude	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years). An exception to this is where there is likely to be substantial improvement after this period, in which case long or medium term may be more appropriate.
Long term	Between 15 years up to (but not including) 25 years.
Medium term	Between 5 years up to (but not including) 15 years.
Short term	Up to (but not including) 5 years.

Methods Used to Evaluate the Nature Conservation Importance of Bird Populations

10.33 There are three levels of Nature Conservation Importance as detailed in Table 10.4.

Table 10.4: Determining Factors of a Population’s Nature Conservation Importance

Importance	Definition
High	Species listed in Annex 1 of the EU Birds Directive. Breeding species listed on Schedule 1 of the Wildlife and Countryside Act (WCA). Populations protected by either an SPA, Site of Special Scientific Interest (SSSI) or both.
Moderate	<ul style="list-style-type: none"> Species listed in the UK Biodiversity Action Plan (BAP) (where these do not fall within the ‘High’ category above). Other Species listed on the Birds of Conservation Concern (BOCC3¹⁷) ‘Red’ list (where these do not fall within the ‘High’ category above). Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed wind farm (where these do not fall within the ‘High’ category above). Species present in regionally important numbers (>1% regional population).
Low	All other species populations not covered by the above categories.

10.34 ‘Target species’ were taken to be those species of High and Moderate NCI (Table 10.4).

Significance Criteria

10.35 The significance of potential effects is determined by integrating the assessments of Conservation Status, Magnitude and NCI in a reasoned way.

10.36 Table 10.5 details the significance criteria that has been used in assessing the effects of the proposed wind farm upon birds:

Table 10.5: Significance Criteria

Significance	Definition
Major	This is a significant effect, as the effect is likely to result in a long term significant adverse effect on the integrity of the population.
Moderate	This is a significant effect, as the effect is likely to result in a medium term or partially significant adverse effect on the integrity of the population.
Minor	The effect is likely to adversely affect the population at an insignificant level by virtue of its limited duration and/or extent, but there will probably be no effect on its integrity. This is not a significant effect.
Negligible	No effect. This is not a significant effect.

¹⁶ Scottish Natural Heritage. 2006. Assessing significance of impacts from onshore Windfarms on birds outwith designated areas;

¹⁷ Eaton , M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. 2009. Birds of conservation concern 3 The population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 102: 296-341.

Cumulative Assessment

- 10.37 The same assessment method as described within the ‘Assessment Methodology’ section has been used to undertake the cumulative assessment. Guidance on undertaking cumulative assessments (SNH 2005 - amended 2010¹⁸) has been used. Cumulative effects are considered in paragraphs 10.179 and 10.180.
- 10.38 By definition, cumulative effects are not possible to evaluate through the study of one development in isolation, but require the assessment of effects when considered in combination with other developments. The context in which these effects are considered is heavily dependent on the ecology of the species assessed. For example, it may be appropriate to consider cumulative collision risk to wildfowl associated with an SPA within the context of their wider foraging range and as such may involve the consideration of developments within 20 km of the SPA (dependent on existing data pertaining to the species in question).
- 10.39 For breeding species, it is necessary to consider the cumulative effects of additional developments in the area (this is likely to be the NHZ for most breeding species), whereby the overall displacement area may be increased. In isolation, it may be considered that local displacement will result in breeding birds moving to adjacent habitats, whereas in reality, these ‘receptor sites’ may be subject to development themselves and would thus be unavailable.

Habitats Regulations Appraisal Methodology

- 10.40 The Habitats Directive is transposed into domestic legislation by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations). Regulation 48 indicates a number of steps to be taken by the competent authority (in this case, Dumfries and Galloway Council) before granting planning permission (the ‘Habitats Regulation Appraisal’). In order of application, these steps are noted as follows:
- Step 1: Consider whether the proposal is directly connected to or necessary for the management of the site (Regulation 48 (1b)). If not:
 - Step 2: Consider whether the proposal, alone or in combination, is likely to have a significant effect (“LSE”) on the site (Regulation 48 (1a)). If so:
 - Step 3: Make an Appropriate Assessment of the implications for the site in view of that site’s conservation objectives (Regulation 48 (1)).
 - Step 4: Consider whether it can be ascertained that the proposal will not adversely affect the integrity of the site (“Integrity Test”) having regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given (Regulation 48 (5 & 6)).
- 10.41 Following on from these first four steps set out in Regulation 48, there are a further four steps set out by the Habitats Regulations, detailed as follows:
- Step 5: Refuse planning permission, subject to Regulation 49, unless it has been ascertained that site integrity is not adversely affected (Regulation 48 (5)).

- Step 6: If the proposal fails the Integrity Test, consider if alternative solutions exist (Regulation 49 (1)). If there are alternative solutions then the competent authority should refuse planning permission. If no alternative solutions exist then proceed to next step.
- Step 7: Consider whether the proposal must be carried out for imperative reasons of overriding public interest (“IROPI”). (Regulation 49 (1)).
- Step 8: If IROPI is considered to exist, consider whether one can secure compensatory measures necessary to ensure the protection of the overall coherence of Natura 2000 (Regulation 53).

- 10.42 The information provided within this assessment will be sufficient to inform the Habitat Regulations Appraisal and the Appropriate Assessment which falls within this (Step 3 above).

Limitations

- 10.43 Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to impacts. These limitations are discussed in paragraphs 10.28 and 10.83. The precautionary approach is taken in these circumstances, as stated in paragraph 10.28, and as such it is considered that these limitations do not affect the robustness of this assessment.

Project Assumptions

- 10.44 Tree clearance and construction of the site access tracks, turbine hard standings and site compound and erection of the turbines is predicted to last up to 18 months. The number of breeding seasons potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The breeding season of most birds at Solwaybank extends from March to August although some species breed earlier (e.g. Common Crossbill which may breed as early as January). For the purposes of this assessment, to take the worst case scenario, it is assumed that, for any given species, construction activities and tree clearance would commence during the breeding season and would therefore potentially affect breeding for two years, assuming that construction will take approximately 18 months.
- 10.45 A Breeding Bird Protection Plan (BBPP) will be agreed in consultation with SNH in advance of construction. This plan will ensure all reasonable measures are taken to avoid disturbance to breeding birds and damage to, or destruction of, nest sites.
- 10.46 All electrical cabling between the proposed turbines and the site substation will be underground and follow existing and new tracks. Connection between the substation and the electrical grid will be subject to a separate planning application, as required.
- 10.47 The permanent meteorological mast will be of lattice tower design. The six guyed temporary masts will be fitted with deflectors of standard industry design to reduce the likelihood of bird collisions if required.

Baseline Conditions

Current Baseline

- 10.48 This section summarises the findings of the desk study and field surveys undertaken during 2010 and 2011 of the site and the surrounding area. Appendix 10.1 details the timing and methods employed, together with the full suite of results and associated figures.

¹⁸ Scottish Natural Heritage (2005 - Revised 2010) Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities

10.49 Reference is also made to the findings from the surveys conducted in 2005 and 2006, which informed the 2009 ES, where appropriate.

Desk Study

10.50 The desk study has confirmed that there are no statutory designations within the site. Information pertaining Special Protection Areas within 20 km (SNH, 2008. Para 13 and Annex B¹⁹) of the proposed wind farm is detailed within Table 10.6 and Figure 10.7.

Table 10.6: Special Protection Areas within 20 km of the Proposed Wind Farm

Distance	Site	SPA Qualifying Features
Within 5 km	None	
Within 10 km	Langholm - Newcastleton Hills SPA	<ul style="list-style-type: none"> Breeding Hen Harrier. Breeding bird assemblages; upland habitat mosaic assemblage.
	Langholm - Newcastleton Hills SSSI	
Within 15 km	Upper Solway Flats and Marshes SPA	Non-breeding populations of: <ul style="list-style-type: none"> Bar-tailed Godwit; Cormorant; Curlew; Dunlin; Golden Plover; Goldeneye; Great-crested Grebe; Grey Plover; Knot; Lapwing; Mallard; Oystercatcher; Pink-footed Goose; Pintail; Redshank; Ringed Plover (non-breeding and passage); Shoveler; Teal; Turnstone; Scaup; Shelduck; Svalbard Barnacle Goose; and Whooper Swan. Bar-tailed Godwit; Curlew; Dunlin, Golden Plover, Goldeneye; Grey Plover; and Knot
	Upper Solway Flats and Marshes SSSI	
Within 20 km	Castle Loch SPA	<ul style="list-style-type: none"> Non-breeding Pink-footed Goose; Non-breeding Goosander; Greylag

¹⁹ Scottish Natural Heritage. March 2008. Natural Heritage Assessment of Small Scale Wind Energy Projects which do not require Formal Environmental Impact Assessment (EIA)

Distance	Site	SPA Qualifying Features
	Castle Loch SSSI	Goose; and Pink-footed Goose.

Field Survey

10.51 The site is dominated by coniferous plantation forestry in the north-west, with the south-east being a mosaic of improved grassland, blanket bog and heath. Refer to **Chapter 9: Ecology** for a more detailed description of the habitats on site.

10.52 The ornithological field surveys extended throughout the site and for a buffer distance of up to 2 km from the MPWB, depending on the species/survey method (see paragraph 10.13 and Appendix 10.1, Annex B).

10.53 The following paragraphs summarise the nature of the findings by species. Full results can be found within Appendix 10.1, Annex C&D.

Golden Plover

10.54 Non-breeding Golden Plover are the most frequently occurring and abundant target species within the site, with nine separate flightlines for the species recorded at a height of between 20 m and 125 m (Potential Collision Height - PCH), totalling 34851.8 bird-seconds (number of birds multiplied by the number of flightline seconds) (Figure 10.1b). All of the Golden Plover records (i.e. including those made from outwith the site, and those records from the 2009 ES) were from non-breeding season (September until mid-March), or from early in the breeding season (i.e. early-April), which indicates that the site and wider area are used by the species as a wintering ground. A further 92 Golden Plover were recorded during winter walkover surveys. The surveys to inform the 2009 ES recorded Golden Plover twice; 1 flock of 14 and a single adult.

Hen Harrier

10.55 Hen Harrier flightlines were recorded during seven of the 12 months surveyed, although only one of these was within the MPWB's 250 m buffer and at PCH, and for a total of 43 seconds (Figure 10.1a). Two such records (i.e. within MPWB) were made during surveying for the 2009 ES with a total time of 30 second recorded at PCH.

10.56 A Hen Harrier winter roost site was located outwith the site during the winter walkover surveys and corroborated with representatives of the D&G Raptor Study Group (see Appendix 10.1, Confidential Annex F and Figure F2). The peak count for the roost during 2010/2011 was two birds (one male, one female), which was down from six birds during the previous winter (Tom Reid, D&G RSG, e-mail). Seven of the 11 total Hen Harrier records (i.e. including those made from outwith the MPWB's 250 m buffer) were from the non-breeding season, which suggests they formed part of this winter roost population.

10.57 No nesting Hen Harriers were recorded from within the survey area (i.e. the MPWB and its 2 km buffer).

Goshawk

10.58 Seven Goshawk flights were recorded from within the 250 m MPWB buffer and at PCH, totalling 217 seconds (Figure 10.1a). These flights included adults and juvenile birds, suggesting that the species is continuing to breed in the area (a previously-known Goshawk nest site recorded during surveys for the 2009 ES approximately 400 m north-west has since become inactive, as suggested during consultation with the RSPB). No Goshawk nest sites were recorded within the proposed wind farm or within a 2 km buffer distance during the 2011 surveys.

10.59 Two further Goshawk sightings were made during the breeding raptor surveys, with two Goshawk plucking posts²⁰ identified within the MPWB also. A single Goshawk sighting was also made during the summer woodland point count surveys.

Osprey

10.60 Three separate Osprey sightings were made during breeding raptor surveys, with one of these records occurring within the MPWB (Figure 10.1a). No breeding sites were identified. Osprey was not recorded during the surveys to inform the 2009 ES.

Merlin

10.61 Three Merlin flights were recorded from within the proposed wind farm site but below PCH, with two further records of birds outwith the proposed wind farm site. No breeding sites were identified from within the MPWB or within a 2 km buffer distance (Figure 10.1a). Merlin was not recorded during the surveys to inform the 2009 ES.

Short-eared Owl

10.62 Two separate Short-eared Owl sightings were made during the breeding raptor surveys, within the 2 km survey buffer, although no nesting sites were identified within the MPWB or within the 2 km buffer (Figure 10.1a). The surveys to inform the 2009 ES recorded 1 adult female to the north of the site.

Barn Owl

10.63 Surveys undertaken in 2005 to inform the 2009 ES recorded breeding Barn Owls on the site, with a nest site identified. No Barn Owls were recorded during the survey work undertaken to inform this ES, with the nest site seemingly abandoned.

Grey Geese

10.64 A skein of grey geese was recorded across the MPWB plus 250 m buffer and at PCH for a total of 1548 bird-seconds. 'Grey geese' is a term assigned to a record where it has not been possible to distinguish between Greylag and Pink-footed Geese in the field (Figure 10.1a). The surveys to inform the 2009 ES recorded a skein of 300+ Pink-footed Geese to the east of the site, above collision risk height.

Greylag Goose and Pink Footed Goose

10.65 A single Greylag Goose skein totalling 248 bird-seconds was recorded overflying the MPWB plus 250 m buffer at PCH, whilst two skeins of Pink-footed Goose were also recorded within the 250 m buffer, although above PCH (Figure 10.1a).

Raptors

10.66 The only raptor confirmed as breeding within the MPWB plus 2 km buffer is one pair of Buzzard (Appendix 10.1 Annex F - Confidential Figure F1). Additional flight activity was recorded for Kestrel and Sparrowhawk, although no nesting sites were identified (Figure 10.1a).

Mute Swans

10.67 A single pair of Mute Swans was confirmed as nesting on a small water body 1 km to the north of the proposed wind farm and was observed flying northwards with two juveniles during the breeding raptor surveys. Mute Swan was not recorded by the 2009 ES surveys.

²⁰ A plucking post is a favoured spot where Goshawks dismember their prey before eating it. Characteristically there are lots of feathers at these spots, and as such it is a useful feature to show that there are Goshawks in the area.

Lapwing

10.68 Two separate Lapwing flights were recorded within the MPWB plus 250 m buffer, although below PCH, with a further bird recorded during winter walkover surveys. No breeding birds were recorded within the MPWB plus 500 m buffer. Lapwing were not recorded by the 2009 ES surveys.

Curlew

10.69 Although flight lines were not recorded for Curlew as they were not initially defined as a target species, 15 separate Curlew flights were recorded (within the MPWB plus 250 m buffer and at PCH). The species was not found to be nesting on the proposed wind farm or surrounding 500 m buffer during surveying for the current ES. Two breeding pairs were recorded during breeding bird surveys in 2005 for the 2009 ES.

Oystercatchers

10.70 Two Oystercatchers were recorded flying within the MPWB plus 250 m buffer. The species was not found to be breeding within the MPWB plus 500 m buffer. Oystercatcher were not recorded by the surveys to inform the 2009 ES.

Common Crossbill and Lesser Redpoll

10.71 Common Crossbill and Lesser Redpoll are present within the forested parts of the proposed wind farm, as recorded during the summer woodland point count survey, and are likely to be nesting here. Three breeding Lesser Redpoll territories were recorded during the 2005 surveying for the 2009 ES although crossbill was not recorded.

Red Grouse and Snipe

10.72 Red Grouse (one pair; one pair also recorded during surveying for the 2009 ES) and Snipe (two pairs) have both been confirmed as nesting within the MPWB plus 500 m buffer, as recorded during the breeding bird surveys.

Passerines

10.73 A large number of passerines are present on the proposed wind farm, with those of greatest conservation concern being Skylark (25 breeding pairs; 30 pairs recorded during surveys conducted in 2005 and 2006 for the 2009 ES). The previous ES also noted two Song Thrush pairs, a Mistle Thrush pair and a Cuckoo pair during the BBS (Figure 10.2).

Future Baseline ('Do-nothing' Scenario)

10.74 In line with PAN 58 guidance, the following section reviews the current prevailing environmental conditions on the proposed wind farm to identify any changes that are likely under these conditions. This enables changes that are predicted to occur as a result of the proposed wind farm to be distinguished from those that are expected to occur regardless.

10.75 Provided the existing management of the proposed wind farm site is continued (sheep grazing and plantation forestry), changes in bird populations during the medium to long term (i.e. up to 25 years) are likely to be typical of those associated with areas of open heathland and plantation forest.

10.76 Plans for the plantation forestry, exclusive of the proposed wind farm associated management, are likely to see a more diverse plantation following planned felling of the current crop (likely to occur between 2016 and 2026), in line with The UK Forestry Standard (Forestry Commission, 2004). This is likely to increase the quality of habitat for passerines.

Windfarm Layout Considerations

10.77 No changes to the proposed wind farm layout were required for ornithological reasons.

Potential Effects

10.78 As discussed previously (paragraph 10.5), the potential effects of the proposed wind farm fall under four separate categories: displacement; habitat loss; habitat modification; and death or injury due to collision with the turbines/development-associated infrastructure. The following section discusses these effects within the context of the three stages of the proposed wind farm (i.e. construction, operation and decommissioning).

10.79 The assessment is applied to those populations of High and Moderate NCI as defined within Table 10.4. In summary, the 13 species listed in Table 10.7 will be considered:

Table 10.7: Nature Conservation Importance of Recorded Bird Populations

Species	Nature Conservation Importance	Reason
Pink-footed Goose	High	Annex 1 & SPA qualifying species
Hen Harrier	High	Schedule 1, Annex 1 & SPA qualifying species
Golden Plover	High	Annex 1 & SPA qualifying species
Goshawk	High	Schedule 1
Osprey	High	Schedule 1 & Annex 1
Merlin	High	Schedule 1 & Annex 1
Short-eared Owl	High	Schedule 1 & Annex 1
Common Crossbill	High	Schedule 1
Greylag Goose	High	SSSI qualifying species
Oystercatcher	High	SPA qualifying species
Curlew	High	SPA qualifying species
Skylark	Moderate	BOCC3 Red list
Lesser Redpoll	Moderate	BOCC3 Red list
All other species recorded	Low	Not covered by moderate or high categories.

10.80 It is necessary to consider the species' current Conservation Status when assessing the likely effects. Table 10.8 summarises this information for the relevant species.

Table 10.8: Conservation Status of Recorded Bird Populations

Species	Conservation Status Information for UK and Scotland	Conservation Status in Scotland & SPA where Relevant
Pink-footed Goose	BOCC Amber list. 50-60% of world population in Scotland in autumn and winter.	241,000 birds (BTO website) in UK, of which ca. 200,000 in Scotland in autumn. Massive historical increase to current numbers.

Species	Conservation Status Information for UK and Scotland	Conservation Status in Scotland & SPA where Relevant
		Upper Solway Flats and Marshes SPA's Non-breeding population: defined as 'Favourable Maintained' on 18 March 2007 (SNH Site Link V3). Castle Loch SPA's Non-breeding Population: defined as 'unfavourable no change' 30 June 1999 (SNH Site Link V3).
Hen Harrier	BOCC Red List. Historic decline, with the current long term trend a probable increase. Low population density and occupation of suitable habitat within Border Hills NHZ	633 pairs in Scotland; stable/increasing in Scotland. Unfavourable Conservation Status within Border Hills NHZ. Langholm - Newcastleton Hills SPA Breeding Population: 'Unfavourable Recovering' on 30 December 2008 (SNH Site Link V3)
Golden Plover (non-breeding)	High percentage of EU wintering population within the UK. BOCC Amber List	20,000 - 60,000 birds in winter in Scotland; stable. Ca 300,000 in winter in UK. Upper Solway Flats and Marshes SPA Non-breeding Population: 'Favourable Maintained' on 18 March 2007 (SNH Site Link V3).
Goshawk	BOCC Green List.	>130 pairs; increasing
Osprey	BOCC Amber List.	182-200 pairs; increasing
Merlin	BOCC Amber List. Historic decline, now stable or increasing.	800 pairs; stable/increasing
Short-eared Owl	BOCC Amber List. Population fluctuates; no trend.	125-1250 pairs; fluctuating
Common Crossbill	BOCC Green List. Population fluctuates; no trend.	5000-50,000 pairs; fluctuating
Greylag Goose	BOCC Amber list. Increasing in UK. Over 95% of Icelandic population winters in UK.	Over 85,000 birds winter in Scotland, with increasing numbers breeding in Scotland. Castle Loch SSSI Non-breeding Population: 'Unfavourable - no change' 31 March 2003 (SNH Site Link)
Oystercatcher	UK Amber List, as UK holds 30-40% of European breeding and wintering populations. Ca 71% of UK breeding population (of around 119,000 to 164,000 pairs) is in Scotland. Breeding numbers increased during 20 th Century with considerable breeding range expansion inland. Wintering numbers stable on estuarine	84,500 to 116,500 breeding pairs in Scotland. 80,000 to 120,000 birds in Scotland in winter (numbers fluctuate between winters). Breeding numbers increased in Scotland in 20 th Century with range expansion inland along rivers and onto agricultural land. Wintering numbers in Scotland slightly increased. Solway Flats and Marshes SPA Non-breeding

Species	Conservation Status Information for UK and Scotland	Conservation Status in Scotland & SPA where Relevant
	WeBS counts but increased on rocky shore sites	Population: 'Favourable Maintained' on 18th March 2007 (SNH Site Link).
Curlew	BOCC Amber List. 31% decline in breeding numbers in UK 25 years. About 20% of the East Atlantic flyway population winters in Scotland.	85,700 in winter in Scotland; numbers in winter stable over recent years or slightly increasing from 1970s (based on WeBS annual indices). Upper Solway Flats and Marshes SPA Non-breeding Population: 'Unfavourable Declining' on 18th March 2007 (SNH Site Link)
Skylark	BOCC Red List. 47% decline in UK population, but mainly in England. BBS data shows 8% increase in Scotland (1995-2008)	290,000-557,000 pairs; stable
Lesser Redpoll	BOCC Red List. 87% decline in 25 years throughout the UK.	7500-15,000 pairs; huge declines

10.81 For ease of reference, the process by which the assessment is made is repeated as follows (as in paragraph 10.18):

- identifying the potential effects of the proposed wind farm;
- considering the likelihood of occurrence of potential effects where appropriate;
- defining the NCI of the bird populations present;
- establishing the population's Conservation Status;
- establishing the Magnitude of the likely effect (both spatial and temporal);
- based on the above information, making a professional judgement as to whether or not the identified effect is Significant with respect to the EIA Regulations;
- if a potential effect is determined to be significant, identifying measures to mitigate or compensate the effect where required;
- considering opportunities for enhancement; and
- considering residual effects after mitigation, compensation or enhancement.

Potential Construction Effects

10.82 The total land-take by the proposed wind farm would result in the long term loss of a relatively small proportion of the site's habitat (approximately 18.26 ha of direct habitat loss resulting from the proposed wind farm infrastructure, representing 2.91% of the site area; see Chapter 9: Ecology). The effects on birds due to this relatively small loss are considered to be **Negligible** spatial and **Long Term** temporal. Even in the case of those species present that are High NCI (see Table 10-7))

it is unlikely that these effects would be significant. The overall impact is therefore considered **Minor and Not Significant** under the terms of the EIA Regulations.

10.83 The main potential effects of construction activities are the temporary displacement and disruption of breeding and foraging birds as a result of noise and visual disturbance. The effects on breeding and foraging birds would be confined to areas in the locality of temporary construction compounds, turbines, tracks and other site infrastructure. Few attempts have been made to quantify the disturbance of birds arising from activities of this type and much of the available information is contradictory. However, larger bird species, those higher up on the food chain, or those that feed in flocks in the open tend to be more vulnerable to disturbance than small birds living in structurally complex or closed habitats such as woodland (Hill *et al.* 1997²¹).

10.84 Construction effects are likely to be greater during the breeding season (roughly March to August inclusive) and will vary in severity depending on the species' relative sensitivity to such disturbance. The following paragraphs consider the species-specific effects.

Skylark

10.85 Skylark (**Moderate** Nature NCI) have been confirmed as breeding within the MPWB plus 500 m buffer (30 pairs in 2005 and 25 pairs in 2011). The Skylark has suffered a well-documented and large population decline in the UK as a whole, although in Scotland an increase of 8% for 1995-2008 has been described (Table 10.8). This species is considered to exhibit low sensitivity to disturbance and few, if any, birds would be displaced. Therefore, given the **Low** spatial and **Short Term** temporal magnitude of impact, **Moderate NCI**, a stable/increasing Conservation Status in Scotland and their low sensitivity to disturbance, the overall impact is considered as **Minor** and therefore **Not Significant** under the terms of the EIA Regulations.

Common Crossbill and Lesser Redpoll

10.86 Tree removal as part of construction will be fairly extensive, and will include approximately half of the plantation forestry into which the proposed wind farm extends (ca. 198 ha). The potential effects upon those species dependent on woodland will be long term as historic nest sites may be lost. The species potentially affected are Common Crossbill (not present in 2005 but present in 2011), and Lesser Redpoll (recorded in 2005 and in 2011). Common Crossbill is **High** NCI and Redpoll is **Moderate** NCI.

10.87 The Common Crossbill population appears fairly stable in the long term, although it appears to experience frequent fluctuations relating to variations in cone crop and in immigration from northern Europe; the Lesser Redpoll however, has suffered a massive population decline within the last 25 years of 87% across its UK range and is thus considered to be in **Unfavourable** Conservation Status. Despite this, assuming the BBPP will ensure nesting Redpoll and Crossbill are protected from disturbance, and taking into account the abundance of suitable habitat within the wider area (into which the birds will be able to move) and the fact that more diverse forestry is to be replanted (in line with the HMP - Chapter 9: Ecology) means that a **Low** spatial and **Medium Term** temporal impact magnitude is considered appropriate for both species. The overall impact is therefore considered to be **Minor and Not Significant** under the terms of the EIA Regulations.

Goshawk

²¹ Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. 1997. Bird disturbance: improving the quality of disturbance research. *Journal of Applied Ecology* 34:275-288.

10.88 The construction activities (and more specifically the planned tree-felling) may prevent hunting Goshawk from fully utilising the proposed wind farm site by virtue of the changing habitat and increased local disturbance.

10.89 Goshawk flights across the proposed wind farm site were the most numerous by any potentially foraging raptor and totalled 10 recorded flights between September 2010 and August 2011. Goshawk are classified as **High** NCI by virtue of their Schedule 1 status. Their current Conservation Status is considered to be **Favourable** in Scotland, with the population increasing. There is a relative abundance of forestry within the wider area. There is also an absence of an active nest site within the wind farm site, together with the fairly low levels of activity recorded during surveying, and localised nature of the construction activities. There is therefore a **Negligible** spatial and **Short Term** temporal impact magnitude. The impact to Goshawk during construction is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations.

Hen Harrier (SPA Qualifying Species)

10.90 Construction activities may prevent foraging birds from fully utilising the site by virtue of the increased local disturbance. This will likely impact upon those birds which forage over upland heath/bog and which will be prevented from doing so by the construction-related disturbance within the proposed wind farm.

10.91 Hen Harrier flights across the proposed wind farm (at all heights) totalled eight flights which were recorded between September 2010 and May 2011 inclusive.

10.92 Hen Harriers are classified as **High** NCI, by virtue of their potential association with the Langholm - Newcastleton Hills SPA, (13 females/pairs; 3% UK total), for which breeding Hen Harriers are the qualifying species. It is assumed by this assessment that the Hen Harriers observed using the site at any time of the year (breeding and non-breeding season) belong to the SPA population. This is a precautionary assumption as, given the migratory nature of Hen Harriers, it is likely that the wintering population is not the same as the SPA breeding population.

10.93 With regards to the Habitat Regulations Appraisal detailed in paragraph 10.40 to 10.42, the proposal is not directly connected to, or necessary for the management of, the SPA (step 1) and it is considered likely to have a significant effect, either alone or in combination, on the SPA (Step 2). Step 3 requires an Appropriate Assessment to be undertaken of the implications for the SPA in view of that SPA's conservation objectives. This assessment provides information to inform the Appropriate Assessment.

10.94 To establish the impact of the proposed wind farm on the integrity of the SPA, it is necessary to consider the relevant conservation objectives which may be affected. Because the proposed wind farm is outwith, and approximately 8 km distant from, the SPA, only two conservation objectives are relevant: To ensure for the qualifying species that the following are maintained in the long term: (1) Population of the species as a viable component of the site; and (2) No significant disturbance of the species.

10.95 Hen Harrier has a generally favourable Conservation Status in much of Scotland, where the population is increasing (Forrester et al. 2007²²). However, in Dumfries and Galloway, the breeding numbers have declined considerably over the last decade, from 37 breeding females in 1997 to only

9 in 2009 (Dumfries and Galloway Bird Report No. 20 (for 2009²³)). The NHZ population is therefore considered to be in unfavourable condition. With regards to SPA population, it was recorded as 'Unfavourable Recovering' on 30 December 2008 (SNH Site Link V3). On this basis, the SPA population is considered to be in unfavourable condition. Overall Hen Harrier activity recorded on site is low and there is an abundance of similar, if not more suitable, foraging habitat within the wider area (the Hen Harrier framework (Fielding et al. 2011²⁴) estimated that there are ca. 2200 km² of suitable feeding and breeding habitat for Hen Harriers in NHZ 20 (Border Hills) and a further ca. 4000 km² of suitable habitat in the adjacent NHZ 19 (Western Southern Uplands and Inner Solway)). Fielding et al. (2011) also showed that Hen Harriers in NHZ 20 (Border Hills) had one of the lowest proportions of suitable habitat that was occupied (33%), and inferred that the population in this NHZ is currently depleted by illegal persecution. Given these considerations, the predicted magnitude of effect of construction is considered to be **Negligible** spatial and **Short Term** temporal. The effect of construction related disturbance upon foraging Hen Harrier belonging both to the regional and SPA population is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Other Foraging Raptor Species

10.96 Merlin, Osprey and Short-eared Owl are classified as **High** NCI due to their Schedule 1 and Annex 1 status, with their respective Conservation Status's assessed as being **Favourable**, with both species showing population increases in Scotland. Four Merlin flights and two Osprey flights were recorded across the MPWB and 250 m buffer. The predicted impact magnitude of the disturbance to the raptors foraging on the proposed wind farm site is considered to be **Negligible** spatial and **Short Term** temporal given the low overall level of raptor activity recorded, the abundance of similar habitat resource within the wider area and the localised nature of the construction activities. The impact to these foraging species is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations.

Golden Plover (SPA Qualifying Species)

10.97 Golden Plover is classified as **High** NCI due to its Annex 1 status, with the Solway Flats and Marshes SPA's population Conservation Status assessed as **Favourable**.

10.98 With regards to the Habitat Regulations Appraisal detailed in paragraph 10.40 to 10.42, as previously stated, the proposal is not directly connected to, or necessary for the management of, the SPA (step 1) and it is considered likely to have a significant effect, either alone or in combination, on the SPA (Step 2). Step 3 requires an Appropriate Assessment to be undertaken of the implications for the SPA in view of that SPA's conservation objectives. This assessment provides information to inform the Appropriate Assessment.

10.99 To establish the impact of the proposed wind farm on the integrity of the SPA, it is necessary to consider the relevant conservation objectives which may be affected. Because the proposed wind farm is outwith, and approximately 13 km distant from, the SPA, only two conservation objectives are relevant: To ensure for the qualifying species that the following are maintained in the long

²² Forrester, R., Andrews, I., McInerney, C., Murray, R., McGowan, B., Zonfrillo, B., Betts, M., Jardine, D. and Grundy, D. 2007. The Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

²³ Dumfries and Galloway Bird Report No. 20 (for 2009). 2010. Birds in Dumfries and Galloway. Scottish Ornithologists' Club, Dumfries & Galloway Branches.

²⁴ Fielding, A., Haworth, P., Whitfield, P., McLeod, D. & Riley, H. 2011. A Conservation Framework for Hen Harriers in the United Kingdom. JNCC Report 441. Joint Nature Conservation Committee, Peterborough.

term: (1) Population of the species as a viable component of the SPA; and (2) No significant disturbance of the species.

10.100 Twenty flocks (totalling 804 birds) were recorded across the MPWB and 250 m buffer. These flights were recorded during 181 hours of observation undertaken during 26 survey days during the winter period. These birds were either passing through the site or using the area as a convenient undisturbed roost site near to foraging pastures (Pearce-Higgins and Yalden 2003²⁵) or low tide intertidal foraging areas (Forrester et al. 2007²⁶). Golden Plover are particularly sensitive to disturbance (Finney et al. 2005²⁷; Pearce-Higgins et al. 2009²⁸; Fielding and Haworth 2010²⁹) and it is therefore likely that they will be displaced by construction activity. However, given the high availability of suitable habitat for roosting in the wider area it is likely that they will be displaced to other suitable roosting habitat nearby. Based on these considerations, the predicted impact magnitude of the disturbance to the Golden Plover roosting on the proposed wind farm site is considered to be **Negligible** spatial and **Short Term** temporal given the low overall level of activity recorded, the abundance of similar habitat resource within the wider area and the localised nature of the construction activities. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Curlew (SPA Qualifying Species)

10.101 Curlew is classified as **High** NCI due to its association with the Solway Flats and Marshes SPA. The SPA's population was defined as 'Unfavourable Declining' on 18th March 2007 (SNH Site Link).

10.102 With regards to the Habitat Regulations Appraisal detailed in paragraph 10.40 to 10.42, as previously stated, the proposal is not directly connected to, or necessary for the management of, the SPA (step 1) and it is considered likely to have a significant effect, either alone or in combination, on the SPA (Step 2). Step 3 requires an Appropriate Assessment to be undertaken of the implications for the SPA in view of that SPA's conservation objectives. This assessment provides information to inform the Appropriate Assessment.

10.103 To establish the impact of the proposed wind farm on the integrity of the SPA, it is necessary to consider the relevant conservation objectives which may be affected. Because the proposed wind farm is out with, and approximately 13 km distant from, the SPA, only two conservation objectives are relevant: To ensure for the qualifying species that the following are maintained in the long term: (1) Population of the species as a viable component of the site; and (2) No significant disturbance of the species.

10.104 A total of 43 Curlew flights (at all heights) were recorded between 16 March and 16 June within the MPWB plus 250 m buffer, although full flight activity details were not recorded, as stated earlier in

²⁵ Pearce-Higgins, J. W. & Yalden, D. W. 2003. Variation in the use of pasture by breeding European golden plovers *Pluvialis apricaria* in relation to prey availability. *Ibis* 145: 365-381.

²⁶ Forrester, R., Andrews, I., McInerney, C., Murray, R., McGowan, B., Zonfrillo, B., Betts, M., Jardine, D. and Grundy, D. 2007. *The Birds of Scotland*. The Scottish Ornithologists' Club, Aberlady.

²⁷ Finney, S.K., Pearce-Higgins, J.W. & Yalden, D.W. 2005. The effect of recreational disturbance on an upland breeding bird, the golden plover *Pluvialis apricaria*. *Biological Conservation* 121: 53-63

²⁸ Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P. and Bullman, R. 2009. Distribution of breeding birds around upland wind farms. *Journal of Applied Ecology*, 46, 1323-1331.

²⁹ Fielding, A.F. & Haworth, P.F. 2010. Farr windfarm: A review of displacement disturbance on golden plover arising from operational turbines between 2005-2009. Haworth Conservation, Isle of Mull.

the assessment (paragraph 10.69). These birds were not breeding within the MPWB plus 500 m buffer and appeared to be passing through the area or within the field adjacent to the site. Curlew are sensitive to disturbance (Pearce-Higgins et al. 2009) and it is therefore likely that they will be displaced by construction activity. However, given that they do not appear to be using the site for breeding or for foraging, the predicted impact magnitude of the disturbance to the Curlew by the construction of the proposed wind farm is considered to be **Negligible** spatial and **Short Term** temporal. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Oystercatcher (SPA Qualifying Species)

10.105 Oystercatcher is classified as **High** NCI due to its association with the Solway Flats and Marshes SPA. The SPA's population was defined as 'Favourable Maintained' on 18 March 2007 (SNH Site Link). A total of 2 Oystercatcher flights (at all heights) were recorded on the 12 April 2011. These birds were not breeding within the MPWB plus 500 m buffer and appeared to be passing through the area to the adjacent farm. Given that they do not appear to be using the site for breeding or for foraging, the predicted impact magnitude of the disturbance to the Oystercatcher by the construction of the proposed wind farm is considered to be **Negligible** spatial and **Short Term** temporal. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Pink-footed Goose (SPA Qualifying Species) and Grey-lag Goose (SSSI Qualifying Species)

10.106 These species were only observed flying through the MPWB plus 250 m buffer and do not use the site for breeding or foraging. Although flight lines of these species may be disturbed by construction activity the impact is likely to be negligible given the relatively small scale of the site and their ability to take an alternative route. Thus, the predicted impact magnitude of the disturbance to these species by the construction of the proposed wind farm is considered to be **Negligible** spatial and **Short Term** temporal. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Potential Operational Effects

Displacement & Indirect Habitat Loss

10.107 The displacement of nesting and foraging birds from the proposed wind farm site has the potential to extend beyond the construction phase, as described above, and to occur during the operational phase of the proposed wind farm. This has been found to occur in a number of individual wind farm studies, generally over distances of 100-200 m, although the effects vary considerably between sites and species (Pearce-Higgins et al. 2009³⁰). Additional existing information (e.g. Whitfield et al. 2010³¹, Douglas et al. 2011³² and Powlesland 2009³³) suggest that the effects are minimal, with most

³⁰ Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridge, I. P. and Bullman, R. 2009. Distribution of breeding birds around upland wind farms. *Journal of Applied Ecology*, 46, 1323-1331.

³¹ Whitfield, D. P., Green, M. & Fielding, M. H. 2010. Are breeding Curlew *Numenius arquata* displaced by wind energy developments? Natural Research Projects Ltd. Banchory, Scotland.

³² Douglas, D. J. T., Bellamy, P. E. and Pearce-Higgins, J. W. 2011. Changes in the abundance and distribution of upland breeding birds at an operational wind farm, *Bird Study*, 58: 1, 37 – 43.

³³ Powlesland, R. G. 2009. Impacts of wind farms on birds: a review. *Science for conservation* 289. Dept of Conservation. New Zealand.

species affected only slightly, if at all, whilst Drewitt & Langston (2006³⁴) highlighted the need for further study in order to accurately quantify displacement effects.

10.108 These figures and studies are largely focussed upon direct displacement (i.e. avoidance of areas surrounding wind farm installations); an additional consideration is the displacement of birds from larger areas where the turbines act as a barrier to bird movement. The likelihood of this impact occurring tends to increase with wind farm size where large turbine arrays can force birds to alter their regular flight-paths, resulting in a potentially significant increase in distance flown and subsequently energy expended. However, a review of the literature suggests that none of the barrier effects identified so far have significant effects on populations (Drewitt & Langston 2006, Masden et al. 2009³⁵, 2010³⁶). Pearce-Higgins *et al.* (2009) also observed certain species experiencing localised population increases with proximity to wind farm installations.

Skylark

10.109 As explained in paragraph 10.85, Skylark is classified as **Moderate** NCI and its Conservation Status is **Stable/Increasing** in Scotland. This species are considered to exhibit low sensitivity to disturbance and few, if any, birds would be displaced during the operational period. Therefore, given these factors and the **Negligible** spatial and albeit **Long Term** temporal magnitude of impact, the overall impact is considered as **Minor** and therefore **Not Significant** under the terms of the EIA Regulations.

Common Crossbill & Lesser Redpoll

10.110 As explained in paragraph 10.86, Common Crossbill and Lesser Redpoll are classified as **High** and **Moderate** NCI (respectively). Common Crossbill's Conservation Status is **long term stable**, however, Redpoll's is considered to be **Unfavourable**. These species are considered to exhibit low sensitivity to disturbance and few, if any, birds would be displaced during the operational period. The restructuring of the forest (as detailed in **Chapter 9: Ecology**) will be of benefit to these species' local populations. Therefore, given these factors and the **Negligible** spatial and albeit **Long Term** temporal magnitude of operational disturbance will be more than offset by the **Moderate spatial** and **Long Term** temporal beneficial effect of forest restructuring. The overall impact is considered as **Negligible** and therefore **Not Significant** under the terms of the EIA Regulations.

Raptors

10.111 In keeping with most other studies of raptor displacement, it appears that foraging Hen Harriers have a low sensitivity to disturbance at operational wind farms, and although further studies are desirable, it is reasonable to conclude that if displacement occurs then it will likely be limited to within 100 m of wind turbines if it occurs at all (Whitfield & Madders 2006³⁷). The raptor species recorded on the proposed wind farm site are of **High** NCI (these comprise Hen Harrier, Goshawk, Merlin, Osprey and Short-eared Owl), however, considering the relative inactivity of raptors on the

³⁴ Painter, A., Little, B. & Lawrence, S. 1999. Continuation of Bird Studies at Blyth Harbour Wind Farm and the Implications for Offshore Wind Farms. Report by Border Wind Limited DTI, ETSU W/13/00485/00/00. In Drewitt, A. L. & Langston, R. L. H. 2006. Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42

³⁵ Masden, E.A., Haydon, D.T., Fox, A.D., Furness, R.W., Bullman, R. & Desholm, M. 2009. Barriers to movement: Impacts of wind farms on migrating birds. *ICES J Mar Sci* 66: 746-753.

³⁶ Masden, E.A., Haydon, D.T., Fox, A.D. & Furness, R.W. 2010. Barriers to movement: Modelling energetic costs of avoiding marine wind farms amongst breeding seabirds. *Mar Pollut Bull* 60: 1085-1091.

³⁷ Whitfield, D.P. & Madders, M. 2006. A review of the impacts of wind farms on hen harriers *Circus cyaneus* and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory, UK.

site and the abundance of similar habitat within the wider area (paragraph 10.95 with regards Hen Harrier), the temporal magnitude of displacement effects will be **Long Term** and spatial magnitude **Low**. The overall impact is therefore assessed as **Minor** and therefore **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Golden Plover (SPA Qualifying Species)

10.112 As explained in paragraph 10.97, Golden Plover is classified as **High** NCI due to its Annex 1 status, with the Solway Flats and Marshes SPA's population Conservation Status assessed as **Favourable**.

10.113 Refer to paragraph 10.98-10.99 for the relevant Habitat Regulations considerations for Golden Plover.

10.114 As described in paragraph 10.100 Golden Plover is sensitive to disturbance and roosting birds are likely to be displaced from the site (although perhaps not to the same degree as during construction). However, given the high availability of suitable habitat for roosting in the wider area it is likely that they will be displaced to other suitable roosting habitat nearby. Based on these considerations, the predicted impact magnitude of the disturbance to the Golden Plover roosting on the proposed wind farm site is considered to be **Negligible** spatial although **Long Term** temporal. Given the low overall level of activity recorded, the abundance of similar habitat resource within the wider area and the localised nature of the displacement. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Curlew (SPA Qualifying Species)

10.115 As described in paragraph 10.101 Curlew is classified as **High** NCI and the SPA's population was defined as **Unfavourable Declining**.

10.116 Refer to paragraph 10.102-10.103 for the relevant Habitat Regulations considerations for Curlew.

10.117 Due to Curlew's sensitivity to disturbance (Pearce-Higgins et al. 2009), it is likely that they will be displaced from the site during the operational period. However, given that they do not appear to be using the site for breeding or for foraging, the predicted impact magnitude of the disturbance to the Curlew by the operation of the proposed wind farm is considered to be **Negligible** spatial and **Long Term** temporal. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Oystercatcher (SPA Qualifying Species)

10.118 As described in paragraph 10.105 Oystercatcher is classified as **High** NCI and the SPA's population was defined as '**Favourable Maintained**'. Oystercatcher are generally quite tolerant to disturbance, however, given that they do not appear to be using the site for breeding or for foraging, the predicted impact magnitude of the disturbance to the Oystercatcher by the operation of the proposed wind farm is considered to be **Negligible** spatial and **Long Term** temporal. The impact is therefore considered to be **Negligible** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Pink-footed Goose (SPA Qualifying Species) and Grey-lag Goose (SSSI Qualifying Species)

10.119 As described in paragraph 10.106 only flight lines of these species may be disturbed. Thus, the predicted impact magnitude of the disturbance to these species by the operation of the proposed wind farm is considered to be **Negligible** spatial and **Long Term** temporal. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Collision Risk

10.120 Those birds that continue to utilise the proposed wind farm site during the lifetime of the proposed wind farm will be at risk of collision with the turbines. The level of collision with wind turbines is presumed to be dependent on the amount of flight activity over the site and the ability of birds to detect and manoeuvre around rotating turbine blades. With this in mind, it is clear that the collision risk will increase with a wind farm's proximity to large concentrations of birds, whether this be breeding and foraging birds, or those utilising specific areas for local or large-scale migration.

10.121 The majority of studies of collisions caused by wind turbines have recorded relatively low levels of mortality (e.g. Winkelman 1992a³⁸, 1992b³⁹, Painter *et al.* 1999⁴⁰, Erickson *et al.* 2001⁴¹ in Drewitt & Langston 2006⁴²). This is perhaps largely a reflection of the fact that many of the studied wind farms are located away from large concentrations of birds. It is also important to note that many records are based only on finding corpses, with no correction for corpses that are overlooked or removed by scavengers (Langston & Pullan 2003⁴³ in Drewitt & Langston 2006).

10.122 Band *et al.* (2007⁴⁴) describe a method of quantifying potential bird collisions with turbines, in which the likelihood of a collision is calculated, and then an 'avoidance rate' (SNH 2010) applied to account for behavioural adaptation of birds to the presence of turbines. This results in a figure for the likely mortality rate at the wind farm which is then assessed within the context of the species' relevant populations to determine the significance of any losses. Full Collision Risk Modelling (CRM) methods and results are detailed within Appendix 10.1, Annex E. Information regarding the technical specifications of the proposed wind farm is detailed in Table 10.9.

³⁸ Winkelman, J.E. 1992a. The Impact of the Sep Wind Park Near Oosterbierum, the Netherlands on Birds 1: Collision Victims. RIN rapport 92/2 Arnhem: Rijksinstituut voor Natuurbeheer. In Drewitt, A. L. & Langston, R. L. H. 2006. Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42

³⁹ Winkelman, J.E. 1992b. The impact of the Sep wind park near Oosterbierum, the Netherlands on birds 2: nocturnal collision risks. RIN rapport 92/3 Arnhem: Rijksinstituut voor Natuurbeheer. In Drewitt, A. L. & Langston, R. L. H. 2006. Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42

⁴⁰ Painter, A., Little, B. & Lawrence, S. 1999. Continuation of Bird Studies at Blyth Harbour Wind Farm and the Implications for Offshore Wind Farms. Report by Border Wind Limited DTI, ETSU W/13/00485/00/00. In Drewitt, A. L. & Langston, R. L. H. 2006. Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42

⁴¹ Erickson, W.P., Johnson, G.D., Strickland, M.D., Young, D.P., Jr Sernja, K.J. & Good, R.E. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. Western EcoSystems Technology Inc. In Drewitt, A. L. & Langston, R. L. H. (2006). Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42

⁴² Drewitt, A. L. & Langston, R. L. H. 2006. Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42

⁴³ Langston, R.H.W. & Pullan, J.D. 2003. Wind farms and birds: an analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues. Report written by Birdlife International on behalf of the Bern Convention. Council Europe Report T-PVS/Inf.

⁴⁴ Band, W., Madders, M., & Whitfield, D.P. 2007. Developing field and analytical methods to assess avian collision risk at wind farms. In: de Lucas, M., Janss, G.F.E. & Ferrer, M. (eds.) *Birds and Wind Farms: Risk Assessment and Mitigation*, pp. 259-275. Quercus, Madrid.

Table 10.9: Wind Turbine Parameters for inclusion into CRM

Parameter	Value
Size of wind farm (MPWB + 250 m buffer)	148.8 ha
No. of turbines	15
Hub height	80 m
Rotor diameter	Maximum 93 m
Rotation period	4.14 sec.
Maximum chord	3.5 m
Rotor depth	1.9
Pitch	15
Operation period	90%

10.123 The Band CRM allows for differentiation between predictable flights, such as those in a relatively constant direction e.g. migration routes, or flights between feeding grounds and roost sites - the 'predictable flight method' (PFM); and unpredictable flights such as those which appear random - the 'unpredictable flight method' (UFM).

10.124 The PFM applies the horizontal span area (i.e. the turbine area of the wind farm within a two-dimensional plane as the bird is flying towards it) to the calculations due to the predictable nature of the flights; this produces a hypothetical 'risk area' in which collisions can occur. The UFM incorporates the full wind farm volume into the 'risk area' to account for the random nature of bird flights.

10.125 The Band CRM also accounts for potential variations in survey effort and visible area where multiple VPs are employed. This 'weighted'/'unweighted' analysis serves to overcome the potential bias that exists with observations made from a particular VP. This is achieved by 'weighting' flight activity at each VP by the contribution of each VP to the overall area watched per hour ('unweighted' analysis assumes equal contribution by each VP).

10.126 It has been accepted that this CRM method is more suitable for some species than others, by virtue of the generic avoidance rates that are applied to those species for which a specific rate has not been empirically devised. Indeed a major criticism of the CRM is that the value of the avoidance rate has a strong influence on predicted deaths yet there is little empirical basis for rate estimation (Whitfield & Madders 2006⁴⁵). Since its inception, the CRM has become more informed by specific avoidance rate studies, which are applied accordingly.

10.127 The CRM is split across two stages: Stage 1 calculates the number of birds flying through the rotors; and Stage 2 calculates the probability of a bird flying through the rotor being hit.

10.128 Data collected for analysis within the CRM included flight line information for all Target Species within 250 m of the proposed turbine locations and at PCH (based on information provided by RES). This 250 m buffer will enable the analysis to account for slight changes in turbine locations due to

⁴⁵ Whitfield, D.P. & Madders, M. 2006. A review of the impacts of wind farms on hen harriers *Circus cyaneus* and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory, UK.

micro-siting; rotor blade width and most importantly, the potential variation in surveyor accuracy due to the effects of parallax⁴⁶.

10.129 An assessment of this impact upon each relevant species is made in the following sections. The CRM was not applied to the passerine⁴⁷ species recorded within the proposed wind farm site, as is standard for such assessments. Devereux et al. (2008⁴⁸) suggest that farmland passerines (including Skylark) are less likely to be collision victims than larger, less manoeuvrable species. On this basis, there is considered to be very little risk of collision mortality for these species. CRM was also not undertaken for Lapwing, Merlin and Osprey due to their very low level of recorded flight activity. Information pertaining to the assumptions required by the CRM (e.g. bird flight speeds etc.) is discussed where appropriate.

Goshawk

10.130 Goshawk is a resident species and thus there was an assumed collision potential for the species for 365 days of the year, and for 12.13 hours per day (the annual average daylight hours for the region). A flight speed of 10 m/s was used in line with studies undertaken by Bruderer & Boldt (2001⁴⁹), with Goshawk biometrics obtained from Snow *et al.* (1998⁵⁰).

10.131 Given the species' resident status and indirect flight habits, the UFM CRM was applied to the Goshawk flight activity.

10.132 The VP surveys recorded seven Goshawk flights within the MPWB and 250 m buffer and at PCH, totalling 217 seconds. When applied to the CRM, this resulted in a predicted 1.2 strikes per year with no avoidance (and accounting for wind farm operations rates), with a predicted 0.024 strikes per year with the accepted 98% avoidance rate. This translates as a mortality rate of one bird every 40.1 years when using the unweighted model, and a rate of 1 bird every 71.3 with the weighted model.

10.133 The Goshawk is considered to be of **High** NCI by virtue of the level of legislative protection afforded to them (Schedule I). However, in light of this low predicted mortality rate and the species' current favourable Conservation Status (Goshawks only started nesting in Scotland in the early 1970s but there are now over 130 breeding pairs). The main threat to this species is considered to be illegal killing, whereas their breeding success is generally high, providing large numbers of potential recruits to the population (Forrester et al. 2007⁵¹). In Dumfries and Galloway, there were 19 pairs nesting in 2009, fledging 33 young according to the Dumfries and Galloway Bird Report No. 20, the impact magnitude is considered to be **Negligible** temporal and **Long Term** spatial, which will result

⁴⁶ The effect whereby the position or direction of an object, such as a flight line of a bird, appears to differ when viewed from different positions.

⁴⁷ A passerine is a bird of the order Passeriformes, which includes more than half of all bird species. Sometimes known as perching birds or, less accurately, as songbirds.

⁴⁸ Devereux, C. L., Denny, M. J. H. & Whittingham, M. J. 2008. Minimal effects of wind turbines on the distribution of wintering farmland birds. *Journal of Applied Ecology* 45, 1689-1694.

⁴⁹ Bruderer, B. & Boldt, A. 2001. Flight characteristics of birds: I. radar measurements of speeds. *Ibis* 143: 178-204.

⁵⁰ Snow, D., Perrins, C.M. & Gillmor, R. 1998. *The Birds of the Western Palearctic*. Concise Edition. Oxford University Press, Oxford.

⁵¹ Forrester, R., Andrews, I., McInerney, C., Murray, R., McGowan, B., Zonfrillo, B., Betts, M., Jardine, D. and Grundy, D. 2007. *The Birds of Scotland*. The Scottish Ornithologists' Club, Aberlady.

in an impact that will be **Minor** and therefore **Not Significant** under the terms of the EIA Regulations.

Hen Harrier (SPA Qualifying Species)

10.134 It is assumed by this assessment that the Hen Harriers observed using the site at any time of the year (breeding and non-breeding season) belong to the SPA population. This is a precautionary assumption as, given the migratory nature of Hen Harriers, it is likely that the wintering population is not the same as the SPA breeding population.

10.135 There were no Hen Harrier flights recorded within the MPWB plus 250 m buffer and at PCH during the breeding season.

10.136 The CRM was run for the flight activity observed at PCH during the non-breeding season. However, because it is assumed that the non-breeding population is the same as the breeding population, collision potential for the species is assumed for 365 days of the year, and for 12.13 hours per day (the annual average daylight hours for the region). As with the Goshawk CRM, the UFM was applied to Hen Harrier flight activity.

10.137 A flight speed of 8 m/s was used in line with similar studies into the species' collision risk (Madders & Whitfield 2006⁵²), with biometrics taken from Snow *et al.* (1998).

10.138 In total 43 seconds of flight activity within the proposed wind farm site and buffer and at PCH was recorded for the species during the non-breeding season. When applied to the CRM, this resulted in a predicted 0.00495 collisions per year in the unweighted model, and 0.00228 collisions in the weighted model. This translates as a mortality rate of one bird every 202 years in the unweighted model, and one in 439 years in the weighted model, with the accepted 99% avoidance rate employed.

10.139 Findings from the 2009 ES describe a collision risk of 0.00632 collisions a year, which translates as a mortality rate of one bird every 158.2 years.

10.140 Given the anticipated loss of large areas of forestry because of the proposed wind farm, habitat management is proposed. Habitat management and forestry restructuring might increase Hen Harrier activity in the short term, as vole numbers tend to increase when trees are planted and grazing animals are excluded. However, second or subsequent rotation areas tend to be less attractive to Hen Harriers than plantations or areas that have not previously held plantation forestry (Forrester et al. 2007⁵³). Given the very large area of suitable habitat for Hen Harriers within this NHZ, and given the lack of Hen Harrier activity recorded on the open ground adjacent to the site (using this as a proxy for potential activity in the area to be replanted) in light of the currently low levels of Hen Harrier activity, it is considered unlikely that the activity levels will increase to the extent that the impact risks are significant for the purposes of this assessment. Certainly, it is not likely to increase activity to an extent that could require mitigation such as replanting with high density sitka spruce.

10.141 Hen Harrier are assumed to be of **High** NCI by virtue of the potential association with the Langholm - Newcastleton Hills SPA (13 females/pairs; 3% UK total), for which breeding Hen Harriers are the qualifying species. As stated, this is a precautionary assumption as, given the migratory nature of

⁵² Whitfield, D.P. & Madders, M. 2006. A review of the impacts of wind farms on hen harriers *Circus cyaneus* and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory, UK.

⁵³ Forrester, R., Andrews, I., McInerney, C., Murray, R., McGowan, B., Zonfrillo, B., Betts, M., Jardine, D. and Grundy, D. 2007. *The Birds of Scotland*. The Scottish Ornithologists' Club, Aberlady.

Hen Harriers, it is likely that the wintering population is not the same as the SPA breeding population. Within a more regional context, the mean Hen Harrier population for the Border Hills NHZ, in which the proposed wind farm is located, is 13 pairs (Fielding et al. 2011).

10.142 With regards to the Habitat Regulations Appraisal detailed in paragraph 10.40 to 10.42, as previously stated, the consideration detailed in paragraph 10.93-10.94 applies here.

10.143 As detailed in paragraph 10.95, despite the generally favourable condition of the Scottish population, the Conservation Status of the regional population is considered to be unfavourable. With regards to the SPA population, it was recorded as 'Unfavourable Recovering' on 30 December 2008 (SNH Site Link V3). Nevertheless, given the very low predicted additive mortality rate (from both this study, and the previous findings from the 2009 ES), the impact magnitude is considered to be **Long Term** temporal and **Negligible** spatial. The overall impact on the regional (NHZ) and SPA population is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Golden Plover (SPA Qualifying Species)

10.144 Golden Plover populations are migratory, and thus breeding and non-breeding populations are assessed separately. Because only non-breeding Golden Plover were recorded, the CRM analysis has only been completed for this population.

10.145 The Golden Plover on site were only observed during the non-breeding season, with those birds recorded up until mid-April considered to be part of the non-breeding population for the purposes of this assessment. Although Golden Plovers may return to breeding territories in southern Scotland from March onwards, some pairs do not arrive until much later and may not lay eggs until May (Forrester et al. 2007). Therefore, birds seen on site in mid-April are likely to be birds that will be returning to breeding grounds in northern Europe. Spring migration of Golden Plovers towards their northern breeding grounds peaks in the last week of April but continues through early May, as shown by counts at bird observatories such as North Ronaldsay (Forrester et al. 2007, graph on page 583).

10.146 The CRM for Golden Plover was undertaken only for the non-breeding season, with the UFM applied accordingly.

10.147 A flight speed of 14 m/s was used, in line with similar modelling for the species on wind farms in Scotland, with biometrics taken from Snow *et al.* (1998⁵⁴).

10.148 Golden Plover numbers within the wind farm site and buffer totalled 434 birds, which occupied PCH for a total of 12132 bird-seconds as observed from VP1, and 22720 as observed from VP2. When applied to the CRM, this resulted in a predicted collision risk of 2.37 birds per year for the unweighted model, and 1.88 when weighted. This translates as a mortality rate of one bird every 0.42 years and one every 0.53 years, respectively.

10.149 Non-breeding Golden Plover are considered to be of **High** NCI by virtue of their inclusion as a qualifying species on the Upper Solway Flats and Marshes SPA (3380 birds, 2% UK population).

10.150 With regards to the Habitat Regulations Appraisal detailed in paragraph 10.40 to 10.42, as previously stated, the consideration detailed in paragraph 10.98-10.99 applies here.

10.151 As illustrated in **Table 10.8**, the UK wintering population appears fairly stable, with the species' 'Amber' status more an indication of the importance of the UK birds, as opposed to an indication of

a decline here. The SPA's population was defined as 'Favourable Maintained' on 18 March 2007 (SNH Site Link V3). A loss of 1.88 birds per year within the context of the SPA population is less than 0.056%, and therefore the impact magnitude is considered to be **Long Term** temporal and **Negligible** spatial. Within the context of the UK population (taking a minimum of 300,000 birds in winter), this percentage loss falls significantly, to 0.00063%. In light of these figures and the population's favourable Conservation Status, it is considered that the impact significance will be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Pink-footed Goose (SPA Qualifying Species)

10.152 Wintering Pink-footed Goose populations are the relevant population to consider within the CRM analysis.

10.153 No Pink-footed Geese were observed on the proposed wind farm site and buffer, and thus CRM was only undertaken for the 'Grey Geese' records to provide a 'worst case' scenario with regards the species presence over the proposed wind farm site.

10.154 A flight speed of 16 m/s was used, in line with similar modelling for the species on wind farms in Scotland, with biometrics taken from Snow *et al.* (1998).

10.155 Pink-footed Goose records totalled 20 birds, which occupied PCH on the MPWB and buffer for a total of 1548 bird-seconds. When applied to the CRM, this resulted in a predicted unweighted collision rate of 0.08 collisions per year, with a weighted value of 0.07 collisions per year. This translates as a predicted mortality rate of one bird every 11.9 years in the unweighted model, and one every 14.1 when weighted.

10.156 Pink-footed Goose at this location are considered to be of **High** NCI by virtue of their potential association with both the Upper Solway Flats and Marshes SPA (14,900 wintering birds) and Castle Loch SPA (8300 wintering birds).

10.157 The Conservation Status of the Upper Solway Flats and Marshes SPA's population was defined as 'Favourable Maintained' on 18 March 2007 (SNH Site Link V3). Castle Loch SPA was classified as 'unfavourable no change' 30 June 1999 (SNH Site Link V3). The national wintering population is considered to be favourable with over 85,000 birds wintering in Scotland.

10.158 With regards to the Habitat Regulations Appraisal detailed in paragraph 10.40 to 10.42, the proposal is not directly connected to, or necessary for the management of, the SPA (Step 1) and it is considered likely to have a significant effect, either alone or in combination, on the SPA (Step 2). Step 3 requires an Appropriate Assessment to be undertaken of the implications for the SPA in view of that SPA's conservation objectives. This assessment provides information to inform the Appropriate Assessment.

10.159 To establish the impact of the proposed wind farm on the integrity of the SPA, it is necessary to consider the relevant conservation objectives which may be affected. Because the proposed wind farm is outwith, and approximately 13 km and 20 km distant from the Upper Solway Flats and Marshes and Castle Loch SPAs respectively, only two conservation objectives are relevant: To ensure for the qualifying species that the following are maintained in the long term: (1) Population of the species as a viable component of the site; and (2) No significant disturbance of the species.

10.160 A loss of 0.07 birds per year within the context of the smallest SPA population (Castle Loch) (i.e. to illustrate the greatest relative loss) is less than 0.001%, and therefore the impact magnitude is considered to be **Long Term** temporal and **Negligible** spatial. Within the context of the UK population (241,000 wintering birds), this percentage loss falls significantly. In light of these

⁵⁴ Snow, D., Perrins, C.M. & Gillmor, R. 1998. The Birds of the Western Palearctic. Concise Edition. Oxford University Press, Oxford.

figures, it is considered that the impact significance will be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Greylag Geese

- 10.161 Greylag Geese populations are migratory, and thus breeding and non-breeding populations are considered separately within the CRM analysis. Because only non-breeding Greylag geese were recorded, the CRM analysis has only been completed for this population.
- 10.162 The Greylag Geese recorded within the proposed wind farm site and 250 m buffer were only observed during the non-breeding season, and thus CRM was only undertaken for this non-breeding population.
- 10.163 For the purposes of the CRM, confirmed Greylag Goose sightings were combined with 'Grey Goose' sightings so as to provide a 'worst case' scenario with regards the species presence over proposed wind farm site.
- 10.164 A flight speed of 16 m/s was used, in line with similar modelling for the species on wind farms in Scotland, with biometrics taken from Snow *et al.* (1998⁵⁵).
- 10.165 Greylag Goose numbers (including 'Grey Goose' records) totalled 28 birds, which occupied PCH within the proposed wind farm site and 250 m buffer for a total of 1796 bird-seconds. When applied to the CRM, this resulted in a predicted unweighted collision rate of 0.12 collisions per year, with a weighted value of 0.11 collisions per year. This translates as a predicted mortality rate of one bird every 8.31 years in the unweighted model, and one every 8.74 when weighted.
- 10.166 The Greylag Geese recorded are considered to be of **High** NCI as although they are not associated with any SPA in the region, they are a notified feature of the Castle Loch SSSI. The Castle Loch SSSI citation does not report actual numbers of Greylag Geese using the loch, but reports that the numbers are "of significance" but below numbers considered to be of National Importance. The Site Management Statement says that wintering greylag goose numbers at this SSSI have declined and the condition of this site feature in 2004 was classified as unfavourable. Therefore, although numbers of this species have increased in the UK, in Scotland, and in south west Scotland (Forrester *et al.* 2007⁵⁶), the local numbers on this SSSI have fallen. Since the species has undergone a large population increase in the UK over recent years, it is thus considered to be in favourable Conservation Status. In light of this, and the low predicted mortality (and likely % range of wintering population likely to be affected here), the impact magnitude is considered to be **Long Term** temporal and **Negligible** spatial. The impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations.

Curlew and Oystercatcher (SPA Qualifying Species)

- 10.167 The Curlew's NCI is considered to be **High** by virtue of its association with the Solway Flats and Marshes SPA. The SPA's population (6,700 (2% of east Atlantic flyway (migratory route)), 7% of British) was defined as 'Unfavourable Declining' on 18th March 2007 (SNH Site Link). A total of 15 Curlew flights were recorded at PCH within the MPWB plus 250 m buffer, although full flight activity details were not recorded, as stated earlier in the assessment (Para 10.68).

⁵⁵ Snow, D., Perrins, C.M. & Gillmor, R. 1998. The Birds of the Western Palearctic. Concise Edition. Oxford University Press, Oxford.

⁵⁶ Forrester, R., Andrews, I., McInerney, C., Murray, R., McGowan, B., Zonfrillo, B., Betts, M., Jardine, D. and Grundy, D. 2007. The Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

- 10.168 Curlew are likely to be at risk of collision with turbines when their nest sites are sufficiently close so that their display flights (during which birds fly at a higher level) bring birds to within PCH more frequently. No Curlew nest sites were discovered within the wind farm area or the 500 m buffer, therefore any flight activity by this species at the site would be unlikely to occur at collision height. Therefore, it is realistic to conclude that the potential collision risk impacts upon the species, for which the relevant population is the Solway Flats and Marshes SPA population, will be of **Long Term** and **Negligible magnitude**. Therefore, the impact is considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.
- 10.169 The Oystercatcher's NCI is considered to be **High** by virtue of its association with the Solway Flats and Marshes SPA. The SPA's population (33,850 wintering birds; 12% UK population) was defined as 'Favourable Maintained' on 18 March 2007 (SNH Site Link). Two Oystercatchers were observed flying at PCH within the 250 m buffer and beyond during early April 2011. As with the Curlew records, these were not complete flight line recordings. However, it is realistic to conclude that, given the low activity recorded, in addition to the Favourable Conservation status of the species, the potential collision risk impacts upon the species, for which the relevant population is the Solway Flats and Marshes SPA population, will be of **Long Term** temporal and **Negligible** spatial magnitude and thus the impact is considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations.

Potential Decommissioning Effects

- 10.170 The potential decommissioning effects are considered to be the same as those encountered during construction albeit within a shorter expected timeframe, with the result being a restored habitat within an area where displaced birds will be able to return. The overall impact is therefore considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations and Habitat Regulations where relevant.

Mitigation

- 10.171 Although no significant effects have been identified in terms of the EIA and Habitat Regulations, as a result of the proposed wind farm, there are a number of proposed mitigation measures which are recommended as a matter of good practice to reduce the potential minor effects described.
- 10.172 As mentioned within paragraph 10.45, a BBPP will be produced in consultation with SNH to ensure that impacts to those species breeding on the proposed wind farm site are minimised. Beyond this, particular consideration will be given to the breeding Common Crossbill and Lesser Redpoll by virtue of their NCI. The BBPP is essential to ensure that all reasonable precautions are taken to protect birds' nests, eggs, and dependent young during construction.
- 10.173 Given the previous information that exists with regard to historical breeding on the site and within its vicinity, in the event of Barn Owl or Goshawk being confirmed as breeding here again (by surveys before and during construction), then buffer distances of 250 m (Barn Owl) and 500 m (Goshawk) will be maintained around any active nest sites until all young have fledged. These buffers will be established initially but may be reviewed in consultation with SNH to consider local topography and the type of activity occurring in the area.
- 10.174 A Habitat Management Plan (HMP) is proposed to implement a conservation management strategy to those areas outwith the proposed wind farm footprint. The HMP will result in positive effects for birds, particularly Common Crossbill and Lesser Redpoll that have been recorded on the site.

Management will include blanket bog restoration and a re-planting strategy designed to increase the levels of native broadleaved trees, whilst retaining conifers and pines within the planting mix, within the Habitat Management Area (see **Ecology, Chapter 9**).

10.175 The blanket bog restoration objective of the HMP will also serve to decrease the suitability of the current bog habitats for nesting raptors (as described within SNH 2010b) by raising the water table and increasing the surface wetness. The impact of this blanket bog restoration will therefore have positive effects through the decrease in collision risk to foraging raptors such as hen harrier as a consequence of reduced activity.

Residual Effects

Residual Construction Effects

10.176 No significant residual construction effects have been identified, as detailed within Table 10.10.

Residual Operational Effects

10.177 No significant residual operational effects have been identified, as detailed within Table 10.10.

Residual Decommissioning Effects

10.178 No significant residual decommissioning effects have been identified, as detailed within Table 10.10.

Cumulative Effects

10.179 Potential cumulative effects on birds are likely only when there is a realistic expectation of adverse effects by two or more developments. Figure 8.27 shows the other developments within 35 km of the site. SNH guidance explains that the relevant area for consideration of cumulative effects on an SPA is 20 km (SNH, 2008. Para. 13). This advice is noted in SNH guidance for small scale wind energy projects but it appears to be the only relevant guidance for designated sites such as SPAs. Also SNH, 2005 notes that the 'limits of the search area' should be considered but no specific reference is made to suitable areas for SPAs. The construction, operational and decommissioning effects of the proposed wind farm on all target species are predicted to be of **Negligible** magnitude. This is defined in Table 10.2 as a '*Very slight reduction in the status or productivity of a bird population due to additive mortality or displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation*'. As a consequence, the effects on the identified target species are all considered to be **Minor**. They are not classified as Negligible effects purely because there is likely to be some level of effect, albeit extremely small with regard to effects at the population level. Therefore, it is appropriate to conclude that the proposed wind farm would not contribute significantly to any of the effects identified in respect of other proposed developments in the area. Therefore the cumulative effects of the proposed wind farm are considered to be **Minor** and **Not Significant** under the terms of the EIA Regulations.

Residual

10.180 There are no significant residual cumulative effects predicted under the Terms of the EIA Regulations.

Summary

Table 10.10: Summary of Potential Impacts, Mitigation and Residual Impacts

Likely Impact	Significant	Mitigation Proposed	Means Implementation	of	Outcome/Residual Impact
Construction: Direct Habitat Loss; Minor	Direct	None	Not Applicable		Minor & Not Significant
Construction: Displacement/disruption effects on Skylark; Minor		None	Not Applicable		Minor & Not Significant
Construction: Displacement/disruption effects on Common Crossbill & Lesser Redpoll; Minor		Ensuring nesting birds are not impacted by construction activities	Breeding Bird Protection Plan (to ensure works progress in accordance with the Wildlife and Countryside Act 1981 (as amended)).		Minor & Not Significant
Construction: Displacement/disruption effects on Goshawk and Barn Owl; Minor		Ensuring nesting birds are not impacted by construction activities	Breeding Bird Protection Plan (to ensure works progress in accordance with the Wildlife and Countryside Act 1981 (as amended)).		Minor & Not Significant
Construction: Displacement/disruption effects on Hen Harrier; Minor		None	Not Applicable		Minor & Not Significant
Construction: Displacement/disruption effects on Merlin, Osprey & Short-eared Owl; Minor		None	Not Applicable		Minor & Not Significant
Construction: Displacement/disruption effects on Golden Plover; Minor		None	Not Applicable		Minor & Not Significant
Construction: Displacement/disruption effects on Curlew; Minor		None	Not Applicable		Minor & Not Significant

Likely Significant Impact	Mitigation Proposed	Means Implementation of	Outcome/Residual Impact
Construction: Displacement/disruption effects on Oystercatcher; Minor	None	Not Applicable	Minor & Not Significant
Construction: Displacement/disruption effects on Pink-footed and Greylag Geese; Minor	None	Not Applicable	Minor & Not Significant
Operation: Displacement & Indirect Habitat Loss on Skylark; Minor	None	Not Applicable	Minor and Not Significant
Operation: Displacement & Indirect Habitat Loss on Common Crossbill and Lesser Redpoll; Negligible	None	Not Applicable	Negligible and Not Significant
Operation: Displacement & Indirect Habitat Loss on Raptors; Minor	None	Not Applicable	Minor and Not Significant
Operation: Displacement & Indirect Habitat Loss on Golden Plover; Minor	None	Not Applicable	Minor and Not Significant
Operation: Displacement & Indirect Habitat Loss on Curlew; Minor	None	Not Applicable	Minor and Not Significant
Operation: Displacement & Indirect Habitat Loss on Oystercatcher; Negligible	None	Not Applicable	Minor and Not Significant

Likely Significant Impact	Mitigation Proposed	Means Implementation of	Outcome/Residual Impact
Operation: Displacement & Indirect Habitat Loss on Pink-footed and Grey-lag Geese; Minor	None	Not Applicable	Minor and Not Significant
Operation: Collision Mortality on Goshawk; Minor	None	Not Applicable	Minor and Not Significant
Operation: Collision Mortality on Hen Harrier; Minor	None	Not Applicable	Minor and Not Significant
Operation: Collision Mortality on Golden Plover; Minor	None	Not Applicable	Minor and Not Significant
Operation: Collision Mortality on Pink-footed Geese; Minor	None	Not Applicable	Minor and Not Significant
Operation: Collision Mortality on Grey-lag Geese; Minor	None	Not Applicable	Minor and Not Significant
Operation: Collision Mortality on Curlew and Oystercatcher; Minor	None	Not Applicable	Minor and Not Significant
Decommissioning: Same as Construction Impacts; Minor	See Construction Impacts	See Construction Impacts	Minor and Not Significant

Statement of Significance

10.181 Given the findings as described within this assessment, it is considered that the potential impacts of the proposed wind farm upon birds will be **Not Significant** under the terms of the EIA Regulations.

Potential Effects on SPAs

Habitat Regulations Appraisal

10.182 Whilst the Habitat Regulations provide that an assessment of the possible effects of a proposed development on a SPA is the responsibility of the competent authority, this section provides a summary examination of the relevant issues pertaining to the potential effect of the proposed wind farm.

- 10.183 As detailed within paragraph 10.16, the proposed wind farm is situated within an area where it may impact upon the qualifying species of three SPAs.
- 10.184 The relevant SPAs and qualifying species (to this wind farm proposal) are: Langholm - Newcastleton Hills SPA (breeding Hen Harrier), Upper Solway Flats and Marshes SPA (Curlew, Oystercatcher, Golden Plover and non-breeding Pink-footed Geese) and Castle Loch SPA (non-breeding Pink-footed Geese). In line with the Habitats Regulations Appraisal described within section 10.40 to 10.42, the proposed wind farm moves to stage two of the Appraisal by virtue of it not being 'directly connected to or necessary for the management of' Langholm - Newcastleton Hills SPA; Upper Solway Flats and Marshes SPA; and Castle Loch SPA.
- 10.185 Stage two requires the consideration of whether the proposal, alone or in combination, is likely to have a significant effect on the site. It is considered that the proposed wind farm is unlikely to have a significant effect on the ornithological interest for which the SPAs qualify, and therefore the proposed wind farm is considered not to present a plausible risk to the SPA's interests and therefore an Appropriate Assessment under the Habitat Regulations is not required.
- 10.186 Potential cumulative effects have been described in paragraphs 10.179 and 10.180 and it is apparent that the proposed wind farm is not likely to have a significant effect on SPA interests in combination with other projects.
- 10.187 Overall, therefore, it is reasonable to conclude that the proposed wind farm will not have a significant effect on the integrity of the SPAs, either alone or in combination with other developments.