7 Ecology

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7 Ecology

7.1 Executive Summary

7.1.1 This chapter considers the potential effects of the proposed Cumberhead West Wind Farm (the Proposed Development) on non-avian ecology.

7.1.2 The scope of the ecological assessment was determined through a combination of a desk study to identify existing ecological data, by considering the previously collected baseline survey results of those local wind farm projects surrounding the site, consultation with relevant nature conservation organisations, and baseline field surveys of the site.

7.1.3 Ecological field surveys within the site were undertaken in 2019 and 2020. Detailed National Vegetation Classification (NVC) habitat surveys recorded that the study area is dominated by low conservation value mature conifer plantation. Out with the expanse of dominant conifer plantation, the study area contains an area of blanket bog around Nutberry Hill as well as a mix of typical upland marshy grassland, acid grassland, mire and woodland communities. Potential groundwater dependent terrestrial ecosystems (GWDTEs) were recorded in the form of flushes and rush pasture (potentially highly groundwater dependent) and wet heath, and some wet grassland habitats (potentially moderately groundwater dependent).

7.1.4 Specific surveys were also undertaken for a range of protected species, including bats. No evidence of otter, water vole, red squirrel, pine marten or great crested newt was recorded. Evidence of badger activity, comprising a sett outside of the site, and various signs within the site were recorded.

7.1.5 Four bat species (common pipistrelle, soprano pipistrelle, Daubenton's and brown long-eared bat) and two genus groups (*Nyctalus spp.* and *Myotis spp*.) were recorded during the temporal (static detector) surveys. No bat roosts were confirmed during baseline surveys, and all potential roost features were sufficiently buffered from proposed infrastructure during the design layout process.

7.1.6 The Proposed Development has been designed to minimise impacts on important habitats or protected species to achieve non-significant effects. The Important Ecological Features (IEFs) taken forward for further assessment due to their higher conservation value and potential sensitivity to remaining impacts were blanket bog (including wet modified bog) and *Nyctalus* and pipistrelle bats.

7.1.7 During the construction stage of the Proposed Development there would inevitably be some direct and indirect habitat loss due to the construction of new infrastructure. Effects of loss of blanket bog and wet modified bog were assessed. No significant effects were predicted, with the extent of direct and indirect losses not being significant in a regional context, particularly with the modified bog being of low quality.

7.1.8 Potential effects on bats were assessed, with the main potential impact identified being the risk of collisions during the operational phase. An assessment was made based on the likely site conditions during the operational period, combined with the collision risk and population vulnerability levels of *Nyctalus* and pipistrelle bat species. A minimum set-back distance of trees from operational turbines (75 m) is part of the embedded design of the Proposed Development, and this would reduce collision risks. It was determined that although a collision risk remains for pipistrelle species, collision rates due to the Proposed Development alone would not be significant in a regional population context. Due to uncertainties in *Nyctalus* population sizes and higher overall risk, a precautionary approach suggests that unmitigated, a potentially significant collision risk may exist, and to address this risk, a Bat Mitigation and Monitoring Plan would be put in place prior to commencement to ensure any residual effects on bats are not significant.

7.1.9 Although no significant effects are predicted to occur to bog habitats, restoration and enhancement of bog within the site is proposed as part of a Habitat Management Plan, which would provide an overall beneficial residual effect.

7.2 Introduction

7.2.1 This chapter considers the potential effects of the Proposed Development on the ecological features present at the site, associated with the construction, operation and decommissioning phases of the Proposed Development. The specific objectives of the chapter are to:

- Describe the ecological baseline of the site and immediate surrounding area (the study area);
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including direct, indirect and cumulative effects;
- Describe the mitigation measures proposed to address any likely significant effects; and
- Assess the residual effects remaining following the implementation of mitigation.

7.2.2 The assessment has been carried out in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Code of Professional Conduct.

7.2.3 A detailed description of the Proposed Development is provided within Chapter 3: Proposed Development; the planning context for the Proposed Development is provided within Chapter 5: Planning Policy.

7.2.4 Effects on birds are addressed within Chapter 8: Ornithology. The effects on hydrology are addressed in Chapter 11: Hydrology. Chapter 11 also considers the hydrological impacts on Groundwater Dependent Terrestrial Ecosystems (GWDTEs) identified in the ecology assessment.

7.2.5 The chapter is supported by the following Technical Appendices:

- Appendix 7.1: National Vegetation Classification and Habitat Survey;
- Appendix 7.2: Protected Species Survey Report.
- Appendix 7.2: Annex C: Confidential Protected Species Survey Report.
- Appendix 7.3: Bat Survey Report;
- Appendix 7.4: Fish Habitat Survey Report; and
- Appendix 7.5: Outline Habitat Management Plan.

7.2.6 It also includes Appendix 7.6: Ecology Scoping Report which was provided to NatureScot (formerly Scottish Natural Heritage (SNH)) in October 2019 to reach agreement that a robust ecological impact assessment for the Proposed Development could be undertaken based on available field survey and desk study information (see Table 7.1).

7.2.7 Figures 7.1 to 7.12 are referenced within the Environmental Impact Assessment Report (EIAR) where relevant.

7.2.8 Confidential information relating to the locations of badger field evidence is presented within Appendix 7.2 Confidential Annex C and Figure 7.5B. The Confidential Annex has limited distribution due to the sensitivity of protected feature locations contained within.

7.3 Legislation, Policy and Guidelines

Legislation

7.3.1 Relevant legislation has been reviewed and taken into account as part of this assessment. Of particular relevance are:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora ("Habitats Directive");

- Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy ("Water Framework Directive");
- Environmental Impact Assessment Directive 2014/52/EU;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- The Wildlife and Countryside Act 1981 (as amended);
- Nature Conservation (Scotland) Act 2004 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011;
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (''The Habitats Regulations''); and
- The Protection of Badgers Act 1992.

Planning Policy

7.3.2 Chapter 5: Planning Policy sets out the planning policy framework that is relevant to the EIA. The policies set out below include those from the South Lanarkshire Local Development Plan (LDP) (2015) and the proposed LDP 2 (due for adoption in early 2021). This section also considers the relevant aspects of Scottish Planning Policy, Planning Advice Notes and other relevant guidance. Of relevance to the ecological assessment presented within this chapter, regard has been given to the following policies:

- UK Post-2010 Biodiversity Framework (2012);
- Scottish Biodiversity Strategy: It's in Your Hands (2004)/2020 Challenge for Scotland's Biodiversity (2013);
- Scottish Government (2013) 2020 Challenge for Scotland's Biodiversity;
- Scottish Government (2016) Draft Peatland and Energy Policy Statement;
- Scottish Government (2017) Planning Advice Note 1/2013 - Environmental Impact Assessment, Revision 1.0;
- Scottish Government (2017). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0.
- Scottish Government (2018) Climate Change Plan: Third Report on Policies and Proposals 2018-2032;

Guidance

7.3.3 The assessment is carried out in accordance with the principles contained within the following guidance:

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (version 1.1). Chartered Institute of Ecology and Environmental Management, Winchester;
- Hundt, L. (2012) Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat Conservation Trust;
- Joint Nature Conservation Committee (JNCC) (2013) Guidelines for selection of biological Sites of Special Scientific Interest (SSSI);

- Natural England (2014) Natural England Technical Information Note TIN 051. Bats and Onshore Wind turbines – Interim Guidance (3rd Edition);
- Scottish Executive (2000) 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;
- Scottish Government (2001) European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements;
- Scottish Government (2010) Management of Carbon-Rich Soils;
- Scottish Government (2017) Planning Circular 1/2017: Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Scottish Environment Protection Agency (SEPA) (2017) Land Use Planning System Guidance Note 4 - Planning guidance on on-shore windfarm developments;
- Scottish Renewables, Scottish Natural Heritage (SNH), SEPA, Forestry Commission (Scotland), Historic Environment Scotland & AEECoW (2019) Good Practice During Windfarm Construction (4th Edition);
- SEPA (2017) Land Use Planning System Guidance Note 31 - Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems;
- SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments;
- SNH (2016) Planning for Development: What to consider and include in Habitat Management Plans (Version 2);
- SNH (2016) Planning for Development: What to consider and include in deer assessments and management at development sites (Version 2);
- SNH (2018) Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland; and
- SNH, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2019) Bats and Onshore Wind Turbines: Survey Assessment and Mitigation.

7.4 Consultation

7.4.1 In undertaking the assessment, consideration has been given to consultation undertaken with relevant organisations as detailed in Table 7.1 below.

7.4.2 Table 7.1 also summarises the consultation responses and provides information on where and how they have been addressed in the assessment, where relevant.

Table 7.1 – Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
NatureScot 22 and 23 October 2019	Pre-scoping consultation e-mail	Pre-scoping consultation agreement of scope of surveys and assessment (Appendix 7.6: Ecology Scoping Report): "*I'm perfectly happy with the Ecology proposals (although I should say that this comes with our usual pre-application caveat that our advice at this stage is given without prejudice to a full and detailed consideration of the impacts of the proposal if submitted for formal consultation as part of the EIA or planning process).*"	Noted.
NatureScot 11 August 2020	Scoping Response	NatureScot advises that the developer should assess the direct and indirect impacts of the proposed development on protected areas and their qualifying interests / notified features in the context of their conservation objectives / site management statements. The assessment should be for the proposal on its own and cumulatively with other plans or projects also affecting the protected areas.	Noted. Information pertaining to these sites is presented in the Designated Sites section of section 7.6 of Chapter 7: Ecology. Natura sites have been considered within a Habitats Regulations Appraisal (HRA) context in this chapter.
		NatureScot recommends that drafts of the proposed Construction Environmental Management Plan [CEMP], Bat Mitigation Plan, Breeding Bird Protection Plan and Species Protection Plan are included in the EIA Report.	The draft CEMP is included as part of this application (refer to Appendix 3.1) and would be finalised subject to agreement of further details via planning conditions. See Project Assumptions within section 7.7 and Mitigation section 7.8 for Species Protection Plan and Bat Mitigation and Monitoring Plan information. The Breeding Bird Protection Plan is

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			referred to in Chapter 8: Ornithology.
		NatureScot recommends the preparation and implementation of a Habitat Management Plan, particularly where measures are required to mitigate for the loss of key habitats (e.g. peatland) or reduce the suitability of the site following development for nesting SPA birds. The Habitat Management Plan should be prepared in accordance with our guidance on What to consider and include in Habitat Management Plans.	An Outline Habitat Management Plan is included as Appendix 7.5 of this chapter, which would seek to restore and enhance bog habitats and native woodland coverage, potentially to the benefit of nesting birds.
RSPB 29 July 2020	Scoping Response	RSPB notes and agrees with the updated NVC habitat survey undertaken on site and within a 250 m buffer area to assess this project's potential impact to sensitive habitats.	Noted.
		RSPB agrees that an appropriate assessment under the HRA process for the closest SAC (Coalburn Moss) will not be necessary due to the distance from this project boundary (3.8 km).	Noted. All designated sites have been screened for assessment in section 7.6 Designated Sites of this chapter.
		We agree with the need to assess effects of this project on the adjacent Muirkirk Uplands SSSIs as part of the EIA process for this project.	Noted. Consideration of all relevant SSSIs is presented in section 7.6 Designated Sites of this chapter.
SEPA	Scoping response	SEPA requests that a map demonstrating that all GWDTE are out with a 100 m radius of all excavations shallower than 1 m and outwith 250 m of all excavations deeper than 1m and proposed groundwater	The distribution of potential GWDTEs is shown in Figure 7.4. Chapter 11: Hydrology considers the hydrological impacts on potential GWDTEs identified in this chapter.

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		abstractions. If micro-siting is to be considered as a mitigation measure the distance of survey needs to be extended by the proposed maximum extent of micro-siting. The survey needs to extend beyond the site boundary where the distances require it.	
		SEPA states if the minimum buffers above cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. We are likely to seek conditions securing appropriate mitigation for all GWDTE affected.	Noted. Chapter 11: Hydrology considers the hydrological impacts on potential GWDTEs identified in this chapter.

7.5 Assessment Methodology and Significance Criteria

Study Area

7.5.1 The area within which the desk-based research and field surveys were undertaken varies depending on the ecological feature and its search/survey requirements. Details of the extent of each study area are described in the relevant 'Baseline Conditions' section of this chapter and associated Appendices 7.1 to 7.4 and shown on their respective Figures 7.1 to 7.12. Hereafter in this chapter, the areas covered by field surveys and assessment are collectively referred to as the 'study area'.

7.5.2 It should be noted that access to the main part of the site where all turbines would be located would be taken via existing access tracks, and tracks which would be created/upgraded as part of the Douglas West Wind Farm and Extension works (see Chapter 3: Proposed Development for further details). If the Douglas West Wind Farm Extension is not constructed in advance of the Proposed Development, then a 1.38 km section of new track would be required within the Douglas West Wind Farm Extension site boundary (see Appendix 3.3 for details on ecology information). No ecology surveys were conducted along the existing access track, with baseline activity levels associated with ongoing commercial forestry activities likely to be similar to wind farm construction vehicular movements. Desk study results from Douglas West, Douglas West Extension and Cumberhead Wind Farms which have covered this route, have been considered in this chapter. The whole access route would be subject to best practice measures during construction, as outlined in section 7.7 Project Assumptions.

Desk Study

7.5.3 A desk study was undertaken to collate available ecological information in relation to the site and surrounding environment.

7.5.4 A search was conducted for the presence of any designated sites with ecological qualifying features and protected species records within 5 km of the Proposed Development (Figure 7.1), using the following sources and organisations:

- National Biodiversity Network (NBN) Atlas Scotland (https://scotland.nbnatlas.org/);
- NatureScot Sitelink (https://sitelink.nature.scot/home) website for designated sites, and Natural Spaces (http://gateway.snh.gov.uk/natural-spaces/index.jsp) website for e.g. carbon and peatland map;
- Scottish Badgers;
- Saving Scotland's Red Squirrels (https://scottishsquirrels.org.uk/squirrel-sightings);
- Glasgow Museums Biological Records Centre;
- NatureScot Carbon and Peatland map 2016 (https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map);
- Deer Distribution Survey 2016 results by the British Deer Society (https://www.bds.org.uk/index.php/research/deer-distribution-survey);
- John Haddow Scottish Leisler Bat Project data;
- South West Scotland Environmental Records Centre (SWSERC); and
- Environmental Statements and EIA Reports from 2004-2019 relating to applications for the local wind farm projects shown in Table 7.2.

7.5.5 The ecological information from the desk study was used to inform the scope of surveys for the Proposed Development.

Table 7.2 – Timing of various ecological surveys carried out at nearby wind farm sites

Project	Phase 1	NVC	Protected Species	Bats	Great Crested Newt	Fish
Hagshaw Hill Extension	2004	-	2004	2004	-	-
Dungavel	2004	2004	2004	-	-	-
Nutberry	2005	2005	2005	2005	-	-
Galawhistle	2008-09	2009	2008-09	2008-09	-	2009
Kype Muir	2010	2010	2010	2010	-	2010
Douglas West Community Wind	2010	2012	2009-10	2010	2012	2010
Auchrobert	2011-12	2011-12	2011-12	2012	2012	-
Kype Muir Extension	2013	2013	2013	2013	-	-
Dalquhandy	2011	2012	2011-12	2011-12	2011-12	-
Cumberhead	2013	2014	2014	2014	2014	2014
Douglas West	2014	2014	2014, 2017	2014-15	2014-15	2012

Project	Phase 1	NVC	Protected Species	Bats	Great Crested Newt	Fish
Hagshaw Hill Repowering	2018	2018	2018	2018	-	-
Douglas West Extension	2018	2018	2018	2018	-	-
Hare Craig	2018	2018	2018	2016	-	2016

Field Surveys

7.5.6 Ecological fieldwork commenced in June 2019 and was completed in August 2020.

7.5.7 The following field survey visits were undertaken to establish the presence of ecological features within the site plus appropriate study area buffers) and were undertaken in line with standard methodologies and guidance (respective study areas are also shown in Figures 7.3 to 7.12).

- NVC habitat surveys: September 2019 and July 2020;
- Protected species surveys: September 2019 and March 2020;
- Bat activity surveys: June-September 2019 and July-August 2020;
- Fish habitat surveys: November 2019; and
- Bat roost potential surveys (undertaken as part of the protected species surveys):

7.5.8 The full suite of survey methods, species specific legislation and results are provided within Appendix 7.1: National Vegetation Classification and Habitat Survey; Appendix 7.2: Protected Species Survey Report; Appendix 7.2: Annex C: Confidential Protected Species Survey Report; Appendix 7.3: Bat Survey Report; and Appendix 7.: Fish Habitat Survey Report; . The field surveys were undertaken following best practice guidance, which are summarised within the relevant appendices.

Assessment of Potential Effect Significance

7.5.9 This section defines the methods used to assess the significance of effects through the process of an evaluation of sensitivity (a combination of Nature Conservation Importance and conservation status) and magnitude of impact for each likely effect.

7.5.10 There can often be varying degrees of uncertainty over the sensitivity of receptors or magnitude of impacts as a result of limited information. A precautionary approach is therefore adopted where the response of a population to an impact is uncertain. The assessment focusses on a 'worst-case' Proposed Development as described below.

7.5.11 The assessment method considers the principles within the guidance detailed by CIEEM (2018).

7.5.12 The assessment for ecology features (unrelated to any Natura 2000 sites) involves the following process:

- identification of the potential ecological impacts of the Proposed Development, including both beneficial and adverse;
- consideration of the likelihood of occurrence of potential impacts where appropriate;
- defining the Nature Conservation Importance of the ecological features present and establishing the feature's conservation status, to give an indication of overall sensitivity;
- establishing the magnitude of the likely impact (both spatial and temporal);

- based on the above information, a professional judgement is made as to whether the identified effect is significant in the context of the EIA Regulations;
- if a potential effect is determined to be significant, measures to avoid, reduce, mitigate or compensate for the effect are suggested where required;
- opportunities for enhancement are considered; and
- residual effects after mitigation, compensation or enhancement are considered.

Determining Sensitivity

7.5.13 Sensitivity of an ecological feature is based on a combination of Nature Conservation Importance and conservation status. Nature Conservation Importance is defined on the basis of the geographic context (based on the guidance within CIEEM, 2018) given in Table 7.3. Assigning a value depends on contextual information about distribution and abundance of a protected species or habitat. This means that even though a feature may be protected through legislation at a national or international level, the relative value of the species' population, or extent/quality of habitat on site may be quite different (e.g. the site population of a protected species may consist of a single transitory animal, which within the context of a thriving local/regional/national population of a species, is therefore of local or regional value rather than national or international).

7.5.14 Where possible, the evaluation of habitat/populations within this assessment will make use of any relevant published evaluation criteria (e.g. The Scottish Biodiversity List (Scottish Government, 2013), JNCC on selection of biological Sites of Special Scientific Interest (SSSIs) (JNCC, 2013a), Mathews *et al*., 2018). Furthermore, JNCC guidance (JNCC, 2008) has been consulted where relevant so that cross-referencing of classifications within different systems can be standardised (e.g. correctly matching NVC types with Annex I habitats where relevant etc.).

7.5.15 Those ecological features identified as being potentially impacted by the Proposed Development, and deemed to be of local, regional, national, and international importance are termed 'Important Ecological Features' (IEFs). These IEFs form the basis of the impact assessment.

7.5.16 Where relevant, information regarding the feature's conservation status is also considered. This enables an appreciation of current population or habitat trends to be incorporated into the definition of sensitivity.

Table 7.3 – Approach to Determining Nature Conservation Importance (adapted from Hill *et al.* 2005)

Nature Conservation Importance of Feature in Geographical Context	Description
International	Qualifying feature of an internationally designated site (e.g. Special Area of Conservation, SAC).
	Species population or habitat type/extent meeting criteria for international designations.
	Species present in internationally important numbers (>1 % of biogeographic populations).
National (UK)	Qualifying feature of a nationally designated site (SSSI, or a National Nature Reserve (NNR)), or meeting the criteria for national designation or qualifying species where there is connectivity.

Nature Conservation Importance of Feature in Geographical Context	Description
	Species present in nationally important numbers (>1 % UK population).
Regional (Natural Heritage Zone or Local Authority Area)	Species present in regionally important numbers (e.g. >1 % of Natural Heritage Zone population).
	Areas of habitat falling below criteria for selection as a SSSI (e.g. areas of semi-natural ancient woodland larger than 0.25 ha).
Local	Features of Local Nature Reserves (LNR).
	Areas of semi-natural ancient woodland smaller than 0.25 ha.
	Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g. species-rich flushes or hedgerows.
Negligible	Usually widespread and common habitats and species. Features falling below local value are not normally considered in detail in the assessment process.

Magnitude of Impact

7.5.17 Impact magnitude refers to changes in the extent and integrity of an ecological feature. A suitable definition of ecological 'integrity' is found within Scottish Executive circular 6/1995 updated by Scottish Executive Rural Affairs Department (SERAD) (2000) which states that, "*The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*". Although this definition is used specifically regarding European level designated sites (SACs and SPAs), it is applied to wider countryside habitats and species for the purposes of this assessment.

7.5.18 Determining the magnitude of any likely impacts requires an understanding of how the ecological features are likely to respond to the Proposed Development. This change can occur during construction, operation or decommissioning of the Proposed Development.

7.5.19 Impacts can be adverse, neutral or beneficial.

7.5.20 Impacts are judged in terms of magnitude in space and time. There are five levels of spatial impacts and five levels of temporal impacts as described in Table 7.4 and Table 7.5.

Table 7.4 – Definition of Spatial Impact Magnitude upon the IEFs

Spatial Magnitude	Description
Very High	Would cause the loss of the majority of a feature (>80 %) or would be sufficient to damage a feature sufficient to immediately affect its viability.
High	Would have a major impact on the feature or its viability. For example, more than 20 % habitat loss or damage.

Spatial Magnitude	Description
Moderate	Would have a moderate impact on the feature or its viability. For example, between 10 – 20 % habitat loss or damage.
Low	Would have a minor impact upon the feature or its viability. For example, less than 10 % habitat loss or damage.
Negligible	Minimal change on a very small scale; impacts not dissimilar to those expected within a 'do nothing' scenario.

Table 7.5 – Definition of Temporal Impact Magnitude upon the IEFs

Temporal Magnitude	Description
Permanent	Impacts continuing indefinitely beyond the span of one human generation (taken here as 30+ years), except where there is likely to be substantial improvement after this period in which case the category Long Term may be more appropriate.
Long term	Between 15 years up to (and including) 30 years.
Medium term	Between 5 years up to (but not including) 15 years.
Short term	Up to (but not including) 5 years.
Negligible	No impact.

Significance

7.5.21 The significance of potential effects is determined by integrating the assessments of sensitivity of the IEF and magnitude of impact in a reasoned way, based on the available evidence and professional judgement.

7.5.22 Table 7.6 details the significance criteria that have been used in assessing the effects of the Proposed Development.

Table 7.6 - Significance Criteria

Significance of Effect	Description
Major	Significant effect, as the effect is likely to result in a long term significant adverse effect on the integrity of the feature.
Moderate	Significant effect, as the effect is likely to result in a medium term or partially significant adverse effect on the integrity of the feature.
Minor	The effect is likely to adversely affect the feature 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 material effects. This is not a significant effect.

7.5.23 Using these definitions, it must be decided whether there will be any effects which will be sufficient to adversely affect the IEF to the extent that its conservation status deteriorates above and beyond that which would be expected should baseline conditions remain (i.e. the 'do nothing' scenario).

7.5.24 Major and moderate effects are considered significant and minor and negligible not significant in accordance with the EIA Regulations.

Cumulative Assessment

7.5.25 NatureScot cumulative assessment guidance (SNH, 2012) is used to inform the cumulative assessment in this chapter. In the interests of focusing on the potential for significant effects, this assessment considers the potential for cumulative effects with other wind farm developments. The spatial context in which these effects are considered is heavily dependent on the ecology of the feature assessed. For example, for water voles it may be appropriate to consider effects specific to individual catchments, should the distance between neighbouring catchments be sufficient to assume no movement of animals between them, whereas for blanket bog the region/Natural Heritage Zone may be the relevant spatial scale. Therefore, an assessment of cumulative effects will be made for each feature, appropriate to its ecology.

Requirements for Mitigation

7.5.26 Mitigation will be required if the assessment determines that there is an unmitigated moderate adverse or major adverse and therefore significant effect on any IEF identified in this assessment.

7.5.27 Even without any significant effects on IEFs, embedded mitigation will be applied in the form of a Species Protection Plan (SPP) to ensure legal compliance and avoid disturbance to IEFs or their protected features (e.g. holts, setts) (see *Project Assumptions*).

Assessment of Residual Effect Significance

7.5.28 If a potential effect is determined to be significant, suggested measures to mitigate or compensate the effect will be considered and the revised significance of residual effects after mitigation will be assessed.

Limitations to Assessment

7.5.29 No significant limitations to the assessment were identified, based on the collation of baseline ecology data in 2019 and 2020 and availability of historic data. Minor survey-specific limitations encountered for each survey type are however outlined in Appendix 7.1: National Vegetation Classification and Habitat Survey; Appendix 7.2: Protected Species Survey Report; Appendix 7.2 Annex C: Confidential Protected Species Survey Report; Appendix 7.3: Bat Survey Report; and Appendix 7.4: Fish Habitat Survey Report.

7.5.30 Limitations exist regarding the knowledge base on how some species, and the populations to which they belong, react to impacts. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

7.6 Baseline Conditions

7.6.1 This section details the results of the desk study and field surveys, and includes:

- Desk study;
- Habitats and GWDTEs;
- Protected species; and
- Design Layout Considerations.

Desk Study

Designated Sites

7.6.2 There are three designated sites located within 5 km of the site that have ecological qualifying features. In addition, areas of ancient woodland have been identified, outside of the site boundary. Details of these are provided within Table 7.7 and Figure 7.1.

Table 7.7 – Designated Sites within 5 km of the Proposed Development

Name	Distance from site boundary (excluding existing access route)	Qualifying Interests	Status
Muirkirk Uplands SSSI	Adjacent to Proposed Development site's western boundary	Blanket bog Upland habitat assemblage	Unfavourable no change
Coalburn Moss SAC and SSSI	3.8 km east	Active raised bog Degraded raised bog Raised bog (SSSI)	Favourable maintained Unfavourable recovering Unfavourable recovering
Blood Moss and Slot Burn SSSI	4.8 km west	Blanket bog	Unfavourable no change

Protected Species

7.6.3 A search on the NBN Atlas for Living Scotland and SWSERC for species records in a 5 km buffer from this location contained records for the following relevant protected or notable species:

- badger (*Meles meles*);
- otter (*Lutra lutra*);
- brown hare (*Lepus europaeus*);
- mountain hare (*Lepus timidus*);
- common lizard (*Zootoca vivipara*); and
- common frog (*Rana temporaria*).

7.6.4 NBN Atlas and SWSERC returned records of the following bat species within a 10 km buffer (Figure 7.6):

- Common pipistrelle (*Pipistrellus pipistrellus*);
- Daubenton's bat (*Myotis daubentonii*);
- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- Soprano pipistrelle (*Pipistrellus pipistrellus*); and
- Pipistrelle species.

7.6.5 In addition, there were a small number of records of Leisler's bat *Nyctalus leisleri* obtained from the John Haddow Scottish Leisler Bat Project database (Figure 7.6).

7.6.6 A review of scoping reports, consultation responses and EIA reports of 14 local wind farm projects (Figure 8.2) found evidence of several protected species, as outlined within Table 7.8 below.

7.6.7 Table 7.8 states whether a species was found to be present (P) or whether there was no evidence (NE) recorded during surveys, or in the cases where species were not included within the scope of surveys, not surveyed (-).

Table 7.8 – Summary of Ecological Findings for Nearby Wind Farm Projects

Species	HH	DU	NU	GA	KY	DWCW	AU	KYX	DQ	CU	DW	RHH	DWX	HC
Badger	NE	P	P	P	P	P	P	NE	P	P	P	P	P	NE
Otter	NE	P	NE	P	P	P	P	P	P	P	P	NE	NE	NE
Water vole	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Pine marten	-	NE	-	-	-	-	NE	-	-	NE	NE	NE	NE	NE
Red squirrel	NE	NE	NE	NE	-	NE	NE	-	NE	NE	NE	NE	NE	NE
Great crested newt	-	-	-	-	-	NE	NE	-	NE	NE	NE	NE	NE	-
Common pipistrelle	-	-	-	P	P	P	P	P	P	P	P	P	P	P
Soprano pipistrelle	-	-	-	P	P	P	P	P	P	P	P	P	P	P
Nathusius' Pipistrelle	-	-	-	NE	P	NE	NE	NE	NE	NE	NE	NE	NE	NE
Myotis sp.	-	-	-	P	P	P	P	P	P	P	P	P	P	P
Nyctalus sp.	-	-	-	NE	P	P	P	P	P	P	P	P	P	P
Brown long-eared bat	-	-	-	P	P	NE	P	NE	NE	P	P	NE	P	P
Brown trout	P	P	P	P	P	P	-	P	-	P	P	-	-	P
Atlantic salmon	NE	NE	P	NE	NE	NE	-	NE	-	NE	NE	-	-	NE
European eel	NE	NE	NE	NE	NE	NE	-	NE	-	NE	NE	-	-	NE

Hagshaw Hill Extension (HH); Dungavel (DU); Nutberry (NU); Galawhistle (GA); Kype Muir (KY); Douglas West Community Wind Farm (DWCW); Auchrobert (AU); Kype Muir Extension (KYX); Dalquhandy (DQ); Cumberhead (CU); Douglas West & Dalquhandy DP Renewable Energy Project (DW); Repowered Hagshaw Hill (RHH); Douglas West Extension (DWX) and Hare Craig Wind Farm (HC).

Peatland

7.6.8 The NatureScot Carbon and Peatland Map 2016[1] was consulted (Figure 7.2) to determine likely peatland classes present in the peat study area; the map provides an indication of the likely presence of peat at a coarse scale. The Carbon and Peatland map has been developed as *"a high-level planning tool to promote consistency and clarity in the preparation of spatial frameworks by planning authorities*". It identifies areas of "nationally important carbon-rich soils, deep peat and priority peatland habitat" as Class 1 and Class 2 peatlands. Class 1 peatlands are also "likely to be of high conservation value" and Class 2 "of potentially high conservation value and restoration potential".

7.6.9 Figure 7.2 indicates that a discrete area of Class 1 peatland exists within the site across Nutberry Hill. A large area of Class 1 peatland is also located out-with and immediately to the west of the site, which falls largely within the Muirkirk and North Lowther Uplands SSSI (Figure 7.1).

Deer

7.6.10 Every five years, the British Deer Society undertakes a survey plotting the current distribution of all six species of wild deer in Great Britain and Northern Ireland and uses it to monitor and record changes from the previous survey to see if the range has changed or expanded. The results of the 2016 Deer Distribution Survey indicate the following in the region of the site:

- Red deer (*Cervus elaphus*) were recorded in 2007 and/or 2011 and reconfirmed in 2016; and

1.1.1

[1] *https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/*

- Roe deer were recorded in 2007 and/or 2011 and reconfirmed in 2016.

Field Surveys

7.6.11 Details regarding field survey methodologies and results are included within Appendices 7.1-7.4. The following section summarises the baseline conditions as identified during these surveys.

Habitat Surveys

7.6.12 Habitat surveys for the Proposed Development followed the NVC scheme (Rodwell *et al.,* 1991-2000) using standard methods (Rodwell, 2006). Surveys were undertaken within the study area as detailed within Appendix 7.1: National Vegetation Classification and Habitat Survey and illustrated in Figures 7.3 to Figure 7.4. The 2019 and 2020 habitat study area covered 927.86 hectares (ha) and in places extended up to 250 m beyond the site boundary (where accessible) as a consequence of the requirement to ensure sufficient buffer areas were surveyed to account for the presence of potential GWDTEs, in line with SEPA guidance (SEPA, 2017a; 2017b).

Phase 1 Habitats

7.6.13 The NVC data were recategorised to the Phase 1 Habitat Survey Classification scheme detailed in JNCC (2010) to provide a broader characterisation of habitats. The extent of Phase 1 habitat types within the study area was calculated using the correlation of specific NVC communities to their respective Phase 1 types, and their extents within Arc GIS, including within mosaic areas. The results of this analysis are summarised in Table 7.9 below, in order of Phase 1 Habitat type code. Figure 7.3 (a to e) display the NVC survey results; however, standard Phase 1 shading has also been used to broadly characterise stands of vegetation based on the dominant NVC community within a particular area.

Table 7.9 – Phase 1 Habitat Types within the NVC Study Area

Phase 1 Habitat Code	Phase 1 Habitat Description	NVC Communities (and sub-communities) Recorded	Area (ha)	% of NVC study area
A1.1.1	Broad-Leaved Semi-Natural Woodland	W7, W7c, W11	1.09	0.12
A1.1.2	Broad-Leaved Plantation Woodland	YBP	3.79	0.41
A1.2.2	Coniferous Plantation Woodland	CP, YCP	661.06	71.24
A4.2	Recently Felled Coniferous Woodland	CF	67.85	7.31
B1.1	Unimproved Acid Grassland	U2a, U4, U4a, U4d	15.59	1.68
B1.2	Semi-Improved Acid Grassland	U4b	2.99	0.32
B2.1	Unimproved Neutral Grassland	MG9	0.77	0.08
B4	Improved Grassland	MG6	0.03	0.00
B5	Marsh/Marshy Grassland	Ja, Je, M23a, M23b, M25b, MG10a, MG9a	20.46	2.21
C1.1	Continuous Bracken	U20, U20a	17.16	1.85
D1.1	Acid Dry Dwarf Shrub Heath	H12, H12a, H21a, H9, H9c	6.47	0.70
D2	Wet Dwarf Shrub Heath	M15, M15b	1.39	0.15

Phase 1 Habitat Code	Phase 1 Habitat Description	NVC Communities (and sub-communities) Recorded	Area (ha)	% of NVC study area
E1.6.1	Blanket Bog	M17, M18a, M19b, M2	53.54	5.78
E1.7	Wet Modified Bog	M19, M19a, M20, M20a, M20b, M25a, Pcom, Sph.	57.64	6.21
E2.1	Acid Neutral Flush	M6c, M6d	2.09	0.23
J3.6	Building	BD	0.02	0.00
J4	Bare Ground	BG	11.93	1.30

NVC Communities

7.6.14 The NVC communities and non-NVC habitat types recorded within the NVC study area are provided in Table 7.10 and include the proportions of particular community or habitat types that are found within the NVC study area, including proportions within mosaic habitats. Full descriptions of the habitats, NVC communities and associated flora of the NVC study area are provided in Appendix 7.1: National Vegetation Classification and Habitat Survey.

7.6.15 The NVC surveys recorded 20 recognised NVC communities within the NVC study area (Figure 7.3), with various associated sub-communities; however, these habitats made up only a small part of the study area, with non-NVC habitat type conifer plantation dominant.

Table 7.10 – Summary of NVC Communities Recorded within the NVC Study Area

NVC Community Code and Name		Extent in study area (ha)	% of study area	Potential GWDTE	Annex I Habitat Type	SBL Priority Habitat
Mires						
M2	*Sphagnum cuspidatum/fallax* bog pool community	0.0074	0.0008	-	7130 Blanket bogs	Blanket bog
M6c, M6d	*Carex nigra-Nardus stricta - Sphagnum fallax, S. palustre, S. capillifolium* and *Polytrichum commune - Juncus acutiflorus* -	2.09	0.23	High	-	Upland flushes, fens and swamps
M15	*M15 Scirpus cespitosus – Erica tetralix* heath	1.25	0.14	Moderate	4010 North Atlantic wet heaths	Upland heathland
M17	*Trichophorum germanicum – Eriophorum vaginatum* blanket mire	1.47	0.16	-	7130 Blanket bogs	Blanket bog
M18a	*Sphagnum magellanicum – Andromeda polifolia*	18.71	2.02	-	7130 Blanket bogs	Blanket bog
M19, M19a, M19b	*Calluna vulgaris – Eriophorum vaginatum* blanket mire - *Erica tetralix* sub-community -	70.41	7.59	-	7130 Blanket bogs	Blanket bog

NVC Community Code and Name		Extent in study area (ha)	% of study area	Potential GWDTE	Annex I Habitat Type	SBL Priority Habitat
	Empetrum nigrum sub-community					
M20, M20a, M20b	*Eriophorum vaginatum* blanket mire - *Calluna vulgaris-Cladonia*	3.45	0.37	-	7130 Blanket bogs	Blanket bog
M23a, M23b	*Juncus acutiflorus - Juncus effusus*	9.05	0.98	High	-	Upland flushes, fens and swamps (applies to M23a only)
M25a, M25b	*Molinia caerulea – Potentilla erecta* mire *Erica tetralix* sub-community - *Molinia caerulea – Potentilla erecta* mire *Anthoxanthum odoratum* sub-community	18.21	1.96	Moderate	7130 Blanket bogs (where peat depth > 0.5 m)	Blanket bogs (where peat depth > 0.5 m)
Dry Heaths						
H9, H9c	*Calluna vulgaris – Deschampsia flexuosa* heath	0.85	0.09	-	4030 European dry heaths	Upland heathland
H12, H12a	*Calluna vulgaris – Vaccinium myrtillus* heath	5.5	0.49	-	4030 European dry heaths	Upland heathland
H21a	*Calluna vulgaris – Pteridium aquilinum*	0.11	0.01	-	4030 European dry heaths	Upland heathland
Calcifugous Grasslands and Bracken-Dominated Vegetation						
U2a	*Festuca ovina – Agrostis capillaris*	0.06	0.01	-	-	-
U4, U4a, U4b, U4d	*Festuca ovina – Agrostis capillaris – Galium saxatile* grassland - *Holcus lanatus – Trifolium repens - Luzula multiflora - Rhytidiadelphus loreus*	18.52	2.00	-	-	-
U20, U20a	*Pteridium aquilinum – Galium saxatile* community - *Anthoxanthum odoratum*	17.16	1.85	-	-	-
Mesotrophic Grasslands						

NVC Community Code and Name		Extent in study area (ha)	% of study area	Potential GWDTE	Annex I Habitat Type	SBL Priority Habitat
MG6	*Lolium perenne – Cynosurus cristatus* grassland	0.03	0.00	-	-	-
MG9, MG9a	*Holcus lanatus – Deschampsia cespitosa* grassland - *Poa trivialis*	2.15	0.232	Moderate	-	-
MG10a	*Holcus lanatus – Juncus effusus* rush-pasture	5.35	0.58	Moderate	-	-
Woodland and Scrub						
W7, W7c	*Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum*	0.85	0.09	High	91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*	Wet woodland
W11	*Quercus petraea – Betula pubescens – Oxalis acetosella* woodland	0.25	0.03		-	-
Non-NVC Community or Feature Type						
BD	Buildings and associated driveways			-	-	-
BG	Bare ground, soil, rock, hardstandings			-	-	-
CF	Clear-felled woodland			-	-	-
CP	Conifer plantation			-	-	-
Ja*	*Juncus acutiflorus* acid grassland community			Moderate	-	-
Je*	*Juncus effusus* acid grassland community			Moderate	-	-
MP	Mixed Plantation			-	-	-
Pcom.	*Polytrichum* commune dominated sward	0.0178	0.0019	-	-	-
Sph.	Carpets of *Sphagna* in forest rides	0.2161	0.0233	-	-	-
YBP	Young Broadleaved Plantation			-	-	-
YCP	Young Coniferous Plantation			-	-	-

** In light of the SEPA classification on potential GWDTEs (SEPA, 2017b), the non-NVC types 'Je' and 'Ja' should also qualify for potential GWDTE status. The classification of moderate sensitivity is keeping in line with similar Juncus spp. dominated grassland communities (e.g. MG10).*

Annex 1 Habitats

7.6.16 Certain NVC communities can also correlate to various Annex I habitat types listed under the Habitats Directive. However, the fact that an NVC community can be attributed to an Annex I type does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its status

can depend on various factors such as quality, extent, species assemblages, geographical setting, and substrates.

7.6.17 NVC survey data and field observations have been compared to JNCC Annex I habitat listings and descriptions (JNCC, 2016a). Those habitats within the study area which could be considered Annex I habitats are also summarised in Table 7.10.

7.6.18 The limited extents and often relatively low quality and degraded nature of these potential Annex I habitats within the NVC study area means none are likely to be considered of more than local Nature Conservation Importance. Full details and discussion of quality of Annex I habitat types present are provided within Appendix 7.1: National Vegetation Classification and Habitat Survey, Figure 7.3 and summarised below.

Scottish Biodiversity List (SBL) Priority Habitats

7.6.19 The SBL (Scottish Government, 2013) is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland. Some of these priority habitats are quite broad and can correlate to many NVC types.

7.6.20 Relevant SBL priority habitat types and corresponding associated NVC types recorded within the NVC study area are also summarised in Table 7.10. These SBL priority habitats also correlate with UK Biodiversity Action Plan (BAP) Priority Habitats (JNCC, 2016b).

Groundwater Dependent Terrestrial Ecosystems

7.6.21 The NVC results were referenced against SEPA guidance (SEPA, 2017b), to identify those habitats which may be classified, depending on the hydrogeological setting, as being potentially groundwater dependent. Potential GWDTE NVC communities recorded within the study area are also summarised in Table 7.10; these are shown in Figure 7.4.

7.6.22 The potential GWDTE sensitivity of each polygon containing a potential GWDTE community was classified on a four-tier approach as follows:

- 'Highly – dominant' where potential high GWDTE(s) dominate the polygon;
- 'Highly – sub-dominant' where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon;
- 'Moderately – dominant' where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present; and
- 'Moderately – sub-dominant' where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no potential high GWDTEs are present.

7.6.23 Where a potential high GWDTE exists in a polygon, it outranks any potential moderate GWDTE communities within that same polygon.

7.6.24 GWDTE sensitivity has been assigned here solely on the SEPA listings (SEPA, 2017b). However, depending on several factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependent on groundwater at all. For an assessment on groundwater dependency of the site, refer to Chapter 11: Hydrology.

Habitat Descriptions

7.6.25 A brief description of the main Phase 1 habitats and associated NVC types recorded within the NVC study area, roughly in order of abundance, is presented below (full descriptions provided in Appendix 7.1: National Vegetation Classification and Habitat Survey). In the following paragraphs where reference is made to NVC community codes, the full community name can be cross-referred to Table 7.10 above.

7.6.26 **Coniferous plantation woodland** was the most dominant habitat, extending across much of the site and study area, and forms homogenous stands of planted *Picea sitchensis*. In certain areas second rotation coniferous plantation woodland has been recently planted and is at a much earlier stage of growth, being identified as young conifer plantation. These habitats are non-NVC communities (CP & YCP) and are therefore not represented within the NVC. Recently felled coniferous woodland was the second most dominant habitat on site consisting of areas of clear-fell which, due to the short time since felling, contain little other than stumps, brash, and disturbed ground.

7.6.27 **Blanket bog** is represented in the study area by M17 *Trichophorum germanicum – Eriophorum vaginatum* blanket mire, M18 *Erica tetralix – Sphagnum papillosum* raised and blanket mire and M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire and is mostly concentrated around Nutberry Hill and north of Standingstone Hill within the study area. These communities classified as blanket bog, rather than wet modified bog often represent areas of relatively undamaged and better quality blanket bog where *Sphagnum* moss is often abundant. M19 is the most common community, however there is also a substantial area of M18; M17 is very scarce.

7.6.28 **Wet modified bog** encompasses the M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire, M20 *Eriophorum vaginatum* blanket mire and M25 *Molinia caerulea – Potentilla erecta* mire (specifically mainly M25a) and M2 *Sphagnum cuspidatum/fallax* bog pool NVC communities together with the non-NVC carpets of Sphagnum or *Polytrichum commune* mosses with no other species present (Sph and Pcom). Associated species within stands of wet modified bog largely mirror the species assemblages described for blanket bog above, but generally with less *Sphagna*. The separation of habitats generally being made on evidence of habitat alteration or modification through time, here predominately through and the negative effects of commercial coniferous woodland planting with associated drainage, disturbance, drying out and shading of vegetation and habitats. As a result, this habitat was recorded across the study area, most often within the forest rides or areas in close proximity to plantation woodland.

7.6.29 **Marsh/marshy grassland** within the study area is generally found within enclosed farmland and near watercourses, and is predominately made up of M23 Juncus *effusus/acutiflorus – Galium palustre* rush-pasture and MG10 *Holcus lanatus – Juncus effusus* grassland, with some smaller areas of the M25b *Molinia caerulea – Potentilla erecta* mire *Anthoxanthum odoratum* sub-community, together with the non-NVC communities *Juncus acutiflorus* (Ja) and *Juncus effusus* (Je).

7.6.30 **Continuous bracken** and scattered bracken is made up of the U20 *Pteridium aquilinum – Galium saxatile* community. This community was found to be concentrated along the Birkenhead Burn in the north and within the open areas around Eaglinside to the east of the study area. This community often appears within mosaics with other grassland, mire and heath communities. Within the continuous areas of bracken, *Pteridium aquilinum* dominates entirely with few other species being present. Within the more scattered areas of bracken, *P. aquilinum* is accompanied by a grassland species assemblage reflecting close affinities to the U4 grassland described above. Several of the stands were found to relate to the U20a *Anthoxanthum odoratum* sub-community.

7.6.31 **Unimproved and semi-improved acid grassland** within the site and study area is made up of the U2 *Deschampsia flexuosa* grassland community and the U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland community. These communities form small areas of grassland, often being found within open areas or clearings surrounded by conifer plantation woodland. Overall, the unimproved grassland is much more dominant than semi-improved grassland areas, this being likely as a result of the site and study area being mostly managed for forestry rather than grazed agricultural land.

7.6.32 **Acid dry dwarf shrub heath** appears infrequently within the study area. The majority is of H12 *Calluna vulgaris – Vaccinium myrtillus* heath, although there are also some very small patches of H9 *Calluna vulgaris – Deschampsia flexuosa* heath and H21 *Calluna vulgaris – Vaccinium myrtillus – Sphagnum capillifolium* heath. These heaths can appear as both homogenous stands or within mosaics with other grassland and mire communities across the study area.

7.6.33 **Broadleaved Plantation Woodland** was recorded south of Standingstone Hill within the central part of the study area. This was composed of a young broadleaved plantation with saplings of *Salix* sp., *Betula* sp., *Alnus glutinosa* and *Sorbus aucuparia*. This habitat is a non-NVC community (YBP) and is therefore not represented within the NVC.

7.6.34 **Acid neutral flushes** within the study area are represented by the M6 *Carex echinata* - *Sphagnum fallax/denticulatum* mire NVC community. This community was often found within areas where there are small flushes, runnels or soakways, and along and within occluding ditches and around minor watercourses or as small components of modified bog. In a number of locations, the community appears in a mosaic with other mire and grassland NVC communities.

Broadleaved Semi-Natural Woodland appears within a number of isolated areas within the study area and overall forms a very small proportion of the study area. The canopy is often composed of well established, mature, semi-natural tree species. This habitat varies in nature being comprised of the woodland communities W7 Alnus glutinosa – Fraxinus excelsior – Lysimachia nemorum and W11 Quercus petrea – Betula pubescens – Oxalis acetosella woodland.

Protected Species

7.6.35 This section summarises the results of the protected species surveys carried out in 2019 and 2020 across the site, and from the results of the desk study which collated information from other local wind farm projects.

7.6.36 Full details of the results for each species are included in the following Appendices and Figures:

- Protected species: Appendix 7.2 (inc. Confidential Annex C), Figures 7.5A and B; and
- Bats: Appendix 7.3, Figures 7.7 to 7.11.

Otter

7.6.37 Records of otter within 5 km of the site were returned by the desk study and evidence of otter was recorded at nine of the 14 surrounding wind farm projects (see Table 7.8). No holts were recorded during the field surveys of the site. A potential resting up area under the root of fallen tree was recorded along the River Nethan south east of Nutberry Hill (Figure 7.5A). The cavity was sheltered and extended for approximately 1.6 m and was approximately 1 m in width. No sign of otter was recorded around the feature. An otter spraint containing bones was recorded within the site, upstream of this feature and was located on bankside vegetation.

7.6.38 The watercourses within the site are variable in their size and characteristics. Many of these watercourses, particularly the Birkenhead Burn, provide suitable commuting habitat for otter within their wider territory range, and may support otter for foraging, commuting and sheltering purposes. The banks are fringed by dense bankside vegetation including bracken, with overhanging banks and other cavities, creating opportunities for otter to utilise the habitats within the site for resting up and permanent shelter. Given the presence of otter in the vicinity of the site, it is possible that the watercourses within the site could form part of an otter's home range and would be used periodically for commuting and foraging, where there is a suitable prey resource.

7.6.39 Suitable habitat for fish was noted in the River Nethan mainstem, Logan Water and the Birkenhead Burn (Technical Appendix 7.4 Fish Habitat Survey Report) which offer suitable prey for otter, with most other watercourses providing minimal fish habitat. It is known that no migratory fish can access the site, therefore the main fisheries presence is the local, resident brown trout (*Salmo trutta*) population.

Water Vole

7.6.40 No records of water vole were returned by the desk study and no records of water vole were noted at any of the local wind farm projects. No burrows or other evidence of water vole were recorded during the field surveys.

7.6.41 The site offers some suitable habitat for water voles with many tributaries within the site having a low flow offering suitability for water vole commuting. The areas of exposed soft peaty banks offer burrowing habitat for water vole, and rush and grassland habitats along banksides offer suitable foraging habitat. Although no evidence of water vole was identified during the surveys, it is possible that the species could colonise the site.

Badger

7.6.42 Badger evidence was returned during the desk study, and presence was recorded at 11 of the other 14 wind farm projects in the local area. Details are provided within the separate Confidential Annex C.

7.6.43 Evidence of badger was also recorded during the baseline surveys in 2019 and 2020. One main badger sett was recorded outside of the site, with paths, latrines, dung pits and feeding signs within the site. Details are provided within Confidential Annex C and Confidential Figure 7.5B.

7.6.44 The majority of the site is considered suitable for badger species due to the presence of sloped ground with mineral soils in some sections of the site.

Pine Marten

7.6.45 No records of pine marten were returned by the desk study. Surveys specifically for pine marten were included within the survey scope some local wind farm projects (Table 7.8), although none recorded confirmed signs of pine marten presence. No dens of pine marten were recorded during the surveys.

7.6.46 A possible sighting of a pine marten was recorded near Birkenhead Burn in 2019 (Figure 7.5A), with a small dark mustelid seen through plantation running along the ground. A definitive identification could not be made due to the brief sighting. Wind thrown trees were present in this area which can offer suitable shelter/den habitat for pine marten. A possible pine marten scat was also located in this area.

Red Squirrel

7.6.47 No records of red squirrel were returned by the desk study and no evidence of red squirrel was recorded during any of the surveys of the 14 local wind farm projects within the vicinity of the site. No dreys or other evidence of red squirrel were recorded during field surveys.

Reptiles

7.6.48 Records of common lizard were returned by the desk study. No reptiles or signs of reptiles were recorded during the field surveys.

7.6.49 The site offers some small aeras of open grassland and peatland habitat suitable for common lizard, slow worm and adder, on undulating ground, often with frequent bracken cover. These species can utilise habitats such as these for basking, sheltering and foraging, as reptiles benefit from a diversity of microhabitats created by a variety of vegetation types (Edgar et al., 2010). Peatland habitats can support small mammals, ground-nesting birds and invertebrates, all of which offer prey to reptiles (Catherine, 2018).

Great Crested Newts

7.6.50 There were no ponds visible on a 1:25,000 Ordnance Survey maps within the Proposed Development site boundary, nor were any ponds recorded during the protected species surveys. A single pond is visible on the 1:25,000 Ordnance Survey map, approximately 300 m east of the Proposed Development site, adjacent to Todlaw property. It was agreed with NatureScot during pre-scoping consultation that the species is likely to be absent from the local area, based on the absence of great crested newts at other project sites within the vicinity of the Proposed Development, therefore, no further survey work was required.

Fish

7.6.51 The site contains some good examples of salmonid spawning and rearing habitat, particularly in the River Nethan along the southern site boundary. While the instream habitat is generally excellent, the full potential of the River Nethan at this point in its catchment is perhaps limited due to potential fragmentation caused by a series of natural bedrock steps which may inhibit upstream migration.

7.6.52 Several of the small watercourses within the Proposed Development site were noted as having low habitat suitability for fish. There were a number of larger watercourses, or sections of larger watercourses, that were considered to have high habitat suitability for brown trout of all age classes

including the River Nethan within the south-east, Birkenhead Burn within the north and Logan Water within the west of the Proposed Development site which flows into the Logan Reservoir. No migratory fish can access the site, therefore the main fisheries presence is the local, resident brown trout population.

Bats

7.6.53 The desk study returned records of the following bat species within 10 km of the Proposed Development: soprano pipistrelle, common pipistrelle, Daubenton's bat, Leisler's bat, Nathusius' pipistrelle and pipistrelle bat species.

7.6.54 No bat roosts or potential bat roosts were located within 300 m of a proposed turbine location. Several buildings and trees with potential roost features (PRFs) were recorded within the wider survey area (Figure 7.8) but were sufficiently buffered during the design layout process (see *Design Layout Considerations* in this section).

7.6.55 Temporal (static detector) bat surveys were conducted in both 2019 and 2020 bat survey seasons; 13 anabats were deployed in 2019, and two in 2020 to account for the relocation of T20 and addition of T21 to the layout (see Figure 7.7 for anabat locations).

7.6.56 A total of four bat species were recorded during temporal surveys: soprano pipistrelle, common pipistrelle, Daubenton's bat and brown long-eared bat (*Plecotus auritus*). Two genus classifications were also recorded within the study area: *Myotis* spp. and *Nyctalus* spp. A total registration count of 23,411 was recorded for all species across all locations. Figures 7.7 to 7.11 provide information on detector locations and activity rates at each, during the monthly surveys.

7.6.57 High collision risk species (as per SNH *et al.* 2019 guidance) recorded on site comprise common pipistrelle, soprano pipistrelle and *Nyctalus* spp. All other bat species and genera recorded are categorised as low collision risk (Daubenton's, brown long-eared and *Myotis* spp.).

7.6.58 Based on SNH *et al.* (2019) guidance, population vulnerability was determined to be 'common' for both pipistrelle species, 'rarer' for Daubenton's and brown long-eared bats, and 'rarest' for *Nytcalus spp.*

7.6.59 The Proposed Development consists of 21 turbines and so falls within the category of 'Medium' project size which is between 10 to 40 turbines (SNH *et al.* 2019). In terms of habitat risk for bats, there are buildings and trees with low, moderate and high bat roosting potential within the study area. There are also burns of different sizes, providing connectivity and foraging habitats throughout the site and the surrounding landscape. The habitat consists of closed plantation with open habitats such as tracks rides and clear-fell, which could be used by foraging bats. The foraging, connectivity and roosting potential of the site results in a habitat risk classification of 'Moderate'.

7.6.60 SNH *et al.* (2019) advises that an overall risk for the site is given, based on project size and habitat risk, to help determine effects at a population level, and the potential requirement for mitigation. The 'Medium' project size combined with a 'Moderate' habitat risk level results in an overall site risk assessment of 'Medium' (see Technical Appendix 7.3 Bat Survey Report for further details)

7.6.61 The Ecobat[2] software tool was used to gain estimates of relative bat activity recorded in 2019 and 2020 at the site. SNH *et al.* (2019) explains that, "*The tool compares data entered by the user with bat survey information collected from similar areas at the same time of year…Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting the levels of bat activity recorded at a site across regions in Britain*". Data from the site were compared with data within a range of 100 km of the site and within 30 days of the survey date (Technical Appendix 7.3).

7.6.62 Table 7.11 presents the results of the Ecobat analysis for the site. The median and maximum percentiles are attributed to one of the following five bat activity categories as defined within SNH *et al.* (2019): Low (0-20 %), Low-Moderate (20-40 %), Moderate (40-60 %), Moderate-High (60-80 %) and High (80-100 %).

1.1.1

[2] http://www.mammal.org.uk/science-research/ecostat/

7.6.63 **Table 7.11 - Percentile Bat Activity – Site Level**

Bat Species	Year	Locations	Median Percentile	Maximum Percentile
Common pipistrelle	2019	1 – 13	69	99
Soprano pipistrelle	2019	1 – 13	69	100
Nyctalus spp.	2019	1 – 13	44	94
Myotis spp.	2019	1 – 13	1	88
Daubenton's bat	2019	1 – 13	1	51
Brown long-eared bat	2019	1 - 13	1	30
Common pipistrelle	2020	14 - 15	47	85
Soprano pipistrelle	2020	14 - 15	40	76
Nyctalus spp.	2020	14 - 15	33	66
Myotis spp.	2020	14 - 15	1	1

7.6.64 The overall risk assessment in Technical Appendix 7.3 Bat Survey Report, combining collision risk, population vulnerability and activity levels concluded a 'Medium (9-12)' to 'High (15)' overall risk for soprano pipistrelle, common pipistrelle and *Nyctalus* spp. throughout the survey period in 2019. In 2020, the overall risk score was 'Medium (9)' to 'High' (15) for common pipistrelle and 'Medium' (6-12) for soprano pipistrelle and *Nyctalus* spp. However, at a finer scale this risk varies by anabat location, year of survey, time of year, and species and this is highlighted in Figures 7.9 to 7.11 which show the risk at each anabat location per species and per month in both 2019 and 2020.

Design Layout Considerations

7.6.65 As part of the iterative design process for the Proposed Development, ecological constraints identified through baseline survey results were considered in order to prevent or minimise adverse effects on ecological receptors. This involved:

- a minimum 50 m buffer for any infrastructure or construction activity around all watercourses, except where a minimum number of watercourse crossings are required. This will minimise effects on associated habitats and protected species;
- avoidance of blanket bog habitat for the location of turbines and infrastructure as far as practicable;
- avoidance of areas of potentially high GWDTEs for infrastructure as far as practicable;
- avoidance of medium or high potential bat roost structures by at least 270 m (based on a minimum 200 m buffer and rotor radius); and
- positioning of turbines at least 50 m (measured from blade-tip) from a feature used by bats (in this case, planation edge), as recommended by SNH *et al.* (2019) to reduce collision risk. The exact distance between the turbine base and plantation edge is dependent on turbine specifications, based on a combination of rotor blade length, hub height and tree height, and the calculation to determine the distance is shown below.

  buffer (b), blade length (bl), the hub height (hh) and feature height (fh)

  $$b = \sqrt{(50\ m + bl)^2 – (hh – fh)^2}$$

  If it is assumed that during the operational period, trees will be up to 20 m tall, then a minimum set-back distance of 73.3 m is estimated, based on a turbine hub height of 122.5 m and a blade length of 76 m. For the ease of determination on the ground, all proposed turbines would be located at or beyond a set-back distance of 75 m.

Micrositing

7.6.66 Any micrositing of infrastructure will take into consideration the potential for direct encroachment onto sensitive habitats or GWDTEs, or indirect alteration of hydrological flows supporting sensitive habitats or GWDTEs. Any micrositing will also take consideration of any disturbance buffer distances on protected species' features identified by the SPP to be prepared prior to construction commencing.

7.7 Potential Effects

7.7.1 This section provides an assessment of the likely effects of the Proposed Development on the IEFs identified through the baseline studies. The assessment of potential effects is based on the Proposed Development description in Chapter 3: Project Description, and is structured as follows:

- project assumptions;
- scoped-out ecological features;
- scoped-in IEFs;
- construction effects;
- operational effects; and
- decommissioning effects.

Project Assumptions

7.7.2 The following assumptions are included in the assessment of otherwise unmitigated impacts on IEFs:

- Turbines will be keyholed within any existing forestry blocks and any new forestry will not be planted within these keyholed areas (Chapter 16: Forestry).
- The construction period will last for up to 18 months, comprising a construction programme as described in Chapter 3: Project Description. The associated infrastructure will include: tracks, crane hardstanding, underground cabling, on-site substation and energy storage compound, maintenance building, temporary construction compound, laydown area, concrete batching plant, potential excavations/borrow workings and two permanent meteorological masts.
- All electrical cabling between the turbines and the associated infrastructure would be underground in shallow trenches which would be reinstated post-construction and follow the access tracks.
- Any ground disturbance areas around permanent infrastructure during construction would be temporary and areas would be reinstated or restored before the construction phase ends or shortly thereafter.
- To ensure reasonable precautions are taken to avoid adverse effects on habitats, protected species and aquatic interests, a suitably qualified Ecological Clerk of Works (ECoW) will be appointed prior to the commencement of construction to advise the Applicant and the Contractor on all ecological matters. The ECoW will be required to be present on the site during the construction phases and will carry out monitoring of works and briefings with regards to any ecological sensitivities on the site to the relevant staff within the Contractor and subcontractors.
- An SPP will be agreed prior to construction commencing and implemented during the construction phase. The SPP will detail measures to safeguard protected species known to be in the area. The SPP will include pre-construction surveys to check for any new protected

species in the vicinity of the construction works, and good practice measures during construction.

- Implementation of appropriate pollution prevention measures (particularly in relation to watercourses) and standard good practice construction environmental management will occur across the site as standard and form part of a robust CEMP (Appendix 3.1).

Scoped-Out Ecological Features

7.7.3 With consideration of the desk-study and baseline data collected and following the design layout considerations and project assumptions sections above, several ecological features can be scoped out of further assessment based on the professional judgement of the EIA team and experience from other relevant projects and policy guidance or standards. The following paragraphs detail the ecological features scoped out.

Designated Sites

7.7.4 There are no designated sites within the site. Based on distances of nearest designated sites from the Proposed Development infrastructure and the ecology of associated qualifying habitat features (see Table 7.7), all designated sites have been scoped out of the assessment due to a lack of likely connectivity. In particular, the infrastructure associated with the Proposed Development is considered sufficiently distant form the Muirkirk and North Lowther Uplands SSSI (adjacent to the site boundary) to avoid any indirect effects on peatland habitats (see Figure 7.1), particularly when appropriate best practice during construction is implemented (see *Project Assumptions* above).

Habitats

7.7.5 Table 7.12 details the estimated direct and indirect losses expected to occur by habitat type, due to all new infrastructure. A total of 10.9 ha of habitats would be directly lost due to permanent infrastructure, with 75 % (8.2 ha) of this comprising conifer plantation. A further 9.7 ha of habitat will be lost from temporary infrastructure (which includes the laydown area and construction compounds as well as the full extent of the three borrow pit search areas) (Table 7.13), with 72 % (7.0 ha) of this comprising conifer plantation.

7.7.6 The predominant habitat loss within the site – commercial conifer forest plantation – is of low conservation value, hosting a species-poor ground layer. It is correspondingly of negligible Nature Conservation Importance (Table 7.3) and sensitivity and is therefore scoped out of the assessment.

7.7.7 Approximately 0.12 ha of marshy grassland may be directly lost due to permanent infrastructure. Within the study area this habitat is made up of M23 and M25 NVC types, with areas of non-NVC dominant *Juncus*, which is species-poor. This habitat is scoped out of the assessment as it is considered to be of negligible Nature Conservation Importance and overall sensitivity. M23 is a rush dominated habitat generally of low ecological value unless particularly species-rich examples are found. The M23 within the study area is often species poor and often recorded in mosaics with other grassland and mire communities. The floristic components were often dominated by *Juncus effusus* with a low diversity of grass species which included *Holcus lanatus*, *Festuca rubra* and occasional *Molinia caerulea*. Other associates included *Galium palustre*, *Rumex acetosa* and *Ranunculus repens*. Mosses were dominated by *Rhytidiadelphus squarrosus* and *Calliergonella cuspidata*. This is a common habitat locally, regionally and nationally and the small direct and indirect losses predicted at the site, as per Tables 7.11 and 7.12, below, are of negligible significance. M23 is considered a potentially high GWDTE (SEPA, 2017a; 2017b), however designation as a potential GWDTE does not infer an intrinsic biodiversity value, and GWDTE status has not been used as criteria to determine conservation importance in the ecology assessment. The data gathered during the NVC surveys has however been used to inform the assessment in Chapter 11: Hydrology.

7.7.8 Dry and wet dwarf shrub heath are identified as being of local importance at the site due to their intrinsic value as being listed as Annex I or SBL habitats (see Table 7.10 and Appendix 7.1), however they occupy such small areas within the study area, and any direct or indirect effects on the habitat

are so small (see habitat loss calculations in Tables 7.11 and 7.12) that they are scoped out of the assessment.

7.7.9 All other habitats (with the exception of blanket bog and wet modified bog) are considered to be of negligible Nature Conservation Importance and sensitivity, and/or of negligible extent, and so have been scoped out of the assessment.

Table 7.12 – Estimated Loss of Habitat for Permanent Infrastructure

Phase 1 Habitat Type	Phase 1 Site Extent (ha)	NVC Community Code or Habitat Type[3]	Direct Habitat Loss (ha)	Direct Habitat Loss as a % of Phase 1 Type in site	Direct & Indirect Habitat Loss (ha)	Direct & Indirect Habitat Loss as a % of Phase 1 Type in site
A1.2.2 Coniferous Plantation Woodland	661.06	CP, YCP	8.19	1.24	As per direct loss	
A4.2 Recently Felled Coniferous Woodland	67.85	CF	0.60	0.88	As per direct loss	
B1.1 Unimproved Acid Grassland	15.59	U4, U4d	0.13	0.83	As per direct loss	
B1.2 Semi-Improved Acid Grassland	2.99	U4b	0.02	0.67	As per direct loss	
B5 Marsh/Marshy Grassland	20.46	M23a, M23b	0.03	0.59	0.19	2.98
		M25b	0.01		0.06	
		MG9a	0.005		0.01	
		MG10a	0.07		0.33	
		Je	0.002		0.01	
C1.1 Continuous Bracken	17.16	U20	0.06	0.35	As per direct loss	
D1.1 Acid Dry Dwarf Shrub Heath	6.47	H12	0.02	0.31	As per direct loss	
D2 Wet Dwarf Shrub Heath	1.39	M15	0.03	2.16	0.13	9.35
E1.6.1 Blanket Bog	53.54	M19b	0.11	0.21	0.25	0.47
E1.7 Wet Modified Bog	57.64	M19, M19a	0.25	1.13	0.66	3.07
		M20a	0.01		0.07	
		M25a	0.37		0.98	
		Sph.	0.02		0.07	
E2.1 Acid/Neutral Flush	2.09	M6c	0.001	0.05	0.004	0.19

1.1.1

[3] Only specific habitats, communities or features subject to habitat losses are presented within this table. Any habitats or communities not listed here are not subject to any predicted direct or indirect habitat losses.

Phase 1 Habitat Type	Phase 1 Site Extent (ha)	NVC Community Code or Habitat Type[3]	Direct Habitat Loss (ha)	Direct Habitat Loss as a % of Phase 1 Type in site	Direct & Indirect Habitat Loss (ha)	Direct & Indirect Habitat Loss as a % of Phase 1 Type in site
J4 Bare Ground	11.93	BG	0.36	3.02	As per direct loss	
TOTAL	**927.86**		**10.29**	**1.11**	**12.14**	**1.31**

Table 7.13 – Estimated Loss of Habitat for Temporary Infrastructure

Phase 1 Habitat Type	Phase 1 Site Extent (ha)	NVC Community Code or Habitat Type[4]	Direct Habitat Loss per NVC (ha)	Direct Habitat Loss as a % of Phase 1 Type in Site	Direct & Indirect Habitat Loss per NVC (ha)	Direct & Indirect Habitat Loss as a % of Phase 1 Type in Site
A1.2.2 Coniferous Plantation Woodland	661.06	CP	7.04	1.06	As per direct loss	
B1.1 Unimproved Acid Grassland	15.59	U4	< 0.0001	< 0.0001	As per direct loss	
B5 Marsh/Marshy Grassland	20.46	M23b	< 0.0001	< 0.0001	0.001	0.005
E1.6.1 Blanket Bog	53.54	M19b	2.08	3.88	2.43	4.54
E1.7 Wet Modified Bog	57.64	M19, M19a	0.36	0.62	0.59	1.02
J4 Bare Ground	11.93	BG	0.20	1.68	As per direct loss	
TOTAL	**927.86**		**9.68**	**1.04**	**10.26**	**1.11**

Protected Species

7.7.10 Effects on badger, otter, water vole, red squirrel, pine marten, great crested newt and reptiles are scoped out of this assessment as significant effects on their populations are not likely due to their absence from the site, lack of protected features recorded, or general low use of the site.

7.7.11 Although present within the site, badger is not identified as an IEF and is therefore scoped out of the assessment for the following reasons. The closest possible badger sett recorded in 2019 and 2020 was located more than 1.5 km away from the nearest proposed turbine location. Given the recommended NatureScot disturbance buffer distances for badger (30 m, or 100 m if blasting/piling[5]), it is considered unlikely that this sett would be affected by the Proposed Development, as long as the appropriate buffers are applied. Should any setts be found within the prescribed disturbance-free buffer distances prior to commencement of construction, appropriate mitigation measures would be undertaken under a SPP to ensure legal compliance and avoid unacceptable impacts on badgers.

7.7.12 Otter is known to be present within the local area, being recorded as present in nine of the 14 local wind farm projects surrounding the Proposed Development site. Suitable habitat for supporting

1.1.1

[4] Only specific habitats, communities or features subject to habitat losses are presented within this table. Any habitats or communities not listed here are not subject to any predicted direct or indirect habitat losses.

[5] https://www.nature.scot/sites/default/files/2020-06/Species%20Planning%20Advice%20-%20badger.pdf

otter is variable within the study area and a potential resting up area was identified under the root of a fallen tree was recorded, with otter spraint recorded nearby. As outlined in the *Design Layout Considerations* section, all infrastructure would be suitably buffered from watercourses (allowing for watercourse crossings) and measures would be employed during construction as part of the SPP which would avoid impacts on otter, including pre-construction surveys.

7.7.13 No evidence of water vole was recorded during baseline surveys for the Proposed Development or any other local wind farm projects. The species is likely to be locally absent.

7.7.14 There was no confirmed evidence of red squirrel or pine marten recorded during the 2019 or 2020 surveys, or baseline surveys of the local wind farm projects. One potential pine marten sighting and a scat were recorded, however neither could be conclusively attributed to the species. Although the habitats within the site offer some potential for pine marten and red squirrel, the lack of confirmed evidence suggests that the site is unlikely to be of importance for their respective populations, if present.

7.7.15 No reptiles were sighted during the survey. The proposed SPP will ensure that all reasonably practicable measures are taken so that provisions of the relevant wildlife legislation are compiled in relation to these protected species, should their presence be recorded.

7.7.16 Fish species are scoped out of this assessment. In order to avoid direct or indirect impacts on fish, a suitable 50 m minimum buffer distance will be kept between infrastructure and watercourses (with the exception of a limited number of watercourse crossings). A SPP will be produced prior to the commencement of construction and will be implemented throughout the duration of construction, with works being monitored by an ECoW. It is also assumed that pollution prevention measures and a CEMP will be implemented during construction and operation of the Proposed Development to ensure no adverse impacts occur from pollution, sedimentation etc.

Bats

7.7.17 Based on SNH *et al.* (2019) guidance, brown long-eared bat and Daubenton's bat in Scotland are considered to be of low vulnerability to wind farms, relating to their relative abundance and low collision risk. Activity rates of these species recorded during baseline surveys in 2019 and 2020 were low. It is therefore considered that these species can be scoped out from the assessment as they are of low sensitivity and of no more than local nature conservation importance.

Deer

7.7.18 Effects on deer are scoped out of this assessment. Deer management would continue at the same level as is currently undertaken, throughout the construction and operation phases. This is expected to be sufficient to maintain deer populations at an appropriate size for the area. The construction impacts associated with the Proposed Development are considered to be sufficiently similar to ongoing commercial forestry activities within the site, and with habitat change limited to keyholed areas and small sections of new access track, significant effects on deer or large-scale displacement of deer from the site is unlikely. In the event, however, that deer are displaced by construction activity, the most likely scenario is that they would move elsewhere to similar habitat within the large expanse of Cumberhead Forest.

Scoped-In IEFs

7.7.19 The assessment of likely effects will be applied to those 'scoped-in' IEFs of local, regional, national, and international Nature Conservation Importance (see Table 7.3) that are known to be present within the site or surrounding area (as confirmed through survey results and desk studies outlined above). As outlined within Table 7.14 below, these comprise:

- blanket bog, including wet modified bog; and
- bats (*Nyctalus* and *Pipistrellus spp.*).

Table 7.14 – Nature Conservation Importance of Scoped-In IEFs

IEF	Nature Conservation Importance	Rationale
Blanket bog including wet modified bog	Local	A mixture of Annex I blanket bog and wet modified bog habitats are found within the site, and show to various degrees, evidence of anthropogenic attempts at drainage and grazing influences. The Carbon and Peatland Map 2016 (Figure 7.2) indicates that a discrete area of Class 1 peatland exists within the site across Nutberry Hill, but much of the remaining open areas are Class 4, predominantly mineral soil with some peat soil. Blanket bog, including wet modified bog within the study area is not considered to be nationally or regionally important due to its general condition and limited extents. Its Nature Conservation Importance is therefore considered to be Local.
Nyctalus sp. bats	Regional	Based on SNH *et al.* (2019) guidance, *Nyctalus* species in Scotland are considered to be of high population vulnerability to wind farms. Mathews *et al.* (2018) concluded that there were insufficient data to make a population estimate for *Nyctalus sp.* at a national level. Although a population estimate of approximately 10,000 individuals was given for Leisler's bats, in Harris *et al.* (1995) (250 individuals in Scotland), this estimate was graded as having very poor reliability. Subsequent evidence from the Southern Scotland Bat Survey of breeding Leisler's bat colonies in south-west Scotland confirm that the estimate of 250 individuals is too low and has suggested a wider range in south-west Scotland than previously estimated. For noctule bat, JNCC (2013b) provided a national estimate of 50,000 individuals, with 250 in Scotland. Again Mathews *et al.* (2018) concluded that there is considerable uncertainty surrounding the population estimates for this species, although they revised the population estimates to 100,500 in Great Britain, and 6,100 in Scotland. Research work by Newson *et al.* (2017) has estimated through spatial modelling that between 16 % and 24 % of the regional populations of high vulnerability species such as *Nyctalus* spp. in southern Scotland overlaps existing or approved wind farms, with 50 % of this overlap concentrated at just 10 % of wind farms, indicating that there are very localised risk areas for *Nyctalus* spp. The study used spatial modelling to stratify the region (southern Scotland) according to potential impact on high vulnerability species by highlighting areas of risk. According to this spatial modelling the predicted occurrence of *Nyctalus* spp. is distributed in the south and south-eastern areas of Dumfries and Galloway. Although no roost locations were identified during baseline studies, the Proposed Development is close to the area of predicted occurrence for *Nyctalus* species.

IEF	Nature Conservation Importance	Rationale
		When considering the information available, *Nyctalus* species are classified as being of Regional Nature Conservation Importance, based on the likely low regional populations, and potential vulnerability to wind farm developments.
Soprano and common pipistrelle bats	Local	Based on SNH *et al.* (2019) guidance, soprano and common pipistrelle species in Scotland are considered to be of medium population vulnerability to wind farms as they are high collision risk, but common species. For soprano pipistrelle Mathews *et al.* (2018) estimated a national population of 4,670,000 adults, with a Scottish population of 1,210,000 adults. For common pipistrelle Mathews *et al.* (2018) estimated a national population of 3,040,000 adults, with a Scottish population of 875,000 adults. The current population trends of both species are unknown, although it was predicted that range and habitat quality are likely to remain stable. When considering the information available, pipistrelle species are classified as being of Local Nature Conservation Importance, based on the likely large, stable regional populations, and potential medium vulnerability to wind farm developments.

Construction

7.7.20 This section provides an assessment of the potential effects of the construction of the Proposed Development upon the scoped-in IEFs.

7.7.21 Impacts on habitats may include direct loss of habitat, e.g. derived from permanent land-take for infrastructure or temporary land-take for the land required to accommodate construction site compounds etc. Impacts on habitats can also be indirect through changes to habitat type associated with forest felling (adverse or beneficial), increased habitat fragmentation, or effects to supporting systems such as groundwater or water-table levels.

7.7.22 Although the laydown area, construction compounds and borrow pits will be restored at the end of construction, taking a precautionary approach, it is assumed for the assessment that the areas of land-take for these parts of the infrastructure also represent permanent losses of habitat due to the uncertainties in re-creating functioning habitat types such as blanket bog. It should be noted that the habitat loss calculations are also precautionary because in practice the borrow pits would not cover the full extent of the search areas.

7.7.23 There may also be some indirect habitat losses to wetland habitats due to drainage effects, and changes to the hydrological regime may also occur. For the purposes of this assessment it is assumed that wetland habitat losses due to indirect drainage effects may extend out to 10 m from infrastructure (i.e. in keeping with indirect drainage assumptions within the carbon calculator (Scottish Government, 2020). In practice it is expected that any indirect drainage effects will only impact wetland habitats at the site such as blanket bog, wet heath, flushes and springs. No indirect drainage effects are expected to impact or alter the quality or composition of 'dry' habitats such as dry dwarf shrub heath, acid grassland etc.

Blanket Bog, Including Wet Modified Bog

7.7.24 Impact: Impacts upon bog habitats during construction would be direct (through habitat loss occurring during construction of the Proposed Development) and indirect (through potential drying effect upon neighbouring bog habitats occurring from the construction period into the operational period). Direct loss would occur in areas where new access tracks pass through this habitat type or where infrastructure such as turbine foundations, crane pads, hardstandings, borrow pits, compounds etc. are constructed on these habitat types. In addition, there may be indirect losses as a result of drainage around infrastructure and disruption to hydrological flows.

7.7.25 Sensitivity: As per Table 7.12, blanket bog and wet modified bog peatland within the study area is considered to be of Local Nature Conservation Importance. Conservation status of this habitat as assessed in JNCC report on blanket bog (JNCC, 2012) is 'Bad' and 'Declining' at the UK level. The overall sensitivity is therefore considered to be medium.

7.7.26 Magnitude: The UK has an estimated 2,196,736 ha of blanket bog (JNCC, 2012) of which around 1,759,000 to 1,800,000 ha is in Scotland (approximately 23 % of the land area) (JNCC, 2012; SNH, 2017b).

7.7.27 Blanket bog, including wet modified bog, covers 111 ha (approximately 12 %) of the NVC study area, with most of this comprising M19, M18 and M25 NVC communities (Table 7.11). Of this extent, a total of 0.76 ha would be directly lost due to permanent infrastructure (Table 7.12), with a further loss of 2.4 ha located within areas of temporary infrastructure (Table 7.12). Direct habitat loss due to permanent infrastructure is predicted to be equivalent of at most 1.3 % of the blanket bog and wet modified bog within the NVC study area. Direct loss of these bog habitats, particularly those of higher conservation value, is therefore of a very small extent within a local and regional context.

7.7.28 In addition to direct losses, there may be some indirect losses because of the zone of drainage around infrastructure (as a worst-case assumed to extend out to 10 m from infrastructure in line with the carbon calculator assumptions). If indirect drainage impacts are fully realised out to 10 m in all blanket bog areas then predicted blanket bog losses due to permanent infrastructure increases to 2.0 ha or 3.5 % of the habitat within the NVC study area and 3.0 ha or 5.6 % for temporary infrastructure. The distance of the impacts of drainage on a peatland is highly variable and depends on various factors such as the type of peatland and its characteristics and properties of the peat; the type, size distribution and frequency of drainage feature; and whether the drainage affects the acrotelm, penetrates the catotelm, or both. Consequently, drainage impacts can be restricted to just a few metres around the feature or extend out to tens of metres, or further (e.g. see review within Landry & Rochefort, 2012). The hydraulic conductivity of the peatland is one of the key variables which affect the extent of drainage. In general, less decomposed more fibric peatlands (which tend to be found commonly in fen type habitats) generally have a higher hydraulic conductivity and drainage impacts can extend to around 50 m, whilst in more decomposed (less fibrous) peat drainage impacts may only extend to 2 m or so. Blanket bog habitats commonly are associated with more highly decomposed peats (Nayak et al., 2008).

7.7.29 With the adoption of good practice and environmental management techniques, and an appropriate and considered drainage design, it is considered unlikely that indirect drainage impacts of this scale (i.e. out to 10 m either side of infrastructure) on an already modified habitat would occur or would have such an impact on the habitat as to result in large-scale vegetation shifts to a lower conservation value habitat type (such as acid grassland for example).

7.7.30 Felling of existing conifer plantation for infrastructure, including key-holing of turbines may increase the overall extent of bog/mire or heath habitat over the long-term operational period of the development, particularly in areas around turbines which require key-holing. No trees would be replanted within at least 75 m of turbines (based on calculated minimum setback distances for bats, see Section 7.8), thereby encouraging open mire or heath type habitats to form.

7.7.31 When considering the likely direct and indirect habitat losses, as well as potentially positive benefits of key-holing, the magnitude of impact within a local or regional context is considered to be negligible spatial, and long-term temporal.

7.7.32 Significance: Given the above consideration of sensitivity and magnitude, the effect significance is considered to be **negligible** and **not significant** under the terms of the EIA Regulations.

Bats

7.7.33 Impact: There is the potential for displacement and/or disturbance to foraging and commuting bats during construction due to the construction of wind farm infrastructure and the forest felling required to accommodate the infrastructure.

7.7.34 Sensitivity: Both common and soprano pipistrelle are widespread in southern Scotland, with *Nyctalus leisleri* distributed mainly in the south and west and *Nyctalus noctula* mainly to the south and east, with some scattered predicted occurrence to the west. The low population estimates for *Nyctalus* spp. in Scotland are likely due to under-recording and an underestimate of the population occurring here. *Nyctalus* bat species within the site are considered to be of Regional Nature Conservation importance, whereas *Pipistrelle* species are of Local Nature Conservation Importance. All bat species recorded in the site are considered to have a favourable Conservation Status. Overall sensitivity is therefore considered to be medium for pipistrelle species, and medium-high for *Nyctalus spp.*

7.7.35 *Magnitude:* In terms of habitat quality for bats within the study area, there are buildings and trees outside of the site boundary with low, moderate and high bat roosting potential (Figure 7.8). There are also burns of different sizes, providing connectivity, and foraging habitats throughout the site and the surrounding landscape. The forest edge habitats such as tracks and rides, and areas of young second rotation crop could be used by foraging bats. However, the large extents of homogeneous Sitka spruce plantation, as well as recent clearfell reduce the suitability of the site. Considering these factors, the site is considered of moderate bat habitat suitability and quality.

7.7.36 Most turbines and infrastructure will be located within forested areas and some felling for this infrastructure will take place where mature plantation exists. Despite the felling that will be undertaken, displacement or disturbance to foraging and commuting bats during construction is considered negligible given the abundance of edge habitats available within the site that will remain unaffected. Linear watercourse features are also largely avoided due to the 50 m watercourse buffer for any infrastructure or construction activity, except where a minimum number of watercourse crossings are required.

7.7.37 Felling and the loss of habitat to the Proposed Development may marginally reduce the foraging opportunities within the site; however, due to the abundance of these habitat types in the surrounding environs across Cumberhead Forest, and the small extent of their loss, it is not considered to be significant. Additionally, felling for infrastructure will create new edge habitats that may be utilised by bats within otherwise impenetrable blocks of conifer forest, and thus overall, the abundance of edge habitat will increase. Forestry replanting of a more diverse range of species will also create new habitats and edge features in the longer term.

7.7.38 Although some bat foraging or commuting behaviour may be altered as a result of construction and forestry restructuring, this is likely to be of Negligible Spatial magnitude and Long-Term Temporal magnitude.

7.7.39 Significance: The effect significance is therefore considered to be **negligible** and **not significant** under the terms of the EIA Regulations for pipistrelle species, and at worst, **minor adverse** and **not significant** for *Nyctalus spp*.

Operation

7.7.40 This section provides an assessment of the likely effects of the operation of the Proposed Development upon the scoped-in IEFs.

7.7.41 All likely direct and indirect effects on blanket bog, including wet modified bog, have been considered in the Construction section above. Indirect habitat loss tends to occur during the operational phase; however, for completeness and ease of assessing impacts they are considered together in the construction effects section. No further impacts on any other habitat IEF are predicted during the operational phase.

Effects on bats of medium-and long-term habitat changes beyond the construction phase were also considered in the Construction section above. Potential disturbance effects are not likely to continue into the operational period, with maintenance work being restricted to turbines and other infrastructure locations. Collision risk is therefore considered to be the only potentially significant effect during the operational period.

Bats

7.7.42 Impact: During the operational phase, there is potential for collision risk upon commuting and foraging bat species, together with the risk that bats may die as a result of barotrauma when flying in close proximity of the turbine blades. For the purposes of this assessment, the potential effects from barotrauma are assumed to be the same as for collision risk. This is due to the lack of published empirical evidence in causes of bat fatalities around wind farms and the difficulties in determining whether bat fatalities are due to strikes (collisions) with the turbine blades or barotrauma.

7.7.43 Research undertaken by Exeter University (DEFRA, 2016) found that most bat fatalities at UK wind farms have been common pipistrelle, soprano pipistrelle and noctule bats, which are considered to be high risk species by SNH *et al.* (2019).

7.7.44 Because the proposed turbines have a blade tip over 150 m, they will require red aviation warning lights. There is some recent evidence that migratory pipistrelle bats may be attracted to red lights, which according to the authors, may lead to an increased collision risk of migratory bats at wind turbines (Voigt *et al.* 2018). The authors did however note a lack of insect hunting at the red light sources, which indicates that the attraction of migratory bats to red light sources was not caused by foraging. Although migratory activities of bats within the UK are relatively poorly known, baseline results suggest that no significant migratory movements were likely to have occurred within the study area, and the risk of additional collisions associated with local foraging bats being attracted to red lights is low.

7.7.45 Sensitivity: *Nyctalus* bat species within the site are considered to be of medium-high sensitivity, whereas Pipistrelle species are of medium sensitivity.

7.7.46 Magnitude: Following SNH *et al.* (2019) guidance, evaluating the vulnerability of a bat population to wind farms is based on three factors: (i) activity level recorded, (ii) population vulnerability (determined by collision risk of species and population size) and (iii) site risk level. These factors are multiplied to generate an overall risk assessment score per species of either Low (0-4), Moderate (5-12) or High (15-25). Technical Appendix 7.3 Bat Survey Report presents the results of this risk assessment for *Nycatalus* and pipistrelle species and provides detailed results from the Ecobat software analysis. Figures 7.9 to 7.11 also present the spatial and temporal risk categories for *Nycatalus* and pipistrelle species, based on the results of the monitoring undertaken at locations across the site in 2019 and 2020. A summary is provided below to inform the assessment.

7.7.47 (i) The following average site activity levels (median and maximum percentiles) were recorded in 2019:

- Common pipistrelle: Moderate-High to High;
- Soprano pipistrelle: Moderate-High to High; and
- *Nyctalus* spp.: Moderate to High.

7.7.48 The following average site activity levels (median and maximum percentiles) were recorded in 2020 (detectors 14 and 15 only):

- Common pipistrelle: Moderate to High;
- Soprano pipistrelle: Low-Moderate to Moderate-High; and
- *Nyctalus* spp.: Low-Moderate to Moderate-High.

7.7.49 (ii) Due to having a 'high' collision risk and a 'common' population abundance rating, common and soprano pipistrelle bat are classified as having 'medium' population vulnerability. *Nyctalus* spp. have

a 'high' collision risk and the 'rarest' population abundance resulting in this species having a 'high' population vulnerability.

7.7.50 (iii) The site has been categorised as a 'Moderate' (level 3) site risk to bats due to its 'Medium' project size and 'Moderate' habitat risk (see Technical Appendix 7.3: Bat Survey Report and Section 7.6).

7.7.51 The following overall risk assessment score for 'Median' and 'Maximum' percentiles was obtained in 2019 for each bat species:

- Common pipistrelle: Medium (12) to High (15).
- Soprano pipistrelle: Medium (12) to High (15).
- *Nyctalus* spp.: Medium (9) to High (15).

7.7.52 The following risk assessment score for 'Median' and 'Maximum' percentiles was obtained in 2020 (detectors 14 and 15) for each bat species:

- Common pipistrelle: Medium (9) to High (15).
- Soprano pipistrelle: Medium (6) to Medium (12).
- *Nyctalus* spp.: Medium (6) to Medium (12).

7.7.53 To provide an indication of how activity varies spatially and temporally by species, Figures 7.9 to 7.11 show the overall median monthly risk assessment scores (low to high) for pipistrelles and *Nyctalus* species at the various sample locations. Table 6.5 of Technical Appendix 7.3 additionally presents the percentage of sample locations in each survey month where a medium percentile 'High' risk assessment score was recorded.

Common and Soprano Pipistrelle

7.7.54 In general, most median risk levels per survey at sample locations for both pipistrelle species were rated as low or medium throughout the survey season in 2019 and 2020, although there was a notable decrease in recorded activity in September. The sample locations most consistently rated as high risk were 10 and 13 (all survey months for common pipistrelle, and all for soprano pipistrelle, apart from point 10 in September 2019), which are both within clearfell habitat towards the northeast part of the site. The two sample locations are closest to turbines T17 and T18 (Figures 7.9 and 7.10).

7.7.55 High risk levels were also recorded at sample location 5 (clearfell) in July only for both species, sample location 4 (clearfell) in August for soprano pipistrelle, and sample location 7 (near plantation edge, track and small pond) in June for common pipistrelle.

7.7.56 Clearfell and plantation edge habitats are therefore likely to provide suitable foraging or commuting habitat for pipistrelles, and it is evident that much of the site is regularly used by both species.

7.7.57 As outlined in section 7.6, *Design Layout Considerations*, a minimum tree set-back distance of 75 m from turbine blade-tip is considered to reduce collision risks to pipistrelle bats by creating sufficient distance to commuting and foraging edge features and reducing activity levels compared to baseline results. This is predicted to reduce the overall median risk assessment of 'medium' towards a 'low' score. Overall, there is still however some potential for localised collision risks associated with turbines, particularly the aforementioned turbines where high-risk levels were recorded. However, within a population context the impact magnitude of this is considered to be no more than Low Spatial and Long-Term Temporal for both species.

Nyctalus spp.

7.7.58 For *Nyctalus* species, most sample locations recorded a mix of low and medium median risk levels per survey, but again with a large drop in activity in September. The only high median risk level was recorded at sample location 12 (young plantation, planation edge and track) in June, outside of the final site boundary and over 500m from the nearest proposed turbine location (T17, Figure 7.11). It

is apparent that most of the site is used less regularly by foraging or commuting *Nyctalus* bats than pipistrelles (which may in part be due to a smaller local population), although a risk of collision does still exist.

7.7.59 *Nyctalus* species were rated from 2019 and 2020 data as having an overall median risk assessment level of 'medium', but for the Proposed Development this score may be lower when taking into consideration that the only sample location where a high activity level was recorded was outside of the final site boundary. A Moderate Spatial and Long-Term Temporal magnitude of impact at a population level is therefore predicted.

Significance:

Common & Soprano Pipistrelle: Given the above consideration of a low to medium overall risk assessment when taking into account that the embedded mitigation of maintaining a set-back distance of trees from turbines would lower activity levels near turbines compared to baseline results, the effect significance of collision risk on common and soprano pipistrelle bats at a population level is considered **minor adverse** and **not significant** in the context of the EIA Regulations.

***Nyctalus* spp**.: Given the above consideration of, at worst, an overall medium risk assessment for *Nyctalus* species on site (taking into account the sensitivity of species and magnitude of impact based on activity levels near turbines), the effect significance of collision risk on *Nyctalus* spp. bats is considered **moderate adverse** and **significant** under the terms of the EIA Regulations.

Decommissioning

7.7.60 Decommissioning effects, because of the distant timeframe until their occurrence (typically around 30 years), are difficult to predict with confidence. They are however considered for the purpose of this assessment to be similar to (or less than) those of construction effects in nature and are likely to be of shorter duration. The significance of effects predicted for IEFs in the construction effects section above are therefore considered appropriately precautionary for assessing decommissioning effects.

7.8 Mitigation

Mitigation During Construction

7.8.1 No further mitigation, in addition to mitigation by design and those measures as described within the *Project Assumptions* section (ECoW, SPP and CEMP) is proposed for the construction period.

Mitigation During Operation

Habitats

7.8.2 None required.

Bats

7.8.3 To reduce effects on *Nyctalus* spp. bats to a non-significant level, a further onsite bat activity monitoring programme would be initiated post-consent and in advance of turbine operation, to inform a detailed Bat Mitigation and Monitoring Plan (BMMP) for the operational period. As Cumberhead Forest is a commercial plantation in a continual cycle of fell and replant, the extent and distribution of clearfell and plantation edge habitat is also in a continual cycle of change within the forest. Additional bat monitoring starting before construction would therefore provide updated information, closer to the operational period, on which to base the measures within the BMMP. The additional monitoring and BMMP can be secured by an appropriately worded condition. The BMMP would be agreed with NatureScot in advance of commencement, and would consider the following measures:

- Reduced rotation speed whilst idling: SNH *et al*. (2019) recommends this as a best practice measure. The guidance notes that, "*The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50 %".* This measure would be put in place on all turbines from the start of the operational period of the Proposed Development.
- Curtailment, as detailed in SNH *et al*. (2019), involves "*raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed*". This would be considered where reduced rotation speed whilst idling does not provide sufficient reduction in risk to bats. Effective and efficient curtailment plans require high resolution information on bat activity combined with detailed weather data on rainfall and wind speed plus information from carcass searches. This information allows any curtailment to focus on specific turbines, times and dates corresponding with periods of high bat activity. Curtailment of certain turbines at particular times of day/year and certain weather conditions would be confirmed ahead of operation if the results of the additional pre-commencement monitoring concludes that further measures are required to ensure the risk to bats is not significant. If implemented, the curtailment plan would be monitored for a further three years to establish its effectiveness and any changes in activity created by surrounding habitat change associated with forestry operations.

Mitigation During Decommissioning

7.8.4 Mitigation measures are likely to be similar to those outlined for the construction phase.

Enhancement Measures

7.8.5 A Habitat Management Plan (HMP) would be agreed with consultees, and implemented during the operational phase of the Proposed Development, which would restore and enhance bog conditions and native woodland coverage within the site, across two Management Areas (see Technical Appendix 7.5 Outline Habitat Management Plan, and Figure 7.13 for details).

7.9 Residual Effects

Construction

7.9.1 Although no unmitigated significant effects are predicted for any IEF, the best-practice management measures (ECoW, CEMP, SPP) will minimise the likelihood of any adverse effects.

7.9.2 With enhancement measures for blanket bog as part of an HMP, the residual significance of construction effects on blanket bog (including wet modified bog) is considered to be **minor beneficial** at a local level.

7.9.3 Residual effects on bats are considered to remain as **negligible** (pipistrelles) and **minor adverse** (*Nyctalus spp.*) and **not significant**.

Operation

7.9.4 The set-back distance of forestry from turbines and the implementation of a BMMP would mean that the residual significance of operational effects (primarily collision risk) on pipistrelle and *Nyctalus* bats are no more than **minor adverse** and **not significant**.

7.10 Cumulative Assessment

7.10.1 The primary concern regarding the assessment of cumulative effects is to identify situations where impacts on habitats or species populations that may be acceptable from individual developments, are judged to be unacceptable combined with nearby existing or proposed projects. In the interests of focusing on the potential for significant effects, this assessment considers the potential for cumulative effects with other wind farm projects.

7.10.2 A number of wind farms projects, at either operational, consented or in planning, are within 10 km of the Proposed Development turbines. Those of most relevance to the cumulative assessment include Hagshaw Hill and Extension, Hagshaw Hill Repowering, Nutberry, Galawhistle, Cumberhead, Hare Craig, Dalquhandy and Douglas West and Extension. All of which are at various stages of operation or development with ecology baselines as described in the *Desk Study* section 7.6.

Blanket Bog and Wet Modified Bog

7.10.3 Blanket bog has been scoped-out of the cumulative assessment as it is considered unlikely that any significant adverse cumulative effects at a regional level would arise as a consequence of the Proposed Development adding to habitat loss associated with other projects. This is due to the residual overall beneficial significance of effect due to the HMP associated with the Proposed Development, as outlined above. Other local wind farm projects have been located on similarly low quality habitats common to the area, and as such no significant cumulative effects are predicted for blanket bog and wet modified bog, particularly when any habitat management plans to aid bog restoration or enhancement are considered (a cumulative effect of **negligible** and not significant within a local and regional context).

Bats

Nyctalus Bats

7.10.4 *Nyctalus spp.* were recorded during baseline surveys for all local wind farm projects with the exception of Galawhistle (albeit no specific surveys were undertaken for Nutberry, Dungavel or the operational Hagshaw wind farms, see Table 7.8 for details). No roosts were however identified at any of these sites, and therefore significant construction-related cumulative effects (habitat loss or disturbance) are considered unlikely, with only localised changes to potential foraging habitats making little difference to the regional population (residual effect of **minor adverse** and **not significant**).

7.10.5 A cumulative collision risk may exist for *Nyctalus* bats where they have been recorded during wind farm baseline surveys. In general, the activity rates at most sites within 10 km were very low, and levels of collisions reaching regional significance are unlikely. When including all sites cumulatively, including the projects nearby with relatively high activity rates (e.g. Cumberhead, Douglas West Extension), a potential significant collision risk may exist in a worst-case scenario if all projects are operational without any mitigation and if the Scottish population (and consequently the regional population) is as low as estimated (e.g. Mathews *et al.* 2018). On balance this situation is unlikely, and with mitigation measures for the Proposed Development, and for other projects (e.g. a similar bat monitoring plan and blade feathering at Douglas West Extension (Douglas West Wind Farm Extension EIA Report, 2019), and a habitat management plan at Douglas West Wind Farm (Douglas West & Dalquhandy DP Renewable Energy Project, EIA Report 2015, Appendix 7.8) likely to improve conditions for foraging *Nyctalus* bats away from turbines), a residual cumulative effect of **minor adverse** and **not significant** is predicted.

Pipistrelle Bats

7.10.6 Although a small number of suitable roost features were recorded during baseline surveys for wind farm projects within 10 km, no roosts were confirmed in locations that may be affected by construction activities. Residual cumulative construction effects on pipistrelle bats are therefore considered to be **negligible** and **not significant**.

7.10.7 Cumulative collision risk during the operational period may exist, although because no project site had particularly consistently high activity rates, the risk of significant levels of collisions at a reasonably large regional population level is considered unlikely. The adverse impacts of collision risk may also be partly offset by increased foraging opportunities that may result from an increase in edge habitats for commuting and foraging, due to the construction of wind farm infrastructure within afforested areas (with appropriate set-back distances from turbines), and habitat management. As such, at most a **minor adverse** and **not significant** effect is predicted.

7.11 Summary

7.11.1 This chapter has considered the potential effects on the ecological features present at the site associated with the construction, operation and decommissioning of the Proposed Development. The assessment method followed the guidance detailed by CIEEM (2018).

7.11.2 It was possible to scope out most species and habitats recorded in the study area from the assessment by virtue of their low conservation value, the type and frequency of field signs present, the small extent of the sensitive habitat, or the negligible scale of potential effects. The IEFs taken forward for assessment were blanket bog (including wet modified bog) and *Nyctalus* and pipistrelle bat species.

7.11.3 Potential construction effects on blanket bog (including wet modified bog) were assessed. The main impact was identified as direct and indirect habitat loss due to land take for infrastructure. In a worst-case scenario, direct and indirect blanket bog and wet modified bog habitat losses, in most cases to already degraded habitat, could be up to 5.0 ha (permanent and temporary infrastructure losses), which would not reach significance at a regional level. No significant effects are therefore predicted (**negligible** and **not significant**).

7.11.4 As no significant construction or decommissioning effects are predicted upon IEFs as a result of the Proposed Development, no further specific mitigation is required in addition to the embedded mitigation (e.g. CEMP, SPP, presence of an ECoW, set-back distances from watercourses) to be implemented as standard, as described above.

7.11.5 Potential operational effects on *Nyctalus* and pipistrelle bats were assessed. With no roost sites likely to be close to the Proposed Development, the main effect addressed was risk of collision with turbines during the operational phase. This has been considered through embedded design with a minimum 75 m set-back distance of trees from turbine blades. It was determined that although a collision risk for these species remains, collision rates due to the Proposed Development alone would not be significant in a regional population context. Due to uncertainties in *Nyctalus* population sizes and the high sensitivity of the species, a precautionary approach suggests that a potentially unmitigated significant risk may exist, and to address this risk, additional pre-construction monitoring and a BMMP is planned.

7.11.6 Enhancement measures would take the form of an HMP which would aim to restore and enhance bog conditions and increase native woodland coverage within the site.

7.11.7 Residual effects on IEFs are therefore considered to be at worst, **minor adverse** and **not significant**.

Table 7.15 – Summary Table

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
During Construction & Decommissioning					
Habitat loss (Blanket bog and wet modified bog)	Negligible	Adverse	Implementation of HMP to restore and enhance bog habitats.	Minor	Beneficial
Habitat loss and disturbance (*Nyctalus* bats)	Minor	Adverse	None required.	Minor	Adverse
Habitat loss and disturbance (Pipistrelle bats)	Negligible	Adverse	None required.	Negligible	Adverse
During Operation					
None (habitats)	n/a	n/a	n/a	n/a	n/a
Collision Risk (*Nyctalus* bats)	Moderate	Adverse	Set-back of turbines from forestry, Bat Mitigation and Monitoring Plan.	Minor	Adverse
Collision Risk (*Pipistrelle* bats)	Minor	Adverse	Set-back of turbines from forestry, Bat Mitigation and Monitoring Plan.	Minor	Adverse
Cumulative Effects					
Habitat loss (Blanket bog and wet modified bog)	Negligible	Adverse	None required.	Negligible	Adverse
Habitat loss and disturbance (*Nyctalus* bats)	Minor	Adverse	None required.	Minor	Adverse
Habitat loss and disturbance (Pipistrelle bats)	Negligible	Adverse	None required.	Negligible	Adverse
Collision Risk (*Nyctalus* bats)	Minor	Adverse	None required.	Minor	Adverse
Collision Risk (*Pipistrelle* bats)	Minor	Adverse	None required.	Minor	Adverse

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