# 7 Ecology and Nature Conservation

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# 7 Ecology and Nature Conservation

## 7.1 Executive Summary

7.1.1 This chapter considers the potential effects of the Proposed Development on non-avian ecology.

7.1.2 The scope of the ecological assessment was determined through a combination of field surveys and desk studies to identify existing ecological data, including consideration of the baseline results of local wind farm projects surrounding the site.

7.1.3 Ecological field surveys within the site were undertaken in 2018. Detailed National Vegetation Classification (NVC) habitat surveys recorded that the study area is dominated by low conservation value mature conifer plantation. Outwith the expanse of dominant conifer plantation, the study area contains a mix of typical upland marshy grassland, acid grassland, mire and woodland communities. The habitats in the study area, outside the forestry plantation, are subject to cattle and sheep grazing, and many areas of mire have been drained historically. 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 latrine within the site, and feeding signs and a potential sett outside of 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. The most commonly recorded species was common pipistrelle, followed by soprano pipistrelle and *Nyctalus spp*. No bat roosts were recorded during baseline surveys.

7.1.6 The Proposed Development has been designed to minimise impacts on important habitats or protected species to achieve non-significant effects. Two Important Ecological Features (IEFs) were taken forward for further assessment due to their higher conservation value and potential sensitivity to remaining impacts: 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 (at most 2.95 ha, the equivalent of 7.4 % of the blanket bog within the study area) 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 population vulnerability of *Nyctalus* (high population vulnerability) and pipistrelle (medium population vulnerability) bat species, and comparisons of activity rates recorded at other wind farm sites. It was determined that although a collision risk exists 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, a precautionary approach suggests that a potentially significant risk may exist, and to address this risk, post-construction monitoring will be put in place to determine whether further measures as part of a Bat Mitigation Plan would be required to ensure any residual effects on bats are not significant.

## 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; the planning context for the Proposed Development is provided within Chapter 5.

7.2.4 Effects on birds are addressed within Chapter 8. The effects on hydrology are addressed in Chapter 11. 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 Report;
- Appendix 7.2: Bat Survey Report; and
- Confidential Annex: Appendix C1: Protected Species Survey Report.

7.2.6 Figures 7.1 to 7.11 are referenced within the Environmental Impact Assessment (EIA) Report where relevant.

7.2.7 Confidential information relating to the locations of protected species' features is presented within Appendix C1 and Figure C7.1 of the Confidential Annex. 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 and guidance documents have been reviewed and taken into account as part of this ecological 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 sets out the planning policy framework that is relevant to the EIA. The policies set out in Chapter 5 include those from the South Lanarkshire Local Development Plan 2015. 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); and
- Scottish Government (2017). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0.

### *Guidance*

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

- ASFB & RAFTS (2012). Advice to DSFBs and Fishery Trusts on Terrestrial Windfarm Planning Process (Mar 2012).
- CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester.
- Collins, J. (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition)*. Bat Conservation Trust;
- European Commission (2011). *Wind energy developments and Natura 2000*;
- Historic Environment Scotland and Scottish Natural Heritage (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*;
- Hundt, L. (2012). *Bat Surveys: Good Practice Guidelines (2nd edition)*. Bat Conservation Trust;
- Joint Nature Conservation Committee (2013). *Guidelines for selection of biological Sites of Special Scientific Interest (SSSI)*;
- Natural England (2014). *Bats and Onshore Wind turbines – Interim Guidance (3rd Edition).* Natural England Technical Information Note TIN 051;
- Rodrigues L., Bach L., Dubourg-Savage M.J., Karapandza B., Kovac D., Kervyn T., Dekker J., Kepel A., Bach P., Collins J., Harbusch C., Park K., Micevski B., Minderman J. (2014). *Guidelines for consideration of bats in wind farm projects*. Revision 2014. EUROBATS Publication Series No. 6;

- Scottish Environment Protection Agency (SEPA) (2017) *Guidance Note 4 - Planning guidance on on-shore windfarm developments*;
- Scottish Executive Rural Affairs Department (SERAD) (2000). *Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds (''The Habitats and Birds Directives''). Revised Guidance Updating Scottish Office Circular No 6/1995*;
- 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 (2016). *Draft Peatland and Energy Policy Statement*;
- Scottish Government (2017b). Planning Circular 1/2017: *Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017*;
- Scottish Government (2017c). *Draft Climate Change Plan-the draft Third Report on Policies and Proposals 2017-2032*;
- Scottish Government, SNH and SEPA (2017). *Peatland Survey - Guidance on Developments on Peatland*;
- Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust (2019). *Bats and Onshore Wind Turbines – survey, assessment and mitigation*;
- Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Scotland (2015). *Good Practice During Windfarm Construction (3rd Edition);* and
- SEPA (2017). *Guidance Note 31 - Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems*;
- SFCC (2007). Fisheries Management SVQ Level 3 – Manage Electrofishing Operations. https://www2.gov.scot/resource/doc/295194/0096726.pdf
- SNH (2012). *Assessing the Cumulative Impact of Onshore Wind Energy Developments*;
- SNH (2013). *Planning for Development: What to consider and include in Habitat Management Plans*; and
- SNH (2015). *Scotland's National Peatland Plan*.

## 7.4 Consultation

7.4.1 In undertaking the assessment, consideration has been given to consultation in 2018 with relevant organisations as detailed in Table 7.1 below. Ecology consultation with SNH during 2018-19 related to the scope of surveys required for the Proposed Development, as presented in the Ecology Scoping Report (MacArthur Green, 2018) – Appendix 4.3.

7.4.2 Table 7.1 summarises the consultation responses and provides information on where and how they have been addressed in the assessment, where relevant. Copies of relevant consultee correspondence are included in Appendices 4.2 and 4.3.

**Table 7.1 – Consultation Responses**

| Consultee and Date | Issue Raised | Response/Action Taken |
|---|---|---|
| SNH - Scoping Response 31 Jan 2019 | We do not consider that the proposal will have a negative impact on the non-ornithology interests of the Muirkirk Uplands SSSI or the North Lowther Uplands SSSI. | Noted. Information pertaining to these sites is presented in Section 7.6 (Designated Sites). |
| | We advise that protected species surveys should have been completed no more than 18 months prior to submission of the application, to ensure that the survey results are a contemporary reflection of species activity at and around the site. | Protected species surveys were conducted within the site in the summer of 2018 (see Section 7.5 and Confidential Appendix C1 for details), thereby taking place within the recommended timeframe prior to submission. |
| | SNH recommends that if planning permission is granted for the proposal the applicant should undertake preconstruction update surveys for otter, water vole, badger, red squirrel and pine marten prior to commencement of construction.<br>Appropriate mitigation/ protection plan should be implemented should evidence of these species be subsequently recorded. | As outlined in Section 7.7 (Project Assumptions), a Species Protection Plan (SPP) will be agreed prior to construction commencing and implemented during the construction phase. The SPP details measures to safeguard protected species known to be in the area. The SPP will include pre-construction protected species surveys. |
| | With regards to mitigation for bats, as a minimum, we would expect turbines to be located where no part of their structure or blades should fall within 50 m of the nearest building, tree or hedgerow. | Natural England (2014) and SNH et al. (2019) bat guidance on set-back distances of linear features from turbine blades has been followed (see Section 7.8 Mitigation). Distances would exceed the minimum prescribed 50 m buffer. |
| | We agree with the conclusions of the Ecology Scoping Report that no further great crested newt surveys are necessary. | Noted. Further rationale is provided in Section 7.7: Scoped-out Ecological Features. |
| | The EIA Report should include full details of the fisheries surveys carried out for neighbouring wind farm developments, in particular | The results of fisheries surveys carried out for the Douglas West Wind Farm have been summarised in Section 7.6 Baseline Conditions and considered in Section 7.7 |

| Consultee and Date | Issue Raised | Response/Action Taken |
|---|---|---|
| | the Douglas West Wind Farm which shares the same catchment of watercourses, including maps of the survey locations and dates they were carried out. | Potential Effects. Results from other local wind farm surveys are also considered as part of the assessment process. |
| | All works should be carried out in accordance with SEPA's Pollution Prevention Guidelines to prevent negative impacts from the discharge of surface water into any watercourses within the site. | 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 Construction Environmental Management Plan (CEMP). |
| | We recommend that if deer are present on or will use the development site, an assessment of the potential impacts on deer welfare, habitats, neighbouring and other interests should be presented. If the development would, or could, result in significant impacts, a draft deer management statement should be provided, setting out how the impacts will be addressed. | Deer are likely to be present in small numbers within the site, and stalking currently occurs to control numbers. 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 key-holed areas and small sections of new access track, significant effects on deer or large-scale displacement of deer from the site is unlikely. No deer management plan is considered necessary, although if it is decided that it should be a condition of consent, such a plan would be agreed with consultees prior to commencement of construction. |
| | The EIA Report should include a map of the National Vegetation Census (NVC) survey results with the wind farm boundary, proposed turbines, tracks and infrastructure layout overlapping. | NVC survey results are shown in Figure 7.3 and described in detail in Appendix 7.1. |

## 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 and 7.2, Appendix C1, and shown on their respective figures. Hereafter in this

chapter, the areas covered by field surveys and assessment are collectively referred to as the 'study area'.

### *Desk Study*

7.5.2 A desk study was undertaken to collate available ecological information in relation to the site and surrounding environment. The desk study was conducted in line with the proposals set out within the Ecology Scoping Report (MacArthur Green, 2018).

7.5.3 A search was conducted for the presence of any designated sites with ecological qualifying features within 5 km of the Proposed Development, using SNH's SiteLink website [https://sitelink.nature.scot].

7.5.4 Ecological information available in the public domain relating to applications for the following eight local wind farm projects (within 2 km of the Proposed Development site) was also considered (refer to Figure 7.2):

- Douglas West & Dalquhandy DP Renewable Energy Project (DW);
- Douglas West Community Wind Farm (DWCW);
- Dalquhandy Wind Farm (DQ);
- Hagshaw Hill Extension Wind Farm (HH);
- Galawhistle Wind Farm (GA);
- Nutberry Wind Farm (NU);
- Cumberhead (Nutberry Extension) Wind Farm (CU); and
- Repowered Hagshaw Hill Wind Farm (RHH).

7.5.5 Information from the above wind farm projects included scoping reports, Environmental Statements (ESs), EIA reports and consultation responses from relevant stakeholders.

7.5.6 Surveys were undertaken at the eight local wind farm projects within the vicinity of the Proposed Development between 2004 and 2018. Table 7.2 as originally presented in the Ecology Scoping Report (MacArthur Green, 2018), outlines the timeline of baseline ecological surveys carried out these sites.

**Table 7.2 – Timeline of Baseline Ecological Surveys Undertaken for Nearby Wind Farm Sites**

| | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HH | | | | | | | | | | | | | | | |
| NU | | | | | | | | | | | | | | | |
| GA | | | | | | | | | | | | | | | |
| DWCW | | | | | | | | | | | | | | | |
| DQ | | | | | | | | | | | | | | | |
| CU | | | | | | | | | | | | | | | |
| DW | | | | | | | | | | | | | | | |
| RHH | | | | | | | | | | | | | | | |

7.5.7 Specific ecology dates for surveys undertaken as part of the baseline for the local wind farm projects are outlined in Table 7.3, as originally presented in the Ecology Scoping Report (MacArthur Green, 2018).

**Table 7.3 – Timing of Various Ecological Surveys Undertaken for Nearby Wind Farm Sites**

| Survey | HH | NU | GA | DWCW | DQ | CU | DW | RHH |
|---|---|---|---|---|---|---|---|---|
| Phase 1 habitats | 2004 | 2005 | 2008-09 | 2010 | 2011 | 2013 | 2014 | 2018 |
| NVC habitats | - | 2005 | 2009 | 2012 | 2012 | 2014 | 2014 | 2018 |
| Protected Species | 2004 | 2005 | 2008-09 | 2009-10 | 2011-12 | 2014 | 2014, 2017 | 2018 |
| Bats | 2004 | 2005 | 2008-09 | 2010 | 2011-12 | 2014 | 2014-15 | 2018 |
| Great Crested Newt | - | - | - | 2012 | 2011-12 | 2014 | 2014-15 | 2018 |
| Fish | - | - | 2009 | 2010 | - | 2014 | 2012 | - |

7.5.8 The ecological information from the desk study was used to inform the scope of surveys for the Proposed Development and give a longer-term overview of the ecological features that may be present, to aid the impact assessment.

### *Field Surveys*

7.5.9 Ecological fieldwork commenced in May 2018 and was completed in September 2018.

7.5.10 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 7.11 and Figure C7.1):

- NVC habitat surveys: August 2018;
- Protected species surveys: June and July 2018;
- Great crested newt suitability index assessment: April 2018;
- Bat activity surveys: May to September 2018; and
- Bat roost potential surveys (undertaken as part of the protected species surveys): June and July 2018.

7.5.11 The full suite of survey methods, species specific legislation and results are provided within Appendices 7.1, 7.2 and Appendix C1. The field surveys were undertaken following best practice guidance, which are summarised within the relevant appendices.

### *Assessment of Potential Effect Significance*

7.5.12 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.

7.5.13 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.

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

7.5.15 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;

- establishing the feature's conservation status where appropriate;
- 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 Nature Conservation Importance**

7.5.16 Nature Conservation Importance is defined on the basis of the geographic context (based on the guidance within CIEEM, 2018) given in Table 7.4. Attributing a value to an ecological feature is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of an importance level. For example, a Special Area of Conservation (SAC) designated under the Habitats Directive is implicitly of European (International) importance. In the case of species, assigning value is less straightforward as contextual information about distribution and abundance is fundamental. This means that even though a species may be protected through legislation at a national or international level, the relative value of the population 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).

7.5.17 Where possible, the valuation 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 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.).

7.5.18 Those ecological features affected at the site 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.

7.5.19 Where relevant, information regarding the particular feature's conservation status is also considered to fully define its sensitivity. This enables an appreciation of current population or habitat trends to be incorporated into the assessment.

**Table 7.4 – Approach to Determining Nature Conservation Importance (adapted from Hill *et al.* 2005)**

| Nature Conservation Importance of Feature in Geographical Context | Description |
|---|---|
| International | An internationally designated site (e.g. SAC). |
| | Site meeting criteria for international designations or qualifying species of an SAC where there is connectivity. |
| | Species present in internationally important numbers (>1 % of biogeographic populations). |

| Nature Conservation Importance of Feature in Geographical Context | Description |
|---|---|
| National (UK) | A nationally designated site (SSSI, or a National Nature Reserve (NNR)), or sites meeting the criteria for national designation or qualifying species where there is connectivity. |
| | Species present in nationally important numbers (>1 % UK population). |
| Regional (Natural Heritage Zone or Local Authority Area) | Species present in regionally important numbers (>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 | 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**

7.5.20 Impact magnitude refers to changes in the extent and integrity of an ecological receptor. A suitable definition of ecological 'integrity' is found within Scottish Executive circular 6/1995 updated by 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.

7.5.21 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 or operation of the Proposed Development.

7.5.22 Impacts can be adverse, neutral or beneficial.

7.5.23 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 7.5 and Table 7.6.

**Table 7.5 – 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. |
| 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 7.6 – 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**

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

7.5.25 Table 7.7 details the significance criteria that have been used in assessing the effects of the Proposed Development.

**Table 7.7 - 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. |

| Significance of Effect | Description |
|---|---|
| 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. |

7.5.26 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).

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

**Cumulative Assessment**

7.5.28 SNH 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 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*

7.5.29 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 chapter.

7.5.30 Even without any significant effects on IEFs, general 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* in Section 7.7).

### *Assessment of Residual Effect Significance*

7.5.31 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*

7.5.32 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.

7.5.33 Potential limitations to the assessment relating to bats are detailed in section 4 of Appendix 7.2, but the site-specific issues can be summarised as follows:

- Detector Data Loss and Data Accuracy: on a small number of occasions, individual bat detectors did not function correctly (see Table 3-3 of Appendix 7.2) and data were only obtained for a few nights. This only happened on one occasion at any affected location, and so overall analysis of monthly survey results is unlikely to be significantly compromised.

- Recording Higher Altitude Activity: bat detectors were placed at ground level only. For the Proposed Development, it is however considered that based on the evidence presented in Section 5.4 of Appendix 7.2, which considers the results of at-height and ground level surveys in the local area, conducting static detector surveys at ground level only is not considered to have affected the ability to adequately determine baseline and future activity levels and conduct a robust assessment of bat activity at the site. Survey results show that overall *Nyctalus* (species that are more commonly found at higher altitude) activity levels were low, and desk studies have shown similar results in the local area, with no known roost sites in the vicinity of the site.

## 7.6 Baseline Conditions

7.6.1 This section details the results of the desk study and field surveys, providing the baseline conditions for the site as noted above, and includes:

- Designated sites within 5 km of the site;
- Results of the desk study;
- Habitats and vegetation; and
- Protected species.

### *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 within proximity to the existing access routes to the site. Details of these are provided within Table 7.8 and Figure 7.1.

**Table 7.8 – Designated Sites within 5 km of the Proposed Development**

| Name | Distance from site (excluding existing access route) | Qualifying Interests | Status |
|---|---|---|---|
| Miller's Wood SSSI | 2.7 km | Upland birch woodland | Unfavourable declining |
| Coalburn Moss SAC and SSSI | 3.5 km | Active raised bog<br>Degraded raised bog | Favourable maintained<br>Unfavourable recovering |
| Muirkirk Uplands SSSI | 4.0 km | Blanket bog | Unfavourable No change |

**Protected Species**

7.6.3 The site is approximately centred on grid reference NS803321. A search on the NBN Atlas for Living Scotland [https://scotland.nbnatlas.org] for species records in a 5 km buffer from this location contained records from 2000 for the following relevant protected or notable species:

- Common pipistrelle (*Pipistrellus pipistrellus)*;
- Mountain hare (*Lepus timidus*);
- Otter (*Lutra lutra*); and
- Red deer (*Cervus elaphus*).

7.6.4 A search was carried out on records from the Scottish Leisler's Bat Project supplied to MacArthur Green by John Haddow in May 2015, which is shown in Table 5-1 of Appendix 7.2 and on Figure 7.6. In total six *Nyctalus spp*. records were found to be within 20 km of the study area, with the closest around 3 km from the site, to the north of Douglas in 2008.

7.6.5 A review of scoping reports, consultation responses and EIA reports of eight local wind farm projects found evidence of several protected species, as outlined within Table 7.9 below, as adapted from the Ecology Scoping Report (MacArthur Green, 2018).

7.6.6 Table 7.9 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 7.9 – Summary of Ecological Findings for Nearby Wind Farm Projects**

| Species | HH | NU | GA | DWCW | DQ | CU | DW | RHH |
|---|---|---|---|---|---|---|---|---|
| Badger | NE | P | P | P | P | P | P | P |
| Otter | NE | NE | P | P | P | P | P | NE |
| Water vole | NE | NE | NE | NE | NE | NE | NE | NE |
| Pine marten | - | - | - | - | - | NE | NE | NE |
| Red squirrel | NE | NE | NE | NE | NE | NE | NE | NE |
| Great crested newt | - | - | - | NE | NE | NE | NE | NE |
| Common pipistrelle | - | - | P | P | P | P | P | P |
| Soprano pipistrelle | - | - | P | P | P | P | P | P |
| *Myotis* sp. | - | - | P | P | P | P | P | P |
| *Nyctalus* sp. | - | - | NE | P | P | P | P | P |
| Brown long-eared bat | - | - | P | NE | NE | P | P | NE |
| Brown trout | P | P | P | P | - | P | P | - |
| Atlantic salmon | NE | P | NE | NE | - | NE | NE | - |
| European eel | NE | NE | NE | NE | - | NE | NE | - |

## *Field Surveys*

7.6.7 Details regarding field survey methodologies and results are included within Appendices 7.1, 7.2 and C1. The following section summarises the baseline conditions as identified during these surveys.

**Habitat Surveys**

7.6.8 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 and illustrated in Figures 7.3 to Figure 7.4. The 2018 habitat study area covered 549.0 hectares (ha) and in places extended up to 300 m beyond the site boundary 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*

7.6.9 The NVC data was cross-referenced to the Phase 1 Habitat Survey Classification scheme (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 GIS, including within mosaic areas. The results of this analysis are summarised in Table 7.10 below, in order of Phase 1 code. Figure 7.3 (a to f) 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 7.10 – 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 | Woodland: broadleaved, semi-natural | W4(b), W7(c), W11, W17 | 1.80 | 0.33 |
| A1.2.2 | Woodland: coniferous, plantation | non-NVC communities (CP) | 378.67 | 68.96 |
| A2.1 | Scrub: dense-continuous | W21, W23 | 0.41 | 0.07 |
| B1.1 | Acid grassland | U4 (b & d), U5, U6(a) | 37.14 | 6.76 |
| B2.1 | Neutral grassland: unimproved/semi-improved | MG9(a) | 0.68 | 0.12 |
| B5 | Marsh/marshy grassland | M23(a & b), M25b, M23-M25 intermediate, MG10(a), non-NVC *Juncus* dominated habitats (Je) | 57.89 | 10.54 |
| C1.1 | Bracken: continuous | U20 (a) | 9.59 | 1.75 |
| D1.1 | Dry dwarf shrub heath - acid | H9(a), H10, H12(a) | 4.10 | 0.75 |
| D2 | Wet dwarf shrub heath | M15(b) | 3.56 | 0.65 |
| D5 | Dry heath/acid grassland mosaic | Mosaics of B1 and D1.1 communities | n/a | n/a |
| E1.7 | Bog: wet modified | M3, M19(a), M20 (a & b), M25a | 39.69 | 7.23 |
| E2.1 | Flush/spring: acid/neutral | M4, M6 (c & d) | 6.74 | 1.23 |
| F1 | Swamp | S9, S10, S12 | 0.77 | 0.14 |
| G1 | Standing water | n/a | 1.29 | 0.23 |
| J3.6 | Buildings | n/a | 0.03 | 0.005 |
| J4 | Bare ground | n/a | 6.56 | 1.19 |

*NVC Communities*

7.6.10 The NVC communities and non-NVC habitat types recorded within the NVC study area are provided in Table 7.11 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.

7.6.11 The NVC surveys recorded 27 recognised NVC communities within the NVC study area, 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.

*Annex I Habitats*

7.6.12 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.

7.6.13 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 7.11.

7.6.14 The 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 and summarised below.

*Scottish Biodiversity List (SBL) Priority Habitats*

7.6.15 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.

7.6.16 Relevant SBL priority habitat types and corresponding associated NVC types recorded within the NVC study area are also summarised in Table 7.11. These SBL priority habitats also correlate with UK Biodiversity Action Plan (BAP) Priority Habitats (JNCC, 2016b).

*Groundwater Dependent Terrestrial Ecosystems*

7.6.17 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 7.11; these are shown in Figure 7.3.

7.6.18 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.

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

7.6.20 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. Further information on groundwater dependency of the site is provided within Chapter 11.

**Table 7.11 – 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 and Flushes** | | | | | | |
| M3 | *Eriophorum angustifolium* bog pool community | 0.18 | 0.03 | - | 7130 Blanket bog (where associated with M17-M20) | Blanket bogs |
| M4 | *Carex rostrata* - *Sphagnum fallax* mire | 0.41 | 0.07 | - | 7140 Transition mires and quaking bogs | Upland flushes, fens and swamps |
| M6c, M6d | *Carex echinata* - *Sphagnum fallax/denticulatum* mire | 6.33 | 1.15 | High | - | Upland flushes, fens and swamps |
| M19, M19a | *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire | 7.14 | 1.30 | - | 7130 Blanket bog | Blanket bog |
| M20, M20a, M20b | *Eriophorum vaginatum* blanket mire | 14.55 | 2.65 | - | 7130 Blanket bog | Blanket bog |
| M23a, M23b | *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture | 37.85 | 6.89 | High | - | Upland flushes, fens and swamps (M23a) |
| M23-M25 | Intermediate community | 5.71 | 1.04 | Moderate-High | - | - |
| M25a, M25b | *Molinia caerulea* – *Potentilla erecta* mire | 26.03 | 4.74 | Moderate | - | - |
| **Wet Heaths** | | | | | | |
| M15, M15b | *Trichophorum germanicum* – *Erica tetralix* wet heath | 3.56 | 0.65 | Moderate | 4010 Northern Atlantic wet heaths with *Erica tetralix* | Upland heathland |
| **Dry Heaths** | | | | | | |
| H9, H9a | *Calluna vulgaris* – *Deschampsia flexuosa* heath | 1.59 | 0.29 | - | 4030 European dry heaths | Upland heathland |
| H10 | *Calluna vulgaris* – *Erica cinerea* heath | 0.40 | 0.07 | - | 4030 European dry heaths | Upland heathland |

| NVC Community Code and Name | | Extent in study area (ha) | % of study area | Potential GWDTE | Annex I Habitat Type | SBL Priority Habitat |
|---|---|---|---|---|---|---|
| H12, H12a | *Calluna vulgaris - Vaccinium myrtillus* heath | 2.11 | 0.38 | - | 4030 European dry heaths | Upland heathland |
| **Calcifugous Grasslands and Bracken-Dominated Vegetation** | | | | | | |
| U4, U4b, U4d | *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland | 24.22 | 4.41 | - | - | - |
| U5 | *Nardus stricta – Galium saxatile* grassland | 2.56 | 0.47 | - | - | - |
| U6, U6a | *Juncus squarrosus – Festuca ovina* grassland | 10.36 | 1.89 | Moderate | - | - |
| U20, U20a | *Pteridium aquilinum – Galium saxatile* community | 9.59 | 1.75 | - | - | - |
| **Mesotrophic Grasslands** | | | | | | |
| MG9, MG9a | *Holcus lanatus- Deschampsia cespitosa* grassland | 0.68 | 0.12 | Moderate | - | - |
| MG10a | *Holcus lanatus – Juncus effusus* rush-pasture | 1.43 | 0.26 | Moderate | - | - |
| **Woodland and Scrub** | | | | | | |
| W4, W4b | *Betula pubescens - Molinia caerulea* woodland | 0.70 | 0.13 | High | - | Upland birchwoods |
| W7, W7c | *Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland | 0.54 | 0.10 | High | - | Wet woodland |
| W11 | *Quercus petraea – Betula pubescens – Oxalis acetosella* woodland | 0.52 | 0.09 | - | - | - |
| W17 | *Q. petraea – B. pubescens - Dicranum majus* woodland | 0.05 | 0.01 | - | - | - |
| W21 | *Crataegus monogyna - Hedera helix* scrub | 0.03 | 0.01 | - | - | - |

| NVC Community Code and Name | | Extent in study area (ha) | % of study area | Potential GWDTE | Annex I Habitat Type | SBL Priority Habitat |
|---|---|---|---|---|---|---|
| W23 | *Ulex europaeus-Rubus fruticosus* scrub | 0.38 | 0.07 | - | - | - |
| **Swamps and Tall Herb-Fens** | | | | | | |
| S9 | *Carex rostrata* swamp | 0.57 | 0.10 | - | - | Upland flushes, fens and swamps |
| S10 | *Equisetum fluviatile* swamp | 0.02 | 0.004 | - | - | Upland flushes, fens and swamps |
| S12 | *Typha latifolia* swamp | 0.19 | 0.03 | - | - | Upland flushes, fens and swamps |
| **Non-NVC Community or Feature Type** | | | | | | |
| CP | Conifer plantation | 378.67 | 68.96 | - | - | - |
| BG | Bare ground, soil, rock, hardstandings | 6.56 | 1.19 | - | - | - |
| BD | Buildings and associated driveways | 0.03 | 0.005 | - | - | - |
| Je | *Juncus effusus* acid grassland community | 4.88 | 0.89 | Moderate* | - | - |
| SW | Standing water | 1.29 | 0.23 | - | - | - |

** 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).*

*Habitat Descriptions*

7.6.21 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). In the following paragraphs where reference is made to NVC community codes, the full community name can be cross-referred to Table 7.11 above.

7.6.22 **Conifer plantation** areas form the most dominant habitat within the study area (see Figure 7.3 and Appendix 7.1, Annex C, Photo C5) and were generally unremarkable in terms of their flora and species composition. Most of the conifer plantation is mature with no ground flora except some scattered mosses, the ground instead being blanketed in woody debris and conifer needles. These woodland plantation areas are floristically impoverished and of negligible botanical importance.

7.6.23 **Marshy grassland** (mainly NVC category M23 with some M25b and MG10) is quite common throughout the study area, the larger expanses are found around watercourse floodplains, in damp grazing pastures and gently sloping ground within the plantation and, more extensively, along the eastern side of the study area. The community is quite species-poor throughout, being dominated by mixtures of *Juncus effusus* and/or *J. acutiflorus* with patches of a low diversity of grasses and herbs. Some *J. acutiflorus* stands are species-poor and lack much in the way of mesophytic herbs, and in a lot of cases could be referred to as the non-NVC *Juncus* neutral grassland as described by Averis & Averis (2015).

7.6.24 U4 is the most common **acid grassland** type and is most abundant within the north and north-west of the study area and in patches along the Shiel Burn. Areas are for the most part the U4b *Holcus lanatus - Trifolium repens* sub-community, where the impacts of historic and more recent grazing levels remain evident, or the U4d *Luzula multiflora - Rhytidiadelphus loreus* sub-community where the coarser looking swards with *Deschampsia cespitosa* dominate the vegetation. The U6 community appears in isolated patches along the north of the study area, most frequently as pure stands of U6. At times areas of U6 were seen to be transitional with M23, M6 and M25 mires in some parts.

7.6.25 **Wet modified bog** comprises mainly M25a and M20 NVC communities, with some M3 and M19. M19 is found to be patchy across the study area, most often within forest rides or along the forest margins. M20 was found to be in a species-poor grassy form across the study area, again often found within forest rides or in a few more extensive areas outwith the plantation forestry. As a result of both communities being subject to the effects of forest drainage, shading effects and sheep grazing, they are deemed to be poor or degraded forms of Annex I habitats.

7.6.26 M25 mire can also fall within the blanket bog Annex I type, usually where the underlying peat depth is greater than 0.5 m and the habitat is wet and contains peat forming species. As described in Appendix 7.1, M25 within the study area is for the most part species-poor and at the drier end of the scale. Many areas are a ubiquitous swathe of *Molinia* tussocks with few associate species and generally lack many of the main peat forming species such as *Sphagnum* mosses. General field observations of M25 indicate that this habitat is unlikely to be on deep peat within the study area, and this was confirmed via peat probing within the site, as described in Chapter 11 and shown in Figure 11.5, where all peat samples in proximity to infrastructure were <0.5 m. Given the character of the majority of M25 within the study area it has not been considered to be of Annex I habitat quality in this case.

7.6.27 The M3 bog pool community recorded is limited to two small areas within the study area, and while this community does include some peat forming bog-mosses, these areas are not deemed extensive enough, are not part of wider M19/M20 blanket bog areas, nor incorporate the often distinctive bog pool surface patterning to be considered Annex I habitat in this case.

7.6.28 Areas of U20 **continuous bracken** can be found along the north of the study area, often following the slopes around the Poniel Water and generally on steep slopes and dry soils in the gullies of the Shiel Burn.

7.6.29 **Flush/springs** are mainly M6 which is widespread throughout the study area, present mostly as small flushes, runnels or soakways, and along and within occluding ditches and around minor watercourses or as small components of modified bog; however, it also occurs as a notable component of many larger basin/valley/floodplain areas in mosaics with other wetland communities, in particular M23 rush-pasture. The vast majority of M6 areas are of the species-poor M6c *Juncus effusus* sub-community with a tall sward of *J. effusus* over a species-poor lawn of *Sphagnum fallax, S. palustre* and *Polytrichum commune*.

7.6.30 All of the patches of H9 **dry heath** were recorded within the north of the study area, with two of the largest patches being found along the steep slopes flanking the Poniel Water. *Calluna vulgaris* is overly dominant within these areas with some sparse *Deschampsia flexuosa, Molinia caerulea* and *Potentilla erecta*. Just a few isolated stands of H12 were recorded within the north and north-west of the NVC study area. The H12a *Calluna vulgaris* sub-community was the main type recorded. This sub-community is species-poor and heavily dominated by *Calluna*, and contained a low density of interweaved sprigs of *Vaccinium myrtillus*. All dry heath in the study area is semi-natural and derived from a long history of grazing and burning.

7.6.31 M15 **wet heath** is present at two locations within the study area outside the plantation forestry. The larger of the two swards can be found to the east and the smaller one to the south-west of Arkney Hill, which forms a mosaic with M25 mire. Due to the intensive level of grazing, particularly over the larger sward, certain obvious components, such as *Calluna vulgaris, Trichophorum germanicum* and *Vaccinium myrtillus* are very short making it difficult to distinguish from the surrounding acid grassland communities (see Appendix A.7.1, Annex C, Photo C2).

**Peatlands**

7.6.32 The Carbon and Peatland Map (SNH, 2016) was consulted to determine likely peatland classes present in the study area; the map provides an indication of the likely presence of peat at a coarse scale.

7.6.33 There is no Class 1 or Class 2 peatland within the study area according to the Carbon and Peatland Map (SNH, 2016). As the Carbon and Peatland Map is a high-level tool, peat depth surveys were also carried out across the study area, as outlined within Chapter 11 and Appendix 11.1.

**Protected Species**

7.6.34 This section summarises the results of the protected species surveys carried out in 2018 across the site, and in previous years on behalf of the local wind farm projects.

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

- Protected species: Confidential Annex: Appendix C1 and Figure C7.1; and
- Bats: Appendix 7.2, Figures 7.6 to 7.11.

*Otter*

7.6.36 There was no evidence of otter recorded within the study area in 2018, and there is variable suitability for otter along the watercourses within the site. The Shiel Burn offers some suitable habitat for commuting otter although foraging opportunities are likely to be limited in the upper reaches. Evidence of otter was recorded at five of the eight surrounding wind farm projects (see Table 7.9), including during the Douglas West Wind Farm surveys. 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. Given the close vicinity of these projects, and the hydrological connectivity between some of the sites, it is likely that otters will occasionally use the watercourses and habitats within the site.

*Water Vole*

7.6.37 There was no evidence of water vole recorded during the survey. There were no records of water vole recorded during the surveys for any of the eight local wind farm projects (Table 7.9).

7.6.38 There were sections of the Shiel Burn which offered suitable habitat for supporting water vole. Hagshaw Burn offered lower suitability for water vole, with many sections enclosed under the coniferous plantation and surrounded by terrestrial vegetation that was dominated by coniferous needles. It is possible that water voles could utilise the habitats that offer greater suitability within the site, although no evidence was recorded during surveys, and presence is considered unlikely.

*Badger*

7.6.39 Evidence of badger was recorded within the study area. A latrine was recorded within the plantation, whilst feeding signs were recorded to the north of the site boundary, and a potential badger sett was recorded to the east of the site boundary. The sett consisted of a single entrance, and had a large amount of spoil present which contained rocks. It was considered to be of a size and structure suitable for supporting badger, although no further field signs, such as guard hairs or prints, were recorded during the survey. The entrance showed evidence of recent excavation and was well-worn.

7.6.40 Badger presence was recorded at seven of the eight local wind farm projects (Table 7.9). There are numerous opportunities for foraging in the surrounding habitats and within the site. The plantation also offers good connectivity between the site and the surrounding area. There are many areas of the site which are considered to be of lower suitability for sett-building, given its very wet and peaty nature. However, there is the potential for the site to support a sett in those areas which are drier and offer a suitable non-peat substrate.

*Pine Marten*

7.6.41 There was no evidence of pine marten recorded during the surveys in 2018, or in previous years. Surveys specifically for pine marten were included within the survey scope for two local wind farm projects (Table 7.9), although neither recorded signs of pine marten presence.

7.6.42 The forestry plantation within the site offers suitable habitat for pine marten, as the species is known to exploit coniferous plantation to create dens, access prey and gain protection from predators (Caryl, 2008).

*Red Squirrel*

7.6.43 No evidence of squirrel was recorded during the survey. No evidence of red squirrel was recorded during any of the surveys of the eight local wind farm projects within the vicinity of the site. The site sits within the Todlaw and Cumberhead woodland which was identified by Poulsom *et al.* (2005) as a red squirrel priority woodland within the Strathclyde region of Scotland. The study noted the Todlaw and Cumberhead woodland as having conifers of cone bearing age, making it able to support foraging red squirrels, and having a population of red squirrels that was considered stable (Poulsom *et al.,* 2005). The plantation has been noted as being close to an area which has been highlighted as priority for grey squirrel control (SNH, 2010), meaning that grey squirrels could also be present within the area.

*Great Crested Newt*

7.6.44 A total of 16 ponds were identified within the vicinity of the site in 2018 (Figure 7.5). A habitat suitability index (HSI) assessment was conducted on 15 ponds (one was scoped out prior to the survey due to not being ponds), 10 of which had been previously assessed during the surveys for the Douglas West Wind Farm project in 2014-15.

7.6.45 As seen on Figure 7.5, ponds within the survey area ranged from poor to excellent suitability for great crested newt. Two ponds were considered to be of 'poor' suitability and one of 'below average' suitability for great crested newt, and therefore no further survey was considered necessary. Six of the ponds were assessed as 'average', five as 'good' and one as 'excellent' suitability for supporting great crested newt.

7.6.46 In line with the proposals outlined within the Ecology Scoping Report (MacArthur Green, 2018), further surveys for great crested newt would only be conducted if a pond previously surveyed had increased in suitability or if new previously unrecorded ponds that may be affected by the Proposed Development were identified. Rationale presented in section 7.7 (*Scoped-Out Ecological Features*) shows that no further surveys were required in 2018, with suitable ponds unlikely to be affected by the Proposed Development.

7.6.47 Great crested newt surveys were conducted at four of the eight local wind farm projects. None of these surveys recorded presence or field signs of great crested newt (Table 7.9). At the Douglas West Wind Farm site, a combination of habitat suitability surveys and eDNA presence/absence surveys in 2015 confirmed that the species was absent within the Douglas West survey area, and it is considered that this is also the case for the Proposed Development.

*Reptiles*

7.6.48 No reptiles were sighted during the surveys, although suitable habitat exists within the site to support reptiles. There are several sunny aspects, associated with the larger forestry rides, and the habitats present in the vicinity of the Shiel Burn which offer good opportunities for basking. The damper areas of the site are likely to offer some foraging potential.

*Fish*

7.6.49 As stated within the Ecology Scoping Report (MacArthur Green, 2018), and based on the information from other local wind farm projects (primarily Douglas West Wind Farm which shares the same catchment of watercourses, eventually to the Douglas Water), it was considered that there is

sufficient information existing to be able to robustly assess potential effects on fish. No further surveys were conducted for fish in 2018.

7.6.50 Fish habitat and electrofishing surveys were conducted in June 2012 on the Douglas West Wind Farm site. The habitat suitability varied across the study area, with Poniel Water exhibiting moderate to high suitability. Shiel Burn within the site flows into Poniel Water. Although Shiel Burn was assessed as having moderate suitability there is extensive bedrock in the area and the culvert on Shiel Burn (grid ref. NS 80834 33052) is impassable to fish. Longhill Burn and Alder Burn to the east of the site, and Broadlea Burn to the south of the site were considered to have low suitability for fish and were not surveyed further.

7.6.51 The results of the electrofishing surveys recorded 'very low' numbers of brown trout within Poniel Water and Shiel Burn only. Population estimates were not able to be drawn due to the low numbers caught. According to the Douglas West Wind Farm assessment, Atlantic salmon (*Salmo salar*) are restricted to watercourses downstream of the site due to the impassable Falls of Clyde approximately 3 km downstream.

7.6.52 There has been extensive historical modification of the watercourses in the local area, for example, the majority of the length of Poniel Water was re-directed for the opencast mine workings, and the pond along Longhill Burn was created as part of the habitat restoration of the opencast mine. The culverts along Longhill Burn, Shiel Burn and Alder Burn are either impassable to fish or in a state of disrepair.

7.6.53 The conditions within the local area, and therefore the habitat suitability of the site, are not considered to have changed significantly since the 2012 surveys. Therefore brown trout are only expected to occur in Poniel Water and Shiel Burn in very low numbers. Alder Burn and Longhill Burn are not expected to sustain brown trout.

*Bats*

7.6.54 No bat roosts or potential bat roosts were located within 200 m of a turbine, or within the wider study area in 2018.

7.6.55 Four bat species were recorded within the study area during the temporal (static detector) surveys carried out in 2018: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Daubenton's (*Myotis daubentonii*) and brown long-eared bat (*Plecotus aurtius*). Two genus groups were also recorded within the study area: *Myotis* species and *Nyctalus* species. A total registration count of 2,688 records, and a mean bat activity index per night (BAI/night) of 5.37 brpn (bat registrations per night) was recorded for the study area. Figures 7.7 to 7.11 provide information on detector locations and activity rates at each, during the monthly surveys.

7.6.56 Of the bat assemblage recorded, *Nyctalus* spp. are classified by SNH *et al.* (2019) as being of high population vulnerability to wind fam developments (a combination of low abundance and high collision risk) and were recorded across the study area through the survey period. A mean total activity rate of 0.35 brpn was recorded, with the highest mean registrations per survey period of greater than one BAI/night at location 1 (5.8 brpn in June, 2.3 brpn in July, 2.2 brpn in August, and a total average of 2.0 brpn), location 9 (1.1 brpn in August) and location 10 (1.27 brpn in June). *Nyctalus* were also recorded at the Repowered Hagshaw Hill, Douglas West, Dalquhandy and Cumberhead project sites.

7.6.57 Moderate activity levels were recorded for medium population vulnerability common pipistrelle and soprano pipistrelle in June at location 10 (29.1 brpn) and at location 7 (20.3 brpn) (Figure 7.8). Both locations 10 and 7 are situated in the north-eastern section of the study area along the edge of conifer planation with Location 7 near the Shiel Burn. These higher common and soprano activity rates at locations 10 and location 7 in June is likely to be the result of optimal environmental conditions and suitable foraging habitats at these locations with connectivity to other suitable forging habitats in the study area such as the Shiel Burn. All other locations recorded a relatively low BAI for these species on each survey visit. Pipistrelle species were recorded at all nearby wind farm sites where bat surveys were undertaken.

7.6.58 Low population vulnerability species (Daubenton's, brown long-eared bat and *Myotis spp.*) recorded low BAI during every survey visit across the study area. *Myotis* bats were recorded at all nearby wind farm sites where bat surveys were undertaken. Brown long-eared bats were recorded at Galawhistle, Douglas West and Cumberhead.

### *Design Layout Considerations*

7.6.59 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 50 m buffer implemented for all watercourses considered to have continuous flow throughout the year in designing the project. There are three locations where Proposed Development infrastructure encroaches into the 50 m buffer:
  - The edge of the crane pad and a short stretch of track alongside the crane pad associated with T4 are within approximately 25 m of the southern-most part of the Shiel Burn. The small watercourse at this location is within a valley and is physically separated from the proposed crane pad and track.
  - The access track between T9 and the area west of T11 is within approximately 25 m (at its closest point) of the eastern-most branch of the Shiel Burn system. This is an existing track which may require upgrading but will not undergo major construction works such as excavation of a new track corridor. The watercourse at this location is within a valley, with the existing track above.
  - The eastern edges of the proposed substation and temporary laydown area are within approximately 30 m of a small drain/tributary of the Longhill Burn. This small drain may not have continuous flow, and a buffer of 30 m is considered to be sufficient.
- avoidance of blanket bog habitat for the location of turbines and infrastructure as far as practicable; and
- avoidance of areas of potentially high GWDTEs for infrastructure as far as practicable.

**Micrositing**

7.6.60 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 and is structured as follows:

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

### *Project Assumptions*

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

- Turbines will be keyholed within the forestry block and any new forestry will not planted within these areas.
- The construction period will last for up to 12 months, comprising a construction programme as described in Chapter 3. The associated infrastructure will include: site access, access tracks, crane hardstanding, underground cabling, on-site substation and maintenance building, energy storage compound, 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 disturbance areas around permanent infrastructure during construction would be temporary and areas 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 details 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 Construction Environmental Management Plan (CEMP).

### *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 (over 5 km away) and the ecology of associated qualifying habitat features (see Table 7.8), all designated sites have been scoped out of the assessment due to a lack of likely connectivity.

**Habitats**

7.7.5 Table 7.12 details the estimated direct and indirect relative losses expected to occur, by habitat type, for all new infrastructure. A total of 9.8 ha habitat would be directly lost due to the Proposed Development, with 8.1 ha (82 %) of this comprising conifer plantation. A further 12.4 ha has been earmarked as a borrow pit search area (Table 7.13), with 10.6 ha (85 %) of this comprising conifer plantation.

7.7.6 The predominant habitat 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 7.4) and sensitivity, and thus scoped out of the assessment.

7.7.7 Approximately 0.35 ha of marshy grassland may be lost due to infrastructure, with a further 0.27 ha within the borrow pit search area[1]. Within the study area this habitat is made up of M23 and M25 NVC types, with areas of non-NVC dominant *Juncus.* 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 generally species-poor and is dominated by mixtures of *Juncus effusus* and/or *Juncus acutiflorus* with patches of a low diversity of grasses such as *Deschampsia cespitosa, Holcus lanatus, Poa trivialis, Anthoxanthum odoratum* and *Agrostis* spp. The herb layer, where present, is usually dominated by common *Trifolium repens, Rumex acetosa, Ranunculus repens* with the occasional appearance of *Epilobium palustre, Galium palustre* and *Achillea millefolium*. Many areas contain little more diversity than this. This is a common habitat locally, regionally and nationally and the small direct and indirect losses predicted at the site, as per Table 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. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform the assessment in Chapter 11.

7.7.8 Dry dwarf shrub heath and acid neutral flush 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 7.11 and Appendix 7.1), however they occupy such small areas within the study area, any direct or indirect effects on the habitat are so minor (see habitat loss calculations in Tables 7.12 and 7.13) that they are scoped out of the assessment.

7.7.9 All other habitats of negligible Nature Conservation Importance and sensitivity (e.g. continuous bracken, species-poor acid grassland) have been scoped out of the assessment.

**Table 7.12 – Estimated Loss of Habitat for Permanent Infrastructure**

| Phase 1 Habitat Type | NVC | Total Extent in study area (NVC) | Direct Habitat Loss: NVC (ha) | Direct Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss: NVC (ha) | Direct & Indirect Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss as % of Extent in Study Area |
|---|---|---|---|---|---|---|---|
| Coniferous Plantation Woodland (A1.2.2) | CP | 378.6 | 8.058 | 8.058 | 22.068 | 22.068 | 4.01 |
| Unimproved Acid Grassland (B1.1) | U4 | 15.1 | 0.137 | 0.162 | 0.635 | 0.949 | 0.12 |
| | U4b | 6.2 | 0.005 | | 0.025 | | 0.00 |

[1] *Note that the area to be affected by borrow pit creation would likely be considerably less than the extent of the borrow pit search area. As such, predicted extents of habitat loss shown are precautionary.*

| Phase 1 Habitat Type | NVC | Total Extent in study area (NVC) | Direct Habitat Loss: NVC (ha) | Direct Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss: NVC (ha) | Direct & Indirect Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss as % of Extent in Study Area |
|---|---|---|---|---|---|---|---|
| | U4d | 2.7 | 0.020 | | 0.247 | | 0.04 |
| | U6 | 8.1 | 0.000 | | 0.027 | | 0.00 |
| | U6a | 2.2 | 0.000 | | 0.015 | | 0.00 |
| Unimproved Neutral Grassland (B2.1) | MG9 | 0.6 | 0.003 | 0.003 | 0.013 | 0.013 | 0.00 |
| Marsh/Marshy Grassland (B5) | Je | 4.8 | 0.143 | 0.352 | 0.623 | 1.503 | 0.11 |
| | M23a | 14.3 | 0.012 | | 0.094 | | 0.02 |
| | M23b | 23.5 | 0.112 | | 0.535 | | 0.10 |
| | M25b | 8.0 | 0.085 | | 0.251 | | 0.05 |
| Continuous Bracken (C1.1) | U20 | 7.5 | 0.037 | 0.037 | 0.163 | 0.178 | 0.03 |
| | U20a | 1.9 | 0.000 | | 0.015 | | 0.00 |
| Acid Dry Dwarf Shrub Heath (D1.1) | H10 | 0.4 | 0.010 | 0.033 | 0.068 | 0.180 | 0.01 |
| | H12a | 2.1 | 0.023 | | 0.112 | | 0.02 |
| Wet Modified Bog (E1.7) | M19a | 6.9 | 0.084 | 0.532 | 0.884 | 2.587 | 0.16 |
| | M20 | 7.1 | 0.009 | | 0.037 | | 0.01 |
| | M20a | 1.8 | 0.087 | | 0.458 | | 0.08 |
| | M25a | 18.0 | 0.318 | | 1.131 | | 0.21 |
| | M3 | 0.2 | 0.035 | | 0.077 | | 0.01 |
| Acid Neutral Flush (E2.1) | M6c | 4.7 | 0.024 | 0.035 | 0.140 | 0.186 | 0.03 |
| | M6d | 1.6 | 0.011 | | 0.046 | | 0.01 |
| Bare Ground (J4) | BG | 8.3 | 0.573 | 0.573 | 1.944 | 1.944 | 0.35 |

**Table 7.13 – Estimated Loss of Habitat for Borrow Pit Search Area**

| Phase 1 Habitat Type | NVC | Total Extent in study area (NVC) | Direct Habitat Loss: NVC (ha) | Direct Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss: NVC (ha) | Direct & Indirect Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss as % of Extent in Study Area |
|---|---|---|---|---|---|---|---|
| Coniferous Plantation Woodland (A1.2.2) | CP | 378.7 | 10.56 | 10.565 | 11.481 | 11.481 | 2.08 |
| Unimproved Acid Grassland (B1.1) | U4 | 15.2 | 0.10 | 0.409 | 0.087 | 0.164 | 0.02 |
| | U4d | 2.8 | 0.30 | | 0.077 | | 0.01 |
| Marsh/Marshy Grassland (B5) | Je | 4.9 | 0.08 | 0.267 | 0.022 | 0.180 | 0.00 |
| | M23a | 14.3 | 0.02 | | 0.018 | | 0.00 |
| | M23b | 23.5 | 0.16 | | 0.140 | | 0.03 |
| | H10 | 0.4 | 0.02 | 0.030 | 0.008 | 0.008 | 0.00 |

| Phase 1 Habitat Type | NVC | Total Extent in study area (NVC) | Direct Habitat Loss: NVC (ha) | Direct Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss: NVC (ha) | Direct & Indirect Habitat Loss: Phase 1 (ha) | Direct & Indirect Habitat Loss as % of Extent in Study Area |
|---|---|---|---|---|---|---|---|
| Acid Dry Dwarf Shrub Heath (D1.1) | H12a | 2.1 | 0.005 | | 0.000 | | 0.00 |
| Wet Modified Bog (E1.7) | M19 | 0.2 | 0.12 | 0.634 | 0.123 | 0.360 | 0.02 |
| | M19a | 7.0 | 0.32 | | 0.174 | | 0.03 |
| | M20a | 1.7 | 0.20 | | 0.06 | | 0.01 |
| Acid Neutral Flush (E2.1) | M6c | 4.8 | 0.01 | 0.014 | 0.012 | 0.012 | 0.002 |
| Bare Ground (J4) | BG | 8.3 | 0.53 | 0.526 | 0.132 | 0.132 | 0.02 |

**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.

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 2018 was located approximately 1 km away from the nearest proposed turbine location and 150 m from the nearest proposed access route (which is an existing road that would already have been upgraded (if required) as part of the Douglas West Wind Farm project). Given the recommended SNH disturbance buffer distances for badger (30 m, or 100 m if blasting/piling), 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 as described in the SPP to ensure legal compliance and avoid impacts on badgers.

7.7.12 Otter is known to be present within the local area, being recorded as present in five of the eight local wind farm projects surrounding the Proposed Development site (including the adjacent Dalquhandy and Douglas West sites). Suitable habitat for supporting otter is variable within the study area although no otter signs, including potential protected features, were recorded during surveys in 2018. 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 at watercourse crossings.

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 evidence of red squirrel or pine marten recorded during the 2018 surveys, or baseline surveys of the local wind farm projects. Although the habitats within the site offer some potential for these species, the lack of 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 evidence of their presence be found.

7.7.16 Great crested newts are scoped out of this assessment. No evidence of great crested newt was found during presence surveys and eDNA sampling of ponds in the Douglas West survey area in 2014-15, and no other local wind farm project recorded any evidence of the species. It is concluded that the species is absent from the local area. A check of the NBN database in May 2018 did not reveal any historic records of great crested newt in the local area. The site is also outside the

recognised range of distribution for the species in Scotland (Wilkinson *et al.* 2014; O'Brien *et al.*, 2017).

7.7.17 Even if individuals were present, the following rationale originally presented to SNH during consultation (email dated 4 June 2018) describes why any impacts associated with the Proposed Development are unlikely:

- Ponds 1, 4-8, 10, 14-17, and newly identified pond L5, have been subject to an updated HSI survey in 2018, and are in close proximity to an existing tarmac surfaced haul road which forms the proposed access for both the Douglas West Wind Farm and Dalquhandy Wind Farm projects. As outlined in the Douglas West Wind Farm SPP, an ECoW will aim to ensure that no protected species are affected by construction activity, by monitoring the areas around construction prior to, and during, activity. Part of this responsibility will be to re-check ponds for great crested newt presence prior to commencement of construction. Appropriate action would then be taken to minimise the risk of impacts should any protected species be identified. A similar condition would likely apply to the Proposed Development given that the same main access track would be used.
- As the main part of the eastern access road to the site is already in existence and any associated upgrade work would already have been undertaken for the Douglas West Wind Farm project, no further upgrades will be required along this part of the route for access to the site. Therefore no further impacts on the ponds listed above are anticipated. Standard construction procedures to avoid pollution of waterbodies (e.g. a CEMP) will be employed to minimise the risk of ponds being affected during the construction of both the Douglas West Wind Farm and the Proposed Development.
- Newly identified ponds L1-L5 which were covered in 2018 by habitat suitability surveys are all around the 500 m buffer, or greater, from the site boundary. The intervening land to the north comprises the steep-banked Poniel Water and to the south of that mature conifer plantation. If great crested newts were to occupy these ponds, the Poneil Water would likely act as a barrier to movement to the site. Even if newts were to cross this, they could in theory use the edge of the plantation for hibernation but would be very unlikely to move through the plantation to the closest proposed infrastructure, which beyond 500 m from these ponds.
- Although closer to the site boundary, ponds 2 and 3 also lie to the north of the plantation forestry, Poneil Water and steep banks. Again, it is considered very unlikely that even if present, newts would utilise the habitat within the site boundary.

7.7.18 Fish species (brown trout) are scoped out of this assessment. In order to avoid direct or indirect impacts on fish, a suitable buffer distance will be kept between turbine locations 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**

7.7.19 Based on SNH *et al.* (2019) guidance, brown long-eared bat and Daubenton's bat in Scotland are considered to be of low population vulnerability to wind farms, relating to their relative abundance and low collision risk. Activity rates of these species recorded during baseline surveys in 2018 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.

### *Scoped-In IEFs*

7.7.20 The assessment of likely effects will be applied to those 'scoped-in' IEFs of local, regional, national, and international Nature Conservation Importance (see Table 7.4) 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 7.13 below, these comprise:

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

**Table 7.13– Nature Conservation Importance of Scoped-In IEFs**

| IEF | Nature Conservation Importance | Relevant Legislation/Guidance & Justification |
|---|---|---|
| Blanket bog including wet modified bog | Local | Blanket bog and wet modified bog habitat within the site shows evidence of anthropogenic attempts at drainage as well as evidence of heavy grazing, whilst few areas remain intact and in relatively good condition. In some areas intensive grazing has resulted in many areas of M25 bog appearing transitional to acid grassland communities and the rush mire community. Bog communities are therefore deemed to be poor or degraded forms of Annex I and SBL habitats.<br><br>The Carbon and Peatland Map (SNH, 2016) indicates that there is no Class 1 or Class 2 peatland within the site, and peat sampling (Figure 11.5) recorded no locations of >0.5 m peat depth.<br><br>Blanket bog and wet modified bog within the study area is not considered to be nationally or regionally important due to its condition. 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.<br><br>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.<br><br>For noctule bat, JNCC (2013b) provided a national estimate of 50,000 individuals, with 250 in Scotland. Again Mathews *et* |

| IEF | Nature Conservation Importance | Relevant Legislation/Guidance & Justification |
|---|---|---|
| | | *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.<br><br>Recent research work 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 (Newson *et al.,* 2017), 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.<br><br>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.<br><br>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.<br><br>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*

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

7.7.22 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.

7.7.23 The most tangible effect during the construction stage of the Proposed Development will be direct habitat loss due to the construction of the new turbines and associated tracks, hardstandings, borrow pits, laydown area and compounds. Much of this infrastructure will be permanent, however borrow pits, temporary construction compounds and the temporary access roads will be restored at the end of construction. Despite the post-construction restoration, and 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.

7.7.24 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, 2017d). In practice it is expected that any indirect drainage effects will only impact wetland habitats at the site such as blanket bog, flushes and springs, wet heath and swamp. 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. and so the inclusion of indirect effects on dry habitats is precautionary.

**Blanket Bog, Including Wet Modified Bog**

7.7.25 Impact: Effects upon blanket bog habitat 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 access tracks pass through this habitat type or where infrastructure such as turbine foundations, crane pads, hardstandings, borrow pits, compounds etc. are sited on these habitat types. In addition, there may be indirect losses as a result of drainage around infrastructure and disruption to hydrological flows.

7.7.26 Sensitivity: As per Table 7.13, blanket bog and wet modified bog 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.

7.7.27 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).

7.7.28 Blanket bog, including wet modified bog, covers 39.7 ha (7.2 %) of the NVC study area, with most of this comprising M25a and M20 degraded mire (Table 7.10). Of this extent, a total of 0.53 ha would be lost due to infrastructure (Table 7.12), with a further 0.63 ha located within the borrow pit search area. Direct habitat loss due to permanent infrastructure is predicted to be equivalent of at most to 3 % of the blanket bog within the NVC study area. Direct loss of blanket bog, particularly that of higher conservation value, is therefore of a very small extent in the local and regional context.

7.7.29 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 all infrastructure (including worst-

case for borrow pits) increase to 2.95 ha or 7.4 % of the habitat within the NVC study area. 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).

7.7.30 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).

7.7.31 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 73.3 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.

7.7.32 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.

7.7.33 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.

***Nyctalus* Bats**

7.7.34 Impact: Foraging or commuting bats may be affected by direct habitat loss or changes in habitat type or quality as a result of temporary or permanent construction impacts. Bats may also be disturbed by impacts associated with construction activities such as increased noise or vibration, or lighting.

7.7.35 Sensitivity: The Nature Conservation Importance of *Nyctalus* bat species is considered to be of regional importance (Table 7.13). The conservation status of *Nyctalus spp*. bats in the UK is considered to be favourable, according to Mathews *et al.* (2018), but the status in Scotland is uncertain due to a lack of data.

7.7.36 The overall sensitivity for *Nyctalus* species is therefore considered to be high, which corresponds with the level of vulnerability to wind farm developments attributed by SNH *et al.* (2019).

7.7.37 Magnitude: No bat roosts were recorded during baseline surveys in 2018, with the closest potential roost features for bats identified within the sheepfold 700 m to the north of the closest proposed turbine location during baseline surveys for both Douglas West and Dalquhandy Wind Farms. No broadleaved trees along watercourses within, or at the site boundary were judged suitable for potential roosting. No *Nyctalus* roosts were recorded during any surveys for other wind farm projects within 10 km of the site (Table 7.14), and low activity rates were generally recorded, suggesting that it is unlikely any roosting *Nyctalus spp.* bats would be affected by construction activities and habitat loss related to the Proposed Development.

7.7.38 Any direct disturbance to commuting or foraging bats due to construction activities is likely to be negligible, particularly with most construction activity limited to daylight hours.

7.7.39 The Proposed Development's Felling and Replanting Plans (Figures 16.3 and 16.4) show that much of the site is due to be felled in stages from 2021 to 2035, and replanted immediately after felling

with mainly Sitka spruce, and some mixed broadleaf along watercourses. Felling these relatively large areas may increase *Nyctalus* activity, similar to findings by Kirkpatrick *et al.* (2017), and therefore although thicket closure may over time again reduce activity rates, overall habitat changes during the lifespan of the Proposed Development may be beneficial, and are considered to be of low spatial and long-term temporal magnitude.

7.7.40 Significance: Given the above consideration of sensitivity and magnitude, and the overall potential benefit of habitat change for *Nyctalus* species, the effect is considered to be **negligible** (beneficial) and not significant under the terms of the EIA Regulations.

**Pipistrelle Bats**

7.7.41 Impact: Foraging or commuting bats may be affected by direct habitat loss or changes in habitat type or quality as a result of temporary or permanent construction impacts. Bats may also be disturbed by impacts associated with construction activities such as increased noise or vibration, or lighting.

7.7.42 Sensitivity: Soprano and common pipistrelles are relatively common in Scotland and the UK, and the Nature Conservation Importance is therefore local for both species. The conservation status for both species in Scotland and regionally is unknown but likely to be stable. Overall sensitivity is therefore considered to be medium.

7.7.43 Magnitude: No pipistrelle bat roosts were recorded during baseline surveys in 2018, with no suitable features recorded within the study area, and no roosts were confirmed during any surveys for other wind farm projects within 10 km of the site (Table 7.14). Construction activities are therefore unlikely to directly affect roosting bats.

7.7.44 Common pipistrelle and soprano pipistrelle accounted for 87.9 % of registrations during baseline surveys, and both species were recorded at every detector location. Common and soprano pipistrelle bats typically forage along edges such as treelines, large hedgerows and water edge (Russ, 1999). Plantation edge gives shelter to invertebrate species especially when there are environmental conditions such as wind and rain (Verboom and Spoelstra, 1999). Extensive clear felling was shown by Kirkpatrick *et al.* (2017) to slightly increase pipistrelle activity rates overall, although the effect was greater for small felled stands (<5 ha) compared to those >30 ha. Higher activity was thought to occur due to the creation of more edge habitat, which is preferred by both *Pipistrellus* species. Although there was evidence that pipistrelle activity rates may reduce over time after clear felling, increased linear features within the site relating to key-holing of turbines and access tracks may overall be beneficial, and are considered to be of low spatial and long-term temporal magnitude.

7.7.45 Significance: Given the above consideration of sensitivity and magnitude, and the overall potential long-term benefit of habitat change for pipistrelle species, the effect is considered to be **negligible** (beneficial) and not significant under the terms of the EIA Regulations.

**Table 7.14 – Pipistrelle and *Nyctalus spp.* activity at Wind Farms within 10 km of Site**

| Site | Status | Habitat Type | Survey Period | Roosts | *Pipistrelle* Static Detector Counts | *Nyctalus* Static Detector Counts | *Pipistrelle* At-height Counts | *Nyctalus* At-height Counts | *Pipistrelle* Mean Bat Passes Per Hour | *Pipistrelle* At-height Mean Bat Passes Per Hour | *Nyctalus* Mean Bat Passes Per Hour | *Nyctalus* At-height Mean Bat Passes Per Hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Broken Cross | Consented (revised app.) | Former opencast land, rough grazing | 2011 and 2012 | No roost features | 3719 (93.6 %) | 12 (0.3 %) | 10 | 1 | 2.02 | 0.02 | 0.007 | 0.002 |
| Cumberhead | Consented (revised app.) | Mature conifer plantation | 2014 | No roost sites recorded | 2735 (89.8 %) | 168 (5.5 %) | 77 (93.9 %) | 1 (1.2 %) | 6.5 | c. 0.9 | c.1.0 (near 5.0 max in July) | 0.01 |
| Dalquhandy | Consented (revised app.) | Former opencast land, rough grazing | 2011 and 2012 | No roost sites were confirmed from inspection surveys in 2012 | 4002 (91.7 %) | 39 (0.9 %) | 13 | 1 | 1.49 | 0.03 | 0.02 | 0.002 |
| Douglas West | Approved | Rough grazing and moorland | 2014 and 2015 | One pipistrelle and/or brown long-eared bat roost was confirmed in a derelict building over 1.0 km from site. | 2075 (93.4 %) | 105 (4.7 %) | 2 | 1 | 1.28 | 0.03 | 0.07 | 0.17 |
| Douglas West Extension | Application | Mature conifer plantation | 2018 | No roost features | 2364 (88.3 %) | 173 (6.4 %) | 0 | n/a | 0.55 | n/a | 0.04 (0.35 brpn) | n/a |
| DWCW | Withdrawn | Rough grazing | 2010 and 2012 | No roost sites. Some Cat 2 & 3 woodland | n/a | n/a | 0 | n/a | n/a | n/a | n/a | n/a |

| Site | Status | Habitat Type | Survey Period | Roosts | *Pipistrelle* Static Detector Counts | *Nyctalus* Static Detector Counts | *Pipistrelle* At-height Counts | *Nyctalus* At-height Counts | *Pipistrelle* Mean Bat Passes Per Hour | *Pipistrelle* At-height Mean Bat Passes Per Hour | *Nyctalus* Mean Bat Passes Per Hour | *Nyctalus* At-height Mean Bat Passes Per Hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | and moorland | | | | | | | | | | |
| Galawhistle | Installed | Open moorland and rough grazing | 2008 and 2009 | Common pipistrelle roost at Monkshead derelict farm building. | Unknown | 0 | 0 | n/a | n/a | n/a | n/a | n/a |
| Hagshaw Hill Repowering | Application (repowering scheme for operational wind farm) | Open moorland and rough grazing | 2018 | No roost sites were recorded, although there were a small number of trees with roost potential along access route | 581 (86.2 %) | 66 (9.8 %) | 0 | n/a | 0.12 | n/a | 0.01 | n/a |
| Kennoxhead | Approved | Conifer plantation | 2012 | No roost sites. Low suitability buildings | 262 (97.0 %) | 2 (0.7 %) | 0 | n/a | 0.61 | n/a | 0.004 | n/a |
| Middle Muir | Approved | Moorland / rough grazing | 2011 | No roost structures within 1 km | 92.40 % | 4 (5.1 %) | 0 | n/a | 1.83 | n/a | 0.01 | n/a |
| Penbreck (3 turbines) | Approved | Conifer plantation | 2015 | Not surveyed | 0 | 0 (0.0 %) | 0 | n/a | 0 | n/a | 0 | n/a |
| Poniel | Approved | Restored surface mine | 2011 and 2012 | No roost sites were recorded, although there were a small number of trees with roost potential | 1645 (94.2 %) | 20 (1.1 %) | 6 | 2 | 1.05 | 0.01 | 0.01 | 0.004 |

### *Operation*

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

7.7.47 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.

7.7.48 Effects on bats of medium- and long-term habitat changes beyond the construction phase were 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.

**Collison Risk**

7.7.49 Impact: During the operational phase, there is a potential collision risk to bats, together with the risk that bats may be affected by barotrauma when flying in close proximity of the turbine blades. For the purposes of this assessment, the potential impacts 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.

7.7.50 Research work by Exeter University (DEFRA, 2016) found that in their study, most bat fatalities at UK wind farms were common pipistrelle, soprano pipistrelle and noctule bats. Collision rates were higher than the relative proportions of their calls recorded in ground-level acoustic surveys, but were more similar to the species distributions found in recordings made at turbine nacelles. The study also found that the risk to bats from wind farms increased with the number of turbines and increased rotor size. In contrast, the height of the nacelle, and the period for which the wind farm had been operational were not independently linked with the risk to bats.

7.7.51 For all bats collectively, the number of bat casualties was found to decline with the area of broadleaf woodland within a 1.5 km radius of the centre of the wind farm, possibly through the provision of alternative foraging habitat. Conversely, the total area of coniferous woodland (including recent clear-fell) was associated with increased risks to noctules. At a smaller spatial scale, sites without broadleaved and mixed woodland in a 500 m radius had a 94 % probability of no noctule bat casualties (coniferous woodland gave similar results to those for broadleaved and mixed woodland).

7.7.52 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.

*Nyctalus Bats*

7.7.53 Sensitivity: *Nyctalus spp.* are of regional Nature Conservation Importance, with an uncertain conservation status at regional or Scotland-wide level. As per the population vulnerability levels to collision risk advised by SNH *et al.* (2019), the overall sensitivity for *Nyctalus* species, is considered to be high.

7.7.54 Magnitude: SNH *et al.* (2019) guidance recommends a two-stage process when assessing potential collision risk to bats for a proposed development. Stage 1 considers habitat within the site, and

development-related features such as size, and number of turbines. An overall assessment of risk is then recommended, by considering the site results in relation to the bat activity output from the Ecobat software tool [http://www.ecobat.org.uk] and taking into account the relative vulnerability of each species of bat present, at the population level.

7.7.55 Based on the SNH *et al.* (2019) guidance, the site was assigned a medium risk value due to the following factors:

- The Proposed Development is medium-sized (>10 turbines), with relatively large turbines (maximum blade length of 76 m and maximum tip height of 200 m), and has other wind farm projects within 5 km;
- Geographical location – the site is located within the known range of a high collision risk species (Leisler's / *Nyctalus spp.*);
- There is negligible roosting suitability within the 200 m plus rotor radius of turbines with the site dominated by closed conifer planation which is considered suboptimal for a bat roost;
- During operation there would be medium foraging and commuting suitability within 200 m plus rotor radius of turbines, based on the assumption that clear-felling would occur in stages, and turbines would be key-holed and connected by 5 m wide access tracks with a 20 m tree-free corridor; and
- The site is connected to the wider landscape by some limited linear features of moderate suitability (some watercourses).

7.7.56 A medium risk was also allocated to the site, in order to determine the survey effort in 2018, based on the guidance at the time of survey commencement (Hundt, 2012).

7.7.57 SNH *et al.* (2019) recommend that an overall assessment of collision risk can then be made by considering the Proposed Development assessment in relation to the comparative bat activity output from the Ecobat [http://www.ecobat.org.uk/] tool (Stage 2), which access a dataset of results of studies to place the baseline survey results within a wider context. At the time of writing, the tool was unavailable as it was still in development stage, and as such in order to contextualise activity rates recorded within the site, the following was considered:

1 A review of *Nyctalus* activity recorded during baseline surveys for the Proposed Development and other wind farm projects within 10 km, which are located in various habitat types (presented in Table 7.14); and

2 A review of general *Nyctalus spp.* behaviour in relation to altitude and habitat, and potential collision risk due to habitat changes during the operational phase.

7.7.58 In relation to point 1, the main findings from the information gathered from other projects within 10 km, as presented in presented in Table 7.14 are:

- No *Nyctalus spp.* roosts are known within this 10 km study area, despite good survey coverage due to a number of wind farm projects, and generally there are a lack of suitable features. The local *Nyctalus* populations are therefore likely to be small, with the local area used for commuting or feeding.
- Numbers of *Nyctalus* registrations were low compared to other bat species, and typically accounted for up to 5 % of all records.
- Mean activity rates (bat passes per hour[2]) of *Nyctalus* spp. were low (generally well below

[2] *Although SNH et al. (2019) guidance uses bat registrations per night instead of bat passes per hour, baseline studies for other local wind farm projects generally have presented activity rates as bpph, and so to allow direct comparisons, this metric has been used here.*

1 bpph), with the Proposed Development recording the third highest mean rate (0.04), after Cumberhead (*c.*1.0) and Douglas West (0.07).

- At-height surveys were undertaken for five projects: Douglas West, Broken Cross, Cumberhead, Dalquhandy and Poniel. For all of these projects, in various habitat types (see Table 7.14), mean *Nyctalus spp.* activity rates were much lower than recorded by ground level detectors, with the exception of Douglas West (although there the sample size was very small with only one *Nyctalus* registration made at-height). Highest overall activity rates, and at-height rates, were recorded at the afforested Cumberhead site. Overall, the data suggest that locally at least, it is unlikely that significant *Nyctalus* activity at higher altitude was unrecorded during baseline surveys for the Proposed Development.

7.7.59 In relation to point 2, *Nyctalus* spp. are open space aerial foragers that spend a considerable proportion of time at higher altitudes (>40 % as recorded by Roemer *et al*. (2017), compared to around 10 % for pipistrelles). It is possible that the *Nyctalus* species recorded within the site do currently feed and/or commute above the tree canopy, as recorded for example at Cumberhead Wind Farm where a 10 m temporary met mast with a microphone attached to the top recorded a mean activity rate of around 0.01 bpph.

7.7.60 The turbine parameters for the Proposed Development have been set as a maximum overall height to blade tip of 200 m, with a maximum blade length of 76 m, a maximum rotor diameter of 155 m, and a maximum hub height of 135 m. This would provide a lower rotor tip height of 40-45 m above ground level, which may be up to 25 m above existing tree height. Based on the results of local studies which recorded lower activity rates at-height compared to ground level across all habitat types, the overall mean *Nyctalus* activity rate of 0.35 brpn, or 0.04 bpph recorded in 2018 is therefore likely to be lower at rotor height. Similarly, the highest mean activity rates of over 1.0 brpn at detector location 1, and at locations 9 and 10 in single months, are likely to be lower at rotor height.

7.7.61 Clear-felling as part of the Proposed Development's Felling Plan may increase the frequency that *Nyctalus* species utilise felled areas of the site during the operational period, with clear fell known to be attractive to *Nyctalus* species (Kirkpatrick *et al.,* 2017). In the short-term period it is possible that this may result in an increased activity rates, and potentially increased collision risk where turbines are located within clear-fell. In the medium- to long-term however, as coupes are replanted soon after felling, thicket closure (apart from in the relatively small key-holed areas around turbines) would potentially reduce overall *Nyctalus* activity, and collision risks, again.

7.7.62 In SNH *et al*. (2019) guidance, the overall risk assessment is a product of multiplying site risk level and the Ecobat activity level category (or equivalent, as is the case here) (Table 7.15).

7.7.63 Despite it being likely that a greater amount of 3-dimensional space was surveyed at height, lower activity rates were consistently recorded at local wind farm projects, as well as at sites for studies reported by DEFRA (2016). Collins and Jones (2009) recorded bat activity at seven sites over an average of five nights, also finding significantly higher bat activity at ground level (~ 2 m) compared to 30 m above ground (measured from bat detectors attached to mobile phone and research masts).

7.7.64 The overall mean activity rate at each proposed turbine location, at rotor height, is therefore likely to be lower than 0.35 brpn (equivalent to one pass every 2-3 nights). Based on the information presented above, the site is considered to have a low level of activity at potential risk heights (i.e. c.40-200 m above ground level).

7.7.65 When the site risk level (medium) is combined with the activity level category (low, at risk heights), the overall risk is considered to be low (falling in range 0-4, Table 7.15).

**Table 7.15 – Overall Risk Assessment for Bats (from SNH *et al.* 2019)**

| Site Risk Level | Ecobat activity category (or equivalent justified categorisation) | | | | | |
|---|---|---|---|---|---|---|
| | Nil (0) | Low (1) | Low-moderate (2) | Moderate (3) | Moderate-high (4) | High (5) |
| Lowest (1) | 0 | 1 | 2 | 3 | 4 | 5 |
| Low (2) | 0 | 2 | 4 | 6 | 8 | 10 |
| Medium (3) | 0 | 3 | 6 | 9 | 12 | 15 |
| High (4) | 0 | 4 | 8 | 12 | 15 | 18 |
| Highest (5) | 0 | 5 | 10 | 15 | 20 | 25 |

7.7.66 The overall magnitude of impact on the populations of *Nyctalus* spp. is therefore considered to be low spatial and long-term temporal.

7.7.67 Significance: Given the above consideration of sensitivity (high) and magnitude (low), the effect significance of collision risk on *Nyctalus* bats is considered to be Moderate Adverse and potentially **significant** under the terms of the EIA Regulations.

*Pipistrelle Bats*

7.7.68 Sensitivity: Pipistrelle bats were determined to be of local nature conservation importance, with a likely stable conservation status at a regional and Scotland-wide level. The overall sensitivity for pipistrelle species, is considered to be medium.

7.7.69 Magnitude: Based on the SNH *et al.* (2019) guidance, the site was assigned a medium risk value to pipistrelle bats due to the following factors:

- The Proposed Development is medium-sized (>10 turbines), with relatively large turbines (maximum blade length of 76 m and maximum rotor tip height of 200 m), and has other wind farm projects within 5 km;
- Geographical location – the site is located within the known range of common and soprano pipistrelle species;
- There is negligible roosting suitability within the 200 m plus rotor radius of turbines with the site dominated by closed conifer planation which is considered suboptimal for a bat roost;
- During operation there would be medium foraging and commuting suitability within 200 m plus rotor radius of turbines, based on the assumption that clear-felled areas would be replanted, and turbines would be key-holed and connected by 5 m wide access tracks with a 20 m tree-free corridor; and
- The site is connected to the wider landscape by some limited linear features of moderate suitability (some watercourses).

7.7.70 Common pipistrelle was the most commonly recorded species by BAI (1,331 registrations and mean activity rate of 2.66 brpn), followed by soprano pipistrelle (1,033 registrations and mean activity rate of 2.06 brpn). The mean BAI activity rate for common pipistrelle and soprano pipistrelle within the study area was considered to be moderate in June at location 10 (29.1 brpn) (112 m from the nearest proposed turbine location) and at location 7 (20.3 brpn) (69 m from the nearest proposed turbine location). For all other locations across the survey period their activity levels were considered to be low.

7.7.71 Common and soprano pipistrelle bats typically forage along edges such as treelines, large hedgerows and water edge (Russ, 1999). Plantation edge gives shelter to invertebrate species especially when there are environmental conditions such as wind and rain (Verboom and Spoelstra, 1999). Both locations 10 and 7 are situated in the north-eastern section of the study area along the edge of conifer planation with Location 7 near the Shiel Burn. The relatively higher common and

soprano activity rates at locations 10 and location 7 in June is likely to be the result of optimal environmental conditions and suitable foraging habitats at these locations with connectivity to other suitable forging habitats in the study area such as the Shiel Burn.

7.7.72 Clear-felling may create more edge habitats within the site, although this may not lead to a significant increase in flight activity – Kirkpatrick *et al.* (2017) found that the size of the felled area influenced activity (for bats overall and pipistrelles), with 90 % higher activity in smaller felled stands (less than 5 ha) compared to larger felled stands (greater than 30 ha). For common pipistrelle, activity in felled areas decreased with the duration since harvesting; the greatest activity occurred in stands felled within two months compared to those harvested more than 16 months previously. Key-holing around turbines and associated access tracks may however create suitable foraging and commuting habitat for pipistrelles over the long-term, resulting in a potential for collision risk throughout the operational period.

7.7.73 A German study has indicated that pipistrelles, which are generally considered to fly at low-mid heights, forage regularly above the forest canopy (Müller *et al.* 2013), potentially explaining their risk from wind turbines. Roemer *et al*. (2017) estimated that around 10 % of pipistrelle activity was at higher altitudes (above 20-45 m), at potential collision risk height, and Wellig *et al*. (2018) found that, 15% of common pipistrelle activity took place within the potential rotor-swept area (50-150 m above ground level).

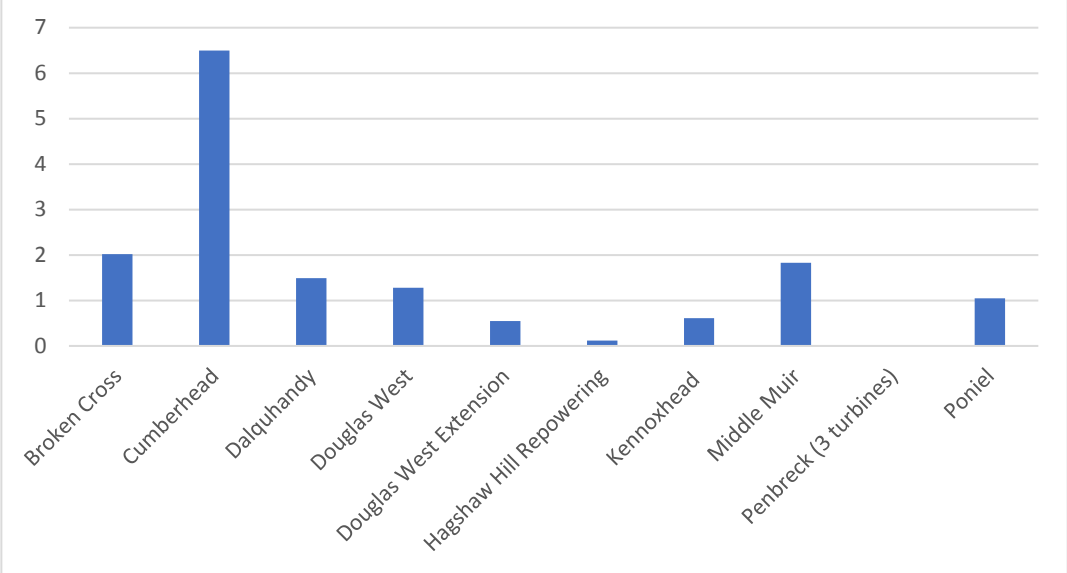


**Chart 1: Medium population vulnerability risk species (Pipistrelle spp.) mean activity rates (bpph) at local wind farm sites**

7.7.74 Results from other local projects (Chart 1 and Table 7.14) showed that the mean pipistrelle activity rate at the Proposed Development (0.55 bpph) was lower than that recorded at most other sites within 10 km, which were more commonly >1.0 bpph. This is likely to be due to the relative lack of suitable linear features within much of the site, and lack of feeding opportunities associated with the dense, closed canopy plantation keeping insect abundance low. In addition, no roost sites were recorded within proximity to the site, and roost suitability is generally low.

7.7.75 The mean pipistrelle activity rates for at-height static detector surveys were much lower than ground level detectors at all sites, typically being 0.01-0.03 bpph, with Cumberhead recording a highest mean rate of c.0.1 bpph.

7.7.76 Based on the SNH *et al.* (2019) guidance, the level of activity within the site during the operational period is therefore considered to be low, particularly that occurring at potential risk heights (c.40-200 m). The overall level of risk (combining site risk and activity levels) is classified as low (Table 7.15). Within the context of the regional populations however, which are likely to be relatively large, the magnitude of impact is considered to be low spatial, and long-term temporal.

7.7.77 Significance: Given the above consideration of sensitivity (medium) and magnitude (low), the effect significance of collision risk on pipistrelle bats is considered to be **minor** adverse and not significant under the terms of the EIA Regulations.

### *Decommissioning*

7.7.78 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*

#### Habitats

7.8.1 General mitigation for habitats would include the standard in-built mitigation and adoption of good practice; for instance, the presence of an ECoW and implementation of appropriate pollution prevention and standard good practice construction environmental management as part of a robust CEMP. To ensure standard good practice measures are effective, pollution prevention proposals will be site specific and adapted to the local ground conditions.

#### Bats

7.8.2 No roost features within the vicinity of the Proposed Development were recorded during baseline surveys. However, should any feature subsequently be found during pre-construction surveys, standard mitigation requires that if felling and/or lopping any tree identified as having roost potential, and/or working within the root plate, any cavities must be checked first. The SPP would ensure that the risk of bats being disturbed by construction activities is minimised.

### *Mitigation During Operation*

#### Habitats

7.8.3 None required.

#### Bats

7.8.4 SNH *et al.* (2019) recommend that to reduce collision risk, turbines should be positioned at least 50 m (measured from blade-tip) from a feature used by bats (in this case, planation edge). 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 and is illustrated in Appendix 7.2.

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

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

7.8.5 If it is assumed that during the operational period, trees will be up to 20 m tall, then a 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. All proposed turbines would be located at or beyond this estimated set-back distance.

7.8.6 This mitigation is considered to be appropriate for pipistrelle bats which fly at predominantly low heights, and use edge features. *Nyctalus* species frequently fly in open areas, including clear-fell however, and this form of mitigation may not be as effective for these species.

7.8.7 In order to assess the long-term risk of collision effects on *Nyctalus* bats, a monitoring plan will be developed prior to construction. It is envisaged that this could use static detectors to record

*Nyctalus* activity in proximity to turbines over the first three years of operation. In addition carcass searches would take place during this period in order to evaluate any ongoing risks. Depending on the outcomes of this monitoring, if required, a Bat Mitigation Plan containing appropriate mitigation measures proportionate to level of risk would be developed, in agreement with SNH. The management measures included in this would be deemed sufficient to be able to reduce the effects on all bat species to a non-significant level.

### *Mitigation During Decommissioning*

7.8.8 Mitigation measures are likely to be similar to those outlined for the construction phase (paragraph 7.9.1).

### *Enhancement Measures*

7.8.9 None required.

## 7.9 Residual Effects

### *Construction*

7.9.1 Although no unmitigated significant effects were predicted for any IEF, the inclusion of management measures (CEMP, SPP) outlined in Section 7.8 will further reduce the likelihood of any adverse effects. However, the residual significance of construction effects on blanket bog and bats are considered to remain as **negligible** and not significant.

### *Operation*

7.9.2 Mitigation measures for bats (set-back distance of forestry from turbines, and post-construction monitoring) 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. These include the Hagshaw Hill Extension, Douglas West, Dalquhandy, Cumberhead, Nutberry and Galawhistle Wind Farms within 2 km, with ecology baselines as described in the *Desk Study* section, plus other such as Poniel and Glentaggart which are >2 km distant. The Repowered Hagshaw Hill Wind Farm and revised schemes for the Cumberhead and Dalquhandy Wind Farms are also presently at application stage and given their proximity and relevance to the Proposed Development have also been considered.

### *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 ecological 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 negligible magnitude of loss of blanket bog habitat, particularly that of good quality, due to the Proposed Development, as outlined above. Other wind farm projects within 10 km have been located on similarly lower quality habitats common to the area, and as such no significant cumulative effects are predicted for blanket bog and wet modified bog (a cumulative effect of **negligible** and not significant).

### *Bats*

#### *Nyctalus* Bats

7.10.4 *Nyctalus spp.* were recorded during baseline surveys for the nearby Repowered Hagshaw Hill Wind Farm, Douglas West, Dalquhandy, and Cumberhead projects, but were absent on the Galawhistle site (no data were collected for Nutberry or Hagshaw Hill). Further afield, the species group was also recorded at Broken Cross, Poniel, Kennoxhead, Middle Muir and Penbreck (see Table 7.14 for details). No roosts were identified at any of these sites, and significant construction-related cumulative effects (habitat loss or disturbance) are considered unlikely (**negligible** 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 with higher activity rates (e.g. Cumberhead), a potential significant collision risk may exist in a worst-case scenario if all projects are operational 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 such (e.g. habitat management plan at Douglas West) likely to improve conditions for foraging *Nyctalus* bats away from turbines, a **minor** adverse and not significant cumulative effect 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. 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 high activity rates, the risk of significant levels of collisions at a 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. 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 two 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 effect is direct and indirect habitat loss due to land take for infrastructure. In a worst-case scenario, indirect blanket bog habitat losses, in most cases to already degraded habitat, could be up to 2.95 ha or 7.4 % of the NVC study area, 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 or enhancement is required in addition to the in-built mitigation and assumed mitigation (e.g. CEMP, SPP, presence of an ECoW, set-back distances from watercourses and plantation edge) 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 recorded, the main effect addressed was risk of collision with turbines during the operational phase. It was determined that although a collision risk exists for these 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 the high sensitivity of the species, a precautionary approach suggests that a potentially significant risk may exist, and to address this risk, post-construction monitoring is planned.

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

**Table 7.14 – Summary Table**

| **Description of Effect** | **Significance of Potential Effect** | | **Mitigation Measure** | **Significance of Residual Effect** | |
|---|---|---|---|---|---|
| | **Significance** | **Beneficial/ Adverse** | | **Significance** | **Beneficial/ Adverse** |
| During Construction / Decommissioning | | | | | |
| Loss of habitat: blanket bog and wet modified bog | Negligible | Adverse | CEMP, ECoW monitoring | Negligible | Adverse |
| Habitat loss/change and disturbance to bats | Negligible | Adverse | SPP, ECoW monitoring | Negligible | Adverse |
| During Operation | | | | | |
| Habitats | No impacts | | None required | No impacts | |
| *Nyctalus* bats: collision risk | Moderate | Adverse | Post-construction monitoring | Minor | Adverse |
| Pipistrelle bats: collision risk | Minor | Adverse | Minimum turbine set-back distance of >50 m from blade tip to plantation edge. | Minor | Adverse |
| Cumulative Effects | | | | | |
| Habitats | Negligible | Adverse | No further mitigation required | Negligible | Adverse |
| Bats | Minor | Adverse | No further mitigation required | Minor | Adverse |

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