

8 Ecology

Introduction

- 8.1 This chapter presents the findings of the assessment of potential effects of the Development on non-avian protected species and habitats. The chapter includes a description of the current ecological condition of the Development Area and the immediate surrounding area, the potential for ecological effects and the potential for mitigation of these effects, and, assesses the residual effects remaining after mitigation has been implemented. Potential effects during the construction and operational phases of the Development are considered. The methodology adopted in undertaking this assessment is also described.
- 8.2 Effects on birds are addressed separately in **Chapter 9: Ornithology**. The effects on hydrology are addressed within **Chapter 7: Hydrology, Hydrogeology, Geology and Soils**. **Chapter 7** also considers the hydrological effects on Ground Water Dependent Terrestrial Ecosystems (GWDTEs) identified in the ecology assessment. Good practice measures to avoid pollution of watercourses on and adjacent to the Development Area are detailed in **Chapter 4: Scheme Description**.
- 8.3 The chapter is supported by the following Technical Appendices:
- **Technical Appendix 8.1: National Vegetation Classification (NVC) Survey Report;**
 - **Technical Appendix 8.2: Protected Species Survey Report;**
 - **Technical Appendix 8.3: Bat Survey Report;**
 - **Technical Appendix 8.4: Electrofishing Survey of the River Nith;**
 - **Technical Appendix 8.5: Draft Species Protection Plan; and**
 - **Technical Appendix 8.6: Outline Conservation Management Plan (OCMP).**
- 8.4 A Confidential Annex to **Technical Appendix 8.2** provides information on the results of the badger survey¹. **Figures 8.1 to 8.9** are referenced in the text where relevant.
- 8.5 Planning policies of relevance to this assessment are provided in **Chapter 5: Policy Context**.
- 8.6 The ecology assessment was undertaken by MacArthur Green.

Scope of the Assessment

Effects Assessed in Full

- 8.7 The assessment considers the potential effects of construction and operation of the Development upon the ecological features identified during the baseline surveys. Effects upon the following features are assessed:
- Designated sites: direct effects (i.e. derived from land-take or disturbance) and indirect effects (i.e. changes caused by effects to supporting systems such as groundwater or over land flow).
 - Terrestrial habitats: direct effects (i.e. derived from land-take or disturbance) and indirect effects (i.e. changes caused by effects to supporting systems such as groundwater or overland flow).
 - Aquatic habitats: effects are limited to the ecological effects of changes in water conditions through potential pollution effects. Hydrological effects are considered in **Chapter 7**.
 - Protected species: direct effects (i.e. loss of life as a result of the Development; loss of key habitat; displacement from key habitat; barrier effects preventing movement to/from key habitats; and general disturbance) and indirect effects (i.e. loss/changes of/to food resources; population fragmentation; degradation of key habitat e.g. as a result of pollution).

Effects Scoped Out

- 8.8 No construction or operational effects were scoped out prior to commencement of surveys and determination of the presence and distribution of ecological features in relation to the planned infrastructure and activities associated with the Development. Subsequent to this, on the basis of the results of the desk based and survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, as well as consideration of consultation responses, the following topic areas have been 'scoped out' of the assessment:
- Effects on generally common and widely distributed habitats or species outwith the following categories:
 - Habitats on Annex I to the Habitats Directive¹, and species on Annex II to the Habitats Directive; and
 - Habitats or species protected by other legislation such as The Wildlife and Countryside Act 1981 (as amended), the Nature Conservation (Scotland) Act 2004 (as amended), or The Protection of Badgers Act 1992.

Assessment Methodology

Assessment Structure

- 8.9 For the Section 36 of the Electricity Act 1989 application process, the assessment method follows the process set out in The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 ('the EIA Regulations') and guidance on the implementation of the EU Birds and Habitats Directive (SERAD, 2001ⁱⁱ).
- 8.10 The assessment methodology involves the following process:
- identifying the potential effects of the Development, including both beneficial and adverse;
 - considering the likelihood of occurrence of potential effects where appropriate;
 - defining the Nature Conservation Value of the important ecological features present;
 - establishing the feature's Conservation Status where appropriate;
 - establishing the magnitude of the likely effect (both spatial and temporal);
 - based on the above information, making a professional judgement as to whether or not the identified effect is significant with respect to the EIA Regulations;
 - if a potential effect is determined to be significant, proposing measures to mitigate or compensate the effect where required;
 - considering opportunities for enhancement; and
 - confirming residual effects after mitigation, compensation or enhancement.

Legislation and Guidance

Legislation

- 8.11 This assessment is carried out in accordance with the principles contained within the following legislation:
- 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");
 - The Environmental Impact Assessment Directive 2011/91/EU;
 - Section 36 of The Electricity Act (1989);
 - The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
 - The Water Environment (Controlled Activities) (Scotland) Regulations 2011;

¹ Badger data is kept confidential due to the risk of human interference.

- The Wildlife and Countryside Act 1981 (as amended);
- The 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.

8.12 In addition to the above and the documents detailed in **Chapter 5**, the following policy documents are of particular relevance to this chapter:

- UK Post-2010 Biodiversity Framework (2012);
- Scottish Biodiversity Strategy: It’s in Your Hands (2004)/2020 Challenge for Scotland’s Biodiversity (2013); and
- South Lanarkshire Biodiversity Strategy 2010-2015.

Guidance

8.13 This assessment is carried out in accordance with the principles contained within the following documents:

- Joint Nature Conservation Committee (2013) Guidelines for selection of biological Sites of Special Scientific Interest (SSSI);
- CIEEM (2016) Guidelines for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition;
- Scottish Executive (2013) Planning Advice Note 1/2013 - Environmental Impact Assessment;
- Scottish Government (2001) European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements;
- Scottish Government (2013): Scottish Biodiversity List;
- Scottish Environment Protection Agency (SEPA) (2014) Guidance Note 4 - Planning guidance on on-shore windfarm developments;
- Scottish Environment Protection Agency (SEPA) (2014) Guidance Note 31 - Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems;
- Scottish Natural Heritage, Scottish Environment Protection Agency, Scottish Government and The James Hutton Institute (2011) Guidance: Development on Peatlands: Site Surveys;
- Scottish Natural Heritage (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments, March 2012;
- Scottish Forestry Strategy (SFS) (2006);
- Scottish Renewables, SNH, SEPA, FC (Scotland), Historic Scotland (2015, 3rd Edition) Good Practice During Windfarm Construction;
- Scottish Natural Heritage (2013) Planning for Development: What to consider and include in Habitat Management Plans;
- Hundt L (2012) Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust;
- Natural England (2014) Natural England Technical Information Note TIN 051. Bats and Onshore Wind turbines – Interim Guidance, Edition 3;
- 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; and
- Collins, J. (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition);

Consultation

8.14 **Table 8-1** summarises the consultation responses received with regard to ecology and provides information on where and how they have been addressed in the assessment, where relevant.

8.15 In addition, **Table 8-1** details the consultation in relation to requests for ecological data.

Table 8-1: Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
South Lanarkshire Council Planning Services 4 th March 2016	Scoping	Suggested that cumulative effects on biodiversity should be considered in the ES.	Cumulative assessments, occurring at the relevant geographical scales for ecological receptors, are included in the Assessment of Effects section of this chapter.
South Lanarkshire Council Planning Services 4 th March 2016	Scoping	The ES should include details of any habitat restoration or creation proposals.	Proposals for habitat restoration and enhancement are summarised below and details provided within the OCMP (Technical Appendix 8.6).
Scottish Natural Heritage 24 February 2016	Scoping	Agreed that effects on nearby designated sites (apart from North Lowther Uplands Site of Special Scientific Interest (SSSI)) can be scoped out of the EIA.	The chapter takes this comment into consideration and the rationale for scoping out other designated sites is detailed in Assessments of Effects.
Scottish Natural Heritage 24 February 2016	Scoping	Welcomed the consideration of habitat management or enhancement proposals.	Habitat management or enhancement proposals are considered within the OCMP (Technical Appendix 8.6).
Scottish Natural Heritage 24 February 2016	Scoping	Production of a deer assessment should be considered.	There are no hill/red deer herds within the Development Area and only Roe deer resident in the forestry blocks where deer pressure is monitored. The forestry blocks are part of the wider Queensberry Estate Deer Management plan. Consideration of deer management is integrated into the OCMP Technical Appendix 8.6 .
Scottish Natural Heritage 24 February 2016	Scoping	Advised against scoping out effects on freshwater pearl mussels until detailed surveys are undertaken.	Freshwater pearl mussel habitat suitability surveys were incorporated into the electrofishing surveys. The survey methods and results are outlined within Technical Appendix 8.4 .
Scottish Natural Heritage 24 February 2016	Scoping	Agreed that great crested newts can be scoped out as there are no suitable habitats nearby.	Noted.
Scottish Natural Heritage 24 February 2016	Scoping	Advised that the operational effects on bats should not be scoped out of the assessment given potential collision risk effects. The decision to scope out potential operational effects on other protected species should be taken following surveys in 2016.	The scoping out of operational effects on protected species is based on the assumption that there will be a species protection plan (SPP) in place (Technical Appendix 8.5). This does not include operational effects on bats which are assessed below.
Scottish Environment Protection Agency (SEPA) 23 February 2016	Scoping	Requested that a Phase 1 Habitat Survey be carried out to assess the potential risk to GWDTEs. The survey distance should take into account any proposed micro-siting distance.	An NVC survey was conducted within up to 250m of infrastructure (Technical Appendix 8.1). The results were used to highlight habitats that fall under the GWDTE classification according to SEPA (2014).
Scottish Environment	Scoping	An NVC Survey should be completed for any wetland	An NVC survey was conducted within up to 250m of infrastructure

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Protection Agency (SEPA) 23 February 2016		identified.	(Technical Appendix 8.1).
Marine Scotland 23 rd February 2016	Scoping	The ES should include details of all water quality, macroinvertebrate and fish population surveys and proposed monitoring programmes.	Survey methods and results of the fisheries, invertebrates and freshwater pearl mussel surveys on watercourses within Technical Appendix 8.4 .
Marine Scotland 23 rd February 2016	Scoping	Recommended consulting with the Nith District Salmon Fishery Board.	Nith District Salmon Fishery Board conducted fish and freshwater pearl mussel surveys on watercourses within and draining the Development Area during summer 2016. Survey methods and results are outlined in Technical Appendix 8.4 .
Marine Scotland 23 rd February 2016	Scoping	Effects on fish populations should be avoided through site specific mitigation and monitoring programmes.	The results of the fish surveys are incorporated into the design layout process by avoidance of watercourses where possible (see NLEI Design Considerations section).
Leadhills Community Council 23 February 2016	Scoping	Otter, red squirrel, newt and water vole surveys should be undertaken to inform the EIA.	The methods and results for the protected species surveys are outlined within Technical Appendix 8.2 .
Leadhills Community Council 23 February 2016	Scoping	Further surveys are recommended to establish where bats hibernate.	Trees and other structures within the turbine envelope, plus a minimum of 200m, have been assessed for their suitability to support roosting bats (see Technical Appendix 8.3).
Leadhills Community Council 23 February 2016	Scoping	Raised concerns in relation to focussing on existing ecological baseline conditions rather than changing ecological conditions.	Within the Assessment of Effects, full consideration is given to the conservation status of each habitat or species, and the likely conditions compared to the 'do nothing' scenario for the lifespan of the Development.
Wanlockhead Village Council 24 February 2016	Scoping	Further surveys are recommended to establish where bats hibernate. Surveys of the moors should also be undertaken to establish bat presence.	Trees and other structures within the turbine envelope, plus a minimum of 200m, have been assessed for their suitability to support roosting bats, following current guidelines ⁱⁱⁱ . Spatial and temporal surveys across the Development Area have also been undertaken, including areas of open moorland (see Technical Appendix 8.3).
Wanlockhead Village Council 24 February 2016	Scoping	Raised concerns in relation to focussing on existing ecological baseline conditions rather than changing ecological conditions.	Within the Assessment of Effects, full consideration is given to the conservation status of each habitat or species, and the likely conditions compared to the 'do nothing' scenario for the lifespan of the Development.
Wanlockhead Village Council 24 February 2016	Scoping	Effects on palmate newt, brown hare and other protected species to be considered in ES.	The methods and results of the protected species survey results are outlined within Technical Appendix 8.2 . Palmate newts and brown hare are only given limited protection under the Wildlife and Countryside act 1981 (as amended). For palmate newts this applies to protection against sale, barter, exchange, transporting for sale and advertising to sell or to buy. The Wildlife and Natural Environment (Scotland) Act 2011 introduced closed

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
			seasons for the killing or taking of wild hares. Therefore no targeted surveys were undertaken for these species.
Wanlockhead Village Council 24 February 2016	Scoping	Effects on badgers, otters, hedgehogs and red squirrel should be assessed.	Protected species recorded during baseline surveys are assessed in the Assessment of Effects section.
Scottish Badgers 21 April 2016	Data Search		Data is referred to in the baseline conditions section (and detailed in Confidential Annex) and is considered within the assessment.
Dumfries & Galloway Environmental Resources Centre (D&GERC) 9 th September 2016	Data Search		Data is referred to in the baseline conditions section and is considered within the assessment.
Marine Scotland 21 st October 2016	Gatecheck Feedback	Requested that site characterisation surveys of water quality of watercourses within and downstream of the Development Area should be undertaken to inform a water quality monitoring programme.	This is covered in Chapter 7 .

Survey Area

- 8.16 The area within which the desk based research and field surveys were undertaken varied depending on search/survey requirements (e.g. the NVC Survey covers an area that extends up to 250m from the proposed turbine locations and 100m from proposed access tracks) within the Development Area (see Figure 8.2). Details of the extent of each search/survey are described in the associated Technical Appendices and shown on Figures 8.5 to 8.8.

Desk Based Research and Data Sources

- 8.17 A desk study was undertaken to collate available ecological information in relation to the Development Area and surrounding environment. This comprised a thorough search of available online datasets as provided by SNH (SNHi SiteLink^{iv}) and requests for ecological datasets (as detailed in **Table 8-1**). The desk study searched for ecological records within 5km of the Development Area.

Field Survey

- 8.18 The following field surveys were undertaken to establish the baseline ecological conditions around the Development Area (plus appropriate buffers), and were undertaken in line with standard methodologies and guidance (full survey areas are shown in **Figures 8.1 to 8.3, 8.5, 8.6 and 8.9**):
- NVC habitat surveys (August to October 2015; July to September 2016);
 - protected species surveys (in particular badger, otter, water vole, pine marten, and red squirrel) (May to August 2016);
 - bat habitat assessment and activity surveys (May to September 2015);
 - bat roost assessments (July 2015);
 - fish habitat and population survey (June and July 2016);
 - aquatic invertebrate survey (June and July 2016); and
 - freshwater pearl mussel habitat assessment survey (June and July 2016);

8.19 The full suite of survey methods, species specific legislation and results are provided within **Technical Appendices 8.1-8.4**. The field surveys were undertaken following best practice guidance, which are summarised within the relevant Technical Appendices.

Assessing Significance

8.20 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 Value and Conservation Status) and Magnitude of effect for each likely effect.

Determining Nature Conservation Value

8.21 Nature Conservation Value is defined on the basis of the geographic context given in **Table 8-2** (which follows the guidance as detailed within CIEEM, 2016^v). Attributing a value to an ecological feature is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of a value 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, including trends based on historical records (CIEEM, 2016^v). 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 Development Area population may consist of a single transitory animal, which within the context of a thriving local/regional/national population of a species, is clearly of local or regional value rather than national or international value).

8.22 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, Joint Nature Conservation Committee (2013^{vi}) on selection of biological SSSIs). Furthermore, JNCC/NBN guidance (2008^{vii}) 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.).

8.23 Those ecological features potentially affected by the Development and deemed to be of local, regional, national and international importance are termed 'Important Ecological Features' (IEFs).

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

Table 8-2: Approach to Valuing Ecological Features (adapted from Hill et al, 2005^{viii})

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.
	Species present in internationally important numbers (>1% of biogeographic populations).
National	A nationally designated site (SSSI, or a National Nature Reserve (NNR)), or sites meeting the criteria for national designation or qualifying species.
	Species present in nationally important numbers (>1% UK population).
	Large areas of priority habitat listed on Annex I of the EC Habitats Directive and smaller areas of such habitat that are essential to maintain the viability of that ecological resource.
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 0.25ha).
Local	Local Nature Reserves (LNR).
	Areas of semi-natural ancient woodland smaller than 0.25ha.
	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.

8.25 The following sections further define the methods used to evaluate magnitude of likely effects and sensitivity.

Magnitude of Effect

8.26 Effect magnitude refers to changes in the extent and integrity of an ecological feature. The only definition of ecological 'integrity' is found within Scottish Executive Circular 6/1995 (2000^{ix}) 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 Special Protection Areas), it is applied to wider countryside habitats and species for the purposes of this assessment.

8.27 Determining the magnitude of any likely effects requires an understanding of how the ecological features are likely to respond to the Development. This change can occur during construction or operation of the Development.

8.28 Effects can be adverse, neutral or beneficial.

8.29 Effects are judged in terms of magnitude in space and time. There are five levels of spatial effects and five levels of temporal effects as described in **Table 8-3** and **Table 8-4**.

Table 8-3: Definition of Spatial Effect 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 effect on the feature, sufficient to result in short-term losses and effects upon its long-term viability. For example, more than 20% habitat loss or damage.
Moderate	Would affect the feature in the short and medium-term, but should not alter its long-term viability. For example, between 10 - 20% habitat loss or damage.
Low	Would have a minor effect upon the feature, either of sufficiently small-scale or of short duration to cause no long-term harm. For example, less than 10% habitat loss or damage.
Negligible	Minimal change on a very small scale; effects not dissimilar to those expected within a 'do nothing' scenario.

Table 8-4: Definition of Temporal Effect Magnitude upon the IEFs

Temporal Magnitude	Description
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as 26+ 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) 25 years.
Medium Term	Between 5 years up to (but not including) 15 years.
Short Term	Up to (but not including) 5 years.
Negligible	No effect.

Significance

8.30 The significance of potential effects is determined by integrating the assessments of sensitivity (Nature Conservation Value and Conservation Status) and magnitude in a reasoned way.

8.31 Table 8-5 details the significance criteria that have been used in assessing the effects of the Development.

Table 8-5: Significance Criteria

Significance of Effect	Description
Major	Significant effect, as the effect is likely to result in a long term significant adverse effect on the integrity of the feature.
Moderate	Significant effect, as the effect is likely to result in a medium term or partially significant

Significance of Effect	Description
	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 effect. This is not a significant effect.

8.32 Using these definitions, a decision is made as to 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).

8.33 Major and moderate effects are considered significant in accordance with the EIA Regulations.

Cumulative Assessment

8.34 SNH (2012) cumulative assessment guidance is used to inform the cumulative assessment in this chapter. Cumulative effects are not possible to evaluate through the study of one development in isolation, but require the assessment of effects when considered in combination with other developments, projects or activities. 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. Therefore, an assessment of cumulative effects is made for each feature, appropriate to its ecology.

Assessment Limitations

8.35 Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to effects. 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.

8.36 There were no other limitations experienced with regards weather conditions during and preceding surveying, with all survey work undertaken during appropriate conditions and seasons (detailed specific survey limitations are discussed in the relevant appendices.)

8.37 Therefore, whilst some limitations have been identified relating to the scientific knowledge for certain species, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on ecology.

Existing Conditions

8.38 This section details the results of the desk study and field surveys, providing the baseline conditions for the Development Area, including:

- designated sites;
- habitats and vegetation; and
- protected or notable species.

Designated Sites and Desk Study

8.39 There are five statutory designated sites within 5km of the Development Area which are designated for ecological features. Details on these are provided in **Table 8-6** and **Figure 8.1**.

Table 8-6: Designated Sites within 5km of the Development Area

Name of Site	Features and Summary Condition	Summary of reasons for designation	Distance from Development Area ²
Upper Nithsdale Woods Special Area of Conservation (SAC)	Mixed woodland on base-rich soils associated with	This complex of sites located on the River Nith and tributaries represents <i>Tilio-Acerion</i> forest in south-west Scotland (9180 <i>Tilio-Acerion</i> forests	Partly within Development Area (southern

Name of Site	Features and Summary Condition	Summary of reasons for designation	Distance from Development Area ²
(99.62ha)	rocky slopes – Unfavourable (09/11/2009)	of slopes, screes and ravines). The individual sites are small, but regionally important due to the highly fragmented nature of remnant semi-natural woodland in this part of Scotland. The woods are ash <i>Fraxinus excelsior</i> -dominated with a dense hazel <i>Corylus avellana</i> understorey, and a rich herbaceous ground flora characteristic of the habitat type.	most edge); no infrastructure present here.
North Lowther Uplands SSSI (7833ha)	Upland Assemblage – Unfavourable (18/10/2005)	The North Lowther Uplands SSSI supports a range of upland habitats and associated species showing good examples of the characteristic plant communities of the Southern Uplands. Habitats include blanket bog, wet and dry heaths and acid grassland, <i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath (heather-bell heather), heather-blaeberry <i>Vaccinium myrtillus</i> heath, deergrass and hare's-tail cottongrass blanket mire (incl. hummocks of two rare species of bog moss <i>Sphagnum fuscum</i> and <i>Sphagnum imbricatum</i>), cross-leaved heath <i>Erica tetralix</i> - <i>Sphagnum papillosum</i> blanket mire, a mosaic of upland grassland habitats (incl. mat grass <i>Nardus stricta</i> - heath bedstraw acid grassland).	Directly adjacent, to the north-west of the Development Area.
Back Wood SSSI (15.15ha)	Upland oak woodland – Unfavourable (08/10/2009)	One of the best remaining examples in Nithsdale District of semi-natural broad-leaved woodland.	To the west of the Development Area at 961m distance.
Mennoch Water SSSI (47.79ha)	Fen Meadow – Favourable (02/09/2002) Upland Oak Woodland – Favourable (02/06/2014)	The Development Area contains one of the most extensive and varied areas of semi-natural woodland, and one of the best examples of wet meadow and species-rich grassland, within Nithsdale District.	Within Development Area; no infrastructure present.
Coshogle Wood SSSI (20.8ha)	Upland Oak Woodland – Favourable (20/01/2001)	The Development Area is notified for its acid-neutral, sessile oak dominated woodland, on steep valley sides and is one of the best examples in upper Nithsdale.	To the south of the Development Area at 4,300m distance.

8.40 The distribution of Ancient Woodland within 5km of the Development Area is shown on **Figure 8.1**.

8.41 Desk study results for protected species are referred to in the relevant species sections below.

Field Surveys and Desk Study

8.42 Details regarding field survey methodologies and results are included within **Technical Appendices 8.1-8.4**. The following section summarises the baseline conditions as identified during these surveys.

Habitat Surveys

8.43 NVC surveys were undertaken during 2015 and 2016. The NVC communities and non-NVC types recorded within the survey area are provided in **Table 8-7** below, and include proportions of particular habitat types that are found within mosaic habitats. Full descriptions of the habitats, NVC communities and associated flora of the survey area are provided in **Technical Appendix 8.1. Figures 8.2.1 to 8.2.29** show the distribution of NVC habitats recorded.

8.44 The survey area covered during NVC surveys is shown in **Figure 8.2** and covers an area that extends up to 250m from the proposed turbine locations and 100m from proposed access tracks within the Development Area. It therefore does not comprise of the whole Development Area, but a buffer around

² Distance is measure at nearest point, unless otherwise detailed.

proposed infrastructure³ (see **Appendix 8.1**) and habitat percentage calculations are based on habitats within the Survey Area.

Table 8-7: NVC Habitat Extents and Classification

NVC Community or Habitat Type	Description	Extent in Survey Area (ha)	% of Survey Area	Annex I Habitat	GWDTE sensitivity ^x
H10	<i>Calluna vulgaris-Erica cinerea</i> heath	0.02	0.001	4030 European dry heaths	-
H12, H12a, H12c	<i>Calluna vulgaris-Vaccinium myrtillus</i> heath	219.33	8.05	4030 European dry heaths	-
H16	<i>Calluna vulgaris-Arctostaphylos uva-ursi</i> heath	2.14	0.08	4030 European dry heaths	-
H18, H18b	<i>Vaccinium myrtillus-Deschampsia flexuosa</i> heath	37.33	1.37	4030 European dry heaths	-
H21	<i>Calluna vulgaris-Vaccinium myrtillus-Sphagnum capillifolium</i> heath	3.24	0.12	4030 European dry heaths	-
M2	<i>Sphagnum cuspidatum/fallax</i> bog pool community	0.19	0.01	7130 Blanket bogs	-
M3	<i>Eriophorum angustifolium</i> bog pool community	0.15	0.01	7130 Blanket bogs	-
M4	<i>Carex rostrata-Sphagnum fallax</i> mire	0.02	0.001	7140 Transition mires and quaking bogs	-
M6, M6b, M6c, M6d	<i>Carex echinata-Sphagnum fallax/denticulatum</i> mire	11.73	0.43	-	High
M15, M15a, M15b, M15d	<i>Trichophorum germanicum-Erica tetralix</i> wet heath	21.11	0.77	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	Moderate
M17, M17c	<i>Trichophorum germanicum-Eriophorum vaginatum</i> blanket mire	38.34	1.41	7130 Blanket bogs	-
M19, M19a, M19b	<i>Calluna vulgaris-Eriophorum vaginatum</i> blanket mire	140.26	5.15	7130 Blanket bogs	-
M20, M20a	<i>Eriophorum vaginatum</i> blanket mire	154.40	5.66	7130 Blanket bogs	-
M23, M23a, M23b	<i>Juncus effusus/acutiflorus-Galium palustre</i> rush-pasture	186.10	6.83	-	High
M25, M25a, M25b	<i>Molinia caerulea-Potentilla erecta</i> mire	684.48	25.11	-	Moderate
M27	<i>Filipendula ulmaria-Angelica sylvestris</i> mire	0.37	0.01	-	Moderate
M32	<i>Philonotis fontana-Saxifraga stellaris</i> spring	0.01	0.0002	-	High
U2, U2b	<i>Deschampsia flexuosa</i> grassland	16.81	0.62	-	-
U4, U4a, U4b, U4d, U4e	<i>Festuca ovina-Agrostis capillaris-Galium saxatile</i> grassland	298.79	10.96	-	-
U5, U5a	<i>Nardus stricta-Galium saxatile</i> grassland	194.77	7.15	-	-
U6, U6a, U6d	<i>Juncus squarrosus-Festuca ovina</i> grassland	57.41	2.11	-	Moderate
U20	<i>Pteridium aquilinum-Galium saxatile</i> community	123.97	4.55	-	-

NVC Community or Habitat Type	Description	Extent in Survey Area (ha)	% of Survey Area	Annex I Habitat	GWDTE sensitivity ^x
MG1, MG1c	<i>Arrhenatherum elatius</i> grassland	3.40	0.12	-	-
MG6	<i>Lolium perenne-Cynosurus cristatus</i> grassland	25.22	0.93	-	-
MG7	<i>Lolium perenne</i> leys and related grasslands	7.96	0.29	-	-
MG9	<i>Holcus lanatus-Deschampsia cespitosa</i> grassland	0.89	0.03	-	Moderate
MG10, MG10a	<i>Holcus lanatus-Juncus effusus</i> rush-pasture	80.99	2.97	-	Moderate
CG10a	<i>Festuca ovina-Agrostis capillaris-Thymus praecox</i> grassland	0.06	0.002	6230 Species-rich <i>Nardus</i> grassland	High
W6	<i>Alnus glutinosa-Urtica dioica</i> woodland	0.04	0.002	-	Moderate
W7	<i>Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum</i> woodland	0.09	0.003	-	High
W9	<i>Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis</i> woodland	0.36	0.01	-	-
W10, W10e	<i>Quercus robur-Pteridium aquilinum-Rubus fruticosus</i> woodland	1.41	0.05	-	-
W11, W11a	<i>Quercus petraea-Betula pubescens-Oxalis acetosella</i> woodland	3.22	0.12	-	-
W17	<i>Quercus petraea-Betula pubescens-Dicranum majus</i> woodland	0.07	0.003	-	-
W21	<i>Crataegus monogyna-Hedera helix</i> scrub	0.33	0.01	-	-
W24	<i>Rubus fruticosus-Holcus lanatus</i> underscrub	0.05	0.002	-	-
OV25	<i>Urtica dioica-Cirsium arvense</i> community	0.39	0.01	-	-
OV27	<i>Epilobium angustifolium</i> community	1.92	0.07	-	-
S19	<i>Eleocharis palustris</i> swamp	0.03	0.001	-	-
JA*	<i>Juncus acutiflorus</i> acid grassland community	2.42	0.09	-	Moderate
JE*	<i>Juncus effusus</i> acid grassland community	18.18	0.67	-	Moderate
Hm*	<i>Holcus mollis</i> dominant	0.05	0.002	-	-
CN*	<i>Carex nigra</i> dominant	6.18	0.23	-	-
CP*	Conifer plantation	223.48	8.20	-	-
YCP*	Young conifer plantation	50.74	1.86	-	-
CF*	Clear-fell	80.45	2.95	-	-
YBP*	Young broadleaved plantation	4.01	0.15	-	-
BD*	Bare ground	1.59	0.06	-	-
BG*	Buildings	19.70	0.72	-	-

³ Due to subsequent layout changes, the Study Area includes areas where infrastructure is no longer proposed.

NVC Community or Habitat Type	Description	Extent in Survey Area (ha)	% of Survey Area	Annex I Habitat	GWDTE sensitivity ^x
MB*	Recent muirburn	0.30	0.01	-	-
RW*	Running water	1.34	0.05	-	-
Total		2725.86	100		

* = non-NVC category

- 8.45 In total, 39 recognised NVC communities were recorded within the Survey Area, along with various associated sub-communities and mosaic habitats; however, a relatively small number of communities account for the majority of the Survey Area. The most common and widespread communities, making up the bulk of the landscape, are M25 *Molinia caerulea* – *Potentilla erecta* mire (25% of Survey Area), M20 *Eriophorum vaginatum* blanket mire (5.7%), M19 *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire (5.1%), M23 *Juncus effusus/acutiflorus* – *Galium palustre* rush-pasture (6.8%), M15 *Trichophorum germanicum* – *Erica tetralix* wet heath (0.77%), H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath (8.0%), MG10 *Holcus lanatus* – *Juncus effusus* rush-pasture, U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* grassland, U5 *Nardus stricta* – *Galium saxatile* grassland and U6 *Juncus squarrosus* – *Festuca ovina* grassland. These communities also form mosaics with each other as well as with a number of other less well represented and fragmentary mire, grassland and heath communities. Areas of semi-natural woodland are scarce within the Development Area and are mainly restricted to small fragments, often within gullies or near watercourses.
- 8.46 The variation in vegetation communities and composition over such a large area reflects changes in soil and substrate type, soil moisture as well as anthropogenic influences on the vegetation (e.g. muir burning, grazing and drainage). Many areas are underlain by peat of various depths and this is reflected in the presence of the true bog communities and wet heath. The majority of the Survey Area contains a characteristically acidophilous flora given its wet upland setting, however many of the less elevated areas tend towards a more neutral (and also wet) species assemblage highlighted by the abundance of rush-pastures present. Calcareous influences are very scarce but do exist and appear as small fragments of CG10 *Festuca ovina* – *Agrostis capillaris* – *Thymus polytrichus* grassland. Flushes are scattered throughout the Development Area and the majority are of the M6 *Carex echinata* – *Sphagnum fallax/denticulatum* mire community. Spring features are rare but there is a small number of M32 *Philonotis fontana* – *Saxifraga stellaris* springs present.
- 8.47 The NVC data was also cross-referenced to the Phase 1 Habitat Survey Classification^{xi} to allow a broader characterisation of habitats. The extent of Phase 1 habitat types within the survey 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 below in order of extent in **Table 8-8**.

Table 8-8 Extent of Phase 1 Habitat Types within the Survey Area

Phase 1 Habitat Code and Description	Extent within Survey Area (ha)	% of the Survey Area
E1.7 - Wet modified bog	838.89	30.78
B1 - Acid grasslands	574.02	21.06
B5 - Marsh/marshy grassland	288.06	10.57
A1.2.2 - Coniferous plantation	274.22	10.06
D1.1 - Dry dwarf shrub heath	262.35	9.62
E1.6.1 - Blanket bog	178.94	6.56
C1.1 - Bracken –continuous	123.97	4.55
A4.2 - Recently-felled woodland – coniferous	80.45	2.95
B2 - Neutral grasslands	37.47	1.37
D2 - Wet dwarf shrub heath	21.11	0.77
J4 - Bare ground	19.70	0.72
E2.1 - Flush/spring - acid/neutral	11.75	0.43

Phase 1 Habitat Code and Description	Extent within Survey Area (ha)	% of the Survey Area
A1.1.1 Broadleaved woodland - semi-natural	5.19	0.19
A1.1.2 - Broadleaved woodland - plantation	4.01	0.15
C3.1 - Tall herb and fern - tall-ruderal	2.36	0.09
J3.6 - Buildings	1.59	0.06
G2 - Running water	1.34	0.05
A2.1 - Scrub - dense/continuous	0.33	0.01
B3 - Calcareous grassland	0.06	0.002
F1 - Swamp	0.03	0.001
E2.3 - Flush/spring - bryophyte dominated	0.01	0.0002
Total	2725.86	100

Groundwater Dependant Terrestrial Ecosystems

- 8.48 The NVC survey results summarised above were referenced against SEPA (2014^{xii}) guidance to identify those habitats classified as, depending on the hydrogeological setting, potential GWDTEs, as detailed in **Table 8-7** and **Figures 8.3.1** to **8.3.29** (see also **Chapter 7** for further assessment details). Wetlands or habitats containing these particular NVC communities are to be considered GWDTEs unless further information can be provided to demonstrate this is not the case.
- 8.49 Many of the NVC communities on the list are very common habitat types across Scotland, and some are otherwise generally of low ecological value. Furthermore, some of the NVC communities may be considered GWDTEs only in certain hydrogeological settings.
- 8.50 Within **Figures 8.3.1** to **8.3.29** the potential GWDTE sensitivity of each polygon containing a potential GWDTE is 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.
- 8.51 Where a potential high GWDTE exists in a polygon it outranks any potential moderate GWDTE communities within that same polygon, irrespective of dominance.
- 8.52 GWDTE sensitivity has been assigned solely on the SEPA listings (SEPA, 2014)^{xiii}. However, depending on a number of 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 dependant on groundwater. Potential hydrological linkages are assessed within the Assessment of Effects section within Chapter 7, which states that all initially identified areas of GWDTEs are considered to be of low groundwater dependency and thus of low sensitivity to changes in groundwater levels or flows. All identified potential GWDTE areas within the Study Area are therefore judged not to be groundwater dependent.

Annex I Habitats

- 8.53 Many NVC communities can also correlate to various Annex I habitat types listed under the Habitats Directive. 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 including quality, extent, species assemblages, geographical setting, and substrates.
- 8.54 NVC survey data and field observations have been compared to JNCC Annex I habitat listings^{xiv} and descriptions. Those habitats within the Survey Area which could be considered Annex I habitats are also

summarised in **Table 8.7**. Full details and discussion of these habitats and their correlation to Annex I habitats are provided with a site-specific context within **Technical Appendix 8.1**.

- 8.55 The locations of these Annex I habitats are shown within **Figure 8.4**. Here, all polygons which contain an Annex I habitat type are shaded, irrespective of the percentage cover of Annex I habitat within that polygon. Each polygon is shaded per the dominant Annex I type within the polygon; however, many polygons contain multiple Annex I habitat types, therefore the communities listed should be cross-referenced to **Table 8.7**.

Badger

- 8.56 A desk-top study included consultation with Scottish Badgers. No historic records for the Development Area were provided but it was noted that this is likely to be a result of a lack of surveying or recording within the search area, rather than an absence of badgers from the Development Area.
- 8.57 The Study Area for this protected species survey concentrated on areas within a 300m buffer around access tracks and turbine areas within the Development Area. (Due to several changes to the initial layouts, the final resulting Study Area consists of the original layout buffers and small additional areas specified for each new layout, some in areas where there is no longer any infrastructure proposed.) Land with the potential to support badger within the Study Area (see **Figure 8.5**) was searched for field signs, with particular attention given to areas around woodland and areas underlain by mineral soils as opposed to peat.
- 8.58 The protected species surveys conducted in May 2016 recorded a potential three-entrance badger sett within the Development Area (see the **Confidential Annex to Technical Appendix 8.2** for further details). The location of this potential sett was re-visited in August 2016 to determine its current status. An additional entrance hole was recorded during this survey, with badger guard hairs recorded within the tunnel and within the spoil heap, suggesting some current usage.
- 8.59 An additional visit was undertaken in August 2016 to search for signs of badger in suitable woodland habitat. Three trail cameras were deployed within the woodland to determine current activity of the potential sett. No evidence of badger was recorded on the trail cameras during their deployment but a fox was seen investigating one of the monitored entrances, although there was no evidence of any species using the entrance in which the badger guard hairs were found.
- 8.60 In general, the Development Area offers limited areas of habitat suitable for supporting badgers. Some areas of woodland offer good foraging opportunities as there is an abundance of dead timber and leaf litter that is likely to support numerous terrestrial invertebrate species which are a good food source. There are also opportunities for sett building within the woodlands within the Study Area. Although no badgers were recorded during the deployment of the trail cameras, it is possible that badgers could utilise the sett and therefore its potential usage cannot be ruled out.

Otter

- 8.61 The Study Area for this protected species survey concentrated on watercourses within a 300m buffer around access tracks and turbine areas within the Development Area. (Due to several changes to the initial layouts, the final resulting Study Area consists of the original layout buffers and small additional areas specified for each new layout, some in areas where there is no longer any infrastructure proposed.) All accessible watercourses within the Study Area (see **Figure 8.5**) were surveyed for otter field signs.
- 8.62 Evidence of otter was recorded within the Study Area in the form of spraints and footprints. No confirmed holts were recorded within the Study Area, although several potential resting up locations were recorded. (**Technical Appendix 8.2**).
- 8.63 Otter spraints (including fresh spraints) were recorded at 25 locations across the Study Area. The majority of the spraints were recorded along the larger watercourses within the Study Area, such as the Wanlock Water and the Cog Burn.
- 8.64 No records for otter within the Study Area (period from 1978 to date) were provided by D&GERC.
- 8.65 The watercourses within the Study Area offer good opportunities for foraging otter. The larger watercourses are considered to be suitable habitat for supporting otter prey species, such as fish. The deeper pooled areas of these watercourses have the potential to support larger fish, and the runs and glides show suitability for fish at other life stages. Fish were observed at several locations throughout the Study Area, including within the Glenbuie Burn, Back Burn, Glenrae Burn and in some of the unnamed tributaries to the Wanlock Water (see section on **Fish** below).

Water vole

- 8.66 The Study Area for this protected species survey concentrated on watercourses within a 300m buffer around access tracks and turbine areas within the Development Area. (Due to several changes to the initial layouts, the final resulting Study Area consists of the original layout buffers and small additional areas specified for each new layout, some in areas where there is no longer any infrastructure proposed.) All watercourses within the Development Area Study Area (see **Figure 8.5**) were surveyed for water vole field signs.
- 8.67 No evidence of water vole was recorded during the protected species surveys. One record was provided by D&GERC of an individual and some burrows on Glensalloch Burn, between Wedder Dod and Tongue Hill in 2007.
- 8.68 In general, the watercourses present throughout the Study Area have variable suitability for water vole.
- 8.69 The larger watercourses have limited suitability for supporting the species as the generally fast water flow and lack of food source vegetation makes them sub-optimal. Many of the smaller watercourses are located on steep slopes, with several in gullies bordered by rock substrate which is unsuitable for burrowing water voles. Some of the smaller watercourses have slower flowing channels that are fringed by more suitable rush vegetation, offering more suitable water vole habitat.

Pine Marten

- 8.70 The Study Area for pine marten concentrated on areas within a 300m buffer around access tracks and turbine areas within the Development Area (see **Figure 8.5**). (Due to several changes to the initial layouts, the final resulting Study Area consists of the original layout buffers and small additional areas specified for each new layout, some in areas where there is no longer any infrastructure proposed.) No evidence of pine marten was found during the protected species surveys, and no historic records were provided for the Study Area.
- 8.71 There are areas of more mature forestry within the Study Area which have the potential to support pine marten. Pine marten are known to exploit old coniferous plantation to create dens, access prey and gain protection from predators. There is the potential that pine marten could utilise these areas if they are present within the Study Area.
- 8.72 There are also large areas of open moorland habitat present within the Study Area. There is some potential for pine marten to use open, felled and rejuvenating land for hunting due to the increased access to prey species, however, these habitats offer an increased risk of predation from foxes and raptor species (MacPherson, 2014)^{xv}.
- 8.73 There are large areas of clear-fell present across the Study Area, with several areas being recently felled. Pine martens are likely to avoid clear-fell, taking preference for forested areas (Halliwell, 1997)^{xvi}. The forestry that remains within the Study Area is of mixed age. There are areas of young plantation that are unlikely to possess the features that can be utilised for den building, such as fallen trees or tree cavities.
- 8.74 There are blocks of plantation present within the wider vicinity of the Study Area, with the nearest forestry being 1.6km to the south-west and 5km to the north-west. Connectivity of these forestry blocks to the Study Area seems to be limited, given the large expanses of open moorland and the presence of large watercourses which could act as a barrier to movement.

Squirrel

- 8.75 The Study Area for this protected species survey concentrated on areas of woodland that have the potential to support red squirrel were surveyed for squirrels within a 300m buffer around access tracks and turbine areas within the Development Area (see **Figure 8.5**). (Due to several changes to the initial layouts, the final resulting Study Area consists of the original layout buffers and small additional areas specified for each new layout, some in areas where there is no longer any infrastructure proposed.)
- 8.76 No red squirrel records within the Study Area from the last 15 years were provided by the D&GERC. Grey squirrels were recorded in the wider area between 2000 and 2006. Evidence of squirrel was recorded during the surveys, with stripped cones recorded in six locations across the Study Area and eaten hazelnuts recorded within the Bank Wood.
- 8.77 It is not possible to determine species of squirrel, red or grey, from these feeding signs alone.
- 8.78 No protected features (i.e. dreys) were recorded within the Study Area.

- 8.79 The majority of the Study Area is considered to be unsuitable for red squirrel due to its open nature and lack of tree cover. Many of the blocks of forestry in the Study Area have been recently clear-felled or are newly planted, meaning that there is a lack of cone producing trees in these areas. There is also a limited amount of connectivity between the forestry blocks and those present outwith the Study Area boundary.
- 8.80 Based on a recording of grey squirrel during camera trapping and the lack of good habitat connectivity of the Development Area, it is likely that grey squirrel is the only squirrel species present on site.
- Bats*
- 8.81 The D&GERC provided data of a hibernaculum roost, occupied in February 2009 by three Daubenton's bats, two Natterer's bats and a pipistrelle bat, to the south-east of the Study Area. The roost is located 810m from any infrastructure and 1124m from the nearest turbine.
- 8.82 Baseline bat activity surveys were completed between May and September 2015.
- Bat Habitat and Roost Assessment*
- 8.83 The Study Area for the bat roost assessment surveys concentrated on areas within a 300m buffer around access tracks and turbine areas within the Development Area. (Due to several changes to the initial layouts, the final resulting Study Area consists of the original layout buffers and small additional areas specified for each new layout, some in areas where there is no longer any infrastructure proposed.)
- 8.84 The daytime habitat inspection recorded habitats of note for bats including stone walls, conifer plantation edges and watercourses within the Development Area. Two properties were identified as potential roosting structures for bats – Duntercleuch House was seen to have low roost potential, and the Clackleith buildings to have moderate roost potential (**Figure 8.7**).
- 8.85 Trees possessing potential roost features were recorded at eleven locations across the Study Area (shown on **Figures 8.6**). A line of trees adjacent to the River Nith (outside the Development Area) were recorded as having a low to moderate potential and trees in the remaining locations were recorded as having moderate roosting potential. Some trees with low roosting potential are in the south-west of the Development Area.
- Overall Spatial and Temporal Bat Surveys*
- 8.86 Overall, five bat species were recorded within the Study Area during the temporal (static detector) and spatial (transect) surveys. The most commonly recorded bat species by bat passes per hour (bpph) was soprano pipistrelle (1.90 bbph) followed by common pipistrelle (1.35 bbph), Pipistrelle sp. (0.05bbph), *Myotis sp.* (most likely Daubenton's) (0.02bbph) *Nyctalus sp.* (0.004bbph) and then possible Nathusius' pipistrelle (0.001bbph).
- 8.87 The greatest activity seen throughout the spatial and temporal survey was a result of medium risk species such as common pipistrelle and soprano pipistrelle numbers. These bat species are classed as being at medium risk of collision but are at low risk at the population level due to their distribution and abundance within the UK. Population estimates for common pipistrelle and soprano pipistrelle bats in the UK in 2005 were 2,430,000 and 1,300,000 respectively (JNCC, 2007)^{xvii}.
- 8.88 The Bat Activity Index (BAI measured in in bbph) for these species is considered to be low: soprano pipistrelle (1.19 bpph), common pipistrelle (0.95 bpph) and pipistrelle species (0.05 bpph). Activity was mainly recorded around the burn at location 7 with activity much reduced on the temporal detectors in more exposed areas (<1 bpph) (**Figure 8.9**).
- Spatial Surveys*
- 8.89 In total, four bat species were recorded during the spatial surveys: soprano pipistrelle; common pipistrelle; *Myotis sp.* and possible Nathusius' pipistrelle (unknown bat and pipistrelle species are not included in the overall number of species recorded for the Study Area). *Myotis* species recorded were mainly Daubenton's (*Myotis daubentonii*) with some records only identifiable to genus level i.e. *Myotis sp.*.
- 8.90 Bats were mainly recorded to be commuting and feeding within the Study Area. No social calls were recorded during the survey.
- Temporal Surveys*
- 8.91 Static detectors were deployed for temporal surveys at seven locations within the Study Area for at least five days per visit during the survey period.
- 8.92 In total, four bat species were recorded during the temporal surveys: common pipistrelle, soprano pipistrelle, pipistrelle species, *Myotis sp.* and *Nyctalus sp.* (unknown bat and Pipistrelle sp. are not included in the overall number of species recorded for the Study Area) with a total of 3.33 bpph recorded for the Study Area. The most commonly recorded by bpph was soprano pipistrelle (1.92 bpph), followed by common pipistrelle (1.36 bpph), pipistrelle species (0.03 bpph) and *Myotis sp.* (0.02 bpph). *Nyctalus* species were recorded during the surveys at two locations (location 4 open/moorland and location 7 edge/burn), but their pass rate was low with only 5 passes in total (0.004 bpph).
- 8.93 The habitat type that recorded the most bat passes per hour was edge/burn at location 7 (20.14 bpph) followed by edge/plantation at location 5 (0.73 bpph), open/moorland at location 4 (0.64 bpph), clearfell at location 6 (0.19 bpph), edge/fence at location 2 (0.14 bpph), open/moorland at location 3 (0.05 bpph) and open/moorland at location 1 (0.02 bpph) (**Figure 8.9**).
- Collision Risk*
- 8.94 Overall recorded bat activity within the Study Area was low for all species of bats.
- 8.95 *Nyctalus sp.* are classed as being at high risk of collision and at high risk at their population level (Natural England, 2014)^{xviii}. The results of the surveys would suggest that *Nyctalus* species are only present within the Study Area infrequently.
- 8.96 Nathusius' pipistrelle are classed as high risk of collision with their population status within the UK currently unknown due to a lack of a data (JNCC, 2007)^{xvii}. With 0.001 bpph recorded, occurrence of this species on site is very infrequent.
- 8.97 *Myotis* species are low risk for collision and also low risk at the population level (Natural England, 2014)^{xviii}. Only low numbers of *Myotis sp.* which were mainly Daubenton's were recorded for the Study Area. Habitat usage was similar to pipistrelle species with *Myotis* species favouring the burns at location 7. BAI for these species is considered to be low at 0.03 bpph.
- Fish*
- 8.98 During electrofishing surveys, salmonids were found to be present in 19 of the 23 locations surveyed. No other fish species were recorded (**Technical Appendix 8.4**).
- 8.99 The upper Wanlock Water contained high densities of trout parr and high densities of trout fry where suitable habitat was available. Some sites contained mature brown trout as well as juvenile trout. Three sites on the Wanlock Water did not contain salmonids.
- 8.100 Juvenile salmon were present in the mid and lower sections of the Wanlock Water and its tributaries in good to excellent densities. The Wanlock Water is predominantly made up of habitat suitable for parr and this is apparent in the data collected. Where fry habitat is available, high densities of fry were present.
- 8.101 The Whitecleuch Burn, a tributary of the Wanlock Water, drains the north of the Development Area footprint and contained good densities of salmon fry and parr and moderate densities of trout fry and parr. The habitat in this burn was suitable for both fry and parr due to the size of substrate present.
- 8.102 A control site, upstream from any potential effects from the proposed Development Area was surveyed in the Spango Water. Salmon were present within this watercourse with excellent densities of salmon parr being of note. These high densities are due to the large quantities of cobbles and boulders found within the lower Spango Water.
- 8.103 The Crawick Water was surveyed downstream from the confluence of the Spango Water and Wanlock Water. Both salmon and trout parr were present at this survey location and are known, from previous survey work, to be present in the entire length of the Crawick Water to its confluence with the River Nith.
- 8.104 The Cog Burn contained, within the Development Area, trout at both sites surveyed and the lower site also contained salmon. Glenshalloch Burn, a tributary of the Cog Burn contained no fish species.
- 8.105 The Glendyne Burn contained excellent densities of trout fry and parr. There are two dams located on the upper Glendyne which would pose a barrier to fish passage.
- 8.106 The distribution of fish species found throughout this series of surveys typically reflected those found in this area of the River Nith catchment. Other than the dams on the Glendyne Burn, there are no significant barriers to prevent fish accessing the main watercourses that drain the Development Area.

8.107 There is evidence of high levels of lead being present in the Wanlock Water (for further details see **Chapter 7 Hydrology, Hydrogeology, Geology and Peat**)⁴.

Aquatic Invertebrates

8.108 Freshwater invertebrate samples were taken at six sites and a biotic index of the water quality (Biological Monitoring Working Party BMWP) and Average Score Per Taxon (ASPT) score assigned (**Technical Appendix 8.4**).

8.109 The BMWP scores assigned through analysis of the freshwater invertebrate communities, indicated that all of the watercourses sampled, except for the Spango Water, have a water quality classification of Moderate.

8.110 The ASPT score assigned, classified all but one site in the Lower Wanlock, as being Excellent. The ASPT score is generally considered to be a more accurate classification as it isn't influenced by the habitat or sampling technique to the degree that the BMWP methodology can be.

8.111 The number of taxa (NTAXA) found to be present is lower than anticipated when compared to other local watercourses but the majority of those taxa found to be present were high rating and would therefore indicate that there is no pollution present.

Freshwater pearl-mussel

8.112 The majority of the watercourses surveyed do not contain suitable substrate for freshwater pearl-mussel as they are composed mostly of pebbles, cobbles and boulders.

8.113 Large sections of the upper Wanlock Water consist of unstable substrate which is unsuitable for freshwater pearl-mussel.

8.114 Four sites were identified as containing limited habitat suitable for freshwater pearl-mussel. These sites were located in the lower sections of the Wanlock Water and in the lower sections of two tributaries entering the lower Wanlock Water.

8.115 Based on historic information and limited habitat it is highly unlikely that freshwater pearl mussels are present.

Reptiles

8.116 Four common lizards were sighted during the surveys.

8.117 A slow worm was observed to the west of the Study Area in July.

8.118 The Study Area offers good habitat for reptiles with numerous sunny aspects which offer good basking opportunities.

8.119 Several features with the potential to support hibernating and/or basking reptiles were recorded within the Study Area, in the form of old stone piles, stone walls and old sheep folds. The numerous stands of bracken offer good sheltering opportunities for reptiles, as well as offering suitable hibernacula for adders during the winter, therefore reptile presence within the Study Area is assumed.

Amphibians

8.120 No suitable habitat for great crested newt is present within the Development Area.

8.121 Species of amphibian recorded during the surveys included: common frog (*Rana temporaria*), along with common frog tadpoles and common toad (*Bufo bufo*).

Other species

8.122 Brown hares were sighted on six occasions during the surveys. Droppings were observed in eleven locations across the Study Area.

8.123 The mixture of young, recently burned and old heather present within the Study Area can provide optimum conditions for hares. It is likely that hares will utilise the majority of the moorland present within the Study Area, as well as the farmland to the west.

8.124 There is limited suitable habitat within the Study Area for hedgehogs, given the restricted extent of woodland edge habitats and hedges.

8.125 Several incidental sightings of invertebrate species were recorded within the Study Area, including: orange-tip butterfly (*Anthocharis cardamines*), green-veined white (*Pieris napi*), two-banded longhorn beetle (*Rhagium bifasciatum*) or beetles (*Geotrupes stercorarius*) and ringlet butterflies (*Aphantopus hyperantus*).

8.126 Other species recorded include red fox (*Vulpes vulpes*), field vole (*Microtus agrestis*) and European rabbit (*Oryctolagus cuniculus*).

Ecological Features Scoped Out of this Assessment

8.127 With consideration of the baseline data collected, and following the design mitigation and those measures described in the 'Design Considerations' section below, several ecological features can be scoped out of further assessment based on their nature conservation value, 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 following surveys.

Designated Sites

8.128 Back Wood SSSI and Coshogle Wood SSSI are at distance from the Development Area (961m and 4,300m respectively) that make any direct and indirect effects on the designated features present at the sites unlikely. North Lowther Uplands SSSI to the north of the Development Area is designated for upland habitat features. This site is to a large part separated from the Development Area by the Crawick Water and considered to be hydrological disconnected from the Development (**Chapter 7 Hydrology, Hydrogeology, Geology and Soils**). With habitat features within a different catchment area from the Development Area, North Lowther Upland SSSI has been scoped out of the assessment.

8.129 The Upper Nithdale Woods SAC and the Mennock Water SSSI lie within the Development Area. The nearest infrastructure is at a distance of 2,100m therefore there is no connectivity to these designated sites.

Habitats

8.130 The following habitats are identified as being of local importance at the Development Area, some due to their listing as Annex I habitats, however they would not be directly impacted by any windfarm infrastructure (**Figures 8.2 and 8.4**), occupy such small areas within the Development Area, and any direct or indirect effects on the habitat would be so minor that effects on them are scoped out of the assessment: wet dwarf shrub heath; flushes; springs; calcareous grassland; swamp; and broadleaved semi-natural woodland (see also **Table 8-10** below).

8.131 Marsh/marshy grassland has also been scoped out of the assessment. This habitat type is very common within the survey area, and is the third most extensive habitat type (see **Table 8-8**). The marshy grassland within the survey area is virtually all rush-dominated habitat types; i.e. NVC types M23 and MG10 and non-NVC types JA and JE, as per **Table 8-7**. These types of habitat are very common within the region, and Scotland. Additionally, being so heavily dominated by rush species, they are generally species-poor and of low ecological value (see **Technical Appendix 8.1**). **Table 8-10** indicates that up to 2.43ha of marshy grassland may be directly lost to infrastructure, however this is only 0.84% of the marshy grassland mapped within the survey area; i.e. a negligible loss, therefore marsh/marshy grassland is scoped out.

Protected Species

8.132 A draft SPP is proposed in **Technical Appendix 8.5** which will ensure that all reasonably practicable measures are taken so that provisions of the relevant wildlife legislation are complied with in relation to these protected species, should any evidence be found.

8.133 Effects on water vole are scoped out of this assessment. No signs of water vole were found during baseline studies. Some areas of habitat were considered suitable for this species, with overall variable habitat suitability on site. One historical water vole record from 2007 was obtained (**Technical Appendix 8.2**), but there is no evidence to suggest a population remains within the Development Area.

8.134 Effects on pine marten are scoped out of this assessment. No signs of pine marten were found during baseline studies (**Technical Appendix 8.2**) and no historic records were found. Although there is some suitable pine marten habitat present, connectivity of the Study Area to surrounding suitable habitat is limited.

⁴ This is a legacy of past lead mining, the majority of which took place from the 18th Century to the mid-20th Century. Heavy metals (lead, zinc, cadmium and copper) were mined at Wanlockhead and Leadhills, east of the Development. This resulted in contamination of groundwater and the Wanlock Water valley downstream of Wanlockhead as a result of minewater discharges and runoff passing through/over mine waste material.

- 8.135 Effects on red squirrels are scoped out of the assessment. The only squirrel field signs found during surveys were a small number of predated cones and hazelnuts (**Technical Appendix 8.2**). No potential protected features (i.e. dreys) were recorded within the Study Area. Due to provision of grey squirrel records as a result of the record search as well as grey squirrels being recorded during baseline studies, it has been assumed that signs belong to grey squirrel. Furthermore the majority of the Study Area is considered unsuitable for squirrels, due to its open nature and lack of trees.
- 8.136 Effects on badger were scoped out of this assessment. Much of the Development and immediate surrounding contains suitable habitat for badger, however limited evidence of badger was recorded within the protected species study area; a potential badger sett was found within the survey area, although use was not confirmed (see **Confidential Annex to Technical Appendix 8.2**). The location of the potential sett is away from any proposed infrastructure. The nearest turbine location is proposed at a distance of 750m and the nearest other infrastructure at a distance of 240m. Given the distance of the potential sett from proposed infrastructure, limited field sign evidence, and the implementation of the SPP, it is considered that potential effects on badger from the proposed Development are negligible and are not considered further in this assessment.
- 8.137 Effects on roosting bats are scoped out of the assessment. Eleven locations with trees with moderate bat roost suitability were recorded. These are all outwith areas of felling. All trees are at a minimum distance of 763m from wind turbine locations and 71m from the nearest infrastructure. Furthermore two properties, one with low and one with moderate bat roost suitability were found during baseline surveys. Bat activity in nearby areas was assessed as low with very low numbers of high sensitivity species recorded (**Technical Appendix 8.3**). The distance of Duntercleuch House (low roost potential) from the nearest turbine location is 865m and 620m from the nearest infrastructure (access track); Clackleith buildings (moderate roost potential) are at 450m distance from the nearest proposed wind turbine location and 70m from the nearest infrastructure (access track). The desk study found a tunnel structure with records of hibernating bats present. The tunnel is 810m from infrastructure and 1124m from the nearest turbine. Given the distance of the buildings and tunnel structure with bat roost potential from proposed infrastructure, and the implementation of the SPP in regards to trees with roost potential, it is considered that potential effects on roosting bats from the proposed Development are **Negligible** and are not considered further in this assessment. However, effects on bats foraging and commuting are assessed within this chapter.
- 8.138 Common lizards and a slow worm were recorded during surveys. Common frogs, common toads and brown hares were also sighted during surveys; however, all of these are mobile species capable of avoiding disturbance (except for reptiles during hibernation) and are all scoped out. Effects on hibernating reptiles are scoped out due to good practise being implemented during the construction and operation of the Development. Effects on great-crested newt have been scoped out, due to no suitable habitat present (also see **Table 8-1** for SNH response).
- 8.139 Effects on standing water, running water and fisheries are scoped out of this assessment. Windfarm layout design considerations have determined that watercourses will be avoided by a minimum buffer of 50m from all construction activity and infrastructure except where water crossings are proposed. Pollution prevention measures will be implemented during construction and operation of the Development to seek to ensure no adverse effects occur. These Good Practice Measures are detailed in **Chapter 4**.
- 8.140 Due to very limited habitat suitability for freshwater pearl-mussel, no signs for this species found during baseline study and no historical data indicating presence of this species, effects on this species have been scoped out of this assessment.
- 8.141 The scoping out of operational effects on protected species is based on the assumption that there will be a SPP in place (**Technical Appendix 8.5**) and a lack of disturbance or other effects. This does not include operational effects on bats which are assessed in the section on Assessment of Effects.

Scoped In IEFs

- 8.142 A summary of the Nature Conservation Value of the remaining IEFs identified within the Development Area which have been 'scoped-in' to the assessment are given in **Table 8-9**, together with the justification for inclusion.

Table 8-9 Nature Conservation Value of Scoped-in IEFs

Important Ecological Feature	Nature Conservation Value	Relevant Legislation/Guidance & Justification
Wet Modified Bog and Blanket Bog	Regional	<p>The wet modified bog within the survey area is a degraded example of blanket bog habitat. Much of the wet modified bog is of the NVC type M25 (684ha or 25.1% of the entire survey area), with other areas of poor M20 blanket mire (154ha or 5.7% of the survey area (Table 8-7). M25 is generally the lowest quality bog community, being species-poor and dominated by purple moor-grass; often lacking many of the main peat forming species, such as broad-branched Sphagna. It is a community of moist, but usually well aerated, acid to neutral peats and peaty soils. Many of the areas of M25 and M20 have been subjected to historical drainage and have evidently been heavily grazed, as seen through the drying of the mire surface and the frequent transitions to and mosaics with acid grasslands (see Technical Appendix 8.1).</p> <p>Better quality blanket bog is present within the survey area to a lesser extent although this is also grazed. These areas correlate to the areas of M17 and M19 mire (and associated M2 and M3 bog pools) which collectively account for 179ha or 6.56% of the survey area (Table 8-7). These communities and their flora are fully described within Technical Appendix 8.1.</p> <p>These communities are associated with Annex I and Scottish Biodiversity List blanket bog classifications. Despite the extent of M20 and M25 wet modified bog within the survey area, its condition means it is unlikely to be considered of Annex I quality, and likely only of Local Nature Conservation Value. In isolation, the lesser extents of M17 and M19 blanket bog habitat would likely also be considered of no more than Local Nature Conservation Value. However, if wet modified bog and blanket bog are considered as a single receptor (despite their quality) within the Development Area then collectively they cover more than 1000ha of the survey area; and due to their extent, this feature has been considered as of Regional Nature Conservation Value.</p>
Dry dwarf shrub heath	Local	<p>Dry heath is common and extensive in certain areas, covering over 262ha (9.6%) of the survey area, particularly in the eastern survey area (Figure 8.2) where large tracts of <i>Calluna</i> dominated dry heath blankets the slopes and summits and is managed for grouse via rotational muir burning; these areas are also grazed by sheep. The majority of dry heath present is H12 <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> heath but there are some substantial patches of other forms of dry heath (Table 8-7). The dry heath present is predominately of the H12a sub-community type which is one of the most common dry heath communities throughout Scotland. A considerable proportion of the H12a present consists of little more than <i>Calluna</i> over a lawn of pleurocarpus mosses with a few sprigs of <i>Vaccinium myrtillus</i> (which itself can be locally absent). Other typical associates are present in very variable abundances (see Technical Appendix 8.1). Locally, burning of the heath has created an intricate patchwork of H12 in different stages of recovery and development.</p> <p>Despite dry heath being listed as an Annex I habitat in the Habitats Directive and as part of the Scottish Biodiversity List 'Upland Heathland' Priority Habitat, the habitat within the survey area is considered to be of Local Nature Conservation Value due to its extent and quality. This type of habitat is widespread throughout the local area and region.</p>
Otter	Local	<p>Otter receive protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).</p> <p>Several potential otter resting sites were found within the Study Area. Field signs indicate frequent and recent use of several watercourses by otter throughout the Study Area. Although watercourses as the main otter habitat have been scoped out (see previous section), otters are highly mobile animals and can potentially use areas away from watercourses. Given that the Development Area offers connectivity and it is known from baseline studies that otter are present, the Development Area is considered to be of local value to this species.</p>
Bat species	Local	<p>All bats species are protected under the following legislation:</p> <p>The Habitats Directive 92/43/EEC and respective domestic legislation;</p> <p>The Wildlife and Countryside Act 1981 (as amended); and</p> <p>The Nature Conservation (Scotland) Act 2004 (as amended).</p> <p>Activity of at least five bat species was confirmed in the study area: common</p>

Important Ecological Feature	Nature Conservation Value	Relevant Legislation/Guidance & Justification
		<p>pipistrelle, soprano pipistrelle, <i>Myotis spp.</i> (incl. <i>M. daubentonii</i>), <i>Nathusius' pipistrelle</i> and <i>Nyctalus sp.</i>. These species are considered to appreciably enrich the ecological resource within the local context.</p> <p>No effects on roosting bats are likely.</p> <p>The Nature Conservation Value of bats across the Study Area is assessed to be Local.</p>

The 'Do Nothing' Scenario

- 8.143 In the absence of the Development, it is likely that the ecological features will generally remain as they are at present, although numbers and distribution may fluctuate depending on the location and timing of management (e.g. forestry, muirburn) at specific locations within the Development Area.

NLEI Design Considerations

- 8.144 The Development has undergone design iterations and evolution in response to the constraints identified as part of the baseline studies and field studies. This has included habitat constraints and associated GWDTE constraints. Specific measures to protect and reduce collision risk to bats have also been implemented as detailed below.
- 8.145 Some turbines will be positioned within commercial coniferous plantation. This will involve felling of parts of the forestry to accommodate infrastructure (see **Figure 4.12** and Technical **Appendix 4.2** for felling proposals). Potential operational effects on bats and bat constraints were considered within the design evolution and layout of the Development. Bats were considered at this stage by ensuring the maintenance of a stand-off distance between the turbines and all newly created woodland edges in the Development Area, in line with Natural England guidance^{xviii}.
- 8.146 The recommended stand-off distance between the feature and the centre of the turbine, needed to maintain a minimum 50m buffer from blade tip to feature top height, has been calculated using the following equation:
- $$b = \sqrt{(50+bl)^2 - (hh-fh)^2}$$
- Where bl = blade length; hh = hub height; and fh = feature height.
- 8.147 Feature height is assumed to be a maximum of 15m as a worst-case scenario for the woodland edge trees within the Development Area, and using the candidate turbine dimensions of a 60m blade length and 90m hub height, this results in a stand-off distance of 80m as follows:
- $$b = \sqrt{(50+60)^2 - (90-15)^2} = 80.47m$$
- 8.148 The distance from turbine locations to the woodland edges created by felling would all be at least of this minimum stand-off buffer distance this distance would be maintained during the operational phase.
- 8.149 No trees that were assessed to have bat roost potential are situated within the proposed felling areas. A SPP will detail measures for the protection of bat species during felling.
- 8.150 The details of in-built mitigation included in the design, design evolution, pollution prevention and standard practice construction environmental management to be implemented are provided within **Chapter 4** and **Chapter 3** and are not repeated here.

Micrositing

- 8.151 It should be noted that the layout of the turbines, and hence tracks and cables, would be subject to 50m micrositing. The assessment of effects presented within this chapter has been based upon the layout defined in **Chapter 4: Scheme Description**. Any micrositing changes would respect the exclusion

zones defined within this chapter such that no infrastructure would be moved to the extent that effects would be any greater than those reported in this chapter.

Assessment of Effects

- 8.152 This section provides an assessment of the effects of the Development on IEFs identified through baseline studies (see **Table 8-9**). The assessment of effects is based on the project description as outlined in **Chapter 4: Scheme Description**. Unless otherwise stated, potential effects identified are considered to be negative. The assessment is structured as follows:
- Construction effects;
 - Operational effects; and
 - Cumulative effects.
- 8.153 The assessment below also makes the following assumptions:
- All electrical cabling between the proposed turbines and the associated infrastructure will be underground in shallow trenches which will be reinstated post-construction and, in most cases, follow the proposed access tracks.
 - Any disturbance areas around permanent infrastructure during construction will be temporary and reinstated or restored before the construction period ends. The only excavation in these areas will be for cabling as noted above and otherwise may only be periodically used for side-casting of spoil until reinstatement.
 - To ensure all reasonable precautions are taken to avoid negative effects on habitats, protected species and aquatic interests, NLEI Ltd will appoint a suitably qualified Ecological Clerk of Works (ECoW) prior to the commencement of construction and they will advise NLEI Ltd and the Principal Contractor on all ecological matters. The ECoW will be required to be present onsite during the construction period and will carry out monitoring of works and briefings with regards to any ecological sensitivities to the relevant staff within the Principal Contractor and subcontractors.
 - An SPP (**Technical Appendix 8.5**) will be implemented during construction. The SPP details measures to safeguard protected species known to be in the area. The SPP includes pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new protected species in the vicinity of the construction works.

Construction Effects

- 8.154 This section provides an assessment of the likely effects of the construction of the Development upon the scoped-in IEFs.
- 8.155 Effects may include direct loss of habitat, e.g. derived from land-take, and indirect changes caused by pollution or effects to supporting systems such as groundwater. Direct effects on protected species may include: loss of key habitat; disturbance of key habitats; displacement from key habitat; barrier effects preventing movement to/from key habitats; and general disturbance. Indirect effects on protected species may include loss or change to food resources; and degradation or alteration of key habitats, e.g. because of pollution or hydrological disturbance. Disturbance caused by construction activities may also pose a risk.

Predicted Construction Effects

- 8.156 The most obvious effect during the construction stage of the proposed Development will be direct habitat loss due to the construction of new access tracks, turbines, hardstandings, laydown areas, compounds and the substation. There may also be some indirect habitat loss due to drainage effects, and changes to the hydrological regime may also occur. **Table 8-10** below details the actual losses predicted to occur, by habitat type, for all new infrastructure.

Table 8-10 Estimated Loss of Habitat

NVC Community or Habitat Type	Phase 1 Habitat Type	Total Extent in Survey Area (ha)	Habitat Loss per NVC (ha)	Habitat Loss per Phase 1 (ha)	Habitat Loss as a % of Extent in Survey Area

NVC Community or Habitat Type	Phase 1 Habitat Type	Total Extent in Survey Area (ha)	Habitat Loss per NVC (ha)	Habitat Loss per Phase 1 (ha)	Habitat Loss as a % of Extent in Survey Area
H10	D1.1 - Dry dwarf shrub heath	262.35	0	2.11	0.81
H12, H12a, H12c			1.95		
H16			0		
H18, H18b			0.16		
H21			0.0002		
MB			0		
M15, M15a, M15b, M15d	D2 - Wet dwarf shrub heath	21.11	0.19	0.19	0.91
M2	E1.6.1 - Blanket bog	178.94	0.0003	6.16	3.44
M3			0.0004		
M17, M17c			1.83		
M19, M19a, M19b			4.32		
M20, M20a, M20b	E1.7 - Wet modified bog	838.89	4.09	15.94	1.90
M25, M25a, M25b			11.85		
M23, M23a, M23b	B5 - Marsh/marshy grassland	288.06	1.37	2.43	0.84
M27			0.03		
MG10, MG10a			0.67		
JA			0		
JE			0.36		
M4	E2.1 - Flush/spring - acid/neutral	11.75	0	0.19	1.66
M6, M6b, M6c, M6d			0.19		
U2, U2b	B1 - Acid grasslands	574.02	0.19	8.47	1.48
U4, U4a, U4b, U4d, U4e			5.88		
U5, U5a			1.48		
U6, U6a, U6d			0.87		
Hm			0		
CN			0.05		
U20			C1.1 - Bracken - continuous		
MG1, MG1c	B2 - Neutral grasslands	37.47	0	0.26	0.68
MG6			0.26		
MG7			0		
MG9			0.00001		
W6	A1.1.1 Broadleaved woodland - semi-natural	5.19	0	0.02	0.47
W7			0		
W9			0.01		
W10, W10e			0.00		
W11, W11a			0.02		
W17			0		
W24			0		
OV25	C3.1 - Tall herb and fern - tall-ruderal	2.36	0.0002	0.11	4.86
OV27			0.11		

NVC Community or Habitat Type	Phase 1 Habitat Type	Total Extent in Survey Area (ha)	Habitat Loss per NVC (ha)	Habitat Loss per Phase 1 (ha)	Habitat Loss as a % of Extent in Survey Area
CP	A1.2.2 - Coniferous plantation	274.22	4.30	5.98	2.18
YCP			1.67		
CF	A4.2 - Recently-felled woodland - coniferous	80.45	2.77	2.77	3.44
BG	J4 - Bare ground	19.70	6.27	6.27	31.83
Total			51.88 ha		

8.157 The following sections assess the effect of these losses for each IEF scoped-in.

Wet Modified Bog & Blanket Bog

8.158 Wet modified bog and blanket bog within the Development Area extensively covers and blankets many of the upland peaty plateaus and adjoining gentle slopes (**Figure 8.2**). Wet modified bog, highlighted by the presence of M25 and M20 NVC communities in the survey area, has been degraded by a legacy of drainage and historical and continuing upland sheep grazing. Many areas of wet modified bog are species-poor *Molinia* grasslands with a drying mire surface in transition to acid grassland (see **Technical Appendix 8.1**). M25 and M20 wet modified bog cover 839ha (30.78%) of the survey area.

8.159 Better quality blanket bog is present, but much less extensive, in the form of NVC types M17 and M19 blanket mire. These areas are also grazed but contain more peat forming species, such as Sphagna. M17 and M19 blanket bogs cover 179ha (6.56%) of the survey area.

8.160 Collectively, wet modified bog and blanket bog therefore accounts for 1,018ha (37.34%) of the survey area.

8.161 Effects upon wet modified and blanket bog habitats during construction will be direct (through habitat loss) and indirect (through potential drying effects upon neighbouring bog habitats). Direct loss will occur in areas where access tracks pass through this habitat type, or where infrastructure such as turbine foundations, hardstandings, compounds etc. are sited on these habitat types.

8.162 As per above, the total amount of direct habitat loss is predicted to be 15.94ha of wet modified bog and 6.16ha of blanket bog; a total of 22.1ha. This represents a loss of 1.9% of the overall extent of wet modified bog and 3.44% of blanket bog within the survey area (mainly due to losses of M25). This represents a small loss of the respective habitat types within the survey area; these losses are negligible when considered at the regional scale (see below).

8.163 In addition, there may be indirect losses given the zone of drainage⁵ around infrastructure. However, given an existing grazed and drying mire surface and with the adoption of best practice construction methods to maintain local hydrological pathways, it is expected that additional losses due to indirect drainage will be negligible.

8.164 The UK has an estimated 2,210,000ha of blanket bog, of which 1,759,000ha is in Scotland and 50,000ha in Dumfries & Galloway^{xix} (i.e. the council area in which the Development lies). When considering the above habitat losses of 22.1ha of wet modified bog and blanket bog (equivalent to 0.04% of blanket bog in Dumfries & Galloway), and accounting for the relative abundance of the habitat within the survey area as well as the wider area, an effect magnitude of **Negligible** spatial and **Long Term** temporal is appropriate.

8.165 The wet modified bog and blanket bog habitat within the Development Area has a Nature Conservation Value of Regional. The effect significance is therefore considered to be **Negligible** and **Not Significant** in the context of the EIA Regulations.

Dry Dwarf Shrub Heath

8.166 Dry heath is common and extensive in certain parts of the Development Area, covering over 262ha (9.6%) of the survey area, particularly in the east (**Figure 8.2**) where large tracts of *Calluna* dominated dry heath blankets the more freely draining steep slopes and summits and is managed for grouse via rotational muir burning; these areas are also grazed by sheep. The majority of dry heath present is NVC

⁵ The average extent of the zone of drainage around drainage features is expected at 10m, based on the SEPA Carbon Calculator Web Tool user guidance: http://informatics.sepa.org.uk/CarbonCalculator/assets/Carbon_calculator_User_Guidance.pdf

type H12, predominately of the H12a *Calluna* sub-community, but there are some substantial patches of other forms of dry heath (**Table 8-7**). H12a is one of the most common dry heath communities throughout Scotland. A considerable proportion of the H12a present consists of little more than *Calluna* over a lawn of pleurocarpous mosses with a few sprigs of *Vaccinium myrtillus* (which itself can be locally absent). Locally, burning of the heath has created an intricate patchwork of H12 in different stages of recovery and development.

- 8.167 Effects upon dry heath habitats during construction will be direct (through habitat loss). Direct loss will occur in areas where access tracks pass through this habitat type, or where infrastructure such as turbine foundations, hardstandings, compounds etc. are sited on this habitat type.
- 8.168 The total amount of direct habitat loss for dry heath is small and predicted to be up to 2.11ha, or 0.81% of the extent of dry heath existing within the survey area.
- 8.169 When considering the above, and the abundance of dry heath within the survey area and regionally, an effect magnitude of **Negligible** spatial and **Long Term** temporal is appropriate.
- 8.170 The dry dwarf shrub heath within the Development Area has a Nature Conservation Value of Local. The effect significance is therefore considered to be **Negligible** and **Not Significant** in the context of the EIA Regulations.

Otter

- 8.171 Otter presence has been confirmed within the Development Area. Evidence of otter was recorded in the form of spraints at 25 locations across the study area and footprints.
- 8.172 Otter has a preference for aquatic edge habitats. The majority of the spraints were recorded along the larger watercourses within the Study Area, such as the Wanlock Water and the Cog Burn. Several of the watercourses offer good opportunities for foraging otter with prey species such as aquatic invertebrates, fish and amphibians confirmed within the Development Area. Bankside tree cover can positively affect where otters hunt, by increasing the amount of invertebrate prey available for fish populations (Strachan *et al.*, 2004)^{xx}.
- 8.173 Bankside tree cover can also provide sheltering opportunities for any otters using the watercourses. Many of the smaller watercourses within the Study Area are located on steep slopes on open ground, with little in the way of bankside cover. There was little evidence of otter utilisation along these steep watercourses, and given that bankside cover is limited, it is unlikely that these smaller watercourses are used often by the species.
- 8.174 Potential otter resting up sites were found during surveys, including one potential resting site underneath a bridge in the north of the Development Area, proposed for the access track route. The area is likely to offer a good temporary resting up area due to the concealment from the nearby road. All other potential resting sites were at a distance of at least 200m to infrastructure and included gaps under rocks that otters could use for resting up, although as many were shallow (the back of the cavity was visible), it is unlikely that these areas will be used for anything other than a temporary resting place.
- 8.175 Otter is a species capable of exploiting a range of habitats (Strachan *et al.*, 2004)^{xx}. The home ranges of otters vary between males and females, with records indicating mean length used by males as 38.8 ± 23.4km and 18.7 ± 3.5km by females (Kruuk, 2006)^{xxi}. Within this home range, there is likely to be a core area where an otter spends at least 50% of its time (Kruuk, 2006)^{xxi}. It is possible that the watercourses present within the Study Area are part of an otter's home range, given the presence of spraints, and it is possible that they use the larger Crawick Water more frequently.
- 8.176 During the construction phase there is potential for effects caused by habitat loss and pollution near water crossings and resulting disturbance and reduction of water quality and therefore prey availability. The loss of habitat to the Development may marginally reduce the foraging opportunities within the Development Area. Direct disturbance may occur at the bridge in the north of the Development Area and is otherwise limited to areas within higher elevation and less used sections of otter habitat.
- 8.177 The potential magnitude of effect upon otter of construction disturbance, direct habitat loss and prey abundance reduction is considered to be **Low** and **Short Term**, resulting in a **Minor** adverse and **Not Significant** effect in the context of the EIA Regulations.

Bat Species

- 8.178 The Development Site consists of habitat that is of low suitability for bats. The loss of habitat to the proposed Development marginally reduces the foraging opportunities within the Development Site;

however, given the proposed replanting areas detailed in the proposed Forestry Plan (**Appendix 4.2**), loss of foraging is expected to be minimal. Due to the creation of new open habitat due to proposed felling within the turbine area and the abundance of the open habitat types present, foraging and commuting habitat loss is considered to be minimal.

- 8.179 Bat activity was considered low across the Study Area, most activity is attributed to medium risk species, predominately pipistrelle species (**Appendix 8.3**) and concentrated during the month of August. The highest concentration of bat activity was at static bat detector location 7 (20.14bpph). This area is situated to the east of the turbine area at over 1000m distance to the nearest turbine. It is adjacent to a watercourse and at a lower altitude. Activity recorded all other locations was low.
- 8.180 Although some foraging and commuting behaviour may be altered as a result of construction and forestry restructuring, this is likely to be of **Low** special magnitude and **Short Term** temporal magnitude.
- 8.181 All species of bats that were found to occur within the Development Area are considered to be of local nature conservation importance. The effect during construction is therefore considered to be **Minor Adverse** and **Not Significant**.

Proposed Mitigation

- 8.182 No further mitigation is required in addition to the assumed and in-built mitigation described elsewhere in this Chapter (e.g. mitigation by design, implementation of a SPP, presence of an ECOW etc.) and standard environmental practices to be employed (as per **Chapter 4: Scheme Description**), as there are no predicted unmitigated significant effects as a result of the construction of the Development. The OCMP (**Appendix 8.6**) will include benefits to bog and heath habitats.

Residual Construction Effects

- 8.183 No significant adverse effects arising from habitat loss, disturbance or displacement are predicted during construction of the Development and no further specific mitigation is required. Therefore, there are also no significant adverse residual effects predicted in association with the construction of the Development.

Operational Effects

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

Predicted Operational Effects Habitats

- 8.185 All likely direct and indirect effects on bog and heath habitats have been considered in the construction effects section above.

Otter

- 8.186 All likely direct and indirect effects on otter have been considered in the Construction Effects section above.

Bats

- 8.187 During the operational phase, rotating turbines present a risk to flying bats as a result of potential collision and / or barotrauma when flying in close proximity to turbines. For the purposes of this assessment, the potential effects from barotrauma are assumed to be the same as for collision. This is due to the lack of published empirical evidence in causes of bat fatalities around windfarms and the difficulties in determining whether bat fatalities are due to strikes (collisions) with the turbine blades or barotrauma.
- 8.188 Recent research work by Exeter University (DEFRA, 2016)^{xxii} found that most bat fatalities at UK windfarms were common pipistrelle bats, soprano pipistrelle bats and noctule (*Nyctalus noctula*). In addition, single carcasses of Nathusius' pipistrelle bat and Natterer's bat were recorded. The study also found that the percentage casualty rates for soprano pipistrelle, common pipistrelle and noctule bats were higher than the relative proportions of their calls recorded from ground level acoustic surveys.
- 8.189 *Nyctalus sp.* bats are assessed by Natural England guidance^{xviii} to be of high risk in terms of collision and threat to national populations. *Nyctalus sp.* was recorded at the Development Area, but in very low numbers; A low activity of 0.004bpph was recorded for *Nyctalus* species at locations 4 (at open ground east of Tongue Hill) and 7 (at Wanlock Water). Location 4 had two *Nyctalus sp.* bat passes during the

September recording session, location 7 had two passes during the August recording period and one further pass during the September recording period. This very low and infrequent *Nyctalus sp.* activity indicates the Development Area is not commonly used by this species. *Nyctalus sp.* are perhaps infrequently commuting across the Development Area (as these species can commute and forage over long distances from roost sites, sometimes up to and over 10km from roosts). According to the research work by Exeter University, acoustic recording from the ground underestimates the abundance of noctule bats within the at risk zone of the turbine rotor sweep (with an up to 21% probability of not detecting noctule bats). Therefore, the temporal surveys may have underestimated the abundance of *Nyctalus* bats. Despite being of high risk in terms of collision and a potential for bat calls being missed due to recording on ground level only, the low levels of activity recorded will indicate the collision risk of *Nyctalus sp.* to be very low. The spatial and temporal magnitudes of effects on the populations of *Nyctalus sp.* across the Development Area are therefore considered to be **Negligible special, Long-term temporal** when the low levels of activity are considered (**Technical Appendix 8.3**). Bats are considered to be of local nature conservation importance. The effect during operation on *Nyctalus sp.* is therefore considered to be **Negligible** and **Not Significant** in the context of the EIA Regulations.

- 8.190 Nathusius' pipistrelle bats are assessed by Natural England guidance to be of high risk in terms of collision and threat to national populations. According to the research work by Exeter University, acoustic recording from the ground underestimates the abundance of Nathusius' pipistrelle bats within the at risk zone of the turbine rotor sweep (with an up to 14% probability of not detecting Nathusius' pipistrelle bats). Therefore, the temporal surveys may have underestimated the abundance of Nathusius' pipistrelle bats. Only one Nathusius pipistrelle registration was recorded during spatial surveys in May with a resulting very low BAI of 0.001. This low Nathusius' pipistrelle activity indicates the Development Area is not commonly used by this species. When considering the low levels of Nathusius' pipistrelle activity across the Development Area and despite the probability of under-recording bats, the spatial and temporal effect magnitude on this species is considered to be **Negligible special, long-term temporal**. The effect significance during operation is therefore considered to be **Negligible** and **Not Significant** effect in the context of the EIA Regulations.
- 8.191 Common and soprano pipistrelle bats are assessed by guidance to be of medium risk in terms of collision although they are of low risk in terms of any threat to national populations. According to the research work by Exeter University, common and soprano pipistrelle have been identified to be of high collision risk and additionally acoustic recording from the ground underestimates the abundance of common and soprano pipistrelle bats, therefore, the temporal surveys may have underestimated the abundance of these pipistrelle bats. However, the study also found that ground level monitoring of activity for both species is a better predictor of fatality than recording at height. Furthermore the presence of woodland within a 1500m radius of windfarms has been shown to reduce the risk of collision to pipistrelle bats, as these woodlands are possibly providing a better foraging resource for bats. Therefore, the location of woodland within 1500m of the Development Area may help in reducing any potential bat fatalities caused by wind turbines. The two pipistrelle species are the most common bats within the survey area. The record provided on the hibernation site within the Development area showed one pipistrelle bat present. The overall BAI for pipistrelle as recorded within the survey area is considered low at 0.95 for common pipistrelle and 1.19 for soprano pipistrelle (**Technical Appendix 8.3**), which indicates that it is unlikely that the Development Area is used by bats commuting to the hibernation site. Although no direct correlation of bat activity levels to collision risk was found during the most recent study, collision risk was found to be generally lowest at locations with low bat activity. Given the low activity levels recorded for both species, collision risk of common and soprano pipistrelle bats is considered to be low. The spatial and temporal magnitudes of effects on the populations of these two species across the Development Area are therefore considered to be **Low spatial and Long Term temporal** when the low levels of activity are considered. Unmitigated, this will result in an overall **Minor adverse** and **Not Significant** effect in the context of the EIA Regulations.
- 8.192 *Myotis spp.* are assessed by Natural England guidance to be of low risk in terms of collision and threat to national populations. The overall BAI for these low risk species (with the majority identified as Daubenton's bats) as recorded within the survey area is considered low at 0.02 (**Technical Appendix 8.3**). The record of the hibernation tunnel structure within the Development Area listed use by a small number of *Myotis* bats. The low *Myotis* BAI recorded, as well as the lack of rise in BAI during September, indicate that the Development Area is unlikely to be used by bats migrating to the hibernation site. When considering the low activity levels of *Myotis spp.* across the survey area, the spatial and temporal effect magnitude on these species is considered to be **Negligible**. The effect significance during operation is therefore considered to be **Negligible** and **Not Significant** effect in the context of the EIA Regulations.

Proposed Mitigation

- 8.193 The OCMP (see **Appendix 8.6**) includes habitat management prescriptions for wet modified bog and blanket bog as well as for dry heath habitats, which aim at increasing biodiversity and quality of the habitats. Measures include damming of active drains and implementation of a grazing regime.
- 8.194 The area proposed for conservation management within the Conservation Management Plan will be considerably more than the 22.1ha and 2.1ha of direct habitat loss that is predicted to occur to bog and dry heath habitats respectively. The aim of the OCMP is to bring an area under positive management measures that are equivalent to 20 times the habitat loss area (excluding commercial forestry) to ensure that an overall net benefit will be delivered for these habitats over the lifetime of the Development.
- 8.195 The OCMP also includes prescriptions for planting of riparian woodland on the lower section of Glendyne Burn running up to Shiel Burn. This is likely to improve overall habitat quality for otter and in the long-term potentially provide enhanced resting site features for this species.
- 8.196 The OCMP prescription of riparian woodland planting on the lower section of Glendyne Burn running up to Shiel Burn for black grouse may be beneficial to bats, as these areas are located away from the turbine areas. In the long-term these areas may provide enhanced riparian foraging and roosting features for bats.
- 8.197 No additional mitigation required in addition to the assumed and in-built measures described elsewhere in this Chapter.

Residual Operational Effects

- 8.198 No significant adverse effects arising from habitat loss, disturbance or displacement, or collision risk are predicted during operation of the Development and no further specific mitigation is required. Therefore, there are also no significant adverse residual effects predicted in association with the operation of the Development.

Cumulative Construction Effects

Predicted Cumulative Effects during Construction

- 8.199 The primary concern regarding the assessment of cumulative effects is to identify situations where effects on habitats or species populations that may be acceptable from individual developments, are judged to be more significant combined with nearby existing or proposed projects. Several other windfarms are present within the wider area, both in planning, under construction and operational (full details are provided in **Chapter 6 Landscape and Visual Amenity**).
- 8.200 Of all protected mammal species observed, bats are most likely to be affected by additional windfarm development because of the distances travelled by some species of foraging bat and the cumulative risks to bat populations as a result of barotrauma and/or collision with wind turbines during operation. The implementation of good practise measures regarding buffer distances of turbines from forestry edges to minimise effects on commuting and foraging bats minimises likelihood of cumulative effect. With negligible to minor adverse residual effects predicted for all bats, these have been scoped out of the cumulative assessment.
- 8.201 The main projects likely to cause similar effects to those associated with the proposed Development are other operational windfarms, those under construction or those consented. Windfarm projects at scoping stage have been excluded from consideration in the cumulative assessment because they generally do not have sufficient information on potential effects to be included, as the baseline survey period is ongoing, or results have not been published. Projects that have been refused or withdrawn have also been excluded.
- 8.202 Although the turbines of Twenty Shilling Hill Windfarm lie further than 5km from the Development Area, a part of the access track infrastructure is within the 5km buffer⁶. Due to the distance of this development, as well as no significant effects predicted from this development on any of the identified IEFs, this development has been excluded from consideration in the cumulative assessment.
- 8.203 Small projects with three or fewer turbines have also been excluded from the cumulative assessment as often these projects are not subject to the same level of detail of assessment, and so there are no

⁶ A 5km study area is generally used for assessing cumulative effects of developments on ecological interest in accordance with CIEEM Guidance.

directly comparable data. Because of the small scale of such projects, effects are likely to be negligible on the IEFs assessed here.

- 8.204 The only development within 5km of the Development Area is Harryburn windfarm. This windfarm is at pre-application stage and therefore no EIA information is available regarding ecological interests (including on wet modified bog or dry dwarf shrub heath).
- 8.205 Given that, with the exception of Harryburn there are no other developments scoped into the cumulative assessment, and that no information on Bog Habitats and Dry Dwarf Shrub Heath is available, the cumulative effects on these habitats is considered to be Negligible and not significant.

Proposed Mitigation

- 8.206 No further mitigation is required in addition to the assumed and in-built measures described elsewhere in this Chapter (e.g. presence of an ECOW, implementation of an OCMP etc.) and standard environmental good practices to be employed, as there are no predicted unmitigated significant cumulative effects as a result of the proposed Development.

Residual Cumulative Effects during Construction

- 8.207 No significant adverse cumulative effects are predicted during construction of the Development and no further specific mitigation is required. Therefore, there are also no significant adverse residual cumulative effects predicted in association with the proposed Development.

Cumulative Operational Effects

Predicted Cumulative Effects during Operation

- 8.208 All likely direct and indirect effects on bog and heath habitats have been considered in the Cumulative Effects during Construction section above.

Proposed Mitigation

- 8.209 No further mitigation is required in addition to the assumed and in-built measures described elsewhere in this Chapter (e.g. presence of an ECOW, implementation of the OCMP etc.) and standard environmental good practices to be employed, as there are no predicted unmitigated significant cumulative effects as a result of the proposed Development.

Residual Cumulative Effects during Construction

- 8.210 No significant adverse cumulative effects are predicted during operation of the proposed Development and no further specific mitigation is required. Therefore, there are also no significant adverse residual cumulative effects predicted in association with the proposed Development.

Interrelationship between Effects

- 8.211 The potential effects of the Development are considered above in terms of effects on ecology as a discrete environmental topic. Indirect and secondary effects resulting from the interaction of direct effects arising both within a topic area and interrelated with other topics areas are also possible.
- 8.212 Of the other topics with potential to affect ecological receptors, those effects identified in **Chapter 7: Hydrology, Hydrogeology, Geology and Peat**, and **Chapter 9: Ornithology** are most likely to produce a measurable effect, including GWDTEs. Interrelated effects could potentially occur due to loss or reduction in quality of suitable habitats for breeding, or indirect effects on foraging due to the changes in conditions for prey species. Direct habitat loss effects have been considered in the Construction Effects section, and although indirect effects on food availability have not been considered above, these are unlikely to be significant for any IEFs.

Further Survey Requirements, Monitoring and Enhancement

- 8.213 Prior to construction, monitoring of the potential otter resting up site underneath the access track bridge will be required, e.g. in form of camera trapping (under license). This will inform the need of further license applications before works commence.

- 8.214 While it is not necessary to compensate for likely non-significant effects (in terms of EIA Regulations), NLEI Ltd proposes to develop a Conservation Management Plan (OCMP) as a good practice measure for the purposes of biodiversity enhancement. For example, The area proposed for conservation management within the CMP will be considerably more than the 22.1ha and 2.1ha of direct habitat loss that is predicted to occur to bog and dry heath habitats respectively. The aim of the OCMP is to bring an area under positive management measures that are equivalent to 20 times the habitat loss area (excluding commercial forestry) to ensure that an overall net benefit will be delivered for these habitats over the lifetime of the Development. A similar approach will be adopted with woodland planting to ensure a clear net biodiversity benefit is achieved.
- 8.215 An outline OCMP is provided in Technical **Appendix 8.6**. The OCMP will be developed into a detailed Final CMP in consultation with relevant stakeholders. Amongst the aims of the OCMP will be management prescriptions and monitoring for the benefits of local habitats, including bats and birds as well as a monitoring programme.

Summary of Significant Effects

- 8.216 This assessment has considered the potential effects on the ecological features present at the Development Area associated with the construction and operation of the proposed Development. The assessment method followed the guidance detailed by CIEEM (2016).
- 8.217 The habitat surveys indicate that the Development Area is dominated by low conservation value mire, grassland and heath communities, some of which are potential GWDTE, Annex I and SBL habitats. Areas of semi-natural woodland are scarce within the Development Area and are mainly restricted to small fragments, often within gullies or near watercourses. Woodland within the Development Area consists mostly of commercial conifer plantation.
- 8.218 Protected species surveys indicate that the Development Area may be used, at least periodically, by otter and badger. Incidental records were also made of common lizard and salmonids were recorded during fish surveys. Five species of bat were recorded during dedicated spatial and temporal bat surveys. No other protected species were recorded.
- 8.219 It was possible to scope out most species and habitats recorded in the study area from the assessment by virtue of their absence from the Development Area, 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.
- 8.220 Potential construction effects on wet modified bog and blanket bog as well as dry dwarf shrub heath were assessed. The main effect being direct habitat loss due to land take for infrastructure. Habitat losses will be small and no significant effects are predicted.
- 8.221 The potential effects on bat activity were also scoped in to the assessment. No significant construction effects, due to disturbance or displacement, are predicted for bats. No significant operational effects, due to collision risk, are predicted for bats given the low levels of activity and the in-built mitigation as part of the Development's design and the maintenance of buffer zones between turbines and edge features.
- 8.222 No cumulative effects have been identified for any of the IEFs.
- 8.223 As no significant effects are predicted upon IEFs as a result of the Development, no further specific mitigation is proposed in addition to the in-built mitigation and assumed mitigation (e.g. SPP, presence of an ECoW) to be implemented, as described above. Additionally, NLEI Ltd proposes to develop a OCMP as a good practice measure for the purposes of biodiversity enhancement of the local area.
- 8.224 On this basis, no residual significant effects on any IEFs are predicted.

ⁱ Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive).

ⁱⁱ SERAD (2001) European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements, October 2001.

ⁱⁱⁱ Hundt L (2012) Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust ISBN-13: 9781872745985

^{iv} SNHi SiteLink (2016). Available at: <https://gateway.snh.gov.uk/sitelink/>. Last Accessed: January 2017

^v CIEEM, (2016). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial Freshwater and Coastal, 2nd edition.

^{vi} Joint Nature Conservation Committee (2013) Guidelines for selection of biological SSSIs.

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