Chapter 8

Ecology & Biodiversity

SCOTTISHPOWER RENEWABLES

Table of contents

List of Figures

List of Technical Appendices

Chapter 8
Ecology & Biodiversity

8.1 Introduction

8.1.1 Chapter Objectives

1. This Chapter considers the likely significant effects on terrestrial ecology associated with the construction and operation of the proposed Development. It should be read with reference to the scheme descriptions in **Chapter 3: Site Selection & Design** and **Chapter 4: Development Description**, as well as other Chapters as referenced throughout. **Chapter 8** relates entirely to non-avian ecology. Please refer to **Chapter 9: Ornithology** for all avian baseline details and assessment.

2. The non-avian ecological studies which form the basis of this chapter were conducted by appropriately qualified and experienced ecologists.

3. The specific objectives of the Chapter are to:

- describe the ecological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

8.1.2 Supporting Documents

4. This ecology Chapter was informed by the following Figures and Technical Appendices:

- Figure 8.1: Ecological Designated Sites Within 5 km;
- Figure 8.2: Phase 1 Habitats;
- Figure 8.3: National Vegetation Classification (NVC);
- Figure 8.4: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- Figure 8.5: Protected Species Survey Results, and
- Figure 8.6: Bat Detector Locations.

- Technical Appendix 8.1: Extended Phase 1 habitat survey;
- Technical Appendix 8.2: National Vegetation Classification (NVC) study;
- Technical Appendix 8.3: Protected mammals;
- Technical Appendix 8.4: Bats;
- Technical Appendix 8.5: Fish and Fresh Water Pearl Mussel Survey;
- Technical Appendix 8.6: Bat Mitigation Plan; and
- Technical Appendix 8.7: Habitat Management Plan.

8.2 Legislation, Policy and Guidelines

5. The ecology assessment has been written with cognisance to relevant legislation, policy and guidance, notably the following:

8.2.1 Legislation

- Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and Wild Flora and Fauna (the Habitats Directive);
- The Wildlife and Countryside Act 1981 (as amended) (WCA);
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) (The Habitats Regulations);
- The Wildlife and Natural Environment (Scotland) Act 2011 (as amended) (WANE Act);
- Nature Conservation (Scotland) Act 2004 (as amended) (NCA);
- Schedule 9 of the Electricity Act 1989 (as amended by the Utilities Act 2000); and
- The Protection of Badgers Act 1992 (as amended).

8.2.2 Planning Policy

- National Planning Framework 3 (Scottish Government, 2014a);
- Scottish Planning Policy (SPP; Scottish Government, 2014b);
- South Ayrshire Local Development Plan (SAC, 2014); and
- Dumfries & Galloway Local Development Plan (D&GC, 2014).

8.2.3 Guidance

6. Planning Advice Note (PAN) 60: Planning for Natural Heritage provides guidance relevant to this assessment and the proposed Development.

7. Further key guidance documents relating to the assessment of effects of windfarms on terrestrial (non-avian) ecological receptors that have been referenced in this assessment include the following:

- The Scottish Biodiversity List (SBL; Scottish Government, 2013);
- Ayrshire Local Biodiversity Action Plan (Ayrshire LBAP) (SAC, 2008);
- Dumfries and Galloway Local Biodiversity Action Plan (D&G LBAP) (Dumfries & Galloway Biodiversity Partnership, 2009);
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018);
- Good Practice during Wind Farm Construction 4th Edition (SNH, 2019a);
- Planning for development: What to consider and include in Habitat Management Plans (SNH, 2016); and
- Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (SEPA, 2017).

8. Where appropriate, more detail relating to specific legislation, guidance or policy is provided in the corresponding Technical Appendix for each specialist input supporting this chapter (i.e. **Technical Appendices 8.1 to 8.5**).

8.3 Consultation

9. In spring of 2019 a Scoping Report was submitted to the Scottish Government's Energy Consents Unit (ECU) to accompany a request for the Scottish Ministers to adopt a Scoping Opinion under Regulation 15 of the EIA Regulations 2017.

10. In undertaking the ecological baseline and impact assessments, consideration has been given to ecological-specific consultee responses to the Scoping request from the relevant organisations. **Table 8.3.1** details those consultation responses that have been provided along with consultation undertaken post Scoping and outlines how these have been addressed.

Table 8.3.1 Consultation responses

Consultee	Date	Issue raised	Applicant action
South Ayrshire Council (SAC)	02/05/2019	No comments relating to non-avian ecological interests received. See	N/A

Consultee	Date	Issue raised	Applicant action
		Chapter 9: Ornithology for opinion relating to avian interests	
Dumfries and Galloway Council (D&GC)	13/05/2019	No ecological comment	N/A
Scottish Natural Heritage (SNH)	11/04/2019	Terrestrial Ecology: Confirmed broadly content with the proposed assessment methodology for ecology. Confirmed that the Galloway Moors Site of Special Scientific Interest (SSSI), Merrick Kells SSSI and Special Area of Conservation (SAC) and Bogton Loch SSSI can be scoped out of the EIA. A number of protected species may be present; species surveys should been completed no more than 18 months prior to submission of the application. Applicant to be familiar with the details of species and associated legislation; any licensing issues are to be fully established as part of the planning application. Full details of survey methodologies, areas surveyed and details of any limitations to survey efforts to be included within the EIA Report. Where survey methods or other work deviates from published guidance, deviations should be agreed in writing with SNH in advance of carrying out survey work. If survey work indicates that otters could be affected by the proposed Development, an otter protection plan should be prepared and put in place. If mitigation measures are not sufficient, a licence will be required before work starts. If any suitable bat roosting sites are identified then further survey work to identify presence or absence, species, numbers, roost function and flightlines should be undertaken prior to the submission and determination of any planning application for this proposal. With regards to the ground-level static surveys proposed for bats, provided SNH can get assurances from ITP	Species surveys have been completed no more than 18 months prior to submission. The EIA Report details information in relation to bat roosting sites, see **Section 8.5.2.2.6.1** and **8.7.1.2.** Following the pre-survey consultation completed with SNH, all static bat detectors used for survey were full-spectrum units. In addition, each deployment was made for a total of 30 days per season which is three times the duration of recommended SNH guidance deployment period (i.e. 10 days per season, SNH 2019b). The met mast was installed before the bat survey programme was arranged, so there was no availability for monitoring at height. However, the longer deployment period for ground-based static detectors is considered sufficient in terms of capturing calls from bats passing at height. A bat protection plan is not required to be put in place, as roosts found are not within the turbine envelope. Designated sites and great crested newt have been scoped out of the EIA assessment with justification provided. Where appropriate, otter, water vole, badger, red squirrel and pine marten protection plans will be put in place. If necessary, licensing will be obtained from SNH. All areas directly or indirectly affected by the development and appropriate buffers up and downstream have been subject to a habitat survey following the Scottish Fisheries Coordination Centre Method (see **Technical Appendix 8.5** and summarised in **Section 8.5 Baseline Conditions**, below). Habitat surveys have informed the likelihood of the presence of
		Energised/SPR that at least 50% of detectors to be used will be full-spectrum detectors e.g. SM2s or SM4s, then using a 50:50 combination of zero-crossing vs. full spectrum detectors would be acceptable. SNH further advise that the different detector types should be distributed randomly throughout the site during survey work. In relation to *Nyctalus* spp, if there are any met masts available on site, recommended that these should be used for at-height monitoring, where available. A bat protection plan should be put in place if any roosts are found. Great Crested Newt surveys can be scoped out of the EIA; the EIA Report should explain the rationale behind this. Water vole, badger, red squirrel and pine marten protection plans should be put in place if any habitats or affected populations are found. A licence will be required from SNH in the event that identified mitigation measures are deemed insufficient. At a minimum, all areas directly or indirectly affected by the development and appropriate buffers up and downstream should be subject to a habitat survey following the Scottish Fisheries Coordination Centre Method. This will inform the likelihood of the presence of salmonids, eels, freshwater pearl mussel and other protected/BAP species and the potential requirement for other species-specific surveys. If deer are present or use the site, an assessment into potential impacts on deer welfare, habitats, neighbouring and other interests should be carried out and presented. If the development will have significant impacts, a draft deer management plan should be produced setting out mitigation measures. The EIA Report to include a map of the phase 1 and NVC survey results with	protected/BAP species and the potential requirement for other species-specific surveys (see **Section 8.5 Baseline Conditions**). No requirement for an assessment into the potential impacts on deer associated with the proposed Development has been identified. The EIA Report includes information on Phase 1 and NVC (see **Section 5.1 Baseline Conditions** and **Figures 8.2** & **8.3**).

Consultee	Date	Issue raised	Applicant action
		the site boundary, turbines, tracks and infrastructure layout overlapping. SNH to continue engagement with Forestry and Land Scotland, regarding requirements for compensatory planting, in line with Scottish Government woodland removal policy.	
Scottish Environment Protection Agency (SEPA)	17/04/2019	Site-specific comments relating to terrestrial ecology: The EIA to map and assess impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers. With areas of the proposed site within an established Sitka Spruce plantation, the use of 'forestry wastes' will only be supported by SEPA when these uses are considered to be beneficial for habitat creation.	Potential GWDTEs are identified (see **Section 8.5 Baseline Conditions** and **Figure 8.4**) and assessed (see **Section 8.6 Assessment of Potential Effects**) Forestry issues, including forestry wastes are addressed in **Chapter 14: Other Issues.**
Cree Valley Community Council	08/04/2019	Did not agree with the proposed survey approach and stated that effects on the salmon population in the High Cree must be considered, as well as all fish species.	Fish surveys have been undertaken: see **Section 8.5.3.2.8 Fisheries**, below, and **Technical Appendix 8.5**
Marine Scotland	27/03/2019	Suggested that the Galloway Fisheries Trust and the Cree District Salmon Fishery Board are consulted.	The Galloway Fisheries Trust was consulted (see comments below, **Section 8.5.2.2.8 Fisheries** and **Technical Appendix 8.5**). The Cree District Salmon Fishery Board was also consulted, but no response has been received.
Royal Society for the Protection of Birds (RSPB) Scotland	30/04/2019	Recommended that a Habitat Management Plan (HMP) is developed and that it should aim to deliver net biodiversity gain as part of the project. Confirmed that it is acceptable to scope out potential impacts upon the Glen App and Galloway Moors Special Protected Area (SPA) and SSSI, the Bogton Loch SSSI and Merrick Kells SSSI.	A HMP is included as **Technical Appendix 8.7)**, presenting opportunities for net biodiversity gains.
Galloway Fisheries Trust (GFT)	24/04/2019	The proposed Development could impact upon a number of watercourses within the Cree catchment and the site access route will cross a number of significant Cree tributaries.	The potential impacts of the proposed Development upon the watercourses within the Cree catchment are assessed. Mitigation measures to limit the disruption of peat are detailed in **Sections 8.6.1 Assumptions**, **8.6.3.1 Habitats** and **8.6.3.2 Species**. An up to date wild fish baseline has been established: see **Technical Appendix 8.5**. Consideration of potential impacts upon wild fish populations associated with the Proposed Development is presented in **Section 8.6**. A survey for Freshwater Pearl Mussel was also undertaken by GFT. See **Technical Appendix 8.5**.
		There is an existing acidification problem associated with extensive conifer afforestation and the drainage of deep peat within the upper Cree Catchment. The subsequent acidification has impacted on wild fish populations. Large scale conifer felling and the disruption of peat soils would be expected to further deteriorate water quality and increase acidification. Monitoring for changes in pH will require careful design, as pH levels will fluctuate depending on factors such as river flows and seasonality. GFT advised that spot sampling may not be adequate and constant water quality monitoring equipment would be required. Requested the opportunity to comment on any water quality monitoring plan, based on extensive experience in monitoring acidification throughout Galloway. Strongly disagreed with the Scoping Report conclusion that no fish surveys are required. At least eight significant watercourses could experience impacts associated with the proposed Development and it is essential that an up-to-date baseline wild fish survey is carried out for the scoping. The risk of impacts upon fish populations from reduced water quality and construction of crossing points will require a detailed baseline fish survey. Noted that some salmon stocking takes place in the Fardin and Clauchrie Burn further downstream from the development site. GFT have offered to provide comments on proposed baseline fish survey methodology and survey site locations. Highlighted the presence of the remains of a freshwater pearl mussel shell from previous survey work. Furthermore, pearl mussel surveys may be required in relation to instream	

Consultee	Date	Issue raised	Applicant action
		works (i.e. culvert placing) in watercourses which are large enough and a suitable habitat to support freshwater pearl mussels.	
Ayrshire Rivers Trust/ Ayrshire Fisheries Trust/ River Stinchar District Salmon Fisheries Board	03/05/2019	An environmental baseline for freshwater fish and macroinvertebrate populations should be provided. Monitoring during and after construction should be undertaken as part of design and mitigation. Monitoring locations within Ayrshire relate to turbines T1, T4, T7 and T2, with all remaining turbine locations falling on the watershed within Dumfries and Galloway. The Muck Water is important for juvenile salmonids and nursery habitats. It is important to ensure protection of the surrounding water courses from pollution incidents during the installation of the proposed Development. Depending upon the severity of a pollution event, there could be potential knock-on effects to substrates and habitats further down the catchment. Fine sediments and silt can result in adverse impacts upon the ecology of rivers. Fish, in particular, are vulnerable as silts and sediments can damage gills and increase rates of infection. Sediments can also reduce the amount of available habitats for refuge and spawning. European eels (*Anguilla Anguilla*) are present within the Muck Water and are registered as critically endangered on the IUCN Red List. Disagreed with the proposed approach to not include assessment of water suitability or fish populations. Impacts associated with the proposed Development will be unknown, if effects to the watercourse and fish populations are not monitored.	Baseline information for freshwater fish and Freshwater Pearl Mussel is provided (see **Technical Appendix 8.5**). SPR will consider the requirement for future monitoring. Potential impacts on surrounding watercourses are assessed in the EIA **Chapter 7: Hydrology, Hydrogeology, Geology and Soils.** Mitigation measures to prevent excess silt entering surrounding watercourses will be put in place during construction (**Sections 8.6.1**, **8.6.3.1** and **8.6.3.2**). The presence of European eels is noted. An assessment of fish populations has been carried out: see **Technical Appendix 8.5.**

Consultee	Date	Issue raised	Applicant action
		Agreed with the proposed ecological surveys for water vole, badger and otter surveys.	
Scottish Forestry	10/05/2019	Any permanent woodland removal must be quantified and proposals for woodland creation to compensate for this woodland loss should be provided to allow compliance with the Scottish Government's Control of Woodland Removal Policy. Felling operations and compensatory planting (if relevant) must be carried out in accordance to good forestry practice as defined in the UK Forestry Standard (UKFS). Recommend ongoing consultation throughout the EIA.	Information on effects on forestry are included in the **Chapter 14: Other Issues**). Consideration will be given to the Control of Woodland Removal Policy requirements. A Windfarm Forest Plan has been developed. FLS have been consulted about the plan and provided input, including a dataset on species observation made by FLS staff over the years. The plan is enclosed as **Technical Appendix 14.4**).
The Galloway and Southern Ayrshire Biosphere	Post-scoping meeting October 2019	Noted the location of the proposed Development within the western buffer area of the Biosphere. Concerns raised regarding the potential for impact on the values of the Biosphere including the 'Sense of Place' and landscape value particularly in relation to the Merrick Wild Land Area.	The Galloway and Southern Ayrshire Biosphere has been considered within the baseline and the EcIA.

8.4 Assessment Methodology and Significance Criteria

8.4.1 Ecological Desk Study

11. A desk study was undertaken as part of **Technical Appendix 8.1** to identify the presence of statutory and non-statutory nature conservation sites, ancient woodland and legally protected or otherwise notable species (i.e. those species of conservation concern, either nationally or within the South Ayrshire or Dumfries & Galloway Local Biodiversity Plans [LBAPs]) ranging to 2 km of the Site. The search distance was increased depending upon the specific ecological feature (i.e. up to 10 km in the case of bat roosts).

8.4.2 Field Studies

12. The area within which the field surveys were undertaken varies depending on the feature. Details of the extent of each study area are further described and presented in the corresponding Technical Appendices and associated figures. The following survey buffers around the application boundary were applied for the ecological studies:

- Phase 1 habitat survey: 50 m;
- NVC survey: 100 m beyond the application boundary (to ensure a minimum of 250 m around deep excavation locations to account for potential GWDTE presence); and
- Protected species: 250 m

8.4.3 Evaluation Methods for Ecological Features

13. **Table 8.4.2** below lists the criteria used to determine the value of ecological features in a geographical context.

Table 8.4.1 Geographical evaluation criteria

Value	Criteria	Examples
International	Nature conservation resource, i.e. designated nature conservation area, habitat or populations of species, of international importance. N.B. For designations, such as a Special Area of Conservation (SAC), this may also include off-site features on which the qualifying population(s) or habitat(s) are considered to depend, based on the best available evidence.	International nature conservation areas: Any SPA or SAC; Any candidate SAC (cSAC). Significant numbers of a designated population outside the designated area. A site supporting more than 1% of the EU population of a species
National (i.e. Scotland)	Nature conservation resource, i.e. designated nature conservation area, habitat or populations of species, of national importance. N.B. For designations, such as a Site of Special Scientific Interest (SSSI) or a National Nature Reserve (NNR), this may also include off-site features on which the qualifying population(s) or habitat(s) are considered to depend, based on the best available evidence.	National nature conservation areas: Any SSSI or NNR designated for biological feature(s). A site supporting more than 1% of the UK population of a species. Nationally important population/assemblage of a European Protected Species (EPS) or species listed on Schedule 1 and/or Schedule 5 of the WCA.
Council area (South Ayrshire/Dumfries & Galloway)	Nature conservation resource, i.e. nature conservation designation, habitat or species, of importance on a county scale.	Statutory and non-statutory nature conservation designations: Any Local Nature Reserve (LNR); Any Scottish Wildlife Trust (SWT) reserve; Any Local Biodiversity Site (LBS); and Ancient Woodland listed on the SNH Ancient Woodland Inventory (SNH, 2010). A council-scale important population/area of a species or habitat listed on the Scottish Biodiversity List (SBL) (Scottish Government, 2013) as requiring conservation action. A county-scale important population/area of a species or habitat listed on the local Biodiversity Action Plan (local BAP). A county-scale important population/assemblage of an EPS or species listed on Schedule 1 or Schedule 5 of the WCA
Local (i.e. within 2 km of the site)	Nature conservation resource, e.g. a habitat or species of importance in the context of the local district.	A breeding population of a species or a viable area of a habitat that is listed in a Local BAP because of its rarity in the locality. An area supporting 0.05-0.5% of the UK population of a species. A breeding population of a species on the SBL. All breeding populations of EPS, Schedule 1 or Schedule 5 species
Less than local	Unremarkable, common and widespread habitats and species of little/no intrinsic nature conservation value.	Common, widespread, modified and/or impoverished habitats. Common, widespread, agricultural and/or exotic species.

14. Where a feature qualifies under two or more criteria, the higher value is applied to the feature.

15. In the present chapter any ecological feature of local or higher value is considered an Important Ecological Feature (IEF).

8.4.4 Impact Assessment Methods

16. The approach to the Ecological Impact Assessment (EcIA) follows the Chartered Institute of Ecology and Environmental Management guidelines (CIEEM, 2018), which prescribe an industry-standard method to define, predict and assess potential ecological effects to a given proposed development. Starting with establishing the baseline through a mix of desk study and field survey, the IEFs are identified and those requiring assessment established through a reasoned process of valuation and consideration of factors, such as statutory requirements, policy objectives for biodiversity, conservation status of the IEF (habitat or species), habitat connectivity and spatial separation from the proposed Development. From this stage, these features are assessed for impacts with the assumption of this being in the presence of construction industry-standard mitigations to ameliorate impacts as far as practicably possible. Additional mitigation strategies can then be determined to minimise any residual impacts that would otherwise be experienced by the IEF and any opportunities for enhancement identified.

17. In summary, the impact assessment process (CIEEM, 2018) involves:

- identifying and characterising impacts and their effects;
- incorporating measures to avoid and mitigate negative impacts and effects;
- assessing the significance of any residual effects after mitigation;
- identifying appropriate compensation measures to offset significant residual effects; and
- identifying opportunities for ecological enhancement.

8.4.5 Ecological Zone of Influence

18. The Ecological Zone of Influence (EZoI) is defined as the area within which there may be ecological features subject to effects from the proposed Development. Such effects could be direct, e.g. habitat loss resulting from land-take or removal of a building occupied by bats, or indirect, e.g. noise or visual disturbance causing a species to move out of the EZoI. The EZoI was determined through:

- review of the existing baseline conditions based on desk study results, field surveys and information supplied by consultees;
- identification of sensitivities of ecological features, where known;
- the outline design of the proposed Development and approach to construction; and
- through liaison with other technical specialists involved in the assessment, e.g. hydrologists and noise specialists.

8.4.6 Temporal Scope

19. Potential impacts on ecological features have been assessed in the context of how the predicted baseline conditions within the EZoI might change between the surveys and the start of construction.

8.4.7 Characterising Ecological Impacts and Effects

20. In accordance with the CIEEM guidelines, the following definitions are used for the terms ‘impact’ and ‘effect’:

- Impact – Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow; and
- Effect – Outcome to an ecological feature from an impact. For example, the effects on a species population from loss of a hedgerow.

21. In accordance with the CIEEM guidelines, when determining impacts on IEFs, reference is made to the following:

- Positive or negative – i.e. whether the impact has a positive or negative effect in terms of nature conservation objectives and policy;
- Magnitude – i.e. the size of an impact, in quantitative terms where possible;
- Extent – i.e. the area over which an impact occurs;
- Duration – i.e. the time for which an impact is expected to last;
- Timing and frequency – i.e. whether impacts occur during critical life stages or seasons; and
- Reversibility – i.e. a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible.

22. Both direct and indirect impacts are considered: Direct ecological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action but affect ecological resources through effects on an intermediary ecosystem, process or feature, e.g. fencing of a development site may cause scrub to invade marshy grassland.

23. For the purposes of this assessment, the predicted impacts on an ecological feature are categorised as 'no impact', 'barely perceptible', 'low', 'medium' or 'high', based on the definitions in **Table 8.4.3**, below.

Table 8.4.3 Levels of impact

Level of impact	Definition
No impact	No detectable impacts on the ecological resource, even in the immediate term
Barely perceptible	Immediately detectable impact but reversible within 12 months. Not expected to affect the conservation status of the nature conservation designation, habitat or species under consideration.
Low	Detectable impacts, and may be irreversible, but either of sufficiently small scale or of short-term duration to have no material impact on the conservation status of the nature conservation designation, habitat or species population.
Medium	Detectable impact on the status of the nature conservation designation, habitat or species population in the medium term but is reversible/replaceable given time, and not a threat to the long-term integrity of the feature.
High	Irreversible impact on the status of the nature conservation designation, habitat or species and likely to threaten the long-term integrity of the feature. Not reversible or replaceable. Will remain detectable in the medium and long term.
The following definitions have been applied in respect to timescales: Immediate: Within approximately 12 months; Short term: Within approximately 1-5 years; Medium term: Within approximately 6-15 years; and Long term: More than 15 years.	

8.4.8 Ecologically Significant Effects

24. An Ecological Impact Assessment (EcIA) is undertaken in relation to the baseline conditions that would be expected to occur in the absence of a proposed development and, therefore, accounts for expected changes to the baseline. Both adverse and beneficial impacts/effects are possible.

25. A significant effect, in ecological terms, is defined as an effect (whether negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area, including cumulative and in-combination impacts.

26. In accordance with the CIEEM guidelines, the approach adopted in this chapter aims to determine if the effect of an impact is significant or not based on a discussion of the factors that characterise it, i.e. the ecological significance of an effect is not dependent on the value of the feature in question. Rather, the value of a feature that will be significantly affected is used to determine the geographical scale at which the effect is significant.

27. In accordance with the current CIEEM guidelines, effects of impacts are assessed in the presence of standard mitigation measures. Additional mitigation may be identified where it is required to reduce a significant effect.

28. Any significant effect remaining post-mitigation (the residual effect), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development control in determining the application.

29. In addition to determining the significance of effects on valued ecological features, this chapter also identifies any legal requirements in relation to wildlife.

8.4.9 Limitations to the Assessment

30. All baseline surveys were conducted under optimal survey conditions and at the appropriate times of year.

31. Phase 1 Habitat Survey: The site visit was undertaken within the optimal botanical survey season, which is from April to October. It is possible that some species may not have been recorded during the survey. However, this is not considered a significant limitation as dominant species were identifiable during the survey and all habitats within the study area were readily identified.

32. Some areas of the coniferous plantation woodland were deemed as too dense to enter and areas of windthrow and felled woodland were deemed as unsafe, due to the instability of trees and wood piles. See **TA 8.1** for full details.

33. NVC Survey: The NVC surveys were carried out during the optimal season for NVC surveys and in favourable conditions for survey. Some small sections of the study area were not accessible owing to forestry operations or because of breeding raptor presence. However, these constraints affected less than 5% of the Survey Area and are not considered to significantly affect the validity of the survey results, or the conclusions in this Chapter; See **TA 8.2** for full details.

34. Protected Mammals: For the Protected Mammals survey, site conditions were suitable, with no heavy rain preceding the survey to potentially wash away otter or water vole field evidence. As such, no survey limitations were identified. It is recognised that the badger survey was undertaken in July-August, which is outwith the optimal time of year (which is from February to April), when there is typically a peak in territorial activity and it is possible that some evidence was obscured by vegetation; however, this is not considered to have compromised the survey, due to the general visibility of badger evidence. See **TA 8.3** for full details.

35. Bat Survey: The full description of limitations to the bat study are presented in **Technical Appendix 8.4**. Issues encountered included various detector failures, which resulted in a reduction of monitoring data; there are also limitations with regards to the identification of bat species using sound analysis, due to overlap in some species calls.

36. The Ecobat analysis process is not entirely suited to the conditions found in Scotland and can skew the actual results derived, thus requiring additional interpretation (the analysis is based on English bat behaviours and takes no account of periods of complete absence of activity, which is common for remote Scottish locations). Although the output from Ecobat has been used to guide the results and discussion of this report, as per the recommendations of the guidelines (SNH, 2019b), it is clear that results incorporating all of the data from the Site (both presence and absence) would have given clearer results upon which to base recommendations for mitigation and compensation.

37. Electrofishing: See **Technical Appendix 8.5** for full details. Limitations to the SFCC method of electrofishing mean that any non-salmonid fish species are counted and measured, but no population estimate is made. Salmonid populations are also estimates; and the absence of fish cannot be ascertained with certainty using electrofishing techniques so a density of zero does not always guarantee these fish are altogether absent from this section of watercourse.

8.5 Baseline Conditions

38. This Section of the report details the results of the desk study and field surveys conducted across the Site and respective study areas, which provides the baseline conditions on which the impact assessment is based.

39. The Site is characterised by afforested upland, typical of this region of Scotland, with the Site accessed from the A714 Girvan-Newton Stewart road. A number of burns, part of the upper River Cree catchment, flow south through the forestry, from the open, south-facing hillsides of Mid Hill, Fell Hill and Cairn Hill.

8.5.1 Desk Study

8.5.1.1 Designated Sites

40. No statutory nature conservation designation overlaps with the Site. There are two statutory nature conservation designations which are designated for ecological features within 5 km of the proposed Development (see **Figure 8.1**): These are the Merrick Kells SAC and SSSI and the Feoch Meadows SSSI. Details of these sites are provided in **Table 8.5.4**, below and **Technical Appendix 8.1** (including **Figure TA_8.1.1** within the appendix).

Table 8.5.4 Designated sites within 5 km of the proposed Development

Site	Designation	Distance from Site	Qualifying Feature/s
Merrick Kells	SAC / SSSI	4.4 km east	Habitats: - Blanket Bog; - Depressions on peat substrates; - upland assemblage, - Dry heaths, - Wet heathland with cross-leaved heath, - Montane acid grasslands, - Acid peat-stained lakes and ponds, - Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels; and - Acidic scree; Species: - Otter; - Blue aeshna dragonfly *Aeshna caerulea*, - Beetles
Feoch Meadows	SSSI	3.3 km south	Habitats: - Fen meadow; and - lowland neutral grassland

42. The proposed Development is located within the Galloway and Southern Ayrshire Biosphere Reserve. The Biosphere Reserve is a non-statutory designation aimed at ensuring sustainable development within its boundary and is "…*comprised of a major bio-geographic region represented by an upland massif centred on the Merrick and the rivers that flow from this upland down through forests and farmland to the sea. Landscape mosaics in the area comprise uplands, moorlands, mires, woodlands and forests, farmland, river valleys, coast and shoreline. The Biosphere Reserve is working to demonstrate the importance of landscapes and ecosystems for the future of sustainable development in a region which is undergoing change in traditional livelihoods*." (UNESCO, 2012).

43. The biosphere programme (UNESCO, 2019) identifies three inter-connected functions for the designated areas:

- **Conservation**: protecting cultural diversity and biodiversity, including genetic variation, species, ecosystems and landscapes and securing services provided by such diversity
- **Development**: fostering economic and human development that is environmentally and socially sustainable and culturally appropriate
- **Logistic support**: facilitating demonstration projects, environmental education and sustainable development education and training, research, and monitoring. While education, research, monitoring and capacity enhancement are seen as components of the logistic or knowledge-generation function of biosphere reserves, they are also integral to the conservation and development functions.

44. No other non-statutory nature conservation designations were identified within 2 km of the Site.

8.5.1.2 Species

8.5.1.2.1 Invasive Plant Species

45. The following non-native, invasive species have been recorded within 2 km of the Site in recent years:

- Himalayan balsam (*Impatiens glandulifera*); and
- Japanese knotweed (*Fallopia japonica*).

8.5.1.2.2 Terrestrial Animals

46. The following 12 animal species of conservation interest have also been recorded within 2 km of the Site in recent years:

- Otter (*Lutra lutra*);
- Pine marten (*Martes martes*);
- Red squirrel (*Sciurus vulgaris*);
- Common pipistrelle (*Pipistrellus pipistrellus*);
- Soprano pipistrelle (*Pipistrellus pygmaeus*);
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat (*Myotis nattereri*);
- Whiskered bat (*Myotis mystacinus*);
- Leisler's bat (*Nyctalus leisleri*);
- Common lizard (*Zootoca vivipara*);
- Palmate newt (*Lissotriton helveticus*); and
- Common toad (*Bufo bufo*).

47. N.B. Bird species identified in the desk study are noted in **Chapter 9: Ornithology** and its associated Technical Appendix.

8.5.2 Field Studies

8.5.2.1 Habitats

48. A total of 15 Phase 1 habitat types, including buildings and tracks, were recorded in the extended Phase 1 habitat survey (see **Technical Appendix 8.1.** Much of the Site is plantation forestry, with a large marshy grassland component and an open area of heath grassland in the centre of the Site, formed through clearing of forestry.

49. The Phase 1 results are shown on **Figure 8.2** and **Table 8.5.5**, below, and have been interpreted from field notes, peat mapping data, and the NVC data and using the equivalent codes as presented in **Table 8.5.6**, which includes those areas of non-NVC communities recorded under Phase 1 habitat criteria.

Table 8.5.5 Phase 1/NVC community equivalents within the study area

Phase 1 Habitat Code	Phase 1 Habitat Description	Corresponding NVC Community Equivalent	Extent in Study Area (ha)	% of Study Area
A1.1.1	Broad-leaved woodland	W2, W4	10.940	0.37
A1.2.2	Coniferous plantation woodland	-	1996.698	67.21
A1.3.2	Mixed plantation woodland	-		
A3.2	Scattered coniferous trees	-		
A3.3	Scattered mixed trees	-		
A4.2	Recently felled coniferous plantation	-	150.50	5.07
B1.1	Acid grassland	U5, U20	0.96	0.03
B5	Marsh/marshy grassland	M23, M25, MG10	336.73	11.33
C1.1	Continuous bracken	U20	0.86	0.03
C3.2	Tall herb	U16	5.56	0.19
D1.1	Dry dwarf shrub heath	H18	329.38	11.09
D2	Wet dwarf shrub heath	M15	46.78	1.57
E1.6.1	Blanket bog	M19, M20	7.32	0.25
E2.1	Flush and spring – acid and neutral	M6	84.05	2.83
G1	Standing water	(including A9)	0.20	0.01
G2.1	Running Water	-		
J3.6	Buildings	-		
J5	Other (tracks, etc.)	-		
			2971.00	99.98%

50. With the majority of the area under commercial plantation forestry, the NVC study provides a more accurate representation of the habitats and mosaics found in the land not under a tree crop.

51. The NVC study is detailed in **Technical Appendix 8.2**, and the results are shown on **Figure 8.3**. With the exception of commercial conifer plantation, categories of vegetation within the study area include the following plant communities:

- Standing water: A9;
- Mires and flushes: M2, M6, M17, M19, M20, M23, M25;
- Wet heaths: M15, M16;
- Dry heaths: H18;
- Grasslands and Montane Communities: U2, U5, U16, U20, MG10, non-standard NVC community *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland; and
- Woodland and scrub: W2, W4.

52. Areas of conifer plantation do not align with NVC communities: these have been described in broad Phase 1 habitat survey terms in **Technical Appendix 8.1**.

53. The most common and widespread semi-natural communities within the study area are M23 *Juncus effusus/acutiflorus-Galium palustre* rush pasture, M6 *Carex echinata-Sphagnum fallax/denticulatum* mire and H18 *Vaccinium myrtillus–Deschampsia flexuosa* heath. The remainder of the study area is made up of a relatively small number of mire, grassland, bracken, woodland and heath communities. The vegetation is often comprised of complex mosaic of two or more communities.

54. The vegetation communities have been heavily influenced by anthropogenic actions, with the single largest factor being the widespread commercial conifer plantation and its associated drainage, drying and shading effects. However, some large and relatively homogenous stands of vegetation occur, notably on hillsides in the north of the study area (Fell Hill, Cairn Hill, Pinbreck Hill, Polmaddie Hill and Craigenreoch) and along the various watercourses, such as the Muck Water, Clauchrie Burn, Fardin Burn and Polmaddie Burn.

55. The following section and **Table 8.5.6**, below, present a summary description of the flora, structure and habitat of these communities within the study area. The NVC communities within each broad habitat type (e.g. woodland) are described in order of community number within the study area.

8.5.2.1.1 Standing water

A9 *Potamogeton natans* community

56. No clear alignment with described sub-communities was recorded.

57. Waterbodies with A9 vegetation are uncommon in the study area but were recorded in three places within the proposed turbine development area, including Loch Scalloch and ponds within disused quarries. The vegetation is poor and limited to broad-leaved pondweed (*Potamogeton natans*) and water horsetail (*Equisetum fluviatile*), with most of the water surface having no vegetation.

8.5.2.1.2 Mires and Flushes

M2 *Sphagnum cuspidatum/fallax* bog pool community

58. The M2b *Sphagnum fallax* sub-community was recorded as a single area underneath an overhead power line in the north western part of the Site, where pools occur in mosaic with other vegetation.

M6 *Carex echinata–Sphagnum recurvum*[1]/denticulatum mire

59. The M6c *Juncus effusus* and M6d *Juncus acutiflorus* sub-communities were recorded widespread and common throughout the study area, especially within rides fed by drainage water from forest coupes. However, M6 also occurs as larger, more natural stands on hillsides in the north of the Site and along watercourses.

M17 *Scirpus cespitosus*[2]*–Eriophorum vaginatum* blanket mire

60. The M17c *Juncus squarrosus-Rhytidiadelphus loreus* sub-community (poor fit) was recorded in a single location: a forestry ride in the north west of the Site, where it occurs in mosaic with M6 mire.

M19 *Calluna vulgaris–Eriophorum vaginatum* blanket mire

61. The M19c *Vaccinium vitis-idaea-Hylocomium splendens* sub-community was recorded on Pinbreck Hill in the north of the Site. The extent of the community was relatively small, but its condition relatively good, with no obvious signs of drainage or hagging (i.e. there is no evidence of the peat being eroded into gullies), unlike in areas outside the study area where hagging is more common.

M20 *Eriophorum vaginatum* blanket mire

62. The M20b *Calluna vulgaris-Cladonia* species sub-community was recorded.

63. M20 blanket mire was recorded on Polmaddie Hill, off the northern application boundary. The vegetation is dominated by hare's-tail cottongrass with locally abundant heath plait-moss and red-stemmed feathermoss. Species present at low abundance include wavy hair-grass, sheep's fescue (*Festuca ovina*), stiff sedge (*Carex bigelowii*), blaeberry and *Cladonia* lichens. The occasional presence of tormentil and little shaggy-moss (*Rhytidiadelphus loreus*) could suggest local transition to other vegetation, notably M19 blanket mire, although, as noted by Averis *et al*. (2004), it is quite common to find bogs dominated by hare's-tail cottongrass that do not correspond well to either of the two described M20 sub-communities.

M23 *Juncus effusus/acutiflorus–Galium palustre* rush-pasture

[1] Now known as *Sphagnum fallax*

[2] Now known as *Trichophorum germanicum*

64. The M23a *Juncus acutiflorus* sub-community and M23b *Juncus effusus* sub-community were recorded widespread at mainly lower altitudes within the Survey Area, where it notably occurs along watercourses, as well as in rides and other open areas within forestry and in former clear-fells.

M25 *Molinia caerulea–Potentilla erecta* mire

65. The M25a *Erica tetralix* sub-community was recorded, occurring mainly in forestry rides, often in mosaic with other communities.

8.5.2.1.3 Wet Heaths

M15 *Trichophorum cespitosum–Erica* tetralix wet heath

66. The M15a *Carex panicea* and M15d *Vaccinium myrtillus* sub-communities were recorded in larger rides and in open areas in mainly the northern part of the study area, but it does not form extensive stands.

M16 *Erica tetralix–Sphagnum compactum* wet heath

67. The M16d *Juncus squarrosus-Dicranum scoparium* sub-community was recorded in only a single location within the study area; in an open area adjacent to plantation forestry in the west of the study area. However, the absence of heather and the presence of foxglove (*Digitalis purpurea*) make this a relatively poor fit with M16.

8.5.2.1.4 Dry Heaths

H18 *Vaccinium myrtillus–Deschampsia flexuosa* heath

68. The H18a *Hylocomium splendens-Rhytidiadelphus loreus* and H18b *Alchemilla alpina-Carex pilulifera* sub-communities were recorded as common the north of the study area, where H18 heath dominates large areas on Fell Hill, Cairn Hill and Pinbreck Hill. The local presence of species atypical of H18 heath would suggest transition to other communities; for example a local transition to H21 *Calluna vulgaris-Vaccinium myrtillus-Sphagnum capillifolium* heath.

8.5.2.1.5 Grasslands and Montane Communities

U2 *Deschampsia flexuosa* grassland

69. The U2b Vaccinium myrtillus sub-community was recorded in clear-felled areas of plantation along the access track in the south-central part of the study area, and the vegetation is also locally present in recent clear-fells. The occasional presence of soft-rush, marsh violet (*Viola palustris*), foxglove and bramble (*Rubus fruticosus*) would suggest a local transition to other vegetation, and some stands also contained regenerating trees, notably Sitka spruce (*Picea sitchensis*) and silver birch (*Betula pendula*).

U5 *Nardus stricta–Galium saxatile* grassland

70. The U5a species-poor, U5b *Agrostis canina-Polytrichum* commune and U5d *Calluna vulgaris-Danthonia decumbens* sub-communities were recorded as present in rides in the north western part of the study area, where U5 occurs in mosaic with other vegetation, such as M6 and M25 mire.

U16 *Luzula sylvatica–Vaccinium myrtillus* tall-herb community

71. The U16b *Anthoxanthum odoratum-Festuca ovina* and U16c species-poor sub-communities were recorded in the north of the study area, notably within H18 heath, where it locally forms large patches.

U20 *Pteridium aquilinum–Galium saxatile* community

72. The U20b *Vaccinium myrtillus-Dicranum scoparium* sub-community, dominated by bracken (*Pteridium aquilinum*), was recorded adjacent to the access track in the southern part of the study area. In some areas the bracken is dense and features few associates. It grades into scrub and tall herb vegetation, with regenerating Sitka spruce and sycamore (*Acer pseudoplatanus*).

MG10 *Holcus lanatus–Juncus effusus* rush-pasture

73. The MG10a typical, and MG10b *Juncus inflexus* sub-communities were recorded as widespread across the study area, although the largest stands are located in the north. The vegetation locally transitions into other community types.

Non-standard NVC Community *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland

74. A single stand of Festuca rubra-Holcus lanatus-Anthoxanthum odoratum grassland was recorded in the north of the study area. This vegetation is not described in the NVC but is mentioned in Rodwell et al. (2000), although atypical species occur at low abundance and might suggest affinity with M23 rush-pasture.

75. The vegetation has little intrinsic floristic value and is therefore not a conservation priority. It is not a wetland community and is therefore not potentially groundwater dependent.

8.5.2.1.6 Woodland and Scrub

W2 *Salix cinerea-Betula pubescens-Phragmites australis* woodland

76. The W2a *Alnus glutinosa-Filipendula ulmaria* sub-community was recorded in a single location at the central part of the study area, where it occurs in mosaic with the U20 bracken community.

W4 *Betula pubescens–Molinia caerulea* woodland

77. Sub-communities: The W4b *Juncus effusus* sub-community was recorded in a single location in the far south of the study area.

8.5.2.1.7 Plantation Forestry

78. As noted above, areas of conifer plantation do not align with NVC communities: described in broad Phase 1 habitat survey terms in **Technical Appendix 8.1**, these are described as:

- Coniferous Plantation Woodland (A1.2.2); the dominant trees species recorded were Scots pine (*Pinus sylvestris*) and Sitka spruce; and
- Mixed Plantation Woodland (A1.3.2); along the edges of the coniferous plantation coupes and made up of a mix of coniferous and broadleaved trees. The dominant species are ash (*Fraxinus excelsior*), grey willow (*Salix cinerea*), goat willow (*Salix caprea*), sessile oak (*Quercus petraea*), rowan (*Sorbus aucuparia*), alder (*Alnus glutinosa*), silver birch and elder (*Sambucus nigra*).

8.5.2.1.8 GWDTEs

79. Many of the communities are potentially groundwater dependent (see **Figure TA 8.2.3**) (SEPA, 2017), but as described in **Chapter 7: Hydrology, Hydrogeology, Geology and Soils** those associated with plantation rides or watercourse corridors are clearly surface water fed. With the bedrock across the Site comprising a low productivity aquifer, and with superficial geology across much of the Site likely to inhibit groundwater flow, there is limited potential for substantial groundwater to be present near the surface, feeding the observed habitats. The base of the hills in the north of the Site, and low-lying area on the southern part of the access road, between hill slopes to the east and the River Cree to the west, are therefore also considered to be areas where surface runoff from the hills will naturally shed and gather.

80. Based on the above considerations, it is concluded that onsite and adjacent habitats identified as being potentially groundwater dependent, are in fact fed largely or entirely by surface water. It is therefore considered that GWDTE are not present at the Site.

Table 8.5.6 NVC Summary

NVC Community	Annex I Habitat	SBL Priority Habitat	Ayrshire LBAP	D&G LBAP	Potential GWDTE Status	Extent in Application Area (ha)	% of Study Area
A9 *Potamogeton natans* community	Not listed	**Ponds** are priority habitats **Oligotrophic and dystrophic lakes**: listed only as habitats on which negative impacts should be avoided Waterbodies with A9 vegetation within the study area are likely to align with either of the two categories	Not listed	* Not relevant – the community was not recorded within the council area	Not listed	0.199	0.01
M2 *Sphagnum cuspidatum/ fallax* bog pool community	M2 is included in the priority habitat description for **7130 Blanket bogs**	M2 is included in the priority habitat description for **blanket mire** (Maddock, 2011)	**Blanket bog**, including bog pools, is a priority habitat but listed as not requiring active conservation management	* Not relevant – the community was not recorded within the council area	Not listed	Too small to record <0.01 ha; included within M6/M23	n/a
M6 *Carex echinata–Sphagnum recurvum/denticulatum* mire	Not listed	**Upland flushes, fens and swamps** are listed with a watching brief only	Not listed but are mentioned as part of the priority description for **blanket bog**	**Upland springs and flushes**	Potentially **highly** groundwater dependent	84.048	2.83
M17 *Scirpus cespitosus–Eriophorum vaginatum* blanket mire	**7130 Blanket bogs**	**Blanket mire**	**Blanket bog**	* Not relevant – the community was not recorded within the council area	Not listed	Too small to record <0.01 ha; included within M19	n/a
M19 *Calluna vulgaris–Eriophorum vaginatum* blanket mire	**7130 Blanket bogs**	**Blanket mire**	**Blanket bog**	* Not relevant – the community was not recorded within the council area	Not listed	5.491	0.19
M20 *Eriophorum vaginatum* blanket mire	**7130 Blanket bogs**	**Blanket mire** is a priority habitat, but M20 mires are generally less valuable for nature conservation than the stands of less modified and impoverished blanket bog from which they have been derived (Averis *et al*., 2004)	**Blanket bog** is a priority habitat, but M20 mires are generally less valuable for nature conservation than the stands of less modified and impoverished blanket bog from which they have been derived (Averis *et al*., 2004)	* Not relevant – the community was not recorded within the council area	Not listed	1.826	0.06
M23 *Juncus effusus/acutiflorus–Galium palustre* rush-pasture	Not listed	M23a is listed in the description for **upland flushes, fens and swamps** (Maddock, 2011), which are listed with a watching brief only **Purple moor-grass and rush-pastures** are priority habitats, although it is the richer M23a vegetation, which is described	**Purple moor-grass and rush-pastures** are priority habitats, although it is the richer M23a vegetation, which is described	**Purple moor-grass and rush-pastures** are priority habitats, although it is the richer M23a vegetation, which is described	Potentially **highly** groundwater dependent	307.882	10.36
M25 *Molinia caerulea–Potentilla erecta* mire	**7130 Blanket bogs** (on peat deeper than 0.5 m)	M25 is included in the priority habitat description for **blanket mire** (Maddock, 2011)	**Blanket bog** is a priority habitat; but the priority habitat description focuses on species-rich vegetation	* Not relevant – the community was not recorded within the council area	Potentially **moderately** groundwater dependent	13.484	0.45
M15 *Trichophorum cespitosum–Erica tetralix* wet heath	**4010 Northern Atlantic wet heaths with *Erica tetralix***	M15 is included in the priority habitat description for both **blanket mire** and **upland heathland** (Maddock, 2011)	**Upland heath**	* Not relevant – the community was not recorded within the council area	Potentially **moderately** groundwater dependent	46.783	1.57

NVC Community	Annex I Habitat	SBL Priority Habitat	Ayrshire LBAP	D&G LBAP	Potential GWDTE Status	Extent in Application Area (ha)	% of Study Area
M16 *Erica tetralix–Sphagnum compactum* wet heath	**4010 Northern Atlantic wet heaths with *Erica tetralix***	**Upland heathland**	**Upland heath**	* Not relevant – the community was not recorded within the council area	Potentially **moderately** groundwater dependent	<0.01 ha	n/a
H18 *Vaccinium myrtillus–Deschampsia flexuosa* heath	**4030 European dry heaths**	**Upland heathland**	**Upland heath**	* Not relevant – the community was not recorded within the council area	Not listed	329.381	11.09
U2 *Deschampsia flexuosa* grassland	Not listed	Listed in the priority habitat description for lowland (to 300m) **dry acid grassland** (Maddock, 2011)	* Not relevant – the community was not recorded within the council area	**Acid grassland** (both lowland and upland types)	Not listed	2.325	0.08
U5 *Nardus stricta–Galium saxatile* grassland	Not listed	***Nardus stricta-Galium saxatile*** grassland listed with a watching brief only	**Lowland dry acid grassland**	**Acid grassland** (both lowland and upland types)	Not listed	0.099	0.01
U16 *Luzula sylvatica–Vaccinium myrtillus* tall-herb community	Not listed	U16 is not a conservation priority in its own right but can support species of conservation interest, notably in inaccessible locations such as **inland rock outcrop and scree habitats**, which is listed as a habitat on which negative impacts should be avoided. However, this specific category is absent from the study area	Not listed	* Not relevant – the community was not recorded within the council area	Potentially **highly** groundwater dependent	5.556	0.19
U20 *Pteridium aquilinum–Galium saxatile* community	Not listed	Not listed	Not listed	Not listed	Not listed	0.863	0.03
MG10 *Holcus lanatus–Juncus effusus* rush-pasture	Not listed	Not listed	Not listed	* Not relevant – the community was not recorded within the council area	Potentially **moderately** groundwater dependent	15.364	0.52
Non-standard NVC Community *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland	Not listed	Not listed	Not listed	* Not relevant – the community was not recorded within the council area	Not listed	Too small to record <0.01 ha; included within U2 grassland	n/a
W2 *Salix cinerea-Betula pubescens-Phragmites australis* woodland	W2a is listed in the description for **91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)**	**Wet woodland**	**Wet woodland**	Not listed	Potentially **moderately** groundwater dependent	4.328	0.15
W4 *Betula pubescens–Molinia caerulea* woodland	Not listed	**Upland birchwoods**	* Not relevant – the community was not recorded within the council area	**Native birchwoods**	Potentially **highly** groundwater dependent	6.613	0.22

8.5.2.2 Species

8.5.2.2.1 Badger

81. During the Protected mammal survey programme of July-August 2019 (see **Figure 8.5 and Technical Appendix 8.3**), badger prints were identified just to the west of the application boundary and a badger skull was found in the open area at the north of the Site. No associated evidence of badger, such as an active or disused sett, was identified near the skull; the skull had probably been moved to the location by a predator or scavenger. No other evidence of badger presence was identified during the survey programme. Habitat suitable for sett-building is present across the area, particularly along the valley of the Muck Water and open areas at the north of the Site. While having potential for sett-building, the plantation forestry is suboptimal for foraging. However, given the high mobility of badger, they could commute and forage throughout the Site.

8.5.2.2.2 Otter

82. Suitable commuting routes were identified along some of the larger watercourses found on the Site. These include the Muck Water, Scalloch Burn, Fardin Burn, Cairnfore Burn, Laniewee Burn and the Sprit Strand. The connectivity of the watercourses to the wider freshwater environment that includes larger rivers such as the Water of Mannoch and Water of Trool, would indicate that otter could use a number of areas within the study area.

83. The Protected Mammals survey (see **Figure 8.5**) identified two otter spraints, on the Thumb Loop and Cairnfore Burn, within the Site. No other evidence of otter presence was identified during the survey, and only the river valley of the Muck Water was considered suitable for holt construction - most of the Site was assessed as unsuitable, due to the flat topography and extent of the wetland habitat.

84. The larger burns of the area support salmonid fish species and evidence of frog and toad presence was identified throughout the Survey Area – all three are otter prey species. Given the connectivity of the Site to the wider area, otter could forage and commute along the watercourses throughout the Site.

8.5.2.2.3 Water Vole

85. Good quality water vole habitat is located along the Scalloch Burn, due to the high-sided banks and water flow speed, and along the Half Mark Burn, Laniewee Burn and Sprit Strand, due to their slow water flow speeds and overhanging vegetation that would provide cover from predation.

86. The species-specific survey identified two water vole burrows within the Site (see **Figure 8.5** and **Technical Appendix 8.3**). A burrow, feeding evidence and droppings were identified on the banks of the Muck Water and a burrow and feeding evidence were identified on the Polmaddie Burn. No other evidence of water vole presence was identified during the survey programme.

8.5.2.2.4 Pine Marten

87. No evidence of pine marten (*Martes martes*), such as scats, prints or dens, was recorded during the protected mammal survey of July-August 2019. However, the pine marten population has been shown to have expanded its range into Southern Scotland, in recent years, although in Dumfries and Galloway they have been found to be concentrated more towards the east of the region (Croose *et. al*, 2014). Due to good connectivity between the areas of plantation and wider supporting habitat there is a potential for pine marten activity within the study area. Residents within close proximity to the Site have previously stated that pine marten have been released in the local area, so there is a possibility that they could use the Site.

8.5.2.2.5 Red Squirrel

88. No evidence of red squirrel (*Sciurus vulgaris*), such as chewed cones or dreys, was recorded during the survey programme (see **Technical Appendix 8.1**). However, the red squirrel population has been well documented within the Galloway Forest and, due to the connectivity between the areas of plantation and wider supporting habitat, it was considered likely that they would be found within the study area.

89. No further species-specific survey was undertaken and no evidence was recorded during the protected mammal survey of July-August 2019.

8.5.2.2.6 Bats

90. Although the Site is dominated by conifer plantation, the initial habitat assessment concluded that a number of habitats provide opportunities for roosting, foraging and/or commuting bats:

- Structures – some structures may provide potential for roosting bats.
- Woodland and trees – the woodland habitat may be beneficial to foraging and commuting bats, particularly along the woodland edges, and four trees were found to have bat roosting potential. Woodland is suitable for species that forage within this habitat e.g. *Myotis* and Pipistrelle species.
- Unimproved and semi-improved grassland – open areas, such as semi-improved grassland, may be suitable for bats that are specific to foraging in open spaces, e.g. common noctule (*Nyctalus noctula*) and Leisler's bat (*Nyctalus leisleri*).
- Burns and lochs – bat species that forage primarily over bodies of water, including Daubenton's bat (*Myotis daubentonii*), would be supported by the watercourses running through the Site and lochs, including Loch Scalloch.

91. The survey methods employed to assess the bat baseline conditions were taken from the latest SNH guidance for assessing bats and onshore wind developments (SNH *et al.* 2019) and the 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016). A summary of the results is provided below, but full details can be found in **Technical Appendix 8.4**.

8.5.2.2.6.1 Preliminary Roost Assessment

92. The Preliminary Roost Assessment (PRA), conducted on 10 May 2019, identified one building at Little Shalloch, a derelict stone farm house with pitched slated roof, located in the west of the Site. This building was assessed as having moderate suitability for summer roosting bats, due to the type of features and the setting of the structure within open habitat associated with recently felled coniferous plantation. Little Shalloch was also assessed as having moderate suitability for winter roosting bats. There are features suitable for small numbers of bats but it is considered unlikely for a large hibernation roost to be present.

93. No trees with potential for use by roosting bats were identified within the Site.

94. Activity surveys were undertaken on 19 August 2019 and 3 September 2019 (one dusk emergence survey and one dawn re-entry survey) around Little Shalloch. The surveys identified four summer non-breeding bat roosts within the building. The species roosting included three soprano pipistrelles, a possible brown long-eared bat or *Myotis* species bat and three unidentified non-echolocating bats.

8.5.2.2.6.2 Automated Bat Detector Surveys

95. As described in **Technical Appendix 8.4**, the automated survey programme commenced with a site walk-over on 25 April 2019, to assess the habitats within the Site and determine the locations for the automated recorders. The Site has been assessed as having moderate habitat risk, because a building within the Site (Little Shalloch) has moderate roost potential and three residential properties are present 1 km outwith the Site boundary, the foraging habitat is of low-moderate quality and there are linear features such as burns, tracks and woodland edge connecting the Site with the wider landscape. Given the scale of the proposed Development, the project size has been assessed as medium. Therefore, the site risk level has been assessed as medium (3), in line with SNH risk assessment guidelines (SNH, 2019b).

96. Twelve automated bat detectors (Titley Anabat Swift detectors with omni-directional microphone on a 1.5 m microphone extension cable) were deployed at twelve locations within various habitats across the Site. The locations were chosen for being close to either the proposed turbine locations or to features of interest. The locations of the detectors are shown on **Figure 8.6.**

97. The detectors were deployed for periods of over 30 days, with the aim of gaining at least 30 days of consecutive bat data each for three seasons (spring, summer and autumn), recording in full spectrum.

8.5.2.2.6.3 Assessment of Potential Risk

98. As described in **Technical Appendix 8.4**, an attempt was made to obtain an objective assessment of bat activity and a measure of relative activity through using the online tool "Ecobat", hosted and developed by the Mammal Society (Lintott *et al.,* 2018). The data input reveals a percentile score and categorised level of bat activity and the results can be interpreted at the local scale and site scale. However, this analysis tool, though adopted as standard

procedure in the 2019 guidance (SNH, 2019b), takes no account of nights with zero returns (i.e. 90 % of the observation period) and therefore artificially elevates the perceived risk. Although the output from Ecobat has been used to guide the results and discussion of this report, as per the recommendations of the guidelines (SNH, 2019b), it is clear that results incorporating all of the data from the Site (both presence and absence) would have given clearer results to base recommendations for mitigation and compensation on.

99. For the whole Site, the survey identified the presence of six species (or genera in the case of more cryptic species) were recorded on the 12 static detectors deployed across the area: soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, *Myotis* species, *Nyctalus* species and brown long-eared bat. Across all detectors for the whole survey period, the total number of passes of all bat species was 23,812. In total, bats were only recorded on 101 nights out of 1,002 nights of detector deployment. (i.e. 10 % of the observed period). As there were many nights where no bats were recorded, it can be concluded that activity as a whole at the Site is low.

100. The most commonly recorded species was soprano pipistrelle (41.4% of all bat passes), followed by common pipistrelle, which made up 39.8% of all bat passes. 17.5% of all bat passes recorded were from *Myotis* species, followed by *Nyctalus* species (noctule or Leisler's bat) (1.2%), brown long-eared bat (0.1%) and Nathusius' pipistrelle (0.0% when rounded to one decimal place – only four passes were recorded in the study).

101. It should be noted that bats were only recorded for 10 % of the observation period, which indicates a relatively low level of actual activity across the area.

102. Analysis showed that, on numerous occasions throughout the survey period, there were high numbers of bat passes recorded on detectors within the species-specific roost emergence times, which may potentially indicate roosts in the local area outwith the Site boundary.

103. Further details of species composition and rate of passes at each detector (D1 to D12) can be found in **Technical Appendix 8.4**. The species mix at each of the detector locations was variable (see **Table TA_8.4.4**), reflecting the locations and surrounding habitats. Detector locations D3 and D5 were selected as representative bat habitats. D3 was located at Little Shalloch and is therefore representative of an area identified as both suitable for foraging and as an identified roost site, though greater than 1 km from the closest proposed turbine; and D5 was located on the eastern shore of Loch Scalloch. Bat activity was very high at these two locations relative to the other locations. The species composition of passes at each detector (D1 to D12) was analysed: soprano pipistrelle passes were most frequent at D4 and common pipistrelle passes were most frequent at D3, as was Nathusius' pipistrelle (which was only encountered at D3). D7 recorded most activity of *Nyctalus* bats, while brown long-eared bat was most frequent at D9. Almost all of the bats at D11 were *Myotis* species (90.6%).

104. Using the SNH criteria (SNH 2019a), which multiplies site risk (medium, 3) against Ecobat activity category, the overall level of risk for high-risk species across the whole site, and per detector and per month can be examined. Both the median and maximum levels of activity were used to calculate the typical site risk level, and the maximum site risk level. The results are presented in **Table 8.5.7**.

105. Only high collision risk species (common, soprano and Nathusius' pipistrelle and *Nyctalus* species) are included within the impact assessment. Low risk species (*Myotis* species and brown long-eared bat) have low collision risk, so the impact of the development on the local bat population would likely be negligible.

106. The overall risk level for all high risk species ranged from low (green) to high (red). At a whole site level, the median risk was medium for common and soprano pipistrelle species and low for Nathusius' pipistrelle and *Nyctalus* species. The maximum whole site risk was high for common pipistrelle, soprano pipistrelle and *Nyctalus* species, and medium for Nathusius' pipistrelle. When considered per month, the median risk to common and soprano pipistrelle was medium for all months (except April for soprano pipistrelle which was low risk). The median risk for Nathusius' pipistrelle in both recorded months was low. For *Nyctalus* bats the median risk was low for four months of the survey and medium for June and August. The maximum risk for common and soprano pipistrelle was high for all months except for October for common pipistrelle (medium) and April for soprano pipistrelle (medium). Nathusius' pipistrelle showed low maximum risk on October and medium maximum risk in June. The maximum risk level for *Nyctalus* species varied from low in April and May, to high in June and July, and medium in August and September.

Table 8.5.7 Overall risk assessment of high-risk species for the site, per detector

Species / Species Group	Location	Median Risk	Maximum Risk	Month	Median Risk	Maximum Risk
Common pipistrelle	Whole site	9	15	April	12	15
	D1	9	9	May	12	15
	D2	6	9	June	9	15
	D3	15	15	July	9	15
	D4	12	15	August	9	15
	D5	9	15	September	9	15
	D6	3	15	October	12	12
	D7	3	9			
	D8	3	3			
	D9	3	6			
	D10	3	6			
	D12	9	15			
Soprano pipistrelle	Whole site	9	15	April	3	12
	D1	6	15	May	9	15
	D2	6	12	June	12	15
	D3	15	15	July	12	15
	D4	3	15	August	9	15
	D5	12	15	September	12	15
	D6	9	12	October	12	15
	D7	3	9			
	D8	3	6			
	D9	3	9			
	D10	6	12			
	D11	3	3			
	D12	9	15			
Nathusius' pipistrelle	Whole site	3	6	June	3	6
	D3	3	6	October	3	3
	D6	3	3			
Nyctalus	Whole site	3	15	April	3	3
	D1	9	9	May	3	3
	D2	3	3	June	6	15
	D3	3	12	July	3	15
	D4	3	6	August	6	12
	D5	9	15	September	3	9
	D6	3	12			
	D7	3	9			
	D9	3	3			
	D10	3	3			
	D12	3	9			

Green (0-4) = Low risk
Amber (5-12) = Medium risk
Red (15-25) = High risk

107. When looking at detector location, the maximum risk for all species/species groups was high for common pipistrelle, soprano pipistrelle and *Nyctalus* species at D5 and high for common and soprano pipistrelle at D3, D4 and S12. It was also high for common pipistrelle at D6. The median risk varied between low and medium, although for common and soprano pipistrelle it was high at D3.

108. As noted above, detector locations D3 and D5 were included as representative of suitable bat habitats (adjacent to the Little Shalloch building and next to a loch, receptively) but these locations not near the proposed turbine location area. Generally, the risk at detector locations in open habitats (D7, D9 andD10) was low or medium whereas detectors closer to bat-friendly features, such as forest edges (D1, D2, D6, D8, D11 and D12) varied from low to high.

109. Temporal patterns in activity revealed the overall risk for common and soprano pipistrelle to be broadly similar across the seasons, albeit slightly lower for common pipistrelle in autumn and slightly lower for soprano pipistrelle in spring. *Nyctalus* species was lower in spring and generally higher in summer. However, as there is no allowance for entering nights where no bat passes were recorded while using the Ecobat software, this analysis is therefore skewed.

Foraging and Commuting

110. Bat activity was found to be lower at detectors located in open areas of habitat, as would be expected, and higher where detectors were located closer to edge features, which may provide more sheltered feeding opportunities and be used to aid navigation. Median activity at D5 which was located on the south shore of Loch Scalloch was moderate/high for *Myotis* species and soprano pipistrelle, and common pipistrelle and *Nyctalus* species displayed moderate activity. The loch is therefore an important foraging resource for bats in the Site. The closest turbine to Loch Scalloch is T4, to be positioned approximately 185 m to the west on the peak of a hill. The infrastructure route for the turbine is from the south, so there is no access route planned closer to the loch

8.5.2.2.7 Herptiles

8.5.2.2.7.1 Reptiles

111. Evidence of common lizard (*Zootoca vivipara*) was recorded during the extended Phase 1 habitat survey (see **Technical Appendix 8.1**) and during subsequent visits to the Site. No incidental observations have been made of other reptiles, but common habitats within the Site, such as woodland and scrub, may provide suitable foraging habitat and shelter for species such as adder (*Vipera berus*) and slow-worm (*Anguis fragilis*), and it is possible that such species are present.

8.5.2.2.7.2 Amphibians

112. Common frog (*Rana temporaria*) was recorded in the extended Phase 1 habitat survey (see **Technical Appendix 8.1**) and there was evidence of suitable waterbodies on the Site that would provide support for amphibians during the reproductive stages of their lifecycle, including the smaller pools of water created by the streams at the side of the track and the standing waterbodies and lochs within the Site for newt species, including smooth newt (*Lissotriton vulgaris*) and palmate newt (*Lissotriton helveticus*). The burns would also support the adult stages of amphibians, including common frog and common toad (*Bufo bufo*). One unidentified newt was reported by an FLS operative in late spring/early summer 2019, in a ride over 600 m to the west of WTG2 and a juvenile palmate newt was noted on 10 July 2019, close to the Site entrance.

113. While the waterbodies found during the survey programme were examined for breeding potential (including by application of the Habitat Suitability Index assessment, see **Technical Appendix 8.1**), no habitat suitability was identified for great crested newt (*Triturus cristatus*).

8.5.2.2.8 Fisheries

114. As detailed in **Technical Appendix 8.5**, Galloway Fisheries Trust (GFT) undertook electrofishing and Freshwater Pearl Mussel surveys in watercourses which could potentially support fish and mussels within the application boundary and wider area, including access tracks. Sixteen watercourse reaches were examined, including the High Cree, two locations on the Clauchrie Burn, the Sprit Strand, Fardin Burn, two locations on the Polmaddie Burn, the Laniewee Burn and a variety of other tributaries of the River Cree within the study area. Three watercourses were checked for fresh water pearl mussel: the High Cree, the Fardin Burn and the Cairnfore Burn.

115. Of the 16 survey locations identified for the fish surveys, one location was found to be too small and unsuitable to support fish and was therefore not surveyed.

116. Notably, no non-salmonid fish were caught during the electrofishing surveys. Electrofishing demonstrated that two watercourses, the Fardin Burn and Clauchrie Burn, contain juvenile salmon. However, both watercourses are stocked with juvenile salmon annually by the Cree District Salmon Fishery Board, and although wild salmon could potentially access these areas, the surveyors from GFT consider that all of the juvenile salmon found in these burns will be stocked fish (see **Technical Appendix 8.5**). Ten of the surveyed locations were found to contain juvenile trout, with the survey establishing that five of these locations have trout fry and all ten contain trout parr.

117. Three watercourses were identified as potentially supporting freshwater pearl mussels; however, no evidence of mussels was recorded.

8.5.3 Predicted Future Baseline

118. Taking no account of potential climate change effects over the long-term, the Site baseline would be expected to continue unchanged, other than undergoing the natural processes of vegetation growth and die-back, animal population numbers and distribution may fluctuate, depending upon the location and timing of ongoing land management activities within the Site. The clearance of large areas of forestry plantation and re-stocking will have the greatest influence on the environmental baseline over time, with the net result that very little change will occur.

8.5.4 Design Layout Considerations

119. As part of the iterative design for the proposed Development (see **Chapter 3: Site Selection & Design** and **Chapter 4: Development Description**), potentially sensitive ecological features have been considered in order to prevent or minimise negative effects. This has included:

- sensitive siting of the proposed infrastructure incorporating appropriate buffer distances from environmental receptors to avoid or reduce effects on the environment;
- potential to use and upgrade much of the existing forestry track, especially along the access route, from the A714, thus limiting loss of habitat to new tracks, as well as re-using some of the existing FLS borrow pits;
- potential for up to 50 m micrositing of infrastructure during construction to ensure the best possible location is chosen;
- application of a minimum 50 m buffer from any infrastructure or construction activity around all watercourses, except where a minimum number of watercourse crossings are required. The layout has been designed to minimise the number of crossings. The application of this buffer would also minimise potential effects on associated habitats and species;
- the track layout has been designed to reduce the extent and number of watercourse crossings required, where possible;
- avoidance of areas of deeper peat (>1 m) for the location of turbines and associated infrastructure, as far as practicable; and
- minimising the take of potential GWDTEs.
- a minimum buffer of 50 m from turbine blade tip to the top of the nearest edge feature (in this case the plantation edge) to reduce the potential for bat collision or barotrauma in line with Natural England Guidance TIN 059 (Mitchell-Jones and Carlin, 2014) advice on key-holed turbines (i.e. a 200 m tip height, 125 m hub height and 75 m blade length results in a minimum of 68 m clearance between turbine base and a 20 m high plantation edge).

8.5.5 Scoped Out IEFs

120. Taking into consideration the collated baseline data, design mitigation, design layout considerations and project assumptions, and using both professional judgement and available guidance, a number of IEFs can be scoped-out of further assessment. The following sections detail the potential receptors scoped-out of further consideration.

8.5.5.1 Designated Sites

121. Feoch Meadows SSSI and Merrick Kells SAC & SSSI are found 3.3 km and 4.4 km from the Site, respectively. For both designated sites, the distance from the application boundary exceeds that at which effects of the proposed Development could potentially be experienced. As a result of this distance, there is no direct habitat connectivity. As both designated sites are beyond the EZoI, and consistent with SNH opinion, they are scoped-out of further consideration.

122. The proposed Development is located within the buffer zone of the Merrick Kells component of the Galloway and Southern Ayrshire Biosphere Reserve. The proposed Development is considered to be consistent with the sustainable economic and community development aims of this non-statutory designation. Located within what is essentially a habitat heavily modified by human activity (i.e. commercial plantation forestry), the proposed Development is not considered to compromise the biosphere theme of "Enriching the Environment", or the designation function of "Conservation" (i.e. the biodiversity of the area, including genetic variation, species and ecosystems, will not be affected). As the proposed Development is not considered to have an impact on the integrity of the Biosphere Reserve, this designated area has been scoped-out of this assessment.

8.5.5.2 Habitats

123. The majority of the Site comprises the non-NVC habitats of standing monoculture plantation coupes and clear-felled areas. Though maturing plantation is considered to have some limited ecological value, as it potentially provides shelter to protected species and possibly a foraging resource to red squirrel, both standing and clear-felled plantation habitat are considered of **less than local** conservation value to the study area and therefore these plantation habitats are scoped-out of further consideration.

124. Blanket bog (M2, M17, M19, M20 and M25) was recorded within the study area. This is an Annex I habitat, which is also a priority on the SBL and both LBAPs and, as such, is a valuable habitat type on a regional, national and international level. However, as indicated by the habitat loss calculations, only M25a mire, recorded as a lesser component (at 10-20% by area) within four marshy grassland-dominated mosaics, has the potential to be affected by the proposed Development. A predicted total of 0.15 ha of these mosaics will be lost to the infrastructure footprint of the proposed Development, with a further 0.52 ha surrounding this permanent infrastructure being affected by habitat transitioning. In the worst-case scenario in which mire habitat comprises 20 % of this affected area, the total M25a to be disturbed would only amount to a maximum of 0.13 ha. In reality it will be less given the mosaic form of the habitats involved. Such a minor loss is considered to be of **less than local** conservation value to the study area and as such M25a mire is scoped-out of further consideration within this assessment.

125. M6 flush habitat is relatively common within the forestry rides and is a species-poor habitat. It also occurs at the base of hill slopes in the north, but in neither setting is M6 identified as being groundwater dependent. M6 flush found within the application boundary is therefore scoped-out as being of **less than local** conservation value to the study area.

126. Marshy grassland within the study area includes the M23 and MG10 rush-pastures and rush-pasture dominated mosaics located adjacent to the proposed Site access (which is to be upgraded) and within many of the forestry rides. Such habitats are generally of low ecological value and are concluded to not be groundwater dependent. The sub-community M23a is noted on the SBL and both local BAPs as being of higher value, though it is both extremely limited in extent and generally in mosaic with wet heath and other marshy grassland habitats. Direct loss of M23 dominated habitat from the proposed infrastructure footprint is predicted to be a total of 1.42 ha while it is anticipated that no MG10 will be lost. Indirect losses to those transition habitats is predicted to be 2.1 ha and 0.02 ha, respectively. M23 and MG10 rush pastures are therefore considered of **less than local** conservation value and are scoped-out of further consideration within this assessment.

127. The acid grasslands (U2 and U5) are of interest as being listed on the SBL, Ayrshire LBAP and/or D&G LBAP, though the components present within the study area are highly limited in extent. U2 is found in distinct areas, while U5 is generally found in mosaic with wet grassland (i.e. M23-dominated). As a relatively common habitat in the wider area of the region, and being of relatively low ecological value, this habitat is considered of **less than local** conservation value to the study area and is therefore scoped out of further consideration.

128. The bracken-dominated U20b habitat is limited in extent within the study area, at 0.86ha. Of this, only a small area (<0.01ha), will be affected by the proposed Development. This habitat has a very low ecological value and as such, is considered of **less than local** conservation value to the study area and is therefore scoped-out of further consideration.

129. W2 wet woodland is Annex I, SBL and Ayr LBAP-listed and is considered a scarce vegetation type in Scotland. The U2a wet woodland sub-community identified within the study area is found in mosaic with low ecological value bracken. As already noted, it was recorded in a single location in the central part of the study area and is likely to have formed as a result of forestry operations and may ultimately develop into a community more typical of south west Scotland, if left undisturbed. Very little of this habitat is predicted to be disturbed (i.e. <0.01 ha) with a potential for 0.04 ha to be indirectly affected from a total resource of 4.33 ha within the study area - a combined total of just over 1 % of the site resource to be potentially affected. The W2a sub-community is not considered to be of high ecological value due to its apparently transitional state and the area which would be potentially impacted is sufficiently small enough to be considered of **less than local** conservation value to the study area and therefore has been scoped-out of further consideration.

130. The W4 upland birch woodland is noted on the SBL and D&G LBAP; however, only a single area of the W4b sub-community (which is possibly present as a result of forestry operations and is transitioning into a more typical woodland) was recorded and it is considered that none of this habitat would be affected by the proposed Development as it is outside of the development footprint. While considered of some modest ecological value, the W4b habitat will not be disturbed and is therefore scoped-out of further consideration within this assessment.

131. Standing water resource within the Site is represented by Loch Scalloch and a few ponds which are present within extant Forestry and Land Scotland borrow pits. Three proposed turbine locations flank the loch: WTGs 4, 7 and 8, but only WTG4 is within the catchment of this waterbody, at c.140 m up-slope. While of value to the site ecology, the loch is considered to be sufficiently distant from the construction disturbance zone of WTG4 to be scoped-out of further consideration. The small pools within the extant borrow pits, though of potential use to the local amphibian population, are considered of **less than local** nature conservation value to the study area, due to their limited biodiversity and extent and are therefore scoped-out of further consideration.

132. Watercourses are listed as a priority habitat on the SBL and included within both LBAPs. Numerous burns are found within the application boundary and several of these are to be crossed by new tracks. The Fardin Burn and Clauchrie Burn are considered particularly sensitive and any new water crossings over these burns would need to be designed to ensure fish access is not impeded. Several existing bridges are noted as requiring to be upgraded. With the exception of these crossing points, and as per **Section 8.5.4** a 50 m buffer has been applied to safeguard the watercourses from all proposed track routes. With this design consideration and through application of standard measures, the potential for construction impacts has been mitigated. Watercourses are therefore scoped-out of further consideration.

8.5.5.3 Protected Species

133. Evidence of badger presence within the Site was limited to a skull, found on the southern slopes of Cairn Hill in the north of the Site, and paw prints found 32 m to the west of the application boundary. While this species is highly mobile and setting habitat is available, the foraging resource of the Site is considered sub-optimal. Inclusion of badger protection measures within the Site Species Protection Plan (SPP) will cover the potential for future presence. Though there is potential for their presence in the future, based on the survey results and habitat assessment, badger is considered to be of **less than local** conservation value to the study area and therefore scoped-out of this assessment.

134. Otter use of the Site has been identified through the survey programme, though this evidence was limited to two spraints on the Thumb Loop. Prey species are present (fish and amphibians) and this EPS and SBL priority species is known to be present within the wider River Cree catchment. However, the Site is part of the upper catchment and presence is likely to be only occasional, though desk study data (received from FLS) indicates historical otter presence within the Clauchrie Burn and Thumb Loop within the last 10 years. Inclusion of otter protection measures within the Site SPP would cover the potential for future presence. With only occasional and limited presence likely, otter is considered to be of **less than local** conservation value to the study area and therefore scoped-out of further consideration.

135. Water vole is an SBL priority species and included on both LBAPs. However, only two active locations were identified during survey and only one of these within the application boundary (downstream of a track watercourse crossing). Though potential habitat was noted within the wider study area, no further evidence of presence was recorded, indicating likely very low numbers of vole present. As outlined in **Section 8.5.4**, buffering infrastructure by a minimum 50 m from watercourses (except for watercourse crossings) and by employing measures during construction as part of the Site SPP, potential impacts to water vole will be avoided. This species is assessed as **less than local** conservation to the study area and therefore scoped-out of further consideration.

136. Both red squirrel and pine marten habitat is available within the study area, but no evidence of either was identified during Site surveys. While presence in the future cannot be ruled-out (desk study records from FLS provided one pine marten and two red squirrel observations for the wider area within the last two years), based on the survey results both red squirrel and pine marten are considered to be of **less than local** conservation value to the study area and therefore scoped-out of further consideration.

137. Roosting bats are scoped out of the assessment. Bats roost in the derelict Little Shalloch structure and may also roost in dwellings south of the Site, but all these 1km or more from the nearest proposed turbine and infrastructure location, and this is considered a sufficient distance to avoid significant impacts on any roosting bats.

138. Habitat loss effects on foraging/commuting bats are scoped out of the assessment. The Site is dominated by closed plantation, although it also includes rides and open ground habitats. Some turbines will be keyholed into the plantation which will result in additional edge habitat, and overall the impact is unlikely to have a negative effect and could be minor positive, although it is unlikely to be significant.

139. *Myotis* species, brown long-eared bats and Nathusius' pipistrelle are scoped out of the assessment. Based on SNH *et al.* (2019b), brown long-eared bat and *Myotis* bats in Scotland are considered to be of low population vulnerability to windfarms, relating to their relative abundance and low collision risk. The activity rate of Nathusius' pipistrelle was very low, with only four passes recorded in the surveys overall.

140. Common lizard were recorded during the survey programme and suitable habitat is present for both common lizard and adder. Both species are considered sufficiently mobile to avoid disturbance, except during the hibernation period. However, no hibernaculae were identified during survey and it is considered unlikely that the proposed Development will cause disturbance to any such features which may be present within the study area. Reptiles are therefore scoped-out of further consideration.

141. The range of great crested newt in south west Scotland is generally restricted to the southern margin and The Machars to the south of Newton Stewart (Wilkinson *et al.*, 2014), being based around suitable breeding ponds in these areas (though several records appear to be around and possibly just north of Newton Stewart). The proposed Development is located to the north of these newt-populated areas, with no direct habitat connectivity to the recorded populations. Due to a lack of suitable breeding ponds within the development area and adjacent wider environment, and an absence of connectivity, this species is considered to be of **less than local** conservation value to the study area and, in line with SNH scoping opinion, has therefore been scoped-out of further consideration.

142. The site has been noted as supporting common frog and has the potential to provide suitable habitat for the SBL-listed common toad and also for smooth newt. These species are, however, relatively common and, if present within the study area, will be able to relocate. Amphibians are assessed as of **less than local** conservation value to the study area and therefore scoped-out of further consideration.

143. Salmonid fish species were identified in 10 out of 16 sampled watercourses, but salmon was only recorded in the Fardin and Clauchrie Burns, which are stocked annually by the Cree District Salmon Fishery Board. The sensitivity of the watercourses is fully acknowledged, but the application of 50 m buffers around watercourses, apart from crossings which will be designed to enable passage by fish, and precautions listed in Section 8.6.1 (i.e. the pollution prevention measures outlined in the Construction Environmental Management Plan (CEMP) (refer to **Technical Appendix 4.1**) will ensure the avoidance of any degradation of water quality and/or impacts on fish populations. Salmonid fish are considered as of **less than local** conservation value to the study area and therefore scoped-out of further consideration.

144. No evidence of freshwater pearl mussel presence was identified through the survey programme. The potential for presence of this species is considered unlikely, a conclusion supported by SNH (Ward, 2019). The conservation value of freshwater pearl mussel has been assessed as **less than local** for the study area and therefore this species is scoped-out of further consideration within the assessment.

8.5.6 Scoped-in IEFs

145. The assessment of likely effects will be applied to those "scoped-in" IEFs of local, regional, national and international Nature Conservation Value (see **Table 8.5.8**, below) that are known to be present within the Site or surrounding area (as confirmed through survey results and consultations outlined above). These comprise a range of priority habitats and species, as identified in **Technical Appendices 8.1 – 8.5.**

Table 8.5.8 Summary of receptor sensitivity

IEF	Nature Conservation Value	Justification
Wet heath (M15)	Local	Annex I, SBL and Ayrshire LBAP habitat. Common within rides and on hill slopes crossed by the access tracks.
Dry heath (H18)	Local	Annex I, SBL and Ayrshire LBAP habitat. Particularly abundant on hill slopes crossed by the access tracks.
Bat species: common and soprano pipistrelles; *Nyctalus* species	Council area for *Nyctalus* species. Local for common pipistrelle and soprano pipistrelle.	EPS, SBL, LBAP priority species. SNH *et al.* (2019) (adapted from Wray *et al.* 2010) consider *Nyctalus* bats (either Leisler's bat, *Nyctalus leisleri*, or noctule, *Nyctalus noctula*) in Scotland to be of high risk to windfarms at the population level, because they are rare species and because individuals are at high risk of collision with turbines. In a recent review, Mathews *et al.* (2018) concluded that there was insufficient data to make a population estimate for *Nyctalus* species at the national level, although they estimated the Scottish population of Leisler's bat to number 6,100 adults. In a survey of high-risk bat species across southern Scotland, Newson *et al.* (2017) had also concluded that that the minimum population sizes of Leisler's bat and noctule for the whole of Scotland is in the thousands, most of which occur in the south. Earlier estimates had put the populations at 250 for each of noctule and Leisler's bat (Harris *et al.* 1995), although these were provided with poor reliability scores. As such, *Nyctalus* bats are given a Council area value. Soprano and common pipistrelles in Scotland are considered to be of medium population vulnerability to windfarms, because they are common species but individuals have a high risk of collision with turbines (SNH *et al.* 2019b). The Scottish population of soprano pipistrelle is estimated to be 1,210,000 adults, whereas for common pipistrelle it is 875,000 adults (Mathews *et al.* 2018). The spatial modelling by Newson *et al.* (2017) predicted the distribution of pipistrelle species to be widespread, but with soprano pipistrelle having noticeably greater levels of activity in lowland river valleys, and noticeably lower activity in upland areas. Both species are assigned a local value in the assessment. As roosting and foraging/commuting habitats are scoped out of the assessment and following the SPP and best practice measures (as outlined in **Section** Error! Reference source not found.), only operation phase impacts are relevant in the assessment.

8.6 Assessment of Potential Effects

146. The following sections provide an assessment of the likely effects of the proposed Development on the IEFs identified through the baseline survey programme. This assessment is based on the development design described in **Chapter 4: Development Description**:

- Construction effects;
- Operational effects; and
- Cumulative effects.

8.6.1 Project Assumptions

147. In conducting the assessment, the following assumptions have been made:

- Existing tracks have been used where possible, in order to reduce the footprint of the proposed Development and to limit the number of watercourse crossings as far as practicable. Upgrading to existing tracks may be required to ensure a minimum 5 m running width, with local widening on corners.
- Watercourse crossings will be designed to enable passage by fish, i.e. will avoid perched inverts that will be sufficiently large for fish passage and to avoid problems with flow rates being too fast for fish to swim against.
- All electrical cable runs between the proposed turbines and the associated power transmission infrastructure would be undergrounded within shallow trenches, within and following the access tracks. These cable trenches would be reinstated post-construction.
- Turbines and infrastructure have also been sited to avoid areas of blanket bog or heath habitat as far as practicable and the design also sought to minimise the take of areas of potential GWDTEs, even though these were subsequently assessed as not being groundwater dependent.
- Disturbance areas around temporary and permanent infrastructure during construction would be reinstated or restored before the construction phase ends.
- All reasonable precautions would be taken to avoid negative effects on habitats, protected species and aquatic interests, with this ensured by appointment of a suitably qualified and experienced Ecological Clerk of Works (ECoW) prior to the commencement of construction; the ECoW would advise SPR and the Principal Contractor on ecological matters and be present on the Site during the construction phase and would be responsible for monitoring of works and conducting site staff briefings with regards to any ecological sensitivities.
- A HMP will be implemented and where necessary will include a Species Protection Plan (SPP) to be implemented during the construction phase (refer to **Technical Appendix 8.7**). The SPP would detail measures to safeguard sensitive habitats and protected species known to be in the area. The SPP would include pre-construction surveys to update the ecological baseline ahead of construction commencing and include good practice measures for the construction phase.
- Appropriate pollution prevention measures and industry-standard good practice construction environmental management procedures will be implemented across the Site as part of a site CEMP, in order to prevent pollution of watercourses within the Site (with particulate matter or other pollutants such as fuel). Good practice techniques will be employed as outlined in **Chapter 7: Hydrology, Hydrogeology, Geology and Soils** and will include:
  - for water crossings: buffer strips around sections of track adjacent to watercourse crossings; and bund and embankment features to be implemented; application of appropriate silt control measures at water crossings;
  - for tracks: camber in track design; trackside drains, e.g. infiltration trenches with check dams; routine maintenance of tracks; cross drains at regular intervals along access tracks; and check dams will be installed immediately above cross drain inlets; and
  - general drainage: no direct discharges of water from works areas to existing drainage channels or surface watercourses; drainage will be directed to infiltration trenches, settlement swales or lagoons.
- Full details of construction mitigation measures will be provided in a CEMP to be agreed with SAC and D&GC, in consultation with SNH and SEPA, post-consent, but prior to development commencing. Documentation will include provision for HMP, SPPs and employment of an ECoW. An outline CEMP is provided in **Technical Appendix 4.1.**

8.6.2 Potential Construction Effects

148. This section details the assessment of likely construction effects of the proposed Development upon the scoped-in IEFs. For transparency, the full analysis of habitat loss is provided in **Table 8.6.9**, showing predicted direct and indirect losses for all habitat types under the development footprint.

8.6.2.1 Habitats

149. Impacts on habitats may include permanent and temporary direct loss, such as habitat lost to the footprint of permanent infrastructure or temporary loss to construction compounds. Indirect impacts can be experienced through increased habitat fragmentation, changes caused by pollution, or effects to supporting systems such as changed water-table levels which result in a habitat transitioning into another type.

150. The most obvious direct loss during the construction phase of the proposed Development relates to the permanent land-take of the access tracks, hard-standings, turbine bases and control compound (including the substation). Temporary laydown areas and construction compounds will be allowed to naturally regenerate, once the project has been completed. It is proposed that part of the temporary construction compound at the site entrance would remain as permanent car parking for visitors wishing to access the Site for recreational purposes. A HMP is provided (refer to **Technical Appendix 8.7**), which presents the proposals to manage, and where practical, enhance the habitat as part of the proposed Development.

151. Direct loss will be to the footprint of the infrastructure, while indirect loss refers to the disturbance zone around this infrastructure in damp or wet habitats, where a transitional habitat is likely to be formed between the infrastructure and the surrounding habitats. This zone has been defined as a worst-case 10 m buffer around the permanent elements of the proposed Development (in practice, transition strips are likely to be reduced for drier vegetation types). As detailed in **Table 8.6.9**, below A total of 27.64 ha of habitat would be permanently lost to the infrastructure footprint (c.1 % of the 2971 ha application area); of this area to be lost, 20.39 ha is currently coniferous plantation and a further 2.78 ha recently clear-felled plantation. The remaining 4.47 ha is comprised of a range of both wet and dry habitat types. Of these, only wet heath and dry heath are considered IEFs.

152. There is potential for indirect habitat losses to wetland habitats, due to the hydrological changes caused by siting of permanent footprint and the associated drainage effects. For the purposes of this assessment it is assumed that wetland habitat (i.e. wet heath, flushes and marshy grassland) losses due to indirect drainage will extend to 10 m from permanent infrastructure, i.e. in keeping with indirect drainage assumptions within the carbon calculator (as displayed in **Table 8.6.9**, below). Although there may be some construction disturbance experienced by the surrounding drier habitats, such habitats are expected to recover in the short terms and, as such, no indirect drainage effects are expected to impact or alter the quality or composition of dry habitats.

Table 8.6.9 Direct and indirect habitat loss by NVC habitat (including mosaics)

Phase 1 habitat type	NVC community or habitat types lost	Total extent in application area (ha)	Direct habitat loss (ha)	Direct habitat loss as a % of NVC community in study area	Direct & Indirect habitat loss (ha)	Direct & indirect habitat loss as % of type in application area
Semi-natural broad-leaved woodland (A1.1.1) /Continuous bracken (C1.1) mosaic	W2 (80%) / U20a (20%)	4.328	0.007	0.172%	As per direct loss	
Coniferous plantation woodland (A1.2.2)	n/a	1996.688	20.387	1.021%	As per direct loss	
Recently felled coniferous plantation (A4.2)	n/a	150.495	2.776	1.845%	As per direct loss	
Unimproved acid grassland (B1.1)	U2b	2.325	0.019	0.814%	As per direct loss	
Marsh/marshy grassland (B5)	MG10b	3.351	0.000	0.000%	0.021	0.617%
Marsh/marshy grassland (B5)	M23b	12.261	1.042	8.500%	1.831	14.932%

Phase 1 habitat type	NVC community or habitat types lost	Total extent in application area (ha)	Direct habitat loss (ha)	Direct habitat loss as a % of NVC community in study area	Direct & Indirect habitat loss (ha)	Direct & indirect habitat loss as % of type in application area
Marsh/marshy grassland (B5) / Coniferous plantation woodland (A1.2.2) mosaic	M23b / Restocked	39.419	0.219	0.556%	0.988	2.506%
Marsh/marshy grassland (B5) / Wet dwarf shrub heath (D2) / Acid/Neutral flush (E2.1) mosaic	M23a (40%) / M15b (25%) / M6d (20%) / M6c (10%) / M23b (5%)	11.982	0.051	0.43%	0.247	2.06%
Marsh/marshy grassland (B5) / Wet dwarf shrub heath (D2) / Acid/Neutral flush (E2.1) mosaic	M23b (50%) / M6c (10%) / M6d (10%) / M15b (10%) / M23a (10%) / U5a (10%)	6.521	0.044	0.672%	0.190	2.914%
Marsh/marshy grassland (B5) / Acid/Neutral flush (E2.1) mosaic	M23b (70%) / M25a (15%) / M6c (10%) / MG10a (5%)	7.384	0.000	0.000%	0.014	0.190%
Marsh/marshy grassland (B5) / Acid/Neutral flush (E2.1) mosaic	M23b (75%) / M6c (25%)	2.870	0.000	0.000%	0.005	0.188%
Marsh/marshy grassland (B5) / Acid/Neutral flush (E2.1) mosaic	M23b (40%) / M6d (30%) / M25a (20%) / M6c (10%)	10.379	0.069	0.668%	0.288	2.779%
Continuous bracken (C1.1)	U20b	0.861	0.000	0.000%	As per direct loss	
Dry dwarf shrub heath (D1.1)	H18a	112.758	1.685	1.494%	As per direct loss	
Dry dwarf shrub heath (D1.1)	H18a (80%) / H18b (20%)	75.839	0.049	0.064%	As per direct loss	
Dry dwarf shrub heath (D1.1)	H18b	14.264	0.686	4.807%	As per direct loss	
Wet dwarf shrub heath (D2)	M15d	15.110	0.157	1.037%	0.679	4.493%
Wet dwarf shrub heath (D2) / Marsh/marshy grassland (B5) / Acid/Neutral flush (E2.1) mosaic	M15b (40%) / M23a (30%) / M6d (25%) / M6c (5%)	2.715	0.120	4.419%	0.262	9.659%
Wet dwarf shrub heath (D2) / Marsh/marshy grassland (B5) / Acid/Neutral flush (E2.1) mosaic	M15b (60%) / M23a (20%) / M6c (15%) / M6d (5%)	7.872	0.059	0.750%	0.259	3.294%
Wet dwarf shrub heath (D2) / Acid/Neutral flush (E2.1) mosaic	M15b (70%) / M15d (20%) / M6c (10%)	2.194	0.013	0.583%	0.104	4.729%
Acid/Neutral flush (E2.1)	M6c	24.701	0.156	0.632%	0.522	2.112%
Acid/Neutral flush (E2.1)	M6c (75%) / M6d (25%)	0.571	0.032	5.602%	0.069	12.166%
Acid/Neutral flush (E2.1) / Wet dwarf shrub heath (D2) / Marsh/marshy grassland (B5) mosaic	M6d (45%) / M23a (30%) / M15c (10%) / M6c (5%) / M15b (5%) / M23b (5%)	10.022	0.040	0.398%	0.152	1.513%
Acid/Neutral flush (E2.1) / Wet dwarf shrub heath (D2) / Marsh/marshy grassland (B5) mosaic	M6d (60%) / M15b (30%) / M25a (10%)	7.754	0.025	0.319%	0.107	1.382%
Total		**2522.64**	**27.64**	n/a	**31.35**	n/a

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

8.6.2.1.1 Wet Heath

154. Impact: Effects upon wet heath habitat during construction would be direct, through habitat loss occurring during construction of the proposed Development access tracks and indirect, through potential drying effect upon neighbouring wet habitats occurring from the construction period into the operational period. This transition would be expected to extend to a worst-case 10 m to either side of proposed Development infrastructure.

155. Nature Conservation Value and Conservation Status: As per **Table 8.6.9**, wet heath within the study area is considered to be of Local nature conservation value, as this is an Annex I, SBL and Ayrshire LBAP habitat. M15 and M16 wet heath is present within rides and on hill slopes crossed by the access tracks, primarily in mosaic with other wet habitats. The overall conservation status of this habitat is assessed as “Bad” but “Stable” in the JNCC (2013a) report on H4010 Wet heath, based on individual conclusions for range, area, structures and functions, and future prospects; however, the Scottish component of wet heath is noted as in favourable condition.

156. Magnitude: Scotland has an estimated 370,000 ha of wet heath in favourable condition (JNCC, 2013a). Combined direct and indirect loss of wet heath (N.B. including mosaic habitat) is indicated at 2.0 ha or 3.12% of the total of this habitat type (including mosaic habitat) within the study area. This is a very small extent of the habitat in context of the local and regional wet heath component and an over-estimate given that wet heath occurs mainly in mosaic with other habitats.

157. With the application of good practice and environmental management techniques, including an appropriate drainage design, it is considered possible to reduce drainage impacts out to either side of infrastructure and thus reduce the transition zone from the assumed worst-case of 10 m. When considering the likely direct and indirect habitat losses (total area of 2.0 ha), the magnitude of negative impact within a local or regional context is considered to be **Barely perceptible spatial** and **long-term temporal**.

158. Significance of Effect: Given the above assessment of sensitivity and magnitude, the effect significance is considered to be negative, **Barely perceptible** and **Not Significant** under the terms of the EIA Regulations.

8.6.2.1.2 Dry Heath

159. Impact: Effects upon dry heath habitat during construction would be direct, through habitat loss occurring during construction of the proposed Development access tracks and three turbines (WTGs 7, 10 and 13)

160. Nature Conservation Value and Conservation Status: As per **Table 8.6.9**, dry heath within the study area is considered to be of Local nature conservation value, as this is an Annex I, SBL and Ayrshire LBAP habitat. H18 dry heath is present on hill slopes crossed by the access tracks. The overall conservation status of this habitat is assessed as "Bad" but "Stable" in the JNCC (2013b) report on H4030 Dry heath, based on individual conclusions for range, area, structures and functions, and future prospects; however, as is the case for wet heath, the Scottish dry heath component is considered to be in favourable condition.

161. Magnitude: Scotland has an estimated 479,000 ha of dry heath in favourable condition (JNCC, 2013b). Combined direct and indirect loss of dry heath is indicated at 2.42 ha or 1.19% of the total of this habitat type within the study area. This is a very small extent of the habitat in context of the local and regional dry heath component.

162. Only direct impacts are considered relevant to this dry habitat. When considering the likely direct habitat loss (total area of 2.42 ha), the magnitude of impact within a local or regional context is considered to be **Barely perceptible spatial** and **long-term temporal**.

163. Significance of Effect: Given the above assessment of sensitivity and magnitude, the effect significance is considered to be negative, **Barely perceptible** and **Not Significant** under the terms of the EIA Regulations.

8.6.2.2 Species

164. Potential effects on bat species IEFs are considered an operational phase issue, discussed in **Section 8.7** below (additional mitigation for other species potentially present during the construction phase are outlined below).

8.6.3 Construction Phase: Additional Mitigation and Compensation

165. No specific mitigation is required during construction beyond the standard in-built mitigation and adoption of good practice as detailed in the project assumptions above (**see Section** Error! Reference source not found.). However, the following good practice mitigation will also be implemented:

- Habitats (general):
  - Site establishment and general surface strip works would include the careful removal, segregation, storage and re-use of vegetated turves, to ensure successful site restoration of track batters and temporary compound areas, as appropriate.
  - Protection of watercourses by provision and maintenance of silt fencing at crossing points.
  - Provision of check-dams supplemented by silt fencing within trackside drainage ditches for the duration of the construction programme. Silt fencing would be strictly maintained for the duration of the construction phase, before removal for the operational phase.
  - Spill kits would be carried by all site vehicles and additional kits to be available at compounds, lay-downs and refuelling areas.
  - Provision of appropriate drainage measures around all compounds and lay-down areas.
  - Use of environmentally friendly (i.e. biodegradable) lubricants and hydraulic fluid products for plant.
  - Light pollution from artificial lighting (potentially required during the construction phase to ensure safe working conditions, during periods of limited natural light) would be non-intrusive, e.g. directed down and towards works activity and away from edge habitats and watercourses, to minimise impact on species using these habitats.

- Species:
  - Works would be conducted during daylight hours where possible, avoiding the sensitive periods of dawn and dusk when wildlife is most active; should works be required to extend beyond dusk, the impact of lighting during construction would be reduced by limiting lighting to allow for dark periods to reduce the impact upon foraging bats: task lighting is to be used on a tightly controlled basis; lights would be switched off immediately upon completion of the task;
  - A site speed limit of 15 mph would be in place at all times to reduce the risk of faunal collisions with construction vehicles.
  - Holes would be covered at the end of each working day or a wooden plank placed inside to allow protected faunal species to escape, should they enter the hole. Any temporarily exposed open pipe system would be capped in such a way as to prevent wildlife gaining access.
  - Reptiles and amphibians: In order to ensure compliance with the Wildlife and Countryside Act 1981 (as amended), mitigation would be required to reduce the chances of inadvertently killing or injuring individual reptiles or amphibians during construction works, which should be undertaken under the supervision of an ECoW. Given the very large spatial scale of the works, fencing and translocation are not considered appropriate. Mitigation would therefore involve habitat management and identification of potential refugia and hibernacula if present. Mulch/woody waste arising from tree felling would be placed in piles located at least 50 m from the subsequent works areas for windfarm construction. The site speed limit of 15 mph would also reduce the likelihood of accidental injury/killing of adder by construction traffic. Where appropriate and safe to do so, all construction working areas with potentially suitable open habitats for reptiles would initially be cut during the active season for reptiles (April to October), under the guidance of the ECoW (e.g., using a brush cutter or tractor mounted flail), to reduce the height of vegetation and make it less attractive for reptile habitation. The ECoW would move any potential refugia or hibernacula from working areas by hand. Working areas would then be kept unsuitable for reptiles through regular cutting until construction in that location commences.
  - Any proposed instream works would require a fish rescue, conducted immediately prior to works commencing.
  - In the event that a protected species is discovered onsite all work in that area would stop immediately and the ECoW contacted. Increased buffer areas may be required in these locations. Details of the local police Wildlife Crime Officer, SNH Area Officer and Scottish Society for the Prevention of Cruelty to Animals (SSPCA) relevant Officer would be held in the site emergency procedure documents.

166. A HMP would be implemented during the construction and operation phases that would focus on restoration of wet modified bog through the blocking of drains as well as creation of riparian woodland. The HMP is outlined in **Technical Appendix 8.7** and includes measures within a 45 ha Habitat Management Area (HMA) located in the north of the Site. The HMA predominantly comprises poor quality wet modified bog, which has mainly been degraded through historical drainage, and the main aspect of the HMP would be drain blocking within this area. The blocking of such historical drainage channels (using "wave dams") has been proven to benefit from positive management to improve the quality of bog habitats and has been used by the SNH Peatland ACTION project on several peat restoration programmes[3]. The aims of the HMP are summarised as:

- Aim 1: Restore Conditions of Modified Blanket Bog;
- Aim 2: Improve Quality of Modified Blanket Bog Habitat; and
- Aim 3: Establish and maintain riparian woodland habitat.

167. The measures which would be implemented include the blocking or damming of 5,180 m of historical drains, conifer removal, and planting of riparian woodland in a c. 0.07 ha area. Monitoring is also proposed to verify if the objectives of the HMP are being met and to inform any change in habitat management. The proposed monitoring includes for the establishment of 30 permanent quadrats in the modified bog habitat, with a combination of vegetative and water level (through permanent dipwell installations at each quadrat) data being recorded across defined years following the construction phase.

8.6.4 Construction Phase: Residual Construction Effects

168. The summary of predicted residual construction effects following implementation of mitigation is shown in **Table 8.6.10**, below. Reasoning is presented in the following paragraphs.

169. Effects on wet heath during construction are considered to be **long-term** negative and **Barely perceptible** magnitude. Although no unmitigated significant effects were predicted, the inclusion of embedded mitigation and

[3] https://www.nature.scot/climate-change/taking-action/peatland-action

adoption of good practice, as detailed above, would further reduce the potential for adverse effects. Effects would therefore remain **Barely perceptible** and **Not significant** under the terms of the EIA regulations.

170. Effects on dry heath during construction are considered to be **long-term** negative and **Barely perceptible** magnitude. Although no unmitigated significant effects were predicted, the inclusion of embedded mitigation and adoption of good practice, as detailed above, would further reduce the potential for adverse effects. Effects would therefore remain **Barely perceptible** and **Not significant** under the terms of the EIA regulations.

171. The proposed habitat management within a c. 45 ha area is likely to result in direct positive effects by improving site hydrology and in turn facilitating the recovery of bog habitat across the area, but most notably within the 10.45 ha closest to dammed drains. In addition, 0.07 ha of riparian woodland would be created where no such habitat currently exists. These works are considered to be **long-term** positive of **low** magnitude (**Not significant** in terms of the EIA regulations).

Table 8.6.10 Summary of predicted construction effects

Predicted Construction Effect	Significance	Mitigation	Significance of Residual Construction Effect
Wet heath	**Barely perceptible** adverse	Embedded mitigation, general habitat and pollution control measures and adoption of good practice	**Barely perceptible**
Dry heath	**Barely perceptible** adverse	Embedded mitigation, general habitat and pollution control measures and adoption of good practice	**Barely perceptible**
Bog habitats	**None**	Implementation of HMP	**Low** beneficial

8.7 Potential Operational Effects

172. This section details the assessment of likely operational effects of the proposed Development upon the scoped-in IEFs.

8.7.1.1 Habitats

8.7.1.1.1 Wet Heath

173. All potential direct and indirect effects on wet heath have been considered under the construction effects, above. With the indirect loss of habitat transition which will occur during the operational phase already included with the construction impact assessment, no further impacts are expected to affect the wet heath habitat.

8.7.1.1.2 Dry Heath

174. As for wet heath, all potential direct and indirect effects on dry heath have been considered under the construction effects above. With the potential for indirect loss due to habitat transition which could occur during the operational phase already included with the construction impact assessment, no further impacts are expected to affect the dry heath habitat

8.7.1.2 Bats

175. Impact: During the operational phase, there is a potential for bats to collide with turbine blades or to suffer 'barotrauma' when flying in close proximity to rotors. For the purposes of this assessment, impacts from barotrauma are assumed to be the same as for collision risk, owing to the paucity of published empirical evidence in causes of bat fatalities around windfarms and the difficulties in determining whether bat fatalities are caused by collisions or barotrauma.

176. Findings of a study completed by Exeter University (DEFRA, 2016) found that most UK onshore windfarm bat fatalities consisted of common pipistrelle, soprano pipistrelle and noctule bats. The findings indicated that collision rates were proportionately higher than the calls recorded during ground-level, static detector surveys, but numbers were more affiliated to the recordings made at turbine hubs. Other findings of the study concluded that the risk presented to bats from onshore windfarms increased with the number of turbines as well as increased rotor size. Conversely, the hub height and the operational period of a given windfarm were not found to be significant in terms of the collision risk presented to bats from onshore windfarms.

177. Both NE (2014) and SNH (2019b) indicate that vulnerability to collision is likely to depend on bat activity relative to the location of turbines and that, due to the non-uniformity of bat activity across a site, risks are also not uniform. Design of the bat surveys, to provide good coverage by detectors, can be an important factor in assessing areas of greatest risk of collision/barotrauma from turbine siting. Risk also reduces with a greater distance from the foraging or commuting habitat; following NE (2014), a minimum buffer of 50 m is required between the rotor tip and habitat features to lower the risk of collision. For the turbines chosen for the proposed Development (i.e. 200 m rotor tip height, 125 m hub height and 75 m blade length and assuming 20 m forestry height), and following the buffer calculation (NE, 2014) to ensure this minimum buffer is achieved, a distance of at least 68 m between a turbine base and the forestry edge is required.

178. With a proposed tip height exceeding 150m, the turbines are required to be equipped with aviation lighting, pursuant to Article 222 of the UK Air Navigation Order (ANO), 2016. Please see **Chapter 4: Development Description** and **Chapter 14: Other Issues** for more details on the aviation lighting specifications required. The lighting would be mounted on the hub of each turbine.

179. Recent evidence indicates that migratory pipistrelle bats may be attracted to red lights, which, may potentially lead to an increased risk of collision with wind turbines (Voigt *et al.*, 2018). It was noted, however, that while bats were recorded as being attracted to red LED lighting, there was a lack of foraging activity once closer to the light source, indicating that the attraction of migratory bats to red light sources is not caused by foraging and is more likely a positive phototaxis response (Voigt *et al.,* 2018). There is only a vague understanding of the migratory behaviour of bats in the UK, but the baseline study results (see **Technical Appendix 8.4**) suggest that no significant migratory movements are likely to have occurred within the study area, and the potential for increased risk of turbine collisions associated with foraging bats being attracted to red lights is considered to be low.

Nyctalus Species

180. Nature Conservation Value and Conservation Status: *Nyctalus* species are considered to be of **Council area** Nature Conservation Value (see **Table 8.5.8**). Following SNH (2019a), *Nyctalus* species are considered to be some of the rarest species with the highest collision risk and, therefore, have a high population vulnerability within a Scottish context.

181. Magnitude: SNH (2019a) recommends a two-stage process to enable the assessment of potential risk to bats presented by an onshore windfarm development. Stage 1 considers potential risk through consideration of the habitats within a site and development-related features (i.e. size and number of turbines). Stage 2 is then undertaken by completing an overall assessment of risk which is then informed by considering the results in relation to the bat activity output from the Ecobat software tool (or equivalent analysis tool) while also taking into account the relative vulnerability of individual species of bat at the population level.

182. As already noted (see **Section 8.5.2.2.6.3 Assessment of Potential Risk**, above), the Site was assessed as having medium habitat risk, as there are roost features within the Site (at Little Shalloch) and wider local area and linear features connecting the Site with the wider landscape. Due to the size and number of proposed turbines, the project size has been assessed as medium. As such, following SNH (2019a), the site risk level has been assessed as medium (out of five categories: lowest, low, medium, high and highest).

183. The SNH (2019a) guidance recommends Stage 2 is followed by using the Ecobat software analysis tool to categorise the recorded activity levels by each deployment season. As noted in the limitations section

(**Section** Error! Reference source not found.), significant issues were experienced with the Ecobat software, in terms of the exclusion of periods where no bats were recorded in to the activity output (i.e. exclusion of 90 % of deployment time with no recorded activity) resulting in a heavily skewed assessment of activity levels for the Site.

184. In order to have a more representative assessment of the potential risk presented to bats, a comparative assessment of activity levels was undertaken using data from windfarm monitoring projects in the wider area (for full details, please refer to **Technical Appendix 8.4**). SPR have provided data to allow for a comparison of bat activity at the Site to data collected from operational projects within the same region (i.e. South West Scotland) which have a known rate of bat fatalities. SPR has conducted detailed acoustic and fatality monitoring at 10 operational windfarms and acoustic monitoring aligned to the current windfarm guidance (SNH, 2019a) at three development phase projects. This combined data set comprised data collected at 71 unique locations with static bat detectors deployed for a total of 1,710 nights, providing a total sample size of 9,367 detector nights of bat activity. Of these, 7,269 samples are from nine projects in south west Scotland and were used for the comparison analysis with the data obtained in relation to the proposed Development.

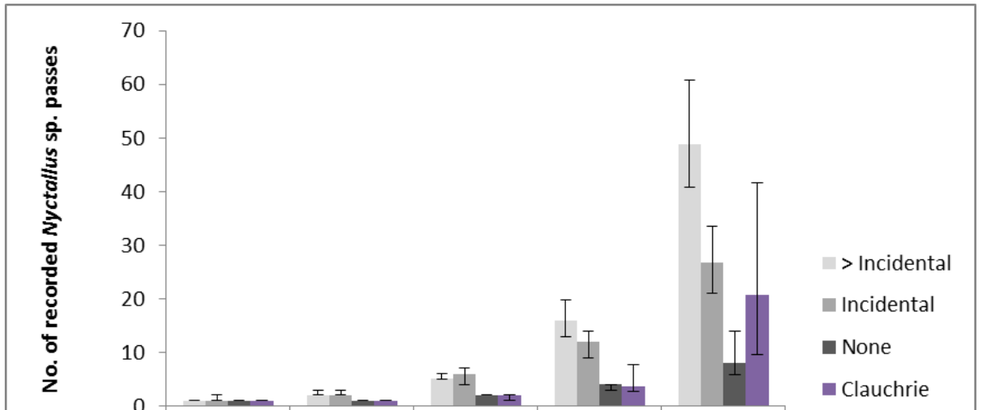
185. Carcass surveys have been undertaken at all 10 of the SPR operational windfarms using methods consistent with the DEFRA study (Mathews *et al.*, 2016). Of these, six were found to have zero bat fatalities, two had an incidental rate of fatality (considered to be less than two bat fatalities/turbine/year) and two had fatality rates greater than two bat fatalities/turbine/year. This dataset can be used as a reference for new projects by providing a comparison of bat activity within a region in a similar manner to Ecobat but, additionally, it can benchmark activity rates for new projects against activity rates of sites with a known rate of bat fatality (confirmed through bat fatality monitoring following developments being commissioned). Due to a non-normal distribution of data, percentiles of bat activity (presented as number of bat passes, by species/species group) are used to ensure that distributional assumptions are not associated with the data comparison. By comparing the number of bat passes registered during baseline studies across the nine comparison sites with known levels of operational bat fatalities (i.e. none, incidental or >incidental), the level of activity recorded at the proposed Development can be assessed and categorised in terms of the potential risk for collision in terms of the baseline activity (or number of bat passes).

186. **Graph 8.7.1**, below, shows the number of *Nyctalus* species bat passes per location per night at different percentiles compared to the same values derived from other operational SPR projects with different categories of bat fatality used as a reference for comparison. For *Nyctalus* species, across all locations monitored, those windfarms found to have no bat fatalities had 7.95 bat passes recorded, whereas those windfarms with an incidental fatality rate (i.e. <2 bat fatalities per turbine per year) had 26.75 recorded bat passes. From these data it is expected that the bat activity at the proposed Development will generate a fatality rate between zero and incidental as the activity level falls below the zero benchmarks at four of the five percentiles and below the incidental benchmark at the fifth percentile.

187. **Graph 8.7.2**, below, shows, when removing the passes recorded at D3 and D5, the number of *Nyctalus* species bat passes per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. As was also seen for pipistrelle species (see below), removing the activity recorded at locations where turbines will not be sited (i.e. D3 and D5) lowers the number of bat passes, and the fatality rate generated falls to zero at each percentile.

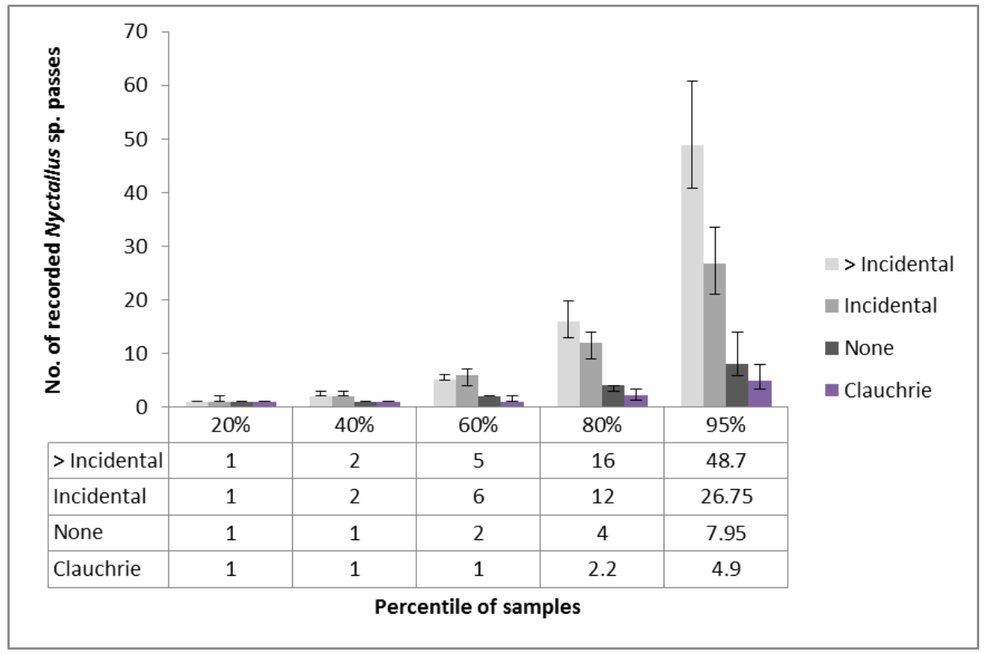
188. **Graph 8.7.3** shows the number of Nyctalus species bat passes at D5 per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is seen that the predicted fatality rate at the upper three percentiles is greater than incidental while the fatality rate at the lower two percentiles is between incidental and greater than incidental.

Graph 8.7.1 Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality. Error bars are 95% CIs derived using bootstrap methods due to non-normal distribution of the datasets. Key: '>incidental' = >2 fatalities/ turbine/ year, 'incidental' = <2 fatalities/ turbine/ year, 'none' = zero fatalities.



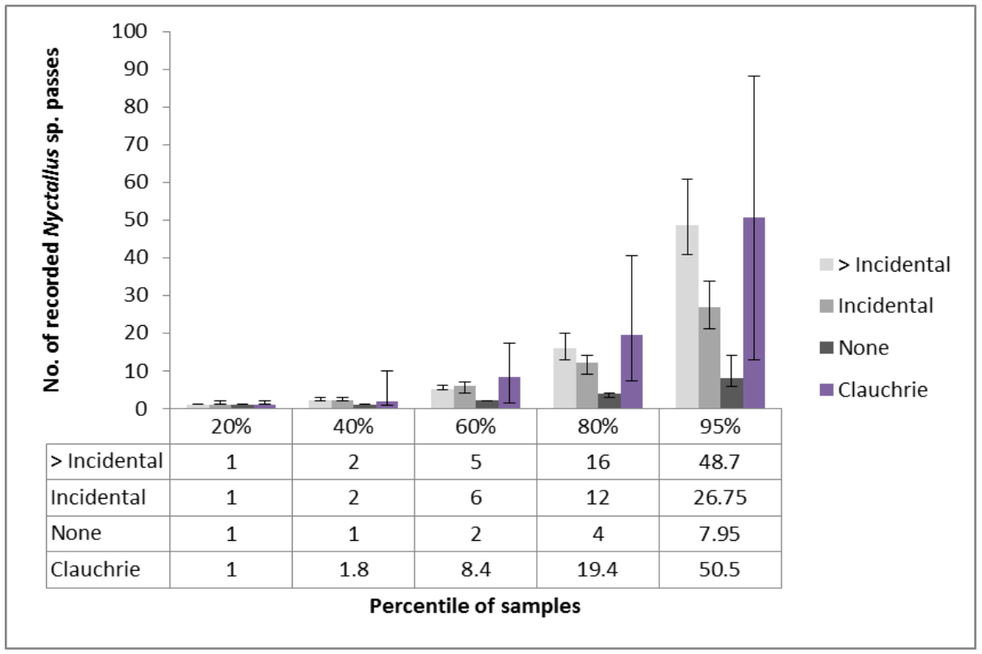
	20%	40%	60%	80%	95%
> Incidental	1	2	5	16	48.7
Incidental	1	2	6	12	26.75
None	1	1	2	4	7.95
Clauchrie	1	1	2	3.6	20.6

Graph 8.7.2 Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - removing data from D3 and D5. Error bars are 95% CIs derived using bootstrap methods due to non-normal distribution of the datasets. Key: '>incidental' = >2 fatalities/ turbine/ year, 'incidental' = <2 fatalities/ turbine/ year, 'none' = zero fatalities.



	20%	40%	60%	80%	95%
> Incidental	1	2	5	16	48.7
Incidental	1	2	6	12	26.75
None	1	1	2	4	7.95
Clauchrie	1	1	1	2.2	4.9

Graph 8.7.3 Number of *Nyctalus* species bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - D5 only. Error bars are 95% CIs derived using bootstrap methods due to non-normal distribution of the datasets. Key: '>incidental' = >2 fatalities/ turbine/ year, 'incidental' = <2 fatalities/ turbine/ year, 'none' = zero fatalities.



	20%	40%	60%	80%	95%
> Incidental	1	2	5	16	48.7
Incidental	1	2	6	12	26.75
None	1	1	2	4	7.95
Clauchrie	1	1.8	8.4	19.4	50.5

189. As described in **Technical Appendix 8.4**, following the assessment above, the overall collision risk presented by the proposed Development to *Nyctalus* bats based on recorded activity is therefore determined to be equivalent to zero. When looking at the detectors sited where the turbines will be located (i.e. removing D3 and D5; see **Figure 8.6** for locations), the predicted fatality rate is equivalent to zero for *Nyctalus* species. WTG4 will be key-holed into plantation. It is not apparent how bats are reaching Loch Scalloch, which means there could be potential risk of collision with WTG4 as bats commute to the loch, although the main route may be via a wide ride to the north. Comparison of activity at D5 with operational sites from SPR data shows the fatality risk is considered between incidental (less than two bats per turbine per year) and greater than incidental for *Nyctalus* bats. However, acknowledging the very slightly higher risk represented by WTG4, the overall collision risk presented by the proposed Development to *Nyctalus* bats based on recorded activity is determined to be **zero-low**.

190. The overall risk for *Nyctalus* species is therefore considered to be **Low**; this is a factor of the Medium site risk level combined with the zero-low activity level category achieved as a result of this species group being rarely identified on site (only recorded in 61 of 1,002 nights – on 6.08 % of the nights observed) and at a limited number of locations (see **Table 8.7.11**).

Table 8.7.11 Risk summary table for *Nyctalus* species

Species	Site risk	Activity level	Collision risk	Overall risk
Nyctalus species	Medium	Zero-Low	High	Low

192. Based on the above consideration of Site risk, activity level and collision risk for *Nyctalus* species, the magnitude of impact is assessed as **Barely perceptible spatial** and **Long-term temporal**.

193. Significance of Effect: Given the consideration of sensitivity and magnitude, the effect significance of collision risk on *Nyctalus* bats is considered to be **Barely perceptible** and **Not Significant** under the terms of the EIA Regulations.

Common and Soprano Pipistrelle

194. Nature Conservation Value and Conservation Status: Common and soprano pipistrelles were determined to be of **Local** Nature Conservation Value (see Error! Reference source not found.**.8**). The pipistrelles are at high collision risk, but being more numerous and with a likely more stable population in the Scottish context, they are considered to have a medium population vulnerability.

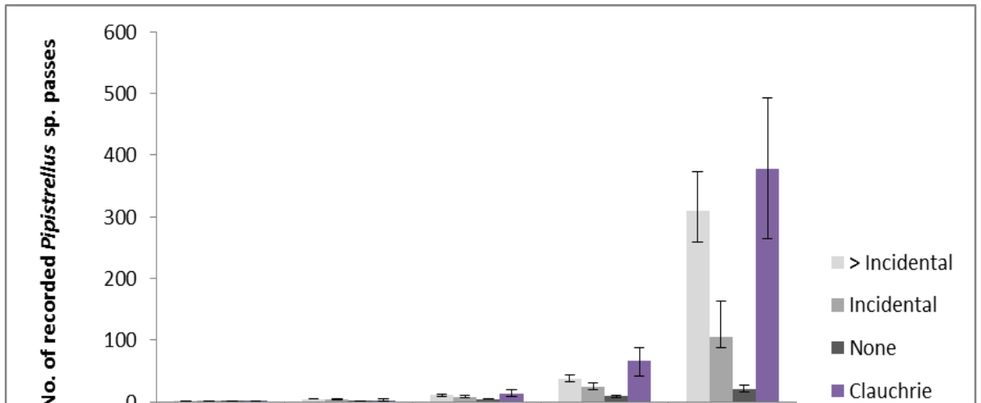
195. Magnitude: The assessment of Magnitude for the two pipistrelle species follows the same steps as described for *Nyctalus* species bats and utilises the same application of SPR data analysis to moderate the data skew of the Ecobat analysis, as detailed in **Technical Appendix 8.4**.

196. **Graph 8.7.4**, below, shows the number of pipistrelle bat passes (soprano and common pipistrelle combined) per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is seen that the bat activity at the proposed Development may generate a fatality rate between zero and incidental at the 20th and 40th percentile, although at the 60th, 80th and 95th percentiles the predicted fatality rate is greater than incidental.

197. **Graph 8.7.5**, below, also shows the number of pipistrelle bat passes (soprano and common pipistrelle combined) per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality, although on this graph passes recorded at D3 and D5 have been removed. It can be seen that removing the activity recorded at locations where turbines will not be sited (i.e. D3 and D5) lowers the number of bat passes greatly and the fatality rate generated reduces to between zero and incidental at the 95th percentile, and equivalent to zero at the other four percentiles.

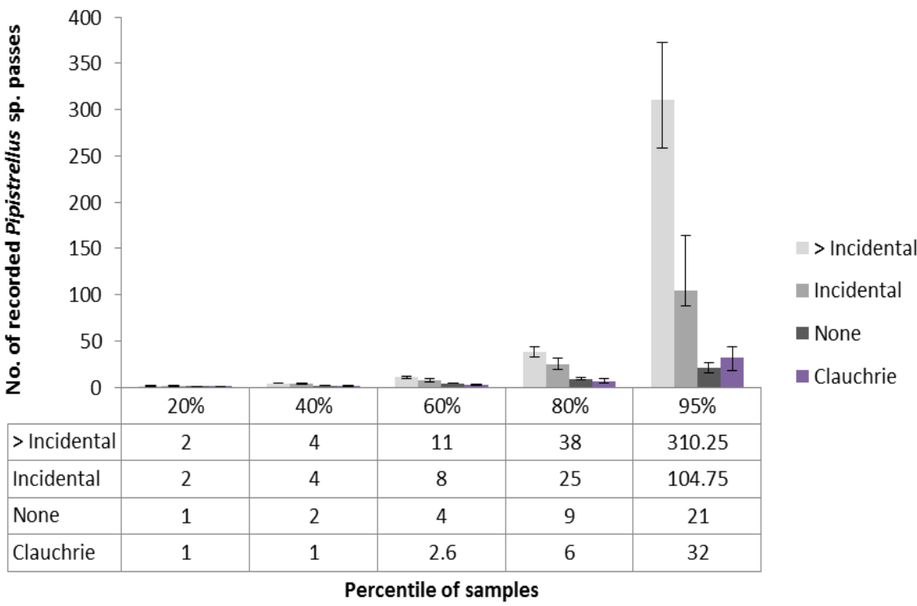
198. As a turbine will be located to the west of D5 (although not directly at D5), this position was compared on its own to the reference range. **Graph 8.7.6** shows the number of pipistrelle bat passes (soprano and common pipistrelle combined) per location per night at different percentiles compared to the same values derived from operational projects with different categories of bat fatality. From these data it is seen that the bat activity at the D5 may generate a fatality rate of greater than incidental (at all but the 95th percentile).

Graph 8.7.4 Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality. Error bars are 95% CIs derived using bootstrap methods due to non-normal distribution of the datasets.



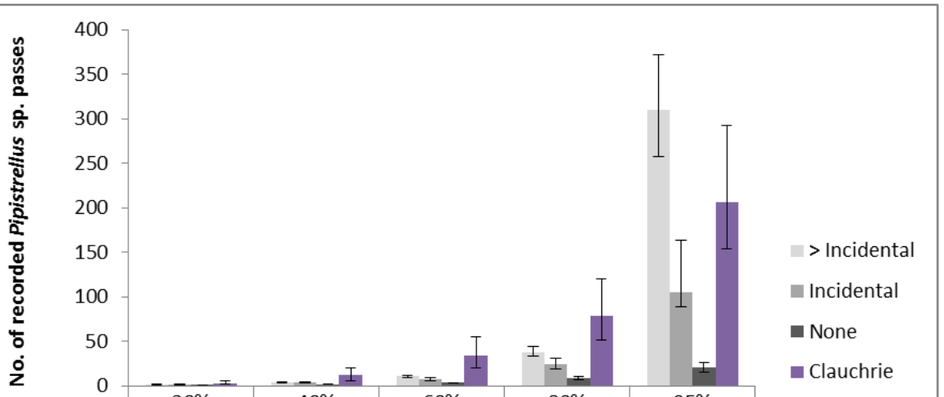
	20%	40%	60%	80%	95%
> Incidental	2	4	11	38	310.25
Incidental	2	4	8	25	104.75
None	1	2	4	9	21
Clauchrie	1	3	14	67.2	377.6

Graph 8.7.5 Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality - removing data from D3 and D5. Error bars are 95% CIs derived using bootstrap methods due to non-normal distribution of the datasets.



	20%	40%	60%	80%	95%
> Incidental	2	4	11	38	310.25
Incidental	2	4	8	25	104.75
None	1	2	4	9	21
Clauchrie	1	1	2.6	6	32

Graph 8.7.6 Number of pipistrelle bat passes per night per location at different percentiles compared to operational projects with a known category of bat fatality – using data from D5 only. Error bars are 95% CIs derived using bootstrap methods due to non-normal distribution of the datasets.



	20%	40%	60%	80%	95%
> Incidental	2	4	11	38	310.25
Incidental	2	4	8	25	104.75
None	1	2	4	9	21
Clauchrie	2.8	12	34.4	78.2	206.8

199. Following the assessment above, when looking at the detectors sited where the turbines will be located (i.e. removing D3 and D5; see **Figure 8.6** for locations), the predicted fatality rate is between zero and incidental (less than two bats per turbine per year) for common and soprano pipistrelles; the overall collision risk presented by the proposed Development to both pipistrelle species, based on recorded activity is therefore determined to be equivalent to **Low**. WTG4 will be key-holed into plantation forestry; this could mean that bats flying to and from Loch Scalloch will be at risk from the turbine if they follow the woodland edge.

200. Despite the potential collision risk category being High, the overall risk for common and soprano pipistrelles is considered to be **Low-medium**; this is a factor of the medium site risk level combined with the moderate activity level category achieved as a result of the frequency and numbers of this species group being identified on the Site. However, there is a risk of collision with WTG4 as bats fly to and from Loch Scalloch. This potential effect is unlikely to be as significant at other key-holed turbines, because they are not near areas of high common and soprano pipistrelle activity.

Table 8.7.12 Risk summary table for Pipistrelle species

Species	Site risk	Activity level	Collision risk	Overall risk
Soprano pipistrelle	Medium	Moderate	High	Low-medium
Common pipistrelle	Medium	Moderate	High	Low-medium

201. With a view to the unknown potential for bat interactions with WTG4, the assessment of the spatial and temporal magnitudes of impacts on the populations of both common and soprano pipistrelle species across the Site: this is impact is therefore considered to be a precautionary **Medium spatial** and **Long-term temporal**.

202. Significance of Effect: Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance of collision risk on common and soprano pipistrelle bats is considered to be **Low-medium** and **Significant** in the context of the EIA Regulations.

8.7.2 Operational Phase: Details of Additional Mitigation and Compensation

203. Additional mitigation measures identified for protected species that may be present on the Site include.

- The key-hole buffers around turbines would be set at 90 m, exceeding the minimum requirements for bat safety, which is defined as a minimum of 50m between rotors and habitat features (NE, 2014);
- Any lighting required for the operational phase (e.g. for maintenance works) would be directed away from any of the identified commuting and foraging routes (i.e. woodland edges and water courses) to avoid unnecessary disturbance to bats;
- As described in **Technical Appendix 8.6**, bat monitoring comprising acoustic surveying and carcass detection would be carried out to determine any requirement for annual curtailment of WTG4. The monitoring would be undertaken between sunset and sunrise in the months from April to October for the lifetime of the proposed Development. Following each annual monitoring period, if the number of bat fatalities was found to be less than two bats for the turbine per year, the operator would be entitled to propose amendments to the curtailment parameters. If the number of bat fatalities was found to be greater than two bats for the turbine per year, the operator would be obligated to propose amendments to the mitigation. Any changes proposed would be consulted on with SNH and implemented the following year with repeated monitoring using the methods described above unless otherwise varied (e.g. to investigate condition in which fatalities are occurring). Annual monitoring would cease upon validation of mitigation measures.

204. The habitat management and monitoring within the HMA described in **Section 8.6.3** and detailed in the **HMP** would continue during the operational phase of the windfarm.

8.7.3 Operational Phase: Residual Effects

205. Application of the additional mitigation and larger key-holing than the required minimum (see **Section 8.5.4**) would reduce the already low potential for bat-blade interactions and thus reduce the overall potential impact to **Barely**

perceptible over the long-term. The summary of predicted residual construction effects following implementation of mitigation is shown in **Table 8.7.13**, below.

Table 8.7.13 Summary of residual effects

Species	Significance	Mitigation	Significance of residual effect
Nyctalus species	**Barely perceptible** adverse	Standard inbuilt mitigation through design, including wide keyhole buffers,	**Barely perceptible** adverse
Common and soprano pipistrelle	**Low**	Standard inbuilt mitigation through design, including wide keyhole buffers, plus monitoring to assess the need for curtailment of WTG4 between sunset and sunrise for April-October	**Barely perceptible** adverse
Bog habitats	**None**	Implementation of HMP	**Low** beneficial

8.7.4 Potential decommissioning effects

206. The consent being sought for the proposed Development is in-perpetuity. However, in the event that the turbines need to be decommissioned in the future, the effects arising from decommissioning are considered to be at worst the same or less significant than those arising from the construction phase.

8.8 Cumulative Assessment

207. Cumulative effects are the additional changes or in-combination effects that result from the proposed Development in conjunction with other similar developments.

208. When assessing cumulative impacts, the primary aim is to identify how the impact on a habitat on one site relates to similar impacts in the wider area for existing or proposed developments which are subject to the EIA process. The developments most likely to cause impacts to a habitat or species in a similar manner to the proposed Development and therefore with the potential to work in a cumulative manner, are other windfarms. Consideration is therefore given to windfarm developments within a potential zone of influence, including those proposed, consented/under construction and operational. Developments at scoping stage have been omitted from the cumulative assessment, as there is generally insufficient data on potential impacts to be included, as the baseline survey period is ongoing, or results have not yet been published. Refused or withdrawn developments are also discounted.

209. Small developments with three or fewer turbines have also been excluded from the cumulative assessment, as such developments are generally not subject to the same level of detail of assessment and therefore no directly comparable data is generated.

210. The zone of potential influence for terrestrial IEFs has been assessed for a 10 km radius from the proposed Development application boundary. The operational 28-turbine Markhill Windfarm is within 5 km of the application boundary, with the operational Hadyard Hill Windfarm (55 turbines) and Assel Valley Wind farm (10 turbines) within 10 km; the eight-turbine Tralorg Windfarm, just on the edge of 10 km distant, is currently under construction.

8.8.1 Habitats

211. None of the other windfarms have direct connectivity to the proposed Development Site. There is, however, a potential for cumulative impacts as a result of loss of the same type of habitat across the wider area of the region, depending upon the scale of that loss from this and other windfarm developments.

212. The loss of 2.0 ha of wet heath as a result of the proposed Development is assessed as **Barely perceptible**, due to the small extent of the habitat within the Site. The contribution of the proposed Development to cumulative impacts on wet heath within the wider Natural Heritage Zone is therefore considered be **Barely perceptible** and an extensive cumulative impact assessment is therefore not necessary. Cumulative impacts on wet heath are therefore considered to be **Barely perceptible** and **Not Significant** in the context of the EIA Regulations.

213. Equally, the loss of 2.42 ha of dry heath as a result of the proposed Development is assessed as **Barely perceptible**, due to the small extent of the habitat within the Site. The contribution of the proposed Development to cumulative impacts on wet heath within the wider Natural Heritage Zone is therefore considered be **Barely perceptible** and an extensive cumulative impact assessment is therefore not necessary. Cumulative impacts on dry heath are therefore considered to be **Barely perceptible** and **Not Significant** in the context of the EIA Regulations.

214. The proposed habitat management within the c. 45 ha HMA is likely to result in direct positive effects by improving site hydrology and in turn facilitating the recovery of bog habitat across the area, but most notably within the 10.45 ha closest to dammed drains. In addition, 0.07 ha of riparian woodland would be created where no such habitat currently exists. These works are considered of **low** magnitude and an extensive cumulative impact assessment is therefore not necessary in the context of the EIA Regulations. Cumulative impacts on bog habitat are therefore considered to be **Not Significant** in the context of the EIA Regulations.

8.8.2 Species

215. Bats are more likely to be affected by the cumulative impacts of windfarm development, due to the distances travelled by some species when foraging and the potential cumulative risks to bat populations as a result of barotrauma and/or collision with operational wind turbines. As noted above, several windfarms are located within 10 km of the proposed Development application boundary. Of those that had EcIARs reporting bat potential, only the EcIAR for the Hadyard Hill Wind Farm identified a negligible impact to bats; the others, such as for the adjacent Mark Hill Wind Farm (Entec, 2005), identified either no cumulative impacts or had scoped-out bats from the assessment process. On a precautionary basis, cumulative impacts on bats are therefore considered to be **Barely perceptible** and **Not Significant** in the context of the EIA Regulations.

8.9 Summary

216. As summarised in **Table 8.9.14** below, residual effects on all IEFs are at worst, **Barely perceptible Adverse** and **Not Significant**.

Table 8.9.14 Summary Table

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
During Construction					
Wet heath	Barely perceptible spatial	Adverse		Barely perceptible spatial	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
Dry heath	Barely perceptible spatial	Adverse	Embedded mitigation, adoption of good practice, plus general habitat and pollution control measures: Habitats (general): • turbine key-hole buffers managed to ensure that regenerating trees do not exceed 3 m in height. • site establishment and general surface strip works to include careful removal segregation, storage of vegetated turves, to promote restoration. Pollution control measures: • protection of watercourses by provision and maintenance of silt fencing at crossing points; • check-dams supplemented by silt fencing within trackside drainage ditches for the duration of the construction programme; • spill kits; • drainage measures around all compounds and lay-downs; • use of biodegradable lubricants and hydraulic fluid products; and • light pollution controls.	Barely perceptible spatial	Adverse
Bog habitats	None	N/A	Implementation of HMP	Low	Beneficial
During Operation					
Wet heath	No impact	-	All effects considered under the construction phase	No impact	-
Dry heath	No impact	-		No impact	-
Bog habitats	None	N/A	Implementation of HMP	Low	Beneficial
Nyctalus bats: collision/barotrauma risk	Low	Adverse	Standard inbuilt mitigation through design, including wide keyhole buffers	Barely perceptible spatial	Adverse
Pipistrelle bats: collision/barotrauma risk	Low-medium	Adverse	Standard inbuilt mitigation through design, including wide keyhole buffers, plus monitoring to assess the need for curtailment of WTG4 between sunset and sunrise for April-October	Barely perceptible spatial	Adverse
Cumulative Effects					
Wet heath	No impact	-	None required	No impact	-
Dry heath	No impact	-	None required	No impact	-
Bat species	Barely perceptible spatial	Adverse	None required	Barely perceptible spatial	Adverse

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