



Balgray Wind Farm

Chapter 8: Ecology

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Document history

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List of Abbreviations

Abbreviation	Description
ASPT	Average Score per Taxon
AWIC	Acid Water Indicator Community
AYR-LBAP	Ayrshire Local Biodiversity Action Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CMS	Construction Method Statement
DAFOR	Dominant, Abundant, Frequent, Occasional and Rare
DGLBAP	Dumfries and Galloway Local Biodiversity Action Plan
EclA	Ecological Impact Assessment
ECU	Energy Consents Unit
EIA	Environmental Impact Assessment
ES	Environmental Statement
GCN	Great Crested Newt
GFT	Galloway Fisheries Trust
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HMP	Habitat Management Plan
IEF	Important Ecological Features
LNR	Local Nature Reserve
LPA	Local Planning authority
NPF4	National Planning Framework 4
NVC	National Vegetation Classification
oBHMP	Outline Biodiversity and Habitat Management Plan
PBA	Protection of Badgers Act 1992
PBRF	Potential Bat Roost Feature
PSS	Protected Species Surveys
RICT	River Invertebrate Classification Tool
RLB	Red Line Boundary
SAC	Special Areas of Conservation
SBL	Scottish Biodiversity List
SEPA	Scotland Environmental Protection Agency
SPA	Special Protection Area
SSSI	Sites of Special Scientific interest
SWEIC	South West Scotland Environmental Information Centre
UKBAP	UK Biodiversity Action Plan priority species
WHPT	Walley, Hawkes, Paisley and Trigg

8. Ecology

8.1 Introduction

- 8.1.1. This Chapter provides an overview of baseline ecological conditions within the Site and immediate surrounding environment. Ornithological interests are not discussed instead they are covered in Chapter 7. This Chapter focuses on assessing ecological features which could be significantly affected by the proposed wind farm, in line with the *Chartered Institute of Ecology and Environmental Management* (CIEEM) guidance¹.
- 8.1.2. The potential ecological effects of the proposed wind farm development during construction, operation and decommissioning are identified, assessed and evaluated in terms of their significance, in accordance with industry guidelines. Cumulative impacts at an appropriate biogeographic scale are described and an assessment of residual impacts, taking into consideration proposed mitigation measures, is also provided. Several elements of this Chapter relating to the identification and assessment of ecological receptors make reference to and are supported by the findings of the hydrological assessments, reported in Chapter 9: Hydrology, Geology and Hydrogeological Assessment of the Environmental Impact Assessment Report (EIAR).
- 8.1.3. Baseline ecological conditions have been established through combining the results of a desk-based review and ecological field surveys to obtain relevant ecological data to ascertain the status of habitats and protected species occurring within the Proposed Development Area and immediate surrounding landscape.
- 8.1.4. The baseline studies referenced in this chapter are supported by the following technical appendices and figures which provide detailed information regarding field survey methods and field data:
- Technical Appendix (8.1): Habitats & Protected Species Survey Results
 - Technical Appendix (8.2): Bat Survey Report;
 - Technical Appendix (8.3): Fish and Macro-invertebrate Survey Report; and
 - Technical appendix (8.4): Balgray Butterfly Survey Report (Confidential)
 - Technical Appendix (8.5): Outline Biodiversity and Habitat Management Plan
 - Technical Appendix (8.6): Confidential Species
 - Figure (8.1): Phase 1 Habitats
 - Figure (8.2): NVC Communities

¹ CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.3*. Chartered Institute of Ecology and Environmental Management, Winchester

- Figure (8.3): Protected Species Survey
- Figure (8.4): Confidential Protected Species
- Figure (8.5): Potential Bat Roost Habitat
- Figure (8.6) Blanket Bog Target Notes

8.1.5. The Ecological Impact Assessment (EclA) has been undertaken on the basis that mitigation by design measures provided within this EIAR will be incorporated into the proposed wind farm development design, construction and operation, where appropriate. These embedded mitigation measures are expected to avoid or minimise any potentially significant adverse ecological impact.

8.2 Terminology

8.2.1. The following zones are defined in this Chapter and its appendices:

- The 'Site' refers to the Red Line Boundary (RLB) as shown on Figure 1.3 of the EIAR. The components of the development which are assessed within this chapter are set out in Chapter 3: Description of Development;
- The 'Study Area' refers to the area for ecological assessment which includes the adopted surveys for habitats and species, shown in Figure 8.3.

8.3 Legislation, Policy and Guidance

8.3.1. The following framework of international, national and local legislation and planning policy guidance, which exists to protect habitats and specific species, has been considered as part of the assessment. Ecological baseline surveys have been conducted following recognised guidelines, and the ecological impact assessment takes account of current CIEEM guidelines (the CIEEM Guidelines¹).

Legislation

- *Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EC Habitats Directive);*
- *Environmental Impact Assessment Directive 85/337/EEC (the EIA Directive);*
- *The Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations), which transposes the Habitats Directive into UK law;*
- *The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012;*
- *The Conservation of Habitats and Species (Amendment) Regulations 2017, relating to reserved matters in Scotland;*
- *Wildlife and Countryside Act 1981 (as amended), (referred to as (WCA));*
- *The Nature Conservation (Scotland) Act 2004;*
- *The Wildlife and Natural Environment (Scotland) Act 2011;*

- *Protection of Badgers Act 1992 (as amended);*
- *Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011, which transpose the EIA Directive into the Scottish planning system; and*
- *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017*

National Policy Guidance

- The principal basis for the policy assessment at a national level will be NPF4 including but not limited to Policy 3 Biodiversity.
- The Policy Intent of Policy 3 is: To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks.
- The Policy Outcomes of Policy 3 are that: Biodiversity is enhanced and better connected including through strengthened nature networks and nature-based solutions.
- For national, major and EIA developments NPF4 Policy 3b requires applicants to demonstrate that biodiversity will be in the “demonstrably better state” required by Policy 3(b), as part of this criteria there is a requirement for proposed developments to provide significant biodiversity enhancements, in addition to any proposed mitigation. This should include nature networks, linking to and strengthening habitat connectivity within and beyond the development, secured within a reasonable timescale and with reasonable certainty. Management arrangements for their long-term retention and monitoring should be included, wherever appropriate
- This and the relationship between the Proposed Development and other relevant policies are considered in more detail in the Planning Statement which accompanies this application.

Other Guidance

- 8.3.2. Particular attention has also been given to the guidance documents listed below that are applicable to assessing the effects of wind farm developments on ecology. Reference has also been made to guidance documents through the report where relevant.
- *European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements;*

- *CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal*; ²
- *Land Use Planning System SEPA Guidance Note 4: Planning Guidance on Wind Farm Developments*³;
- *Bats and onshore wind turbines - survey, assessment and mitigation*⁴
- *Good Practice during Wind Farm Construction*⁵;
- *Handbook for Phase 1 Habitat survey: a technique for environmental audit*⁶
- *National Vegetation Classification Users' handbook*⁷;
- *Scottish Biodiversity List*⁸ (SBL) (with habitat description from the UKBAP^{13, 10}); and
- *Dumfries & Galloway Local Biodiversity Action Plan*¹¹.

8.4 Consultation

8.4.1. Prior to the submission of a scoping request, Fred. Olsen Renewables Limited (the Applicant) entered into early consultation with both NatureScot and the Galloway Fisheries Trust to outline and agree a survey scope and schedule for the Proposed Development. Table 8.1 below details the response from NatureScot.

Table 8.1: Summary of NatureScot response from initial consultation on proposed ecology scope. Response dated 31 July 2023.

Comments raised and recommendations	Relevant section/comments
We do not hold any specific data in relation to this location and it appears that you have	Vegetation surveys of the site have been undertaken to UK Hab, Phase 1 and NVC

² CIEEM (2024). *Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland; Terrestrial, Freshwater and Coastal*, Version 1.4. Chartered Institute of Ecology and Environmental Management, Winchester

³ SEPA, 2012. *Land Use Planning System Guidance Note 4: Planning guidance on wind farm developments*. Appendix 2. Version 9: 11th September 2017

⁴ NatureScot (2021) *Bats and onshore wind turbines - survey, assessment and mitigation*. Available online: <https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation>

⁵ NatureScot (2024) *Good practice during wind farm construction*. Available online: <https://www.nature.scot/doc/good-practice-during-wind-farm-construction#:~:text=Turbines%20and%20other%20infrastructure%20should,constraints%20identified%20during%20the%20EIA.>

⁶ JNCC, (2010). *Handbook for Phase 1 Habitat survey: a technique for environmental audit*. JNCC, Peterborough

⁷ Rodwell, J. S. (2006). *National Vegetation Classification: Users' handbook*. JNCC, Peterborough

⁸ The Scottish Government, 2013b. *Scottish Biodiversity List*. Accessed online: <https://www.nature.scot/doc/scottish-biodiversity-list> last accessed 15/11/2024

⁹ <https://jncc.gov.uk/our-work/uk-bap-priority-species/> last accessed 15/11/2024

¹⁰ <https://jncc.gov.uk/our-work/uk-bap-priority-habitats/> last accessed 15/11/2024

¹¹ Normal, et al. (2009) *Dumfries & Galloway Local Biodiversity Action Plan*. Dumfries & Galloway Biodiversity Partnership.

addressed most of the elements detailed in our scoping and pre-application guidance for onshore wind farms document. The only element that you appear not to have mentioned specifically is the peatland resource on the site. The carbon and peatland map 2016 data only covers a small portion of the development boundary and therefore peat depth survey data may well be required to inform the EIA. We also note that you intend to use UKHab as a survey protocol. This is an approach that we do not currently support in Scotland where EUNIS is still the main classification system. Given that you also intend to undertake NVC survey for the site, this is unlikely to be an issue	methodology. Due to comments over UK Hab suitability for Scotland habitats, this assessment has used Phase 1 and NVC methodology in its final submission. See Technical Appendix 9-4: Peat Assessment Report for additional information regarding peat.
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- 8.4.2. As per NatureScot guidance for Environmental Impact Assessment (EIA) Table¹², a scoping document was issued to a range of consultees in January 2024. No features were scoped out of further assessment within the scoping report. The scoping discussions also made reference to a possible forestry creation scheme which was being considered at that time. Reference to this has been made in the consultation response.
- 8.4.3. A scoping response was received from the Scottish Government Energy Consents Unit (ECU) on 24 April 2024. Details of the scoping responses which are of relevance to ecology are provided in Table 8.2 below.

Table 8.2: Summary of scoping responses in relation to the ecological elements for the proposed wind farm development.

Consultee: NatureScot: 06 March 2024	
Summary	
The scope outlined for the EIA is in line with our pre application guidance for onshore wind farms. We have provided comment in relation to topics relevant to our remit as well as addressing questions raised in the scoping document.	
Protected species	
Comments raised and recommendations	Relevant section/comments
We are happy with the scope presented for ecological interests and support the work proposed to assess the site for Marsh Fritillary, which is a UK biodiversity action plan species and is a rarity in Southern Scotland.	Full adult butterfly and a larval web survey were undertaken in 2024. See Technical Appendix 8.4 and Section 8.6 for full results.
Habitats	

¹² Scottish Natural Heritage (2018) *Environmental Impact Assessment Handbook Environmental Impact Assessment Handbook Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland.*

Comments raised and recommendations	Relevant section/comments
With regards the potential change in baseline if the site is approved for forestry, we are happy that the assessment considers the impacts on habitats as they stand at present. Should the forestry proposal gain consent prior to submission for Balgray, then we do not perceive this as a significant issue in terms of the EIA. Changes to habitat composition and associated impacts will be dealt with through the forestry application process. In terms of measuring habitat loss, we agree that this is calculated based on the habitat present for the majority of the project.	At the time of writing this assessment, no forest creation scheme had been submitted. Additionally, discussions were still ongoing between parties involved in the forestry creation scheme as such no detailed planting schemes were available. Subsequently, the assessment including habitat loss has been determined from the current site baseline.
Biodiversity Net Gain	
Comments raised and recommendations	Relevant section/comments
Policy 3 of National Planning Framework 4 (NPF4) requires that new developments deliver positive net gain for biodiversity. For a wind farm, the main mode of delivery is through the implementation of a habitat management plan (HMP) that compensates for any residual effects resulting from the proposal. We strongly advise that the application includes a well-developed HMP that allows consultees to assess the merits of the proposal in line with NPF4. We recommend taking account of our developing with nature guidance and our habitat management plans guidance to inform the proposal and plans.	See Section 8.10 for an overview and a Outline Biodiversity Habitat Management Plan has been provided (Technical Appendix 8.5)
Consultee: Galloway Fisheries Trust: 25 March 2024	
Fisheries	
Comments raised and recommendations	Relevant section/comments
We appreciate that Locogen Ltd contacted GFT early last year to discuss the proposed development site and any surveys we considered relevant to the site. After considering the site we proposed electrofishing and aquatic invertebrate surveys, which follows the Marine Directorate guidance titled 'Monitoring watercourses in relation to onshore wind farm developments: generic monitoring programme' (https://www.gov.scot/publications/monitoring-watercourses-in-relation-to-onshore-wind-farm-developments-generic-monitoring-programme). This guidance states the need for fish surveys and aquatic invertebrates and provides guidance and minimum standards. Locogen agreed for these surveys to be undertaken.	Baseline fish and macroinvertebrate surveys were undertaken in September 2023 full results are detailed in Technical Appendix 8.3
GFT expressed that any water course crossing over Hewke Burn must ensure fish access is protected, recommending timings of works and instream fish capture to mitigate potential impacts. GFT also expressed interest in potential biodiversity net gain measures, requesting that opportunities to increase the resilience of water courses to climate change impacts is considered; potentially including riparian tree planting	See mitigation Section 8.10.
Consultee: Scottish Environmental Protection Agency (SEPA): 29 February 2024	
Comments raised and recommendations	Relevant section/comments
We welcome the intention to include an assessment of GWDTE based on National Vegetation Classification (NVC) mapping. We understand it is currently	See Figure (8.2)

considered unlikely that areas of moderate or high potential GWDTE will actually be groundwater dependent. In order to agree with that conclusion, we would need to have the opportunity to review the ecology surveys and assessment of the site. We also note the reference to a wetland area and small springs in Section 9.2 of the report so would expect these to be mapped and identified and, along with other potential GWDTE identified, assessed and appropriate buffers implemented in accordance with our guidance as part of the EIAR. If GWDTE are identified a site-specific assessment of the likelihood that habitats are true GWDTE will be required.	Chapter 9: Hydrology, Geology and Hydrogeological Assessment.
While we are broadly content with the proposed assessment approach in relation to UKHab we have been made aware of concerns regarding the use of this methodology for detailed surveys of wetland habitats, therefore until these issues are resolved, we will require a NVC survey at the application stage. These concerns relate to discrepancies in habitat definitions of common Scottish wetland communities; ambiguity in correspondences to NVC types; unclear descriptions of physical characteristics and the limitation in representation of mosaics of multiple habitat types (typical in upland and wetland areas).	Vegetation surveys of the site have been undertaken to UK Hab, Phase 1 and NVC methodology. Due to comments over UK Hab suitability for Scotland habitats, this assessment has used Phase 1 and NVC methodology. See Technical Appendix 8.1.

8.5 Survey Methodology

Desk Study

- 8.5.1. A desk-based review has been undertaken following CIEEM best practice guidelines¹. The desk-based study collated relevant public survey data and historical records of protected species from the Site and surrounding environment. The purpose of the desk-based review was to help inform and guide the baseline ecological field survey and identify any potential constraints or potential important ecological receptors early in the process.
- 8.5.2. Data requests were submitted to the South West Scotland Environmental Information Centre (SWSEIC) on 24 July 2024 to obtain records / information for the following:
- Sites with conservation designations located within a 10km of the Options Area:
 - Sites of Special Scientific interest (SSSI)
 - Special Areas of Conservation (SAC)
 - Ramsar sites
 - Non-designated sites within 2 km
 - Protected data within 2 km (all years)
 - Bat data within 10 km (all years) to account for wider ranging species (*Nyctalus* sp.)
 - Ancient woodland inventory within 2 km

- 8.5.3. NatureScot's SiteLink¹³ was used to determine qualifying features of each designated site.

Field surveys

- 8.5.4. This ecological assessment focuses on the Proposed Development Site and appropriate buffer (the Study Area). Study Areas are shown in Figure 8.1. Study areas for ecological receptors may vary due to species specific search/survey requirements. These have been informed by best practice guidance.
- 8.5.5. A brief description of the survey methodology undertaken can be found below. Further detail on survey methods employed can be found in Technical Appendixes 8.2, 8.3 and 8.4.
- 8.5.6. Limitations for each targeted survey are addressed in each survey section.

Phase 1 Habitat Survey

- 8.5.7. A Phase 1 habitat survey of the development area and 250m buffer (where accessible) was undertaken early September 2023 (05 to 11 September 2023) this is within NatureScot's optimum survey window for detailed habitat assessment¹⁴. The survey followed the Joint Nature Conservation Committee's (JNCC) Handbook for Phase 1 Habitat Survey.
- 8.5.8. Descriptions of the habitat types and target notes were provided. Target notes recorded additional details of habitat/vegetation structure and any features of ecological interest within the Study Area.

National Vegetation Classification (NVC) Survey

- 8.5.9. National Vegetation Classification (NVC) surveys of the full site and 250m buffer (where accessible) was undertaken in conjunction with the Phase 1 surveys in early September 2023 (05 to 11 September 2023). NVC surveys followed standardised methodology detailed in the *National Vegetation Classification: Users' Handbook*⁷. Communities and sub-communities were mapped in the field using a spatially accurate GPS enabled tablet with Q-field software.
- 8.5.10. Target notes were recorded to provide additional information on habitat features, species composition/abundance and to note any features of ecological interest. Where areas were deemed to support varied communities or habitat mosaics, the proportion of each was estimated in field and recorded (where possible).
- 8.5.11. Where appropriate, 2m x 2m quadrats were used to collect data for comparison with published species accounts.

¹³ <https://sitelink.nature.scot/home> last accessed 15/11/2024

¹⁴ NatureScot (2024) Ecological Survey Calendar. Accessed online: <https://www.nature.scot/doc/ecological-survey-calendar>

Ground Water Dependent Terrestrial Ecosystem Assessment

- 8.5.12. The potential of habitats to be Ground Water Dependant Terrestrial Ecosystems (GWDTE) was assessed based on: SEPA guidance¹⁵. This guidance uses NVC communities to give an indication of groundwater dependency; the guidance is adapted from the UKTAG list of NVC communities and associated groundwater dependency scores¹⁶.

Bat Surveys

Bat roost assessment

- 8.5.13. Preliminary bat roost assessment was undertaken through August – September 2023, during wider protected species surveys. Ground based assessment of the study areas were focused predominantly on identifying trees within the Site which could support Potential Bat Roost Features (PBRF). Trees which supported PBRF were assessed according to the Bat Conservation Trust guidance that was current at the time of the survey¹⁷.

Ground-level static surveys

- 8.5.14. Fixed position static detector surveys were carried out across the 2024 survey season, with three deployments across April, July and September. Six Song Meter Mini Bat static detectors were deployed at each turbine location, mounted approximately 2m in height. In total each detector was deployed for a minimum of 10 nights per deployment.
- 8.5.15. Detectors were deployed at sample locations of highest value habitat close to the proposed turbines. This approach was adopted so that a worst-case scenario could be assessed and peak bat activity within the vicinity to turbine locations could be recorded.
- 8.5.16. Elitech RC-5+ Reusable USB Temperature Data loggers were also set up at each detector/turbine locations to monitor the temperature for each survey night.

Bat Survey limitations

- 8.5.17. All surveys were undertaken from ground level.

¹⁵ SEPA (2024) Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems. Available online: <https://www.sepa.org.uk/media/a1yh0blq/guidance-on-assessing-the-impacts-of-developments-on-groundwater-dependent-terrestrial-ecosystems.docx>

¹⁶ Water Framework Directive (2008) ANNEX 1: NVC plant communities and dependency on groundwater (table updated 5 October 2009). Available online: <https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/UKTAG%20guidance%205%20ab%20ANNEX%201%20updated%205%20October%202009.pdf>

¹⁷ Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

- 8.5.18. It is not always possible to identify a bat call to species level, especially for *Myotis* species, or if the call is not clear. Files may contain only fragments of a call, or else the bat may be calling from a distance from the detector in which case it may not be complete enough to assign to a specific species.
- 8.5.19. Due to design evolution, the locations for some of the turbines has changed throughout the monitoring period. This has resulted in no data being collected for Turbine 6 location (T6) during the Spring monitoring period. This reduced data is not considered to significantly affect the overall conclusions of this assessment.
- 8.5.20. Passive monitoring cannot determine bat abundance within the Site, it can only provide an indication of the level of activity for specific locations.
- 8.5.21. No wind speed data was collected, number of nights suitability has been based on weather temperatures only.
- 8.5.22. Current guidance⁴ recommends the use of the Ecobat tool to obtain a measure of relative bat activity. However, this software was / is not available at the time of writing. Instead, data was analysed through the British Trust of Ornithology (BTO) acoustic pipeline and the consultant ecologist's professional judgment were used in its place.

Great Crested Newt

- 8.5.23. All suitable waterbodies within the Site were surveyed for Great Crested Newt (GCN). Surveys were limited to Hallhills Loch, which is the only waterbody within the Site for potential breeding GCN. A presence/absence survey was completed in 2024.
- 8.5.24. When present in waterbodies GCN release trace amounts of DNA into the water column, water samples collected from target ponds can be analysed and used to confirm GCN habitation or establish absence. Collection of water samples from Hallhills Loch were undertaken on 04 June 2024.
- 8.5.25. Analysis of the water samples were completed by *SureScreen Scientifics Ltd*. The collected samples were analysed for the presence of GCN eDNA following the protocol stated in Biggs *et al.*¹⁸.

Water vole

- 8.5.26. Water vole (*Arvicola amphibious*) surveys were undertaken in September 2023 and June 2024. Preliminary surveys in 2023 identified potential suitable habitat within the Site for water vole habitation, further survey effort in June 2024 was undertaken to attempt to identify field signs and evidence of use. Field signs searched for were as described in Strachen, Moorhouse & Gelling (2011)¹⁹.

¹⁸ Biggs J, et al (2014). *Analytical and methodological development for improved surveillance of the Great Crested Newt*. Defra Project WC1067. Freshwater Habitats Trust: Oxford.

¹⁹ Strachen, R., Moorhouse, T. & Gelling, M. (2011). *The Water Vole Conservation Handbook*. 3rd Edition, Wildlife Conservation Research Unit, University of Oxford, Abingdon

Marsh fritillary

8.5.27. Surveys to fully assess marsh fritillary (*Euphydryas aurinia*) populations within the Development Area were undertaken between May – October 2024. The surveys were split into three components, these being:

- Habitat suitability assessments this involved mapping the distribution of devil's-bit scabious (*Succisa pratensis*) within the Site. Devil's-bit scabious is the larval food plant, results of the survey were used to identify areas of potential suitable habitat. These were undertaken in May 2024.
- Weekly butterfly transects were undertaken from 13 May 2024 – 29 July 2024. This coincides with the entire typical adult flight period. In total four transects were surveyed, with each transect aiming to cover examples of a range of suitable habitats.
- Three larval web counts were undertaken in August, September and October 2024. Web counts were undertaken along the same transects as the butterfly surveys. Vegetation on 1m either side (i.e. a 2m band across the site) of the transect was searched thoroughly, which equated to 1.25% of the total area of suitable habitat. The peak number of larval webs found in each section were added together to provide a total number of larval webs per transect. Survey visits were timed to avoid periods of heavy precipitation as heavy rain can cause larval webs to disintegrate.

8.5.28. Butterfly transects and larval web counts followed standard methodology^{20 21 22}.

8.5.29. Following completion of larval web counts the data was used to inform an estimate for the total number of larval webs across the entirety of suitable habitat identified. An estimated total number of larval webs was calculated using the formula below:

$$\text{Larval web estimate} = \text{larval web count} \times \text{total suitable habitat area} / \text{area sampled (2 x transect length)}$$

8.5.30. Full details on methodology can be found in Technical Appendix 8.4.

Survey Limitations

8.5.31. Due to the size of the Site, only a small proportion of the suitable habitat area was sampled (a 2m wide strip for larval web counts, which amounts to 1.25% of the total suitable habitat area) and a 4m wide strip for adult counts) along transect sections.

²⁰ Hill, D., Fasham, M., Tucker, G., Shewry, M. & Shaw, P. (2005) *Handbook of Biodiversity Methods*. Cambridge University Press, Cambridge.

²¹ Pollard, E. & Yates, T.J. (1993) *Monitoring Butterflies for Ecology and Conservation*. Chapman & Hall, London

²² UK Butterfly Monitoring Scheme (UK BMS). (No date). *Ng2: Monitoring Marsh Fritillary Larval Webs*. Available online: <https://ukbms.org/sites/default/files/downloads/UKBMS%20Ng2%20%20Marsh%20Frit%20Webs%20guidance%20notes.pdf>

Although the route was selected to give good coverage of a range of habitats present, key colony areas could have been missed or the transects selected may have been poorly representative of the overall area. However, efforts were made to ensure representative sampling and extrapolation is an accepted technique in ecology and conservation to estimate population density when resources are limited. Although greater survey effort may have provided more accurate counts (and larval density estimates), the survey effort was considered sufficient to provide robust baseline data.

- 8.5.32. For the butterfly adult transect visits, weather conditions were generally good during the survey visits (calm, clear dry and moderately warm). However, temperature and cloud cover / percent sunshine did not meet the guidance recommendations on the following visits: visit 2, visit 4 for transect 4 only, visit 5, visit 6, visit 8, visit 12. Despite aiming to carry out survey visits in suitable conditions, weather during the summer of 2024 was unusually cool and damp. Even during good summers, it can be difficult to time visits to coincide with suitable conditions at upland sites in Scotland. However, weather conditions during butterfly transect visits was not considered a significant limitation, since large numbers of marsh fritillaries were recorded on visits 5 and 6 under suboptimal conditions. The frequency of survey visits and good coverage of the adult flight period also meant that occasional suboptimal conditions were unlikely to affect the robustness of peak count data collected.
- 8.5.33. Weather during 2023 will also have influenced the populations present in 2024. Conditions in 2023 were also atypical; warm and dry in June, then cooler and damper in July and August. Therefore, the results may not reflect normal conditions, however some degree of population fluctuation as a result of weather conditions is expected annually.
- 8.5.34. None of these limitations are considered significant for the purposes of these surveys.

Fish and macro-invertebrate survey

- 8.5.35. The Site is on the Dryfe water, falling within the River Annan catchment. Baseline electrofishing, freshwater macroinvertebrate and water quality surveys were undertaken in September 2023 by the Galloway Fisheries Trust (GFT) on six sites within the Site; these were selected by the GFT.

Fish survey

- 8.5.36. Electrofishing is the main methods for assessing juvenile salmonids populations. Each survey site was fished four times using a fully quantitative approach which is fully detailed in the Technical Appendix 8.3. After the electrofishing has been completed, a targeted and detailed habitat survey was completed of the Site noting length, channel widths, and instream/bankside habitat.
- 8.5.37. Table 8.3 below provides details on the sites where electrofishing was undertaken.

Table 8.3: Electrofishing sites.

Watercourse / River Order	Grid Reference	Survey Month
Hewke Burn (below loch)	315838 588667	September 2023
Tributary of Halhills Loch	316065 588705	September 2023
Hewke Burn (above loch)	316564 588550	September 2023
Tributary of Hewke Burn	316626 588534	September 2023
Kirkcroft Burn	315629 587864	September 2023
Upper Hope Burn	316522 586714	September 2023

- 8.5.38. The electrofishing study focused on assessing the status of juvenile salmonid species, namely salmon and trout. The study separated fish densities into fry and parr. Salmonid and trout fry (0+) classify as young fish less than one year old resulting from spawning at the end of 2022. Parr (1+ and older 1++) are young fish of greater than one year and greater than two years old (where present) from spawning in 2021 or previously. Trout of up to three or four years old are also included in this category.
- 8.5.39. Fish density results are classified according to the Scottish Fisheries Coordination Centre (SFCC) Scottish national classification scheme and are expressed as being absent, very low, low, moderate, high or very high excellent (see Technical Appendix 8.3).
- 8.5.40. At each survey site the presence of non-salmonid fish species is noted. However, population densities for these species are not calculated instead numbers of individuals are counted.

Freshwater Macroinvertebrate

- 8.5.41. Macroinvertebrate surveys were conducted to gain an understanding of the health of the invertebrate communities at each sample site, with samples being collected alongside electrofishing sites (at the first suitable habitat upstream of the electrofishing site unless stated otherwise). Invertebrate samples were collected using a standard 25 cm frame kick sampling net with 1 mm mesh immediately post electrofishing.
- 8.5.42. Samples were sorted and individuals counted and identified to family level in accordance with the Walley, Hawkes, Paisley and Trigg (WHPT) (2014)²³ sampling for biotic assessment. Samples were scored using WHPT system which affords scores to invertebrate family's dependant on their general water quality requirements and analysed using the River Invertebrate Classification Tool (RICT) Model 44 software. Full methodology can be found in Technical Appendix 8.3.

²³ Water Framework Directive – United Kingdom Technical Advisory Group (WFD-UKTAG) (2014) *Invertebrates (General Degradation): Walley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT)*. Stirling, Water Framework Directive – United Kingdom Advisory Group.

Protected species

- 8.5.43. Protected Species Surveys (PSS) for badger (*Meles meles*), otter (*Lutra lutra*), red squirrel (*Sciurus vulgaris*) and pine marten (*Martes martes*) were carried out throughout the Site and up to 250m buffer (where accessible) between August – November 2023.
- 8.5.44. Surveys of the proposed access route and 250m buffer were undertaken in September 2024.
- 8.5.45. All suitable habitats including watercourses, woodland, grassland and heathland within the site were surveyed to current standard guidance each species. Including Neal & Cheeseman (1996)²⁴, Bang & Dahlstrøm (2001)²⁵, Sargent et al (2003)²⁶, Chanin (2003)²⁷, and Dean (2021)²⁸.

²⁴ Neal, E. & Cheeseman, C. (1996). *Badgers*. Poyser Natural History

²⁵ Bang, P. & Dahlstrøm, P. (2001). *Animal Tracks and Signs*. Oxford University Press, Oxford

²⁶ Sargent, G., Morris, P. and Troughton, G. (2003). *How to Find and Identify Mammals*, 3rd Edition. The Mammal Society, Southampton

²⁷ Chanin, P (2003). *Monitoring the Otter Lutra lutra*. *Conserving Natura 2000 Rivers*: Monitoring Series No. 10. English Nature, Peterborough

²⁸ Dean, M. (2021) *Water Vole Field Signs and Habitat Assessment: A practical Guide to Water Vole Surveys*. Exeter: Pelagic Publishing.

8.6 Survey Results

Desk Study: Designated Sites

- 8.6.1. A total of five designated sites were identified within a 10km radius of the Proposed Development. However, Castle Loch RAMSAR, and Special Protection Area (SPA) which are designated due to ornithological purposes and as such will not be discussed further within this assessment.
- 8.6.2. The remaining three designated sites are all Sites of Special Scientific Interest (SSSI). Perchhell Loch is the closest and is designated for basin fen habitats and its water beetle assemblages including *Hydroporus elongatulus* which has a limited range in the Scotland. There are no Special Areas of Conservation or locally designated sites within 10km of the Proposed Development.
- 8.6.3. A summary of identified designated sites within 10km is provided in Table 8.4.

Table 8.4: Statutory sites within 10km, designated for ecological features.

Site	Designation	Notified Features	Proximity to Balgray
Perchhall Loch	SSSI	<i>Fen</i> : Basin Fen <i>Invertebrates</i> : Beetles	5.4km
Dryfe Water	SSSI	<i>Woodland</i> : Upland mixed ash woodland	6.8km
Lochmaben Lochs	SSSI	<i>Freshwater habitats</i> : Eutrophic loch <i>Fens</i> : Open water transition fen <i>Invertebrates</i> : Beetle assemblage <i>Invertebrates</i> : Fly assemblage	10km

Desk Study: Protected Species

- 8.6.4. A list of target / protected species recorded within 2km of the Proposed Development and records for bats within 10km is provided below in Table 8.5. Additionally, a search for Ancient Woodland within 2km of the site was undertaken.
- 8.6.5. Results of the data search highlighted that there are areas of ancient semi-natural woodland, ancient woodland and plantation on ancient woodland. Polygons of woodland along the south boundary of the Site are designated as ancient woodland.

Furthermore, an area of Plantation on Ancient Woodland Site (PAWS) is present within the site.

Table 8.5: SWSEIC records for protected/target species recorded within 2km of the SA; and for bats up to 10km.

Taxon Group	Common Name	Covering Legislation	Record No	Last Recorded
Terrestrial mammal	Natterer's Bat	EPS, Sch 5, SBL, DG-LBAP	13	2016
	Pipistrelle sp.	EPS, Sch 5, SBL	102	2018
	Common Pipistrelle	EPS, Sch 5, AYR-LBAP, DG-LBAP	145	2018
	Soprano Pipistrelle	EPS, Sch 5	126	2022
	Brown Long-eared Bat	EPS, Sch 5	10	2018
	Bats	EPS, Sch 5	62	2019
	Whiskered/Brandt's Bat	EPS, Sch 5, AYR-LBAP, DG-LBAP, SBL	5	2016
	Daubenton's Bat	EPS, Sch 5, DG-LBAP, SBL	30	2016
	Lesser Noctule	EPS, Sch 5, DG-LBAP	128	2022
	Whiskered Bat	EPS, Sch 5, AYR-LBAP, DG-LBAP, SBL	7	1995
	<i>Nyctalus</i> Bat species	EPS, Sch 5	36	2018
	Nathusius's Pipistrelle	EPS, Sch 5, WCA5, SBL	12	2018
	American mink	Sch 9	1	2013
	European badger	PBA	2	1960
	Eurasian red squirrel	Sch 5, SBL, UKBAP, AYR-LBAP, DG-LBAP		
	European Otter	EPS, Sch 5, SBL, UKBAP, AYR-LBAP, DG-LBAP	13	1991
	West European Hedgehog	SBL, UKBAP	1	2007
	Brown Hare	AYR-LBAP, DG-LBAP, SBL, UKBAP	2	2021
Amphibian	Common toad	Sch 5, SBL, UKBAP	1	2020
	Common frog	Sch 5	2	2021
	Palmate newt	Sch 5	6	2021
Reptile	Common lizard	Sch 5, SBL, UKBAP, Sch 5	1	2021
flowering plant	Bluebell	Sch 8, DG-LBAP	2	2021
	Lesser Butterfly-orchid	DG-LBAP, SBL, UKBAP	2	2013
	Heath Cudweed	DG-LBAP, SBL	1	1985
insect - butterfly	Dingy Skipper	DG-LBAP, UKBAP	4	2009
	Small Heath	SBL, UKBAP	14	2022

	Small Pearl-bordered Fritillary	DG-LBAP, SBL, UKBAP	5	2022
	Small Heath	SBL, UKBAP	1	2021
	Small Pearl-bordered Fritillary	DG-LBAP, SBL, UKBAP	1	2021
insect - moth	Latticed Heath	SBL, UKBAP	3	2022
	Cinnabar	SBL, UKBAP	3	2022
	Rosy Rustic	SBL, UKBAP	1	2021
	Sallow	SBL, UKBAP	1	2021
	Small Square-spot	SBL, UKBAP	1	2021
	Centre-barred Sallow	SBL, UKBAP	1	2021
Key: EPS = European Protected Species; Sch 5 & 8= species fully or partially protected under Schedule 5 or 8 of the Wildlife & Countryside Act 1981 (as amended); PBA = Protection of Badgers Act 1992 (as amended); SBL = Scottish Biodiversity List species; UKBAP = UK Biodiversity Action Plan priority species; DG-LBAP = Dumfries and Galloway Local Biodiversity Action Plan Priority Species; AYR-LBAP = Ayrshire Local Biodiversity Action Plan key species				

Field survey results

Phase 1 Habitat Survey

- 8.6.6. The majority of the Site consists of open ground habitat, with the dominant habitat on-site consisting of improved grassland. Improved grassland is generally agricultural, with the main use for grazing. Marshy grassland is abundant within the development area, forming the predominant habitat in the north/northeastern extent of the Site.
- 8.6.7. Whilst grassland forms the dominant broad habitat type within the study and development area, the Site does support a mosaic of mire habitat including bog and flush habitats, alongside isolated parcels of heathland. The northeastern boundary of the site supports the main extent of fen habitat within the Site, with basin mire encompassing an area of wet modified bog; basin mire is present within the wider site, however, in lower density and its range is restricted to the northern banks of Hallhills Loch.
- 8.6.8. Hallhills Loch is a mesotrophic waterbody within the northern section of the site.
- 8.6.9. Mature Sitka spruce (*Picea sitchensis*) plantation is the dominant habitat surrounding the proposed access to the north. However, along plantation boundaries and within rides/glades, semi-improved neutral grassland and marshy grassland is present.
- 8.6.10. Overall, 25 different habitat types were recorded within the Site including:
- Eight woodland habitats
 - Six grassland habitats
 - One heathland habitat
 - Six mire habitats
 - Two swamp habitat

- And one open water habitat

8.6.11. All habitats identified within the survey area are listed in Table 8.6 alongside their extent within the Site and corresponding NVC habitats which were recorded. Further information on NVC communities can be found below.

Table 8.6: Phase 1 habitat types identified within the Site, alongside extent and corresponding NVC communities.

Phase 1 Code	Phase 1 habitat type	Extent (ha)	NVC communities
A1.1.1	Broadleaved woodland – semi-natural	2.30	W9a, W11, W17, W18
A1.1.2	Broadleaved woodland – plantation	3.05	W4a, W7a, W7c
A1.2.1	Coniferous woodland – semi-natural	0.05	W18
A1.2.2	Coniferous woodland – plantation	46.16	OV24, OV27
A1.2.2/A1.3.1 mosaic	Coniferous woodland – plantation / Mixed woodland – semi-natural	0.29	See constituent habitats
A2	Scrub	0.14	
A2.2	Scrub – scattered	1.39	W24
A3	Parkland scattered trees	1.14	
A4.2	Recently felled woodland – coniferous		
B1.1	Acid grassland – unimproved	0.85	U4a
B1.1/C1.2	Acid grassland – unimproved / Bracken – scattered	2.99	See constituent habitats
B1.2	Acid grassland – semi-improved	4.32	U4b
B1.2/C1.1	Acid grassland – semi-improved / Bracken – scattered	1.56	See constituent habitats
B2.2	Neutral grassland – semi-improved	28.88	MG10a, MG1a, MG9, MG23b, MG6a, CF,
B2.2/B5 mosaic	Neutral grassland – semi-improved / Marshy grassland	1.54	See constituent habitats
B2.2/B4	Neutral grassland – semi-improved/improved grassland	3.98	See constituent habitats
B3.2	Calcareous grassland – semi-improved	0.07	CG10a
B4	Improved grassland	276.39	MG6b, MG6a, MG7a, MG7b,
B5	Marshy grassland	108	M23, M23a, M23b, M25, M25a, M25b, M27c, MG10
B5/B2.2/B4 mosaic	Marshy grassland / Neutral grassland – semi-improved/Improved grassland	1.27	See constituent habitats
B5/D2/B1.1	Marshy grassland / Wet dwarf shrub heath / Acid grassland – unimproved	15.38	See constituent habitats

B5/B2.2	Marshy grassland / Neutral grassland – semi-improved	1.08	See constituent habitats
C3.1	Other – tall ruderal	0.01	OV24
D2	Wet dwarf shrub heath	4.15	M15b
E1.2	Bog – raised bog	0.21	M6c
E1.7	Bog – modified bog	19.3	M25b, M17a, M15b, M18 Mosaic
E1.8	Bog – dry modified bog	0.06	M20b
E2.1	Flush and spring - acid/neutral flush	0.08	M6c
E2.2	Flush and spring - basin flush	0.41	M10, M37
E2.2/E3.2	Flush and spring - basin flush / Fen – flood-plain mire	0.06	See constituent habitats
E3.2	Fen – basin mire	4.64	M9
F1	Swamp	0.95	S9a, S9b, S10
G1.2	Standing water – mesotrophic	2.6	
I2.1	Artificial - quarry	0.06	

NVC Communities

8.6.12. Where possible habitats have been assessed to NVC communities or sub-community level. Classification of habitats has followed Rodwell (1991²⁹³⁰³¹³²). A total of 42 NVC communities & sub-communities were recorded within the Site, including:

- Eight woodland communities, with four identified to sub-communities
- Two calcifugous (acid) grassland communities, both identified to sub-community level
- Five mesotrophic (neutral) grassland communities, four to sub-communities
- One calcicolous (calcareous) sub-community
- Ten mire and heath communities, nine down to sub-community level
- And three swamp habitats all identified to sub-community level.

²⁹ Rodwell, J.S. (ed.) 1991. *British Plant Communities. Volume 1. Woodlands and scrub*. Cambridge University Press.

³⁰ Rodwell, J.S. (ed.) 1991. *British Plant Communities. Volume 2. Mires and heaths*. Cambridge University Press.

³¹ Rodwell, J. S. (ed.) 1992. *British Plant Communities. Volume 3. Grassland and montane communities*. Cambridge University Press.

³² Rodwell, J.S. (ed.) 1995. *British Plant Communities. Volume 4. Aquatic communities, swamps and tall-herb fens*. Cambridge University Press

- 8.6.13. NVC communities identified within the Site have been mapped and are presented in Figure 8.2. Where a mosaic of NVC communities are present, and overall percentages have been supplied, these have been mapped according to the highest percentage habitat present. A number of Phase 1 habitats do not correlate to NVC, as such these have been labelled as non-NVC within the accompanying figure. Table 8.7 summarises the NVC communities and sub-communities recorded within the Site.
- 8.6.14. Certain NVC communities can correlate to Scottish Biodiversity List (SBL) habitats and Annex 1 habitat types which are listed under the Habitats Directive. These are also summarised in the table below, however, the fact that a NVC community can be attributed to a SBL or Annex I habitat type does not necessarily mean all instances of that NVC community constitutes a protected or priority habitat. Classification is dependent on various factors such as quality, extent, species assemblages, geographical setting, and substrates. Identified Annex I habitats on-site are further discussed below.
- 8.6.15. Table 8.7 also provides detail on potential GWDTE within the Site. Similarly to Annex I habitats, certain NVC communities are synonymous with GWDTE and can be used to provide an indication of potential groundwater dependant habitats within the Site.
- 8.6.16. SEPA Guidance and the UKTAG list³ has been used to identify habitats/communities of moderate to high potential for Scottish habitats; this has been used to provide an indication only of potential GWDTE on-site, more in depth assessment of potential GWDTE which has included Site characteristics such as geology, superficial geology and topography is detailed in Chapter 9.

Table 8.7:NVC communities identified within the Site.

NVC Community	SBL Habitats	Corresponding Annex I Habitat Type	GWDTE Potential
Woodlands			
W4a <i>Betula pubescens</i> - <i>Molinia caerulea</i> woodland, <i>Dryopteris dilatata</i> - <i>Rubus fruticosus</i> sub-community	Upland Birchwood's	H91C0 Caledonian forest	High
W7a <i>Alnus glutino study area</i> - <i>Fraxinus excelsior</i> - <i>Lysimachia nemorum</i> woodland, <i>Urtica dioica</i> sub-community	Wet Woodland	91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	High
W7c <i>Alnus glutinosa</i> - <i>Fraxinus excelsior</i> - <i>Lysimachia nemorum</i> woodland, <i>Deschampsia cespitosa</i> sub-community	Wet Woodland	91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	High
W9a <i>Fraxinus excelsior</i> - <i>Sorbus aucuparia</i> - <i>Mercurialis perennis</i> woodland, typical sub-community			

W11 <i>Quercus petraea</i> - <i>Betula pubescens</i> - <i>Oxalis acetosella</i> woodland	Upland Birchwoods	H91A0 Western acidic oak woodland	-
W17 <i>Quercus petraea</i> - <i>Betula pubescens</i> - <i>Dicranum majus</i> woodland	Upland Birchwoods	H91A0 Western acidic oak woodland	-
W18 <i>Pinus sylvestris</i> - <i>Hylocomium splendens</i> woodland	Native pinewoods	H91C0 Caledonian forest / H91D0 Bog woodland	-
W24 <i>Rubus fruticosus</i> - <i>Holcus lanatus</i> underscrub	-	-	-
Calcifugous			
U2		-	-
U4a <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, typical sub-community	Lowland Dry Acid Grassland	-	-
U4b <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, <i>Holcus lanatus</i> - <i>Trifolium repens</i> sub-community	Lowland Dry Acid Grassland	-	-
U20a	Lowland Dry Acid Grassland	-	-
Mesotrophic Grassland			
MG1 <i>Arrhenatherum elatius</i> grassland	-	-	-
MG6a <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland, typical sub-community	-	-	-
MG6b <i>Lolium perenne</i> - <i>Cynosurus cristatus</i> grassland, <i>Anthoxanthum odoratum</i> sub-community	-	-	-
MG7a <i>Lolium perenne</i> leys and related grasslands, <i>Lolium perenne</i> - <i>Trifolium repens</i> leys	-	-	-
MG7b <i>Lolium perenne</i> leys and related grasslands, <i>Lolium perenne</i> - <i>Poa trivialis</i> leys	-	-	-
MG9 <i>Holcus lanatus</i> - <i>Deschampsia cespitosa</i> grassland	-	-	-
MG9a <i>Holcus lanatus</i> - <i>Deschampsia cespitosa</i> grassland, <i>Poa trivialis</i> sub-community	-	-	-
MG10 <i>Holcus lanatus</i> - <i>Juncus effusus</i> rush-pasture	-	-	-

MG10a <i>Holcus lanatus</i> - <i>Juncus effusus</i> rush-pasture, typical sub-community	-	-	-
Calcicolous			
CG10a <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Thymus praecox</i> grassland, <i>Trifolium repens</i> - <i>Luzula campestris</i> sub-community	Lowland Calcareous Grassland	-	High
Mires and Heaths			
M6 <i>Carex echinata</i> - <i>Sphagnum recurvum/auriculatum</i> mire	Upland Flushes, Fens and Swamps	-	High
M6c <i>Carex echinata</i> - <i>Sphagnum recurvum/auriculatum</i> mire, <i>Juncus effusus</i> sub-community	Upland Flushes, Fens and Swamps	-	High
M9 <i>Carex rostrata</i> – <i>Calliergon cuspidatum/giganteum</i> mire	Upland Flushes, Fens and Swamps	H7140 Transition mire & H7130 Blanket Bog	High
M9a <i>Carex rostrata</i> - <i>Calliergon cuspidatum/giganteum</i> mire, <i>Campylium stellatum</i> - <i>Scorpidium scorpioides</i> sub-community	Upland Flushes, Fens and Swamps	H7140 Transition mire & H7130 Blanket Bog	High
M10 <i>Carex dioica</i> – <i>Pinguicula vulgaris</i> mire	Lowland Fen	Calcium-rich springwater-fed fens	High
M15b <i>Scirpus cespitosus</i> - <i>Erica tetralix</i> wet heath, typical sub-community	Lowland heathland	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	Moderate
M17a <i>Scirpus cespitosus</i> - <i>Eriophorum vaginatum</i> blanket mire, <i>Drosera rotundifolia</i> - <i>Sphagnum</i> spp. sub-community	Blanket Bog	7130 Blanket Bog	-
M18 <i>Erica tetralix</i> - <i>Sphagnum papillosum</i> raised and blanket mire	Blanket Bog	7130 Blanket Bog	-
M20 <i>Eriophorum vaginatum</i> blanket and raised mire	Blanket Bog	7130 Blanket Bog	-
M23 <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush-pasture	Upland flushes, fens & swamps	-	Moderate
M23a <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush-pasture, <i>Juncus acutiflorus</i> sub-community	Upland flushes, fens & swamps	-	Moderate
M23b <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush-pasture, <i>Juncus effusus</i> sub-community	Upland flushes, fens & swamps	-	High

M25 <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire	Purple moor-grass & rush pastures	7130 Blanket Bog	Moderate
M25a <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire, <i>Erica tetralix</i> sub-community	Purple moor-grass & rush pastures	7130 Blanket Bog	Moderate
M25b <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire, <i>Anthoxanthum odoratum</i> sub-community	Purple moor-grass & rush pastures	7130 Blanket Bog	Moderate
M27c <i>Filipendula ulmaria</i> - <i>Angelica sylvestris</i> mire, <i>Juncus effusus</i> - <i>Holcus lanatus</i> sub-community	-	-	Moderate
S9a <i>Carex rostrata</i> swamp, <i>Carex rostrata</i> sub-community	-	-	
S9b <i>Carex rostrata</i> swamp, <i>Menyanthes trifoliata</i> - <i>Equisetum fluviatile</i> sub-community	-	-	
S10b <i>Equisetum fluviatile</i> swamp, <i>Carex rostrata</i> sub-community	-	-	
Open Ground Habitat			
OV24 - <i>Urtica dioica</i> - <i>Galium aparine</i> community	-	-	

NVC Community descriptions

- 8.6.17. To provide additional context, a brief description of notable NVC communities, mosaic habitat and identified Annex I Habitats is presented below. To provide additional information Figure 8.2 can be used in conjunction with the below descriptions.
- 8.6.18. **M25 – M23 Mosaic** This habitat type was found frequently within the Development area. This habitat is a mosaic of M25 *Molinia caerulea*-*Potentilla erecta* mire and M23 *Juncus effusus* / *acutiflorus*-*Galium palustre* rush-pasture. Floristically the habitats are closer in composition to M25 due to purple moor grass (*Molinia caerulea*) being generally dominant throughout and a low species richness. The habitats support frequent and in times co-dominant rush species including soft rush (*Juncus effusus*) and sharp flowered rush (*Juncus acutiflorus*), which can be typical of M25 communities³³. The communities present are generally species-poor, however, herbs typical of M23a habitats were recorded including carnation sedge (*Carex panicea*) marsh bedstraw (*Geum palustre*), short, fruited willowherb (*Epilobium obscurum*),

³³ Rodwell, J.S. (Ed.). 1991b. *British Plant Communities Volume 2: Mires and heaths*. Cambridge University Press, Cambridge

sorrel (*Rumex acetosa*), bugle (*Ajuga reptans*), creeping buttercup (*Ranunculus repens*), marsh thistle (*Cirsium palustre*), and tormentil (*Potentilla erecta*).

- 8.6.19. **M23a & M23b** in addition to forming an intergrade habitat of M25 – M23, areas dominated by *Juncus* sp. are present within the Development area. Identified M23a & M23b sub-communities were recorded within the central to northern section of the Site are generally species-poor. However, M23 communities within the eastern Development Area are generally species-rich, particularly where in proximity to M10 and M9 communities.
- 8.6.20. **M9a** communities are present along the eastern boundary of the Site. M9 within this area has formed a transitional mire (M9a), in fine mosaic with ombrogenous communities on raised bodies (islands) of peat (M18 and M20), with transitional areas of acid flush (M6). Both the bog and acid flush communities are significantly enriched and herb rich. The community has been classified as sub community M9a due to the presence of bryophytes such as *Drepanocladus revolvens*, *Campylium stellatum* and base-tolerant *Sphagna* (*S.warnstorffii* & *S.contortum*). Also, the short, open structure with high cover of short sedges is indicative of M9a, comparative to M9b which would have a high, dense cover of tall mesotrophic herbs. This habitat classifies as Annex I: H7140 Transition mire, additional detail for this community within the Site can be found in Technical Appendix 8.1, alongside species lists and constancy/abundance data.
- 8.6.21. **M10-M37 Mosaic** correlating to the Annex I H230 Calcium Rich Springwater Fens. This is small area (0.06-ha) in the southeast boundary of the Site. The habitat is spring fed, with tufa³⁴ formations present.
- 8.6.22. **M15b** communities were recorded in three locations within the Site and also formed mosaic habitats alongside M17 (see below). Annex I type 4010 Northern Atlantic wet heaths correlates with NVC communities M15, only sub-community M15b was recorded within the Site. In areas the habitat is typical of the community with cross-leaved heath (*Erica tetralix*), and heather (*Calluna vulgaris*), dominant.
- 8.6.23. **M17a-M15b mosaics & Bog Mosaics** M17a-M15b mosaics & Bog Mosaics form areas of blanket bog within the Site. Four of the identified bog areas were considered to support communities and environmental conditions which correlate directly to Annex I 7130 Blanket Bog. Generally, the areas were considered to be comprised of shallow peat, supporting degraded M17 *Scirpus cespitosus* – *Eriophorum vaginatum* blanket mire, intergrading with M15 *Scirpus cespitosus* – *Erica tetralix* wet heath mosaics. Despite the shallow peat, vegetation composition was close to M17, with abundant hair-tail cottongrass (*Eriophorum vaginatum*) and carpets of *Sphagnum capillifolium* and *Sphagnum papillosum* recorded.
- 8.6.24. The areas of bog along the southeast boundary of the Site were noted to be degraded; these areas are adjacent to each other with peat depths noted to range between 10cm – c.1m. Results from the habitat surveys suggest that several factors are contributing to the degraded condition of the blanket bog, including drying and poaching from grazing pressures. Dominant hummocks of hairs tail cottongrass, and deergrass (*Trichophorum cespitosum*) recorded, in addition to hummocks of purple moor grass

³⁴ Tufa is a terrestrial freshwater accumulation of calcium carbonate

(*Molinia caerulea*) beginning to thicken and some areas grading to grassier habitat and towards M20 *Eriophorum vaginatum* blanket & raised mire. Occasional Sitka spruce regeneration was also recorded. Impacts from intensive grazing was also recorded, with poached areas and pulled up sphagnum recorded throughout. However, it was noted that these areas had good restoration potential, with sphagnum generally recorded throughout, alongside other bog associates including cranberry (*Vaccinium oxycoccos*). Full target notes for Blanket bog habitats can be found in Technical Appendix 8.1.

Bats

- 8.6.25. No bat roosts have been identified during the surveys and there is no Potential Bat Roost Habitat (PBRH) within 361 m of the proposed turbine locations (200m plus proposed rotor diameter). Potential roosting habitat within the Site is limited to mature broadleaved trees offering a low - moderate risk of supporting roosting bats. Trees with potential for supporting roosting bats are predominantly concentrated in a woodland parcel along the southern boundary of the Site (See Technical Appendix 8.4 and Figure 8.5).
- 8.6.26. Full details of bat survey results can be found in Technical Appendix 8.2; a summary is provided below. The 2024 activity surveys recorded nine bat species over the three deployments and across the sample locations. Confirmed Species include:
- Noctule (*Nyctalus noctule*)
 - Leislars bats (*Nyctalus leisleri*)
 - Common pipistrelle (*Pipistrellus pipistrellus*)
 - Soprano pipistrelle (*Pipistrellus pygmaeus*)
 - Nathusius's pipistrelle (*Pipistrellus nathusii*)
 - Daubentons (*Myotis daubentoniid*)
 - Natterers (*Myotis nattereri*)
 - Whiskered bats (*Myotis mystacinus*)
 - Brown long-eared bats (*Plecotus auritus*)
- 8.6.27. Common pipistrelle was the most frequently recorded, accounting for 56% of the total bat contacts recorded across the three deployments.
- 8.6.28. Chart 8.1 below provides an overview of species abundance at each sample site. Static monitoring found that the highest level of bat activity within the Site was recorded at sample location six. This location is in a valley between two hills with bordering plantation woodland to the north and is sited within marshy grassland. Hewke Burn flows adjacent to location six, and Hall Hills Loch is located approximately 300m southwest. All nine species of bats were recorded at this location, recording the highest level of summer activity recorded across all six sites. The results indicate that Hewke Burn is used as a commuting corridor, particularly by noctule during the autumn period; potentially acting as a commuting corridor between summer and hibernation roost sites.

- 8.6.29. Sample location 1 registered the second highest number of bat calls; species diversity at this location was lower, with common pipistrelle the dominant species recorded. Activity at location one was low throughout the spring and summer deployment, however, autumn saw activity spike at this location with the bulk of the activity (90% of all calls) recorded during September; see Chart 8.2 below. The spike in activity during the autumn deployment could be due to a number of factors including the establishment of a courtship territory by a single male common pipistrelle or use of the habitat by foraging bats prior to hibernation.
- 8.6.30. Mating male common pipistrelle's occupy solitary roosts in late summer and autumn, establishing individual territories³⁵. Within these territories males undertake distinctive songflights to attract females. Songflights are a type of social call, distinct from foraging / commuting calls, these calls occur at lower frequencies (below 20 kHz) and are made up usually of four components in series of concentrated calls³⁶. During this time males can spend up to 40% of their time in songflight, looking to attract small groups of females³⁵.
- 8.6.31. To determine whether a potential common pipistrelle mating territory had been established further in-depth analysis of the recordings was undertaken. Analysis showed that out of 1,988 common pipistrelle recordings, only 17 included social calls; all social calls were interspersed randomly in isolation (i.e not part of a longer social call sequence) throughout regular call sequences. Therefore, it is likely that these were agnostic (non-mating) social calls, emitted during foraging / commuting. If a mating territory had been established it is expected that a significantly higher number of social calls would have been recorded, of which extended sequences which indicate songflight would be present. Therefore, it is considered that the increase in activity at deployment location 1 is a result of autumn foraging opposed to breeding behaviour.

³⁵ Altringham, J. D. (2003). *British Bats*. Harper Collins, ISBN 000 220140 X.

³⁶ Middleton, N. (2006) *A study of the emission of social calls by Pipistrellus spp. within central Scotland; including a description of their typical social call structure*. Volume 3: BaTML Publications: ISSN 1750-0796

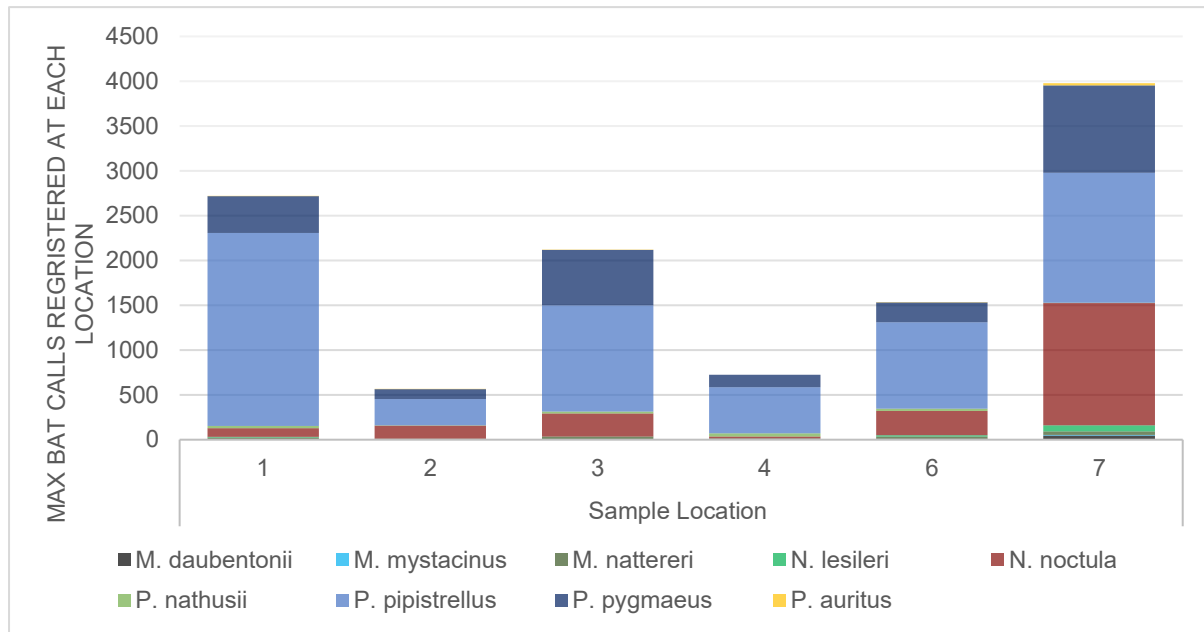


Chart 8.1: 2024 bat species recorded at each sample location.

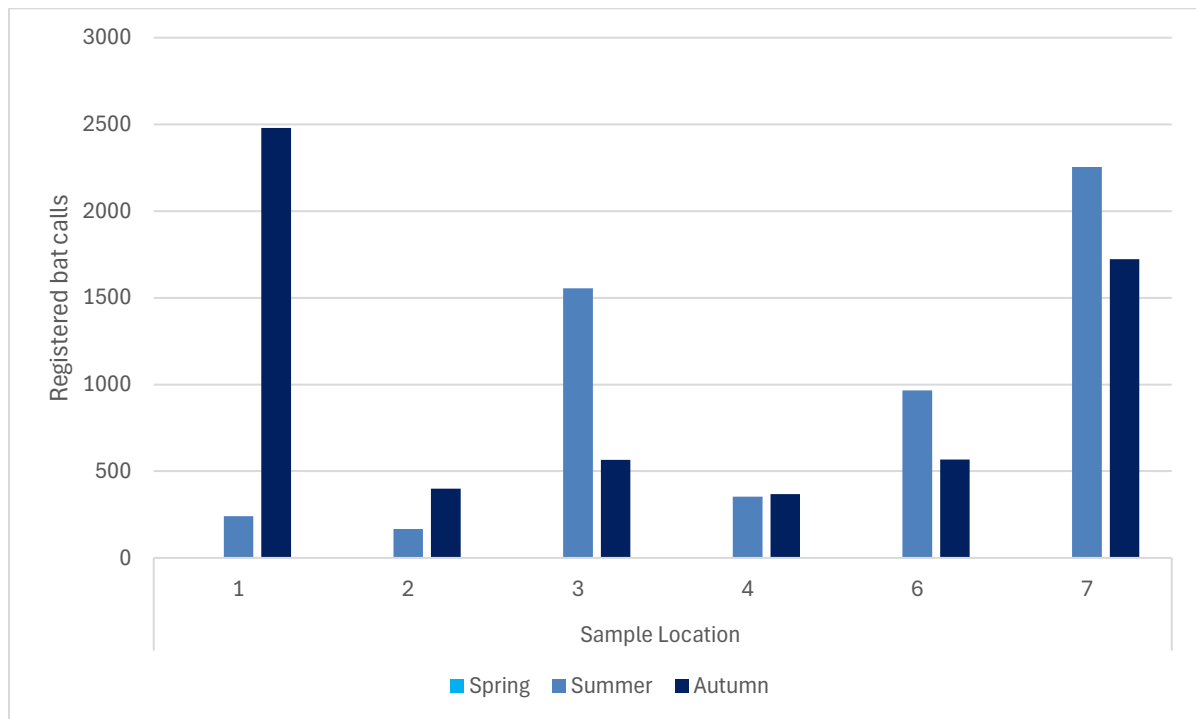


Chart 8.2: Bat activity at each sample location across the three deployments.

Marsh Fritillary

- 8.6.32. Full details of Marsh fritillary survey results can be found in Technical Appendix 8.4.
- 8.6.33. The habitat suitability surveys recorded devil's-bit scabious widely across the north and east of the Site, with lower densities in the south. Overall, density was variable, usually identified as part of a mixed sward or in small patches. The highest density of devil's-bit scabious was recorded along the eastern boundary of the site in the basin mire habitat at White Hill. Marshy grassland (M25-M23 mosaic) north and northwest of Hallhills Loch supports lower more scattered densities of the foodplant, likely a consequence of increased competition from rank grasses, creating a more closed sward structure. Overall, A total of 58.79 ha of potentially suitable habitat for marsh fritillaries was identified.
- 8.6.34. A total of 400 adult marsh fritillaries were recorded during the transect surveys. The highest number of adult marsh fritillaries (89.75% of all recorded adults) were recorded along transect three, which covered the northeastern section of suitable habitat along White Hill.
- 8.6.35. Several other species of butterfly were incidentally recorded during the transect surveys, including two other butterfly species with conservation statuses: small pearl-bordered fritillary (*Boloria selene*) (Vulnerable (GB), an SBL and LBAP species) and small heath (*Coenonympha pamphilus*) (Vulnerable (GB) and an SBL species).
- 8.6.36. A peak count total of 649 larval webs were found to be present (based on peak counts for each transect section). Similarly to the results of the peak adult count, transect 3 recorded the highest peak count of larval webs. Table 8.8 below details the results of the butterfly and larval web count surveys.

Table 8.8: Total counts of marsh fritillary adults and larval webs for each transect.

Transect	Total adult count	Total larval count
1	7	9
2	25	42
3	359	579
4	9	19
Total:	400	649

- 8.6.37. Both the adult transects data and larval web counts suggest the core colony area is located in valley mire habitat and surrounding damp grassland at Whitehill in the north east of the Site, however small numbers of adults and larvae were identified widely, but in low numbers throughout other suitable habitat patches. These areas are located in the north and east of the site around Hallhills Loch, as well as in more localised patches further south. These southern patches are likely relict examples of more extensive suitable habitat, since they occurred around degraded heaths and bogs where grazing pressure appears to have been higher than on other parts of the Site.

- 8.6.38. Larval web transect data was extrapolated to give a predicted number of larval webs across the whole suitable habitat area (81.0ha). The calculation provided an estimate of 35,359 larval webs which could be present in the suitable habitat area. This number suggests that the marsh fritillary population at the Site is large (under Barnett & Warren, 1995 categories³⁷), supporting greater than 1,000 individuals. Subsequently, it was determined that the population may be of regional or national significance.

Badger

- 8.6.39. Full results of badger surveys including sett locations, and signs of activity can be found in the confidential Technical Appendix 8.6.
- 8.6.40. Evidence of badger was found throughout the Site, with field signs including latrines, mammal tracks, and snuffle holes recorded. In addition, several badger setts, were recorded within the Site; several of these were outlier setts which showed no evidence of recent use (accumulation of debris in entrance holes). Three main setts were identified, two of these are located outside of the development boundary. A large active six-entrance sett (See Confidential Appendix 8.6 & Figure 8.4) was recorded in the northeast area of the Site. This sett showed evidence of recent use including spoil heaps and old bedding material present; the sett is assumed active and used in a breeding capacity.
- 8.6.41. Surveys undertaken in September 2024 of the proposed access and 250m buffer identified no confirmed setts within the 250m of the existing/proposed access track. However, evidence of badger activity, including snuffle holes, latrines and foraging activity was recorded throughout.

Red Squirrel

- 8.6.42. Six signs of squirrel activity were recorded during the 2023 protected species surveys. All records related to feeding signs, with four of the records relating to areas outside of the Site, within adjacent mature Sitka spruce plantation. Two of the records were within the Site, with a total of ten old spruce cones identified in a parcel of plantation woodland adjacent to the proposed Battery Energy Storage System (BESS).
- 8.6.43. No dreys or potential dreys were identified.
- 8.6.44. September 2024 surveys of the proposed access track and buffer identified increased densities of squirrel feeding signs throughout the Site. This is to be expected due to the dominant habitat type (coniferous plantation) offering suitable squirrel habitat. A feeding post was recorded, however no dreys or potential dreys were identified.
- 8.6.45. Although species of squirrel cannot be discerned from feeding signs alone, there are high numbers of red squirrel records within the locale, and within adjacent woodland; subsequently it is considered likely that proposed feeding signs are a result of red squirrel.

³⁷ Barnett, L.K. & Warren, M.S. (1995). *Species Action Plan Marsh Fritillary Eurodryas aurinia*. Butterfly Conservation, Wareham.

Otter

- 8.6.46. Signs of otter activity were recorded during the protected species surveys in 2023. Overall, three otter spraints were identified along Hewke Burn. A potential otter couch was identified at the base of a goat willow (*Salix caprea*) along the western bank of Hewke Burn (See Confidential Appendix 8.6 & Figure 8.4), with flattened vegetation and a spraint recorded.
- 8.6.47. The evidence suggests that use of the Site by otter is mainly in a forging / commuting capacity with current use appearing to be limited to Hewke Burn and in association, Hallhills Loch.

Water vole

- 8.6.48. Suitable habitat within the Site is limited to Hewke Burn and an unnamed watercourse which drains out of Hallhills Loch. No signs of water vole were found during the 2023 PS surveys or targeted 2024 surveys.

Reptiles

- 8.6.49. Specific reptile surveys were not carried out as part of the PSS scope. However, features with the potential to be used by reptiles (e.g. possible hibernacula) and incidental sightings were recorded within the Site.
- 8.6.50. A single common lizard (*Zootoca vivipara*) was recorded during the 2023 PSS. The sighting was recorded in a parcel of acid grassland (U4a) on the northeast facing slope of Firtree Hill. A potential hibernacula was identified during the proposed access PS surveys, with a collapsed section of stone sheepfold potentially offering hibernacula suitable habitat.
- 8.6.51. Common lizards were also incidentally recorded during the 2024 targeted butterfly transects. Habitats within the site are suitable habitat for supporting reptile assemblages; habitat mosaics and site topography will provide foraging, basking and hibernation opportunities.

Amphibians

- 8.6.52. Hallhills Loch is the only significant body of standing water within the Site. eDNA testing of the loch in May 2024 returned a negative result for GCN presence. OS maps of the wider landscape shows that there are an additional two ponds within 500m of the Site; one approximately 200m north within coniferous woodland plantation, and the remaining waterbody ~50m east of the Site at Hog Hill. The two waterbodies outside of the Site were not accessed for GCN presence due to access limitations.
- 8.6.53. However, this is not considered a significant constraint. GCN exist in meta populations which use a series of interconnected breeding ponds, generally staying within 250 m of their breeding ponds³⁸. Waterbodies to the north and east of the Site are approximately 580 m and 1.6 km from Hallhill Loch respectively, as such due to

³⁸ Langton, T.E.S., Beckett, C.L., and Foster, J.P. (2001), *Great Crested Newt Conservation Handbook*, Froglife, Halesworth.

embedded distance it is considered unlikely that the identified waterbodies are supporting a metapopulation.

- 8.6.54. Furthermore, whilst the site may contain small bog pools, and small temporary bodies of water, GCN are unlikely to use these as breeding habitat. Due to likely absence in Hallhills Loch and a lack of connected waterbodies within the immediate vicinity it is assumed that GCN are absent from the Site.
- 8.6.55. However, the site does offer quality terrestrial habitat for amphibians, with drainage channels, marshy grasslands, and wet heath providing foraging and refugia habitat. In addition, more ubiquitous amphibian species with less specialised breeding habitat may use small temporal or ephemeral waterbodies to breed. Identification of common frog (*Rana temporaria*) tadpoles within a small temporary body of water which has formed from quarry activities during the 2024 protected species access surveys evidence this. Common frogs were also incidentally recorded during the 2024 butterfly surveys. It is therefore assumed that the site supports populations of common amphibian species.

Fish & Macro-invertebrate

8.6.56. Full results of the fish and macroinvertebrate surveys can be found in Technical Appendix 8.3.

8.6.57. Of the six sites that were surveyed, three sites, (all of which were located along or were a tributary of Hewke Burn) supported brown trout (*Salmo trutta*). Two recorded no fish and one was determined to be unsuitable for supporting fish. Results of the electrofishing are summarised in Table 8.9 below.

Table 8.9: Results from the 2023 electrofishing surveys.

Site Code	Watercourse /River Order	Grid Ref	Survey Month	Density per 100 m ² water				Sensitivity Rating
				Atlantic Salmon Fry	Atlantic Salmon Parr	Brown Trout Fry	Brown Trout Parr	
BG1	Hewke Burn (below loch)	315838 588667	September 2023	0	0	0	3.003	FISH
BG2	Tributary of Halhills Loch	316065 588705	September 2023	NA	NA	NA	NA	Unfishable
BG3	Hewke Burn (above loch)	316564 588550	September 2023	0	0	52.891	1.824	FISH
BG4	Tributary of Hewke Burn	316626 588534	September 2023	0	0	72.581	0	FISH
BG5	Kirkcroft Burn	315629 587864	September 2023	0	0	0	0	NONE
BG6	Upper Hope Burn	316522 586714	September 2023	0	0	0	0	NONE

8.6.58. Kirkcroft Burn was one of the sites which recorded no fish. The burn ranged in depths from between 0-30cm, with substrates primarily consisting of gravels (40%) and pebbles (40%). Flow regimes in the burn is primarily of run (40%) and riffle (40%) with the remaining 20% glides. Generally, it was expected that fish would be present in this watercourse.

8.6.59. The Average Score per Taxon (ASPT) scores showed that the water quality across all sites ranged from 'Moderate' to 'Good', with majority of the watercourses sampled (3/5) scoring good. The proportion of Sediment-sensitive Invertebrate Index (PSI) scores indicate that all sample sites have some level of sedimentation.

8.6.60. Results of the Acid Water Indicator Community (AWIC) Index showed that all watercourses sampled had a mean pH of either 7.36 or 7.74.

8.7 Impact Assessment

- 8.7.1. This section summarises how the significance of effects on the ecological features of interest (non-avian) were assessed. All effects have been assessed with the assumption that all embedded mitigation measures (outlined in Section 8.10), will be implemented in full.
- 8.7.2. The approach taken to assess ecological effects follows the guidance document produced by the CIEEM in 2018 (updated 2024)¹. These guidelines set out the process through the following stages:
- Identification of Important Ecological Features (IEF's); ecological receptors with the highest value present at a Site that may be impacted within the zone of influence for the proposed wind farm;
 - Identifying and characterising potential impacts and their effects, based on the construction, operation and decommissioning activities associated with the proposed wind farm development;
 - Determining significance of potential impacts / effects taking into account characteristics including extent, magnitude, duration, frequency / timing and reversibility;
 - Identifying mitigation measures required to address significant adverse/ negative effects;
 - Determining the residual impact significance after the effects of mitigation have been considered, including a description of any legal and policy consequences and;
 - Identification of any monitoring requirements.

Determination of Important Ecological Features

- 8.7.3. The assessment involves identifying IEFs in accordance with CIEEM guidelines¹. IEFs, their value and importance can be based on a number of reasons including consideration to legal protection afforded to an ecological feature, their respective roles in ecosystem functionality, rarity or to the extent that they are threatened throughout their natural range.
- 8.7.4. Importance should be considered within a defined geographical context. Following CIEEM guidance, Table 8.10 below provides a frame of reference that will be adopted for the assessment.

Table 8.10: Defined geographical context for evaluating important ecological features.

Level of value	Example
International	An internationally designated site.
	Site meeting criteria for international designations or qualifying species of a study area where there is connectivity.
	Species present in internationally important numbers (>1% of biogeographic populations).
National	A nationally designated site (SSSI, or a National Nature Reserve (NNR)), or sites meeting the criteria for national designation or qualifying species where there is connectivity.
Regional	Species present in regionally important numbers (>1% of Natural Heritage Zone population)
	Areas of habitat falling below criteria for selection as a SSSI (e.g. areas of semi natural ancient woodland larger than 0.25ha).
Local	Local Nature Reserves (LNR).
	Areas of semi-natural ancient woodland smaller than 0.25ha.
	Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g. species-rich flushes or hedgerows.
Negligible	Usually widespread and common habitats and species. Features falling below local value are not normally considered in detail in the assessment process.

8.7.5. Part of the process of attributing value at a species level is less straightforward than that of designated sites. When valuing species, contextual information such as distribution, abundance and local populations should be used in combination with professional judgment to determine what population level effects should be assessed against. For example, for species which have wider ranging territories such as otter, it may be more appropriate to assess potential effects against the otter population in a whole catchment, whereas for more localised or habitat specialist's species, such as great crested newt, value may be attributed to groups of related colonies which function as a meta-population.

Valuing Bats

8.7.6. For the purpose of the assessment and for assigning value to bats, guidance set out by NatureScot⁴ has been considered. NatureScot guidance identifies the risk of wind turbines on individual bat species / guilds of bats based on behavioural ecology (flight, foraging type and habitat preferences) and rarity. Table 8.11 summarises the vulnerability and risk of collision for bat species found in Scotland.

Table 8.11: Vulnerability and risk of collision for bat species found in Scotland (taken from NatureScot)⁴.

Scotland	Low collision risk	Medium collision risk	High collision risk
Common species	n/a Low vulnerability	n/a Low vulnerability	Common pipistrelle Soprano pipistrelle Medium vulnerability
Rarer species	Brown long-eared Daubenton's Natterer's Low vulnerability	n/a Medium vulnerability	n/a High vulnerability
Rarest species	Whiskered Brandt's Medium vulnerability	n/a High vulnerability	Nathusius' pipistrelle Noctule Leisler's High vulnerability

Characterising Potential Effects on Ecological Receptors

8.7.7. Following CIEEM guidance, where possible, the magnitude of effects has been quantified and expressed. Where this is not possible, a more qualitative approach will be taken following the criteria detailed in Table 8.12.

Table 8.12: Criteria used to determine magnitude of ecological impacts.

Magnitude	Description
Very High	Result in large-scale, permanent changes in an ecological feature, and likely to change its ecological integrity. These effects are therefore likely to result in overall changes in the conservation status of an ecological feature.
High	Result in large-scale, permanent changes in a receptor, and likely to change its ecological integrity. These effects are therefore likely to result in overall changes in the conservation status of a receptor.
Moderate	Include moderate-scale long-term changes in a receptor, or larger-scale temporary changes, but the integrity of the receptor is not likely to be affected. This may mean that there are temporary changes in the conservation status of the receptor, but these are reversible and unlikely to be permanent.
Minor	Include effects that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These effects are unlikely to result in overall changes in the conservation status of a receptor.
Negligible	No perceptible change in the ecological feature

- 8.7.8. The assessment also takes into account duration of the effect, i.e. short-term (for example only during construction) or long-term (throughout the lifetime of the Proposed Development), following CIEEM guidance, duration of effects will be assessed on a species level, taking into account ecological characteristics (i.e. life-cycle and fecundity). The permanence or reversibility of predicted effects will also be assessed,
- 8.7.9. Effects can either be negative or positive. Positive and negative effects are categorised below in Table 8.13.

Table 8.13: Summary of positive and negative effects.

Effect	Description
Positive	A change that improves the quality of the environment e.g. by increasing species diversity, extending habitat or improving water quality. This may also include halting or slowing an existing decline in the quality of the environment.
Negative	A change which reduces the quality of the environment e.g. destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution

Determining Significance of Potential Ecological Effects

- 8.7.10. The CIEEM guidelines use only two categories to classify effects: “significant” or “not significant”. A ‘significant effect’ is defined as an *“effect that either supports or undermines biodiversity conservation objectives for ‘important ecological features’”*. The significance of an effect is determined by considering the value of the receptor and the magnitude of the effect and applying professional judgement as to whether the integrity of the receptor will be affected. This concept can be applied to both designated sites (for example, a SSSI) and to defined populations (for example an otter population).
- 8.7.11. In this assessment, an effect that threatens the integrity of a receptor is considered to be significant in terms of the EIA Regulations. Effects assessed as ‘not significant’ should be considered as not significant in terms of the EIA Regulations. It should be noted that, alongside the criteria provided, professional judgement is applied in determining the significance of a potential effect.
- 8.7.12. Where appropriate, mitigation and/or compensation measures, including the design process, are identified to avoid and reduce potentially significant effects. It is also good practice to propose mitigation measures to reduce negative effects that are not significant, to safeguard biodiversity and ensure no net loss from the development in line with national policy³⁹⁴⁰. The significance of residual effects on receptors after the

³⁹ Scottish Government (2024) *National Planning Framework 4*. Available online: <https://www.gov.scot/publications/national-planning-framework-4/pages/3/>

⁴⁰ Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011) <http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm>

effects of mitigation have been considered, can then be determined and recommendations for required monitoring can be made.

8.8 Assessment of effects

Scoped-out Ecological Features

8.8.1. With consideration of the desk-study, and baseline field studies undertaken, potential significant impacts on several ecological receptors can be scoped out of further assessment and not taken forward as IEF's. Table 8.14 below details the ecological receptors which have been scoped out and provides rationale for this assessment.

Table 8.14: Scoped out ecological features.

Ecological Receptor	Covering legislation and guidance	Rationale
Designated Sites		
- Perchhall Loch SSSI - Dryfe Water SSSI - Lochmaben Lochs SSSI	An SSSI is an area that has been notified as being of special interest due to its flora, fauna or geological or physiographical features under the Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act, 2004.	All SSSI are over 5 km from the proposed development Site; being 5.4km, 6.4km and 10 km respectively. All sites are designated for habitat or invertebrate assemblages. Due to embedded distance between the Proposed Development and the SSSI's there no identifiable pathways for potential effects which would impact integrity of the SSSI or qualifying features.
Protected Species		
Badger	PBA, UKBAP, AYR-LBAP, DG-LBAP	Signs of badger and several setts, including a main sett were recorded within the Site study area. Evidence suggests that badger frequently use the surrounding conifer plantations for foraging and commuting, and the Site itself supports breeding. However, potential effects to badger will generally be restricted to the construction phase of the development and it is anticipated that with the embedded mitigation detailed in Section 8.10 (adoption of buffers and a Species Protection Plan (SPP), any licensable activities and direct impact to individuals will be avoided. Following completion of the construction phase there should be no long-term effects on the badger population within the Site. In the wider context badgers are considered to be widespread throughout Dumfries and Galloway, with an

		estimated 1,613 main setts ⁴¹ throughout the region. Subsequently, the Proposed Development will have a negligible impact on badger on a geographical level and no further assessment is considered to be required.
Otter	EPS, Sch 5, SBL, UKBAP, AYR-LBAP, DG-LBAP	Evidence of otter was identified along Hewke Burn with spraints and a potential couch identified. Subsequently it is determined that otters are using the Site in a foraging and commuting capacity, there is no evidence to currently suggest breeding on-site. Otters are relatively widespread throughout Scotland, with freshwater dwelling otters having a large home range of up to 32km ⁴² . Subsequently, Hewke Burn and Hallhills Loch are likely used as part of a wider territory within the River Annan catchment. Proposed infrastructure is approximately 130 m from the identified couch at its closets point, and the single water crossing is over 200 m to the north. This exceeds the recommended buffer from NatureScot for development. The proposed SPP and up-dated survey's prior to construction would ensure all reasonable measures are taken to avoid disturbance to otters or damage to their places of shelter during construction.
Great Crested Newt Amphibians: common frog	EPS; SBL; Sch 5	eDNA surveys for the Site returned a negative result for GCN presence, and due to distance between surrounding waterbodies, it is considered unlikely that ponds within 500m support GCN populations. As such no impacts or effects are predicted and they are scoped out of the assessment at this stage. SPP, and adoption of pollution protection measures should ensure that all reasonably practicable measures to protect more ubiquitous amphibian species within the site has been taken.
Reptiles	SBL; Sch 5	Common lizards were recorded during the 2023 PS surveys and incidentally during the 2024 butterfly surveys. A potential hibernaculum was recorded within coniferous plantation during PS

⁴¹ Mitchell-Jones, A.J. 2020. *Badger impacts on biodiversity and agriculture in Scotland: a literature review*. NatureScot Research Report No. 1205.

⁴² Scottish Natural Heritage (2015) *Trends of Otters in Scotland*. Available online: <https://web.archive.org/web/20220808103505/https://www.nature.scot/doc/trend-notes-otters-scotland>

		surveys for the proposed access route; potential hibernacula is over 40 m from the operational forestry track which will be used for access. Whilst the Proposed Development will result in a minor loss of habitat where common lizard was recorded (0.16 – ha), 95% of the habitat will be retained. Adoption of a SPP would ensure that all reasonably practicable measures are taken so that provisions of relevant wildlife legislation are compiled during construction.
Red Squirrel	Sch 5 and 6; SBL; LBAP	Squirrel feeding signs were recorded within the study area both in the 2023 and 2024 PS surveys; no dreys or potential dreys were found. Whilst it not possible to determine between red squirrel and grey squirrel through feeding signs alone, this assessment has adopted a precautionary principle and is assuming that feeding signs are attributed to red squirrels. All red squirrel signs were identified within coniferous plantation, outside of development areas. Adoption of a SPP and pre-construction surveys will ensure that all reasonably practicable measures to protect red squirrel populations within the immediate surroundings have been undertaken.
Water vole	EPS; Sch 5; SBL; LBAP	No signs of water vole activity were identified during the 2023 PS surveys. Suitable habitat is present along Hewke Burn and associated tributaries during targeted surveys in 2024. Due to a lack of evidence water vole are scoped out of the assessment at this stage.
Habitats		
Improved Grassland		Improved grassland covers the largest area within the Site. This habitat is does not support any NVC communities which correspond to any priority neutral grasslands. This habitat type is widespread and of generally low ecological value due to agricultural improvements and management.
Acid grassland – unimproved and improved		A small extent of acid grassland is present within the Balgray Wind Farm study area. Habitat parcels of NVC communities U2, U4a, and U4b were recorded, whilst U20 communities formed parts of habitat mosaics. Acid grassland is one of the most extensive semi-natural habitats within the UK, with Scotland supporting an estimated

		743,000ha, and only community U6 is listed as a SBL habitat. Acid grassland parcels within the Site are small in extent (>3%) of the total area and are fragmented. Due to this the grasslands are not considered to appreciably enrich the ecological resource within the local context and have not been taken forward as IEF's.
Neutral Grassland	Overlaps with SBL Coastal and Floodplain grazing marsh	Semi-neutral grassland within the Site do not support any NVC communities which directly classify as priority or protected habitats (MG3 & MG4). NVC neutral grassland communities within the Site (MG10 & MG9) do overlap with priority habitat Coastal and floodplain grazing marsh. However, semi-natural grasslands within the site are either a result of forestry felling where species have colonised the disturbed areas or set within improved grassland. Examples within the site are generally species-poor, rank, and / or poor examples of the communities. Therefore, it is not considered to appreciably ecologically enrich the site and is scoped out of the assessment at this stage.
Broadleaved woodland – plantation	Can overlap with SBL Wet woodland, and Annex 1 habitat <i>H91EO Alder woodland on floodplains</i>	A small area of broadleaved woodland plantation sited close to the proposed BESS. This woodland is a poor example of NVC community W7c and is limited in its extent in the Site. Therefore, it is not considered to be an IEF in ecological terms.
Coniferous woodland – semi-natural	Semi-natural coniferous woodland can be included within Annex 1 habitat 'Caledonian forest' and is afforded protection under the EC Habitats Directive. Native pinewoods are described in the UKBAP and listed on the SBL.	Within the Balgray Wind Farm study area, there is a small extent of semi-natural coniferous woodland (including vegetation corresponding to the W18 NVC community). The area consists of a dozen Scots pine trees along the northeastern side of the access track. The area appears to be planted and is a poor match for Annex I or SBL habitats as such is not considered to appreciably ecologically enrich the site and is scoped out of the assessment at this stage.
Coniferous woodland – plantation	None	Coniferous forest plantation is common throughout Scotland and is not protected under environmental legislation. Is therefore not considered to be an IEF in ecological terms. It should be noted however that it does provide habitat for red squirrel.

Scrub	None	Common and widespread habitat throughout Scotland, therefore not considered to be an IEF in ecological terms.
Scattered scrub	None	The habitat on site is an area of felled woodland that is scrubbing over with <i>Rubus</i> sp. The habitat is indicative of disturbed ground and natural regeneration and is a common and widespread habitat throughout Scotland. Therefore, not considered to be an IEF in ecological terms.
Parkland and trees		Small area of retained beech trees just falling within the Development area on the southern boundary, not considered to be an IEF in ecological terms.
Flush and spring - acid/neutral flush	Upland flushes, fens and swamps are described in the UKBAP, and are priority habitats listed on the SBL. Acid and neutral flush vegetation communities are recognised as GWDTEs and afforded protection under the WFD.	The total extent of this habitat within the Site is a single small parcel of acid / neutral flush which categorises as NVC community M6. This habitat accounts for approximately 0.02% of the Development Area, as such it is not considered to be a IEF of the Site.
Quarry	None	This habitat type is not protected under environmental legislation and is therefore not considered to be an IEF
Track	None	This habitat type is not protected under environmental legislation and is therefore not considered to be an IEF

Important Ecological Features

8.8.2. Table 8.15 below summaries which species and habitats are considered to be IEF and provides a rational for these assessments.

Table 8.15: Overview of potential ecological features for the Proposed Development.

Potential Important Ecological Features (IEF)	Relevant legislation and guidance	Conservation Value	Rationale
Species			
Marsh Fritillary	Marsh Fritillary is Fully protected under the 1981 Wildlife and Countryside Act and is listed on the SBL.	National	Marsh fritillary is threatened across the UK and Europe, it is fully protected under the Wildlife and Countryside Act 1981. Studies throughout 2024 has determined that the Site supports a large population of marsh fritillary butterflies, with M9a habitat along the east boundary supporting the core population within the Site, however, suitable habitat within the Site covers approximately 59 ha with varying densities of marsh fritillary recorded throughout. The current range of known marsh fritillary populations within Scotland are restricted to the Inner Hebrides and coastal areas of mainland Argyll, subsequently, the population at the Site is disjunct from the known populations and is currently the most southern known Scottish population⁴³. Under SSSI designation criteria, the presence of a large and viable marsh fritillary population (an Annex II species with Vulnerable (GB)

⁴³ Butterfly Conservation Scotland. *Managing land for the Marsh Fritillary*. Available online: <https://butterfly-conservation.org/sites/default/files/habitat-marshfritillary-scotland.pdf>

			conservation status) at the Site would qualify the site for SSSI designation. Marsh Fritillary has been assessed of National importance within this assessment.
Bats	All bat species are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) (Habitat Regulations). Common and soprano pipistrelles, Daubenton's bat, Natterer's bat and Brown long-eared bat are listed on the SBL and are all LBAP species.	Local	No bat roosts or potential bat roost habitat has been identified within 362 m (200m + rotor diameter) of the proposed turbine locations. Bat activity surveys throughout 2024 identified nine bat species using the site: with common pipistrelle, soprano pipistrelle and noctule most abundant. Site activity by bats will not meet the criteria for SSSI designation, and the most abundant species on-site are widespread; the Scottish common pipistrelle population numbering a minimum of 28,5000 individuals ⁴⁴ . Therefore, importance of bat populations within the site will be no greater than Local.
Fish	Brown trout are a UK BAP and SBL priority species.	Local	Hewke Burn and its tributaries support brown trout fry and parr. Due to its limited range within the site fish population will have no greater value than Local importance.
Habitats			
Broadleaved woodland – semi-natural	Semi-natural broadleaved woodland can potentially be included with Annex I habitat ' <i>Western acidic oak</i>	Local	Within the Site, there is a small extent of Broadleaved woodland – semi-natural (including vegetation corresponding to the

⁴⁴ European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, *Joint Nature Conservation Committee*. Available online: <https://jncc.gov.uk/jncc-assets/Art17/S1309-SC-Habitats-Directive-Art17-2019.pdf>

	woodland', 'Caladonian forest' and 'Bog woodland', these are afforded protection under the EC Habitats Directive.		W11 and W17 NVC communities). The areas are fragmented and are sited within the larger coniferous plantation. All areas are considered to be a poor / suboptimal matches for Annex I or SBL habitats as such is not considered to be of any higher importance than Local.
Calcareous grassland – semi-improved	Calcareous grassland are described in the UKBAP, and are priority habitats listed on the SBL.	Local	A small area of calcareous grassland was recorded within the Site. Due to its extent, this habitat will have no greater value than Local importance.
Marshy Grassland	Marshy grassland is described in UKBAP priority habitat within upland flushes, fens and swamps, and purple moor grass and rush pastures are listed on SBL. Associated vegetation communities are classed as GWDTE and afforded protection under the WFD.	Local	Marshy grassland is the second most extensive habitat type across the survey area. Eight NVC communities including M23, and M25 and associated sub-communities were recorded within its extent. M25 is a main vegetation community that is associated with purple moor rush pasture. This habitat is widespread throughout the UK, with Scotland supporting an estimated 4,500 ha of purple moor rush pasture. M25 habitat within the Site is generally species-poor and forms a habitat mosaic with several other grassland / mire communities. Evidence of historical improvement was recorded. Due to the extent of M25 community within the Site this has been assessed as having local value, however due to low species diversity no higher importance is anticipated.
Wet dwarf shrub heath	Wet dwarf shrub heath is included within the Annex I habitat 'Northern	Local	Within the Site, a small extent of wet heath (vegetation corresponding to the M15 NVC

	<i>Atlantic wet heaths with Erica tetralix</i> and is afforded protection under the EC Habitats Directive. Upland heathland is described in the UKBAP and is listed on the SBL. Wet heath is recognised as having moderate groundwater dependence and may be classed as a GWDTE and be afforded protection under the WFD.		community) is present. This habitat is fragmented throughout the Site and typically forms mosaics with other mire communities. An estimated 100,000 ha of heathland is found in Dumfries and Galloway, including the most extensive area of wet heath south of the highlands. Due to its extent and fragmentation in the site, this habitat has been assessed as local importance.
Blanket bog	Blanket bog is an Annex I habitat and afforded protection under the EC Habitats Directive. Blanket bog is described in the UKBAP and is listed on the SBL.	Local	Several areas of Blanket bog totalling approximately 20 ha were recorded within the Site. Blanket bog is one of Scotland's most common semi-natural habitats, covering ~1.8 million hectares, 23% of Scotland's land area ⁴⁵ . An estimated 50, 000 ha of blanket bog is found in Dumfries and Galloway. This habitat is of local importance due to providing habitat diversity within the site.
Dry modified bog	Blanket bog is described in the UKBAP and is listed on the SBL and this habitat encompasses all areas of blanket bog supporting semi-natural blanket bog vegetation, regardless of its status as 'active' or peat-forming.	Local	A small extent of dry modified bog was recorded. This habitat will be of no greater than local importance due to its size.
Flush and spring - basic flush	Upland flushes, fens and swamps are described in the UKBAP and are priority habitats listed on the SBL.	Local	A small extent of basic flush which corresponds to M10 vegetation communities

⁴⁵ NatureScot (2023) Blanket Bog. Available online: <https://www.nature.scot/landscapes-and-habitats/habitat-types/mountains-heaths-and-bogs/blanket-bog>

	basin flush vegetation communities are included within Annex I habitat ' <i>Calcium-rich springwater-fed fens</i> ' and is afforded protection under the EC habitats directive. Basin flush communities can also be classed as GWDTEs and afforded protection under the WFD.		was recorded in several parcels throughout the Site. A small area classifies as Annex I habitat and is fed by a calcium rich spring. Due its limited extent this habitat is of no greater than local importance.
Fen – basin mire	Upland flushes, fens and swamps are described in the UKBAP and are priority habitats listed on the SBL. basin mire vegetation communities are included within Annex I habitat ' <i>Transition mires</i> ' and is afforded protection under the EC habitats directive. Basin mire communities are classed as GWDTEs and afforded protection under the Water Framework Directive (WFD).	Regional / National	Within the Site, basin mire, categorising as M9a NVC community is present along the eastern boundary of the Site totalling approximately 4.5 ha. This habitat was determined to be base rich, with influence from M10 habitat on slopes above the basin mire to the west. This has led to the formation of herb rich transitional mire, with a mosaic of acid flushes. Fens are widespread throughout the UK; however, they are uneven in their distribution and have suffered declines due to agricultural intensification and changes in land use practices. There is around 250 ha of fen present in Dumfries and Galloway ⁴⁶ . Following guidance due to its rarity / localised community M9a communities should be considered for SSSI notification ⁴⁷ . The extent

⁴⁶ Dumfries and Galloway Biodiversity Partnership, 2009. Dumfries and Galloway Local Biodiversity Action Plan 2009 – Part 3: Species Action Plans. Available at: <https://swseic.org.uk/wp-content/uploads/2018/06/DGLBAP2009-part3.pdf>

⁴⁷ JNCC (1989) Guidelines for the selection of biological SSSI's Part 2: Detailed guidelines for habitats and species groups: 7 FENS. Available online: <https://data.jncc.gov.uk/data/7a31e226-8f0b-44f7-bfb5-e81ec9e68597/SSSIs-Chapter07.pdf>

			of continuous M9 habitat is relatively low (sub 5ha), subsequently, this is generally below the threshold for SSSI selection in a cultivated lowland environment. However, the guidelines for the selection of biological SSSI's in regard to fens is subject to revision, with current guidance dating to 1989. This habitat supports the core population of marsh fritillary within the Site, a nationally protected species and a population of regional/National importance. For this assessment a precautionary approach has been adopted and it is assumed that the basin fen within the site would meet the criteria for SSSI selection, in addition to supporting marsh fritillary and has been assessed as being of National importance.
Swamp	Swamps are described in UKBAP priority habitat upland flushes, fens and swamps, and are listed on SBL.	Local	Of local importance in context with the Site and habitat diversity.
Standing water – mesotrophic	Mesotrophic lakes described in the UKBAP and are priority habitats listed on the SBL.	Local	One standing body of water (Hallhills Loch) is present in the Site. Mesotrophic lakes are infrequent throughout the UK and are generally restricted to the uplands of the north and west ⁴⁸ . Hewke Burn flows through the loch, as such it is likely that brown trout are present. Hallhills Loch is treated as being Locally important, increasing habitat diversity

⁴⁸ UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

			within the site and likely supporting UK BAP, and SBL priority species.
GWDTE	GWDTE are afforded protection under the WFD	N/A	There is a requirement under the WFD to carry out assessment of the likely impacts of development on habitats which are dependent on groundwater in line with SEPA LUPS guidance ³ . Guidance states that survey of all habitats within 250 m of excavations greater than 1 m deep is undertaken, and within 100 m of all other excavations.

8.9 Predicted Effects without mitigation

Site Preparation and Construction Effects – Habitats

- 8.9.1. The Site preparation and construction phase of the Proposed Development will result in habitat loss due to construction of access tracks, turbine bases, crane hardstandings, Battery Energy Storage System (BESS), construction compound, construction of a substation, borrow pits and other associated infrastructure representing a total area of 15.045 ha. This equates to 3.85% of the overall total Development Area.
- 8.9.2. The extent of permanent and temporary loss of each of the habitats present on site is shown in Table 8.16. Temporary loss refers to areas that will be reinstated following construction (i.e. borrow pits, earth fill, and cut) and it is expected that habitats within these areas will return to their original state or type present prior to construction within the lifespan of the development (35 years), with a confident expectancy of within ten years post-construction. The total area of temporary loss of habitat is 6.682ha with a total area of permanent habitat loss of 8.363ha.
- 8.9.3. To give a complete overview of predicted habitats loss (temporary and permanent) by the Proposed Development Table 8.16 includes all habitats recorded within the development area. However, only those habitats which have been identified as IEF's are further discussed / assessed. Habitats in bold italics have been identified as IEF.

Table 8.16: Habitat loss calculations (predicted) for temporary and permanent loss due to the Proposed Development.

Phase 1 habitat type	Extent within Development Area (ha)	Extent of permanent and temporary loss within the Development Area (ha)	% of permanent and temporary loss within the Development Area	Extent of permanent loss within Development Area (ha)	% permanent loss within Development Area
Broadleaved woodland - Semi-natural	0.310	0.003	-0.97	0.001	-0.32
Broadleaved Woodland - plantation	0.420	0.00	0.00	0.00	0.000
Coniferous woodland – semi -natural	0.050	0.00	0.00	0.00	0.000
Coniferous woodland - plantation	11.710	0.037	-0.32	0.008	-0.14
Scrub	0.140	0.013	-9.29	0.008	-5.71
Scattered Scrub	1.360	0.00	0.00	0.00	0.000
Parkland – scattered trees	0.010	0.00	0.00	0.00	0.000
Acid grassland – unimproved	3.740	0.339	-9.06	0.122	-3.26
Acid grassland – semi-improved	2.680	0.027	-1.22	0.014	-0.06
Neutral grassland – semi-improved	22.030	0.268	-1.22	0.035	-0.16
Improved grassland	176	7.84	-4.45	3.731	-2.12
Poor semi-improved grassland	0.960	0.136	-14.17	0.136	-14.17
Calcareous grassland –	0.070	0.000	0.000	0.000	0.000

semi-improved					
Marshy grassland	123.180	6.02	-4.89	4.042	-3.28
Wet dwarf heath shrub	4.150	0.045	-1.08	0.028	-0.67
Bog – modified bog	12.020	0.251	-2.09	0.206	-1.71
Bog – dry modified bog	0.060	0.00	0.00	0.00	0.000
Flush and spring – Acid / neutral flush	0.080	0.045	-56.25	0.015	-18.75
Flush and spring – Basin flush	0.470	0.021	-4.47	0.009	-1.91
Fen – basin mire	4.360	0.00	0.00	0.00	0.000
Open water - mesotrophic	2.604	0.00	0.00	0.00	0.000
Artificial - quarry	0.023	0.00	0.00	0.00	0.000
Track	0.822	0.00	0.00	0.00	0.000

8.9.4. Measurements for habitat loss have been taken from QGIS, area habitats were measured to three decimal points.

Broadleaved woodland -Semi-natural

8.9.5. The total extent of broadleaved semi-natural woodland within the development area is 0.310 ha. This habitat is exclusively found along the proposed access track, interspersed throughout the coniferous plantation. Impacts from the Proposed Development will be limited to a total of 0.003 ha of habitat which could be impacted through upgrades to the existing forestry access track; this is a very small area to be impacted, and there is potential that no trees will require felling to facilitate works. Permanent habitat loss will be 0.001, which accounts for -.032% of the habitat type within the development areas. Unmitigated effects on this habitat through direct habitat loss has been assessed as **negligible** magnitude and therefore **not significant**.

Acid grassland – unimproved and Acid grassland semi-improved

8.9.6. Acid grassland within the Site totals 6.42ha, with unimproved acid grassland totalling 3.740ha. Permanent habitat loss for acid grassland is restricted to proposed access track as such the overall loss is low, totalling 0.366 ha across both unimproved and

semi-improved habitats. Overall, there will be a permanent reduction of -3.26% of unimproved and -0.06% semi-improved acid grassland within the site. Effects have been assessed as **minor** magnitude and **not significant**.

Calcareous grassland – semi-improved

- 8.9.7. No loss of this habitat is anticipated within the Site. Therefore, effects of habitat loss due to the Proposed Development on this habitat are predicted to be **negligible** magnitude and therefore **not significant**.

Marshy grassland

- 8.9.8. The total extent of marshy grassland within the Site comprises 123.180 ha, accounting for 32.41% of the total development area. In total 3.779 ha of marshy grassland will be permanently lost (-3.09%) due to preparation and construction of turbine bases, crane pads and access tracks; this is the largest total area of habitat loss for a single habitat type within the Site. However, this direct loss is a small loss of this habitat type in regional context.
- 8.9.9. Construction activities may result in indirect hydrological effects on marshy grassland NVC communities which are present within the site. Principally to M23a communities which are classified as having high GWDTE potential. Alterations for flow regimes have the potential to affect the integrity of these habitats.
- 8.9.10. Construction activities may also result in disturbance or damage to this habitat type from dust created from construction activities and to water quality through accidental pollution events.
- 8.9.11. Effects on marshy grassland communities from direct habitat loss and any unmitigated effects of preparation and construction in terms of hydrology and dust on marshy grassland communities are predicted to be **negative** of **minor** magnitude and therefore **not significant**.

Wet dwarf heath shrub

- 8.9.12. Wet dwarf heath shrub covers a total area of 4.15 ha within the site which comprises just over 1% of the total site area. However, this habitat is fragmented throughout, with the largest parcel totalling 1.579 ha. The Proposed Development will result in a permanent loss of 0.028 ha, which equates to a 0.67% reduction in wet dwarf heath within the site. Subsequently, the level of direct loss of wet dwarf shrub heath is minimal, and of negligible value in a regional context. The Site is currently in use for agricultural purposes, with much of the Site being subject to some form of anthropogenic management (drainage, fertiliser input, intensive grazing). Ecological succession, and agricultural improvement are some of the main threats affecting lowland heathlands⁴⁹, therefore, it is not improbable that the extent of habitat loss detailed above wouldn't occur even in the absence of the Proposed Development

⁴⁹ JNCC (2009) *Common Standards Monitoring Guidance for Lowland Heathland: Version 2009*. ISSN 1743-8160.

given the Sites current use. Therefore, direct habitat loss is assessed as **negligible** magnitude and **not significant**.

- 8.9.13. Wet dwarf shrub heath has been identified as a potential GWDT, and some areas of this habitat type are located within 250 m of turbine foundations, and 100 m from access tracks. Construction activities may result in indirect effects on wet dwarf shrub heath due to changes in underlying hydrological flow; construction activities have the potential to interrupt hydrological connectivity and affect the overall integrity of this habitat type. See Chapter 9: Hydrology
- 8.9.14. Any unmitigated effects of preparation and construction in terms of hydrology impacts from on dry dwarf shrub heath are predicted to be of **minor** magnitude and therefore **not significant**.

Bog – Modified bog & Dry modified bog

- 8.9.15. The total extent of blanket bog within the Site comprises 12.020 ha. Combined with dry modified bog, bog habitat within the Site accounts for 3.18% of habitat area.
- 8.9.16. No direct habitat loss of the dry modified bog is anticipated during site preparation or construction. Furthermore, dry modified bog occurs where there have historically been anthropogenic impacts to the habitat resulting in changes to its hydrology, vegetation and physical characterises.
- 8.9.17. Construction of a section of access track, will result in the permanent loss of 0.206 ha of blanket bog within the site: equating to a 1.71% reduction. This is a small area in terms of the site, and a negligible loss in a regional context.
- 8.9.18. However, indirect effects from construction activities could result in damage or disturbance to this habitat. Construction of access tracks and turbine infrastructure could result in changes to hydrological flow; all areas of modified bog and dry modified bog are within either 250 m of infrastructure or 100 m of access roads. Therefore, there is potential that hydrological connectivity could be affected, which could result in changes to vegetation communities or effect the overall integrity of the habitat type. Furthermore, there is a risk of damage / disturbance from dust generating activities during construction. Bog habitats support a range on non-vascular plants (i.e. sphagnum moss), due to morphological characteristics these species are more susceptible to environmental influences, particularly particulate matter⁵⁰. There is also a risk of pollution incidents occurring during the construction phase of development.
- 8.9.19. In isolation, the loss of bog habitat within the Site would constitute a minor magnitude, not significant impact. However, in combination with indirect effects it has been assessed that unmitigated impacts to blanket bog are of **moderate** magnitude, and **not significant**.

⁵⁰ Vanicela BD, Nebel M, Stephan M, Riethmüller C, Gresser GT. (2021) *Quantitative analysis of fine dust particles on moss surfaces under laboratory conditions using the example of Brachythecium rutabulum*. Environ Sci Pollut Res Int.

Flush and spring – Basin flush

- 8.9.20. The total extent of basin flush habitat within the site comprises 0.470ha; parcels of this habitat type are fragmented throughout the site, with the largest single area measuring 0.248 ha. It is from this area that 0.009 ha of habitat will be permanently lost to the construction of an access track. Overall, the total permanent loss will equate to a 1.93% reduction basin flush within the site.
- 8.9.21. NVC communities associated with these habitats are classified as having high potential dependency for GWDTE. All identified areas of basin fen are within either 250 m from turbine infrastructure or 100m of access tracks. Subsequently, there is a potential risk of construction activities having indirect effects on these habitats, particularly regarding hydrology. Impacts on potential GWDTE is further discussed below.
- 8.9.22. Any unmitigated effects of preparation and construction, in terms of hydrology on basin flush are predicted to be of **moderate** magnitude and therefore **not significant**.

Fen - Basin mire

- 8.9.23. No loss of this habitat is anticipated within the Site. Subsequently, there will be no anticipated effects from direct habitat loss. However, this habitat classifies as potentially high GWDTE and is within 250 m of turbine infrastructure and within 100 m of proposed access tracks, subsequently there is potential that this habitat could negatively affected during site preparation and construction. Potential indirect impacts to this habitat are further discussed in below.
- 8.9.24. Surveys indicate that irrigation from the M10 habitat (flush and spring- basin flush) approximately 140 m to the west of the basin mire is a contributing factor to the base-enrichment and species composition and diversity within the basin mire. An access track is proposed to go through this M10 habitat, fragmenting the basin mire and flush habitat. Subsequently, in the absence of mitigation the Proposed Development could result in indirect impacts to the hydrological flow between these habitats. Which could result effect species diversity and potentially the integrity of the basin mire.
- 8.9.25. Any unmitigated effects of preparation and construction, in terms of hydrology on basin mire are predicted to be of **High** magnitude and therefore **significant**.

Open water – mesotrophic

- 8.9.26. Hallhills Loch covers a total extent of 2.604 ha, which accounts for less than 1% of the overall Site. No direct loss of this habitat is anticipated through construction activities.
- 8.9.27. However, Turbine 6, is within 85 m of the waterbody, subsequently, the Loch is at risk of indirect effects throughout the construction phase. Site preparation and construction for Turbine 6 has the potential to negatively effect the hydrological connectivity of the waterbody to the surrounding habitats. Furthermore, there is a risk of damage to this habitat as a result of an accidental pollution event, or from dust generating activities which could adversely effect macrophytes, and aquatic fauna.

- 8.9.28. Any unmitigated effects from adjacent construction and site preparation activities are therefore predicted to be negative and of **moderate** magnitude, due to the reversibility of potential impacts effects have been assessed as **not significant**.

Groundwater Dependant Terrestrial Ecosystems (GWDTE)

- 8.9.29. NVC surveys of the Site identified nine habitat communities and subcommunities which classify as potentially supporting GWDTE under SEPA guidance³ The following communities and their potential for GWDTE are outlined below in Table 8.17.

Table 8.17: NVC communities within the Study Area which have the potential to be supported by groundwater.

Community	GWDTE Potential
W4a <i>Betula pubescens</i> - <i>Molinia caerulea</i> woodland, <i>Dryopteris dilatata</i> - <i>Rubus fruticosus</i> sub-community	High
W7a <i>Alnus glutinosa</i> study area- <i>Fraxinus excelsior</i> - <i>Lysimachia nemorum</i> woodland, <i>Urtica dioica</i> sub-community	High
CG10a <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Thymus praecox</i> grassland, <i>Trifolium repens</i> - <i>Luzula campestris</i> sub-community	High
M6 <i>Carex echinata</i> - <i>Sphagnum recurvum/auriculatum</i> mire	High
M9 <i>Carex rostrata</i> – <i>Calliergon cuspidatum/giganteum</i> mire	High
M10 <i>Carex dioica</i> – <i>Pinguicula vulgaris</i> mire	High
M15b <i>Scirpus cespitosus</i>	Moderate
M23 <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush-pasture	Moderate
M25 <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire	Moderate

- 8.9.30. An assessment of potential GWDTE habitats within the Site has been undertaken as part of the EIA process. The findings show that NVC communities which have the potential for high GWDTE are generally located on ground adjacent to watercourses or within existing surface water flow routes and underlain by either low permeability peat, glacial till and bedrock deposits. This distribution is not typical of that which is sustained by emerging groundwater, such as springs or seepage lines but rather it is likely to be supported by rainfall, surface water ponding and water logging of soils adjacent to watercourses or above the low permeability deposits. Therefore, habitats and NVC communities within the Site are not considered to be sustained by groundwater feeding. Full details can be found in Technical Appendix 9.1: Groundwater Dependent Terrestrial Ecosystems (GWDTEs) Assessment.

Subsequently, no further assessment of potential GWDTE habitats within the Site was required and effects to GWDTE from the Proposed Development is considered **Negligible** and **Not Significant**.

Site Preparation and Construction Effects – Species

8.9.31. The potential impacts to species during construction are described below.

Fish

- 8.9.32. During construction, there is potential for the construction of new infrastructure such as turbines, crane pad foundations, access tracks, watercourse crossings, temporary construction compounds, substation and the proposed borrow pits to result in the loss, disturbance or degradation of the surrounding aquatic habitats.
- 8.9.33. With the exception of access track watercourse crossings, all other infrastructure and proposed borrow pits will be located at a minimum distance of 50 m from watercourses; therefore, there will be no direct loss of aquatic habitats.
- 8.9.34. There will however be a need for three new access track crossings of local watercourses; see Appendix 9.2 for full details.
- 8.9.35. These will comprise of culvert structures (see Technical Appendix 9.2: Schedule of Watercourse Crossings) and will therefore result in direct loss of aquatic habitat under the footprint of the culverts. There may also be further temporary disturbance to stream beds if there is a need to temporarily divert watercourses to enable construction of culverts to take place.
- 8.9.36. Indirect habitat effects may also arise from construction of watercourse crossings as both require an element of ground/stream bank disturbance in order to construct / install the culvert pipe and lay the road surface. Direct loss of riparian or bankside habitat will occur as will potential temporary degrading/disturbance to in-stream habitat due to the risk of erosion or sediment/construction material polluting the watercourse and being deposited upon the streambed and other aquatic habitats immediately downstream.
- 8.9.37. Brown trout populations were recorded in Hewke Burn and its tributaries, subsequently, due to the requirement for watercourse crossings there is a risk to fisheries within the Site during the preparation and construction phase. Potential impacts could include direct mortality, siltation from ground disturbance, accelerated or exacerbated erosion of watercourse banksides, hydrological changes to watercourses and surface water run-off, pollution of watercourses leading to fish mortality, and the blocking or hindering of the upstream/downstream migration of fish.
- 8.9.38. In the absence of mitigation, effects on fish populations within the Site have been assessed as negative, **moderate** magnitude and therefore **not significant**.

Bats

- 8.9.39. The Proposed Development consists predominantly of open habitat, with marshy and improved grassland the dominant habitat types within the Site; woodland edges

border the site on several boundaries. Nine species of bats were recorded during the 2024 activity surveys, with common pipistrelle, soprano pipistrelle and noctules recording the highest level of activity. The loss of habitat to the Proposed Development will marginally reduce the foraging opportunities within the Site. However, direct habitat loss will be low and restricted to open habitats which are widespread with the site and surrounding landscape. Furthermore, studies have shown that common and soprano pipistrelle show preference over edge habitats comparative to open spaces for foraging in Scottish farmed landscapes⁵¹. As such the reduction of foraging habitat is considered to be minimal.

- 8.9.40. No bat roosts or potential bat roost habitat was identified within 200m + rotor diameter (162 m) of proposed turbine locations. Additionally, habitats which have the potential to support bat roost features, will be largely retained within the Site. A small amount of coniferous plantation will be lost to facilitate access to the Site.
- 8.9.41. Without pre-construction checks for potential bat roosts within areas of coniferous woodland habitat to be lost, there is a low but potential risk of disturbance to roosting bats during construction activities.
- 8.9.42. Bat foraging and commuting habitat lost to the development is assessed as **negligible** magnitude and therefore **not significant**.
- 8.9.43. The risk of bat roosts being identified within areas of coniferous plantation to be felled is considered improbable, however, to account for any potential risk pre-construction surveys felling areas will be undertaken. Should any bat roosts be identified appropriate mitigation will be applied and detailed within the CMS.

Marsh fritillary

- 8.9.44. The extent of suitable habitat for marsh fritillary within the Site covers a total area of 58.79 ha, with the core population inhabiting basin flush habitat along the east boundary. Where possible direct loss of suitable fritillary habitat has been avoided; however, the Proposed Development will result in a direct loss of 1.068 ha of existing suitable marsh fritillary habitat, this comprises 1.8% of the overall suitable habitat within the site.
- 8.9.45. The majority of the habitat loss is a result of Turbine 6 infrastructure including access tracks, crane pads and turbine bases. Whilst Turbine 6 is sited within habitat which is suitable for fritillaries, devil's-bit scabious within this area occurs at lower densities due to tall rank grasses (likely a result of reduced management) which has likely inhibited scabious growth. Subsequently whilst present, numbers of adult butterflies and larval webs were recorded in low numbers, and it was determined that this area did not support the core population with the Site.

⁵¹ Downs, N.C. and Racey, P.A. (2006) 'The use by bats of habitat features in mixed farmland in Scotland', *Acta Chiropterologica*, 8(1), pp. 169–185. doi:10.3161/1733-5329(2006)8[169:tubboh]2.0.co;2.

- 8.9.46. If the vegetation to the northeast of Hallhills Loch continues to outcompete devil's-bit scabious, it is likely that that suitable habitat within this area will further degrade and has the potential to be lost regardless of the Proposed Development. Surveys in 2024 indicate that this has likely occurred historically within the site with small, fragmented pockets of suitable habitat to the south, which are likely a relict example of more extensive suitable habitat. Despite the potential for further degradation and loss of suitability, this assessment has considered the effects of direct habitat loss from current Site conditions. As detailed above the proposed development will see a direct loss of 1.8% of suitable habitat. However, direct habitat loss will avoid habitat (basin mire (M9)) along the eastern boundary which supports the core marsh fritillary population with the Site. Direct habitat loss will be restricted to marshy grassland (M25-M23 mosaic) which currently supports low numbers of foodplants and adult butterflies/larvae. As such the direct loss of suitable habitat from the Proposed Development has been assessed as negative, of **minor** magnitude and therefore **not significant**.
- 8.9.47. There is potential that larval webs, or egg bearing plants could be destroyed during site preparation or construction. Additionally, whilst hydrological assessments have shown that the areas of suitable fritillary habitat to the northeast of Hallhills Loch are unlikely to classify as GWDTE, there is potential for development to indirect effects to the hydrological characteristics of areas of suitable habitat, which could result in a shift in vegetation community over time which would reduce marsh fritillary range within the site.
- 8.9.48. Furthermore, whilst there will be no direct habitat loss from fen - basin mire habitat along Whitehill Moss, (which currently supports the core marsh fritillary population), there is proposed infrastructure within 250m. A proposed access track will cut through adjacent flush and spring habitat (M10), the habitat surveys indicate that irrigation from the M10 habitat (flush and spring- basin flush) approximately 140 m to the west of the basin mire is a contributing factor to the base-enrichment and species composition and diversity within the basin mire. Subsequently, in the absence of mitigation, hydrological flow between the two habitats could be affected, which has the potential to effect species diversity and potentially the integrity of the basin mire habitat, which in turn could affect the suitability of the habitat for the marsh fritillary population. However, this flushing from the M10 habitat is unlikely to be the primary factor that determines environmental conditions within the basin mire. Subsequently, should hydrological flow be impacted during construction it is unlikely to significantly affect the ecological integrity of the habitat and suitability for marsh fritillary.
- 8.9.49. Overall, any unmitigated effects from Site preparation and construction on marsh fritillary populations and suitable habitat have been assessed as negative, **Moderate** magnitude and therefore **not significant**.

Operation Effects – Habitats

- 8.9.50. Operation of the Proposed Development will not cause any additional habitat loss. However, there is a small risk of pollution incidents or major maintenance/repair activities causing damage.
- 8.9.51. Any unmitigated operational effects on habitats within the Site are predicted to be negative, of **minor** magnitude and therefore **not significant**.
- 8.9.52. Operational management plans will ensure the risk of these incidents remains low, and that there is a plan in place to deal with any incidents that do occur.

Operation Effects – Species

Fish

- 8.9.53. During operation there remains a risk of contamination of the watercourses from surface water run-off, oil or other leaks from turbine machinery, spills during maintenance or leaks from maintenance vehicles. Prevention and consideration of these effects are further discussed in Chapter 9: Hydrology, Geology and Hydrogeological Assessment. Due to the low levels of site personnel, vehicles or machinery required during operation of the Proposed Development within proximity to watercourses, any unmitigated operational effects on fish is considered to be unlikely, however, impacts would be negative of **minor** magnitude and therefore **not significant**.

Bats

Turbine operation

- 8.9.54. During the operational phase, there is a risk of mortality to individual bats a result of potential collision and / or barotrauma⁵² when flying in close proximity to turbines.
- 8.9.55. Studies have shown that the majority of bat fatalities at UK wind farm sites are attributed to three species; common pipistrelle, soprano pipistrelle and Noctules⁵³. These species are categorised as being of high collision risk within the UK⁵⁴, likely due to their foraging characteristics (aerial hawking) and use of open space habitat. These three species recorded the highest number of bat contacts during the 2024 activity surveys, with detector locations 1, 3 and 7 recording the highest levels of activity.
- 8.9.56. Other species including Daubenton's, whiskered, Natterers and brown long-eared bats were recorded across the Site. Activity for these species was much lower, with only Natterers bats recording above 100 registered calls throughout the three

⁵² Injury caused by a change in air pressure, affecting typically the ear or the lung

⁵³ DEFRA (2016), *Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management*. University of Exeter.

⁵⁴ Downs, N.C. and Racey, P.A. (2006a) 'The use by bats of habitat features in mixed farmland in Scotland', *Acta Chiropterologica*, 8(1), pp. 169–185. doi:10.3161/1733-5329(2006)8[169:tubboh]2.0.co;2.

deployments. These species with the exception of Daubentons, are generally classified as narrow space foragers, strongly associated with woodland habitats⁵⁵. Daubenton's are classified as more open habitat foragers, however, this species almost exclusively uses waterbodies as to forage, where they exploit prey from the water's surface⁵⁶. Subsequently, due to preferred foraging habitats and methods, these species are classed as low risk to collision from turbines. Due to the low levels of activity within the site, siting of turbines (open habitats), and low collision risk operational effects on these species have been classified as **negligible** magnitude and **not significant**.

- 8.9.57. Detector location 6 (closest to Turbine 6) recorded the highest level of bat activity during the 2024 surveys. The detector was located along Hewke Burn within a valley between two woodlands, approximately 150 m from the proposed turbine location. Turbine 6 is sited within open grassland habitat, with Hewke Burn approximately 90 m away and woodland edge habitat over 115 m to the north. A study on habitat uses by foraging bats in Scotland found that there was a significant reduction in pipistrelle activity between tree lined habitat and adjacent open habitats within 35 m of each other⁵⁴. Subsequently, it is likely that pipistrelle activity will in reality be lower at Turbine 6 comparative to the results of the 2024 activity survey. However, noctule presence was high at this location, particularly in the autumn deployment, these species are adapted to open space foraging / commuting as such the embedded distance between the turbine location and surrounding habitat is less likely to significantly change activity levels.
- 8.9.58. Similarly to the above, detector location 5 was sited along woodland edge habitat, recording moderate levels of common pipistrelle activity throughout the summer deployment. However, the proposed turbine location is approximately 120 m south within open habitat with no identifiable commuting corridors (hedgerows, watercourses etc). As such pipistrelle activity is anticipated to be lower at the turbine site.
- 8.9.59. Detector location 3 whilst in open habitat with no woodland edge features within 700 m is ecologically connected to Hewke Burn through one of its tributaries. Therefore, bats, in particular pipistrelles are likely using Hewke Burn and its tributaries as a commuting corridor to connect surrounding habitats to the marshy grassland, increasing foraging opportunities during the summer months. There was a significant reduction in activity at this location during the autumn deployment
- 8.9.60. Detector location 1 (Turbine 1) recorded a spike in common pipistrelle activity during the Autumn deployment. The results indicate that the habitats in this area including woodland edge and waterbodies at Hog Hill may be an important foraging resource for common pipistrelle prior to hibernation.

⁵⁵ Collins, J. (ed) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition)*. The Bat Conservation Trust, London. ISBN-978-1-7395126-0-6

⁵⁶ Voigt, C.C. *et al.* (2021) 'The impact of light pollution on bats varies according to foraging guild and habitat context', *BioScience*, 71(10), pp. 1103–1109. doi:10.1093/biosci/biab087.

- 8.9.61. Unmitigated impacts from operational effects on common pipistrelle, and soprano pipistrelles at Turbine 1, 3 and 6 have been assessed as negative, **moderate** magnitude and therefore **not significant**.
- 8.9.62. Unmitigated impacts from operational effects on noctules at Turbine 6 have been assessed as negative, **moderate** magnitude and **significant**.

Bats - Battery Energy Storage System

- 8.9.63. Installation of the BESS is proposed at the southern end of the Site, immediately adjacent to a small parcel of coniferous woodland plantation within improved grassland habitat. No bat activity surveys have been undertaken within this area; however, woodland edge habitat will provide foraging opportunities for widespread species within the site.
- 8.9.64. The proposed BESS will likely have an adverse effect on foraging bats which utilise the edge of the plantation, due to the introduction of ambient noise generated from the battery units. Whilst this is unlikely to completely preclude foraging within this area, it is likely that introduced noise will have a negative effect with the potential to alter bat foraging behaviour within the immediate vicinity. Introduction of noise to foraging bats has been shown to reduce overall foraging attempts and foraging efficiency⁵⁷.
- 8.9.65. However, effects are likely to be localised to the BESS area, and the functional loss of a small section of coniferous plantation in the context of the wider surroundings and available foraging habitat is considered to be of **negligible** magnitude and therefore **not significant**.

Marsh Fritillary

- 8.9.66. Operation of the Proposed Development will not cause any additional direct loss of suitable marsh fritillary habitat. However, there is a small risk of pollution incidents or major maintenance/repair activities causing indirect damage to areas of existing suitable habitat within the site, which could affect negatively the functionality of the habitat.
- 8.9.67. Any unmitigated operational effects on marsh fritillary within the Site are predicted to be negative, of **minor** magnitude and therefore **not significant**.

Decommissioning Effects

- 8.9.68. Decommissioning effects will be of similar or lower magnitude to the preparation and construction phase effects with restoration following decommissioning expected to return the Proposed Development to baseline conditions

⁵⁷ : Allen LC, Hristov NI, Rubin JJ, Lightsey JT, Barber JR. 2021 *Noise distracts foraging bats*. Proc. R. Soc. B 288: 20202689. <https://doi.org/10.1098/rspb.2020.2689>

8.10 Embedded mitigation & Enhancement

Mitigation by Design

- 8.10.1. During the design process, several aspects were taken into consideration in order to minimise the potential risk to species and habitats arising from the Proposed Development. See Chapter 2: Site Selection and Design of the EIA for details.
- 8.10.2. In order to minimise land take and potential impacts on habitats and protected species, use of an existing forestry access track to the north is proposed as the main access to Site. No additional land take will be required where use of or upgrading of existing access tracks is incorporated as part of the design.
- 8.10.3. A minimum distance of 50 m has been maintained between the proposed infrastructure and watercourses where practical, with the exception of three watercourse crossings. The watercourse crossings will be designed in keeping with SEPA good practice⁵⁸, (see Chapter 9: Hydrology, Geology and Hydrogeological Assessment).
- 8.10.4. The infrastructure layout of the Proposed Development has been designed to avoid sensitive habitats wherever practical (i.e. blanket bog, and areas of potentially high GWDTE), and areas of deepest peat whilst still taking into account other constraints (i.e. landscape and heritage). Where avoidance has not been practical, access infrastructure will be constructed in such a way as to ensure the integrity and connectivity of the hydrology of sensitive habitats will be maintained. Access tracks will be designed in keeping with recommended good practice⁵⁹. Further detail is provided in Chapter 9: Hydrology, Geology and Hydrogeological Assessment.
- 8.10.5. Where infrastructure is located close to habitats which are hydrologically influenced it will be designed to maintain hydrological connectivity in the surrounding habitat, for example through the use of cross drains and/or waterbars. Further details on design methods to mitigate potential impacts on potential GWDTEs are discussed in Chapter 9: Hydrology, Geology and Hydrogeological Assessment
- 8.10.6. To reduce the risk to bats, the infrastructure layout of the Proposed Development has been designed to incorporate a 50 m buffer between turbine blade tip and nearest feature as per recommended guidance⁴ The following buffers were adopted as part of the design:

- **Woodlands:**

Proposed hub height: 119 m, proposed blade length: 81 m, predicted maximum feature height: 55 m.

Calculated buffer distance: 114 m

- **Watercourses & waterbodies:**

⁵⁸ SEPA, (2010). *Engineering in the water environment: good practice guide - river crossings* (2nd Edition), SEPA

⁵⁹ SNH, (2013). *Constructed tracks in the Scottish Uplands*. Available at: <https://www.nature.scot/doc/archive/constructed-tracks-scottish-uplands>

Proposed hub height: 119 m, proposed blade length: 81 m, used feature height: 0 m

Calculated buffer distance: 54 m

- 8.10.7. Following NatureScot guidance, a 30 m buffer between active badger setts and infrastructure, and 100 m buffer for pile driving or blasting work (borrow pits) has been implemented. Additionally, a 30 m buffer between identified otter resting places (couches) and infrastructure has been adopted⁶⁰.

Habitat Management Plan

- 8.10.8. As part of the proposed wind development a Habitat Management Plan (HMP) will be Implemented, the final HMP will be produced in consultation with the Landowner, and NatureScot. The HMP will focus predominantly on:
- Marsh fritillary populations
 - Peatland restoration

An Outline Biodiversity Habitat Management Plan (oBHMP) has been provided in conjunction with this Chapter (Technical Appendix 8.5).

Marsh Fritillary

- 8.10.9. The main aim of the HMP will be to increase the overall area of suitable habitat within the site and enhance the quality of existing habitat to the northeast and west of Hallhill Loch for marsh fritillary. Within the Site, there is a significant amount of habitat which has the potential to support marsh fritillary (M25a & b & M23a vegetation communities) but currently does not offer suitable conditions (lacks devil's-bit scabious). Initial plans which seek to increase the range of suitable habitat and connect fragmented areas have highlighted 22.246 ha which may be suitable for restoration / management. If successful, this would result in an increase from 57.89 ha of suitable habitat to 79.968 ha; a 38% increase in suitable habitat within the Site from baseline conditions.
- 8.10.10. Restoration will be achieved through the adoption of suitable management practices (cattle grazing), and supplementary seeding / plug planting of devil's bit-scabious;

⁶⁰ NatureScot (2024) *Standing advice for planning consultations – Otters*. Available online: <https://www.nature.scot/doc/standing-advice-planning-consultations-otters>

this has been shown to successfully increase the extent of the larval food plant at sites in Scotland and England^{61 62}.

- 8.10.11. Furthermore, adoption of a suitable cattle grazing regime to the northeast and west of Hallhills Loch, will aim to reduce grass competition and allow the larval food plant to increase in density and range; potentially increasing the resilience of fritillary populations in these areas.
- 8.10.1. If successfully implemented the measures proposed in the oBHMP will have a significant positive effect for marsh fritillary populations within the Site and immediate surroundings. The proposed habitat creation for marsh fritillary will suitably mitigate the direct loss of 1.068 ha of existing suitable habitat and will also provide significant biodiversity enhancements within the Site. The proposed measures have sought not only to increase the overall area of suitable habitat, but to also strengthen habitat connectivity, and improve the condition of the current suitable habitat. The proposed management and habitat creation measures have been designed following established guidance and techniques which have been successfully implemented in restoration projects for marsh fritillary; offering a degree of certainty to the proposed measures. Subsequently, it is determined that the Proposed Development will provide significant biodiversity enhancements for marsh fritillary, meeting the objectives of Policy 3 of NPF 4.

Peatland restoration

- 8.10.2. Opportunities for peatland restoration within the Site will be explored, both to mitigate the small loss of blanket bog habitat from the Proposed Development and to meet the objectives of National Planning Framework 4. Two areas of peatland which are directly adjacent to each other were noted to be degraded during the habitat surveys have been identified for possible restoration. To meet NatureScot guidance of 1:10 at least 2.064 ha of peatland restoration is required. Currently, the identified areas measure 3.989 ha, restoration of these areas would exceed NatureScots recommended 1:10⁶³, suitably mitigating the loss of peatland within the Site.
- 8.10.3. Additionally, the proposed restoration will restore an additional c.1.9-ha of peatland over the required amount for mitigation. Additional peatland restoration will provide increased biodiversity enhancements within the Site, further meeting Policy 3 of NPF 4.

⁶¹ Kirkland, P. (2014) *Experimental marsh fritillary habitat restoration project Avongovrie, Islay*. Scottish Natural Heritage Commissioned Report No. 544.

⁶² Plackett, J., Bourn, N.A. & Bulman, C.R. (2012). *Restoring Marsh Fritillary metapopulations on Dartmoor*. Pages 6-9 in: S. Ellis, N.A. Bourn & C.R. Bulman (eds.) *Landscape-scale conservation for butterflies and moths: lessons from the UK*. Butterfly Conservation.

⁶³ NatureScot (2023) *Advising on peatland, carbon-rich soils and priority peatland habitats in development management*. Available online: <https://www.nature.scot/doc/advising-peatland-carbon-rich-soils-and-priority-peatland-habitats-development-management>

Construction

Pre-commencement mitigation measures

- 8.10.4. Prior to commencement of construction works, pre-construction surveys will be carried out. These will include surveys for mammals, fish and water quality surveys. Updated surveys will inform Species Protection Plans (SPP) for marsh fritillary butterfly, badger, red squirrel, bats and otter – should be agreed and secured via a appropriately worded and effective Planning Condition.
- 8.10.5. This will enable any refinements to be made if necessary to mitigation, micro-siting and/or the construction programme to take into account any updated distribution or presence of protected species.
- 8.10.6. All relevant mitigation measures would be implemented through a Construction Management Statement (CMS), which will be agreed with the Local Planning Authority (LPA) in consultation with NatureScot and SEPA – should be agreed and secured via a Planning Condition.

Fish Monitoring

- 8.10.7. A Fisheries Management Plan (FMP) will be developed in consultation with GFT, to ensure that fisheries, principally brown trout stocks within the Site are protected throughout all phases of the development. This will include up-dated pre-construction surveys, and surveys during and post construction. At least two external control sites will be included in the FMP, accurately determine if any impacts on fish and invertebrate health are due to the Proposed Development or due to external causes.

Marsh Fritillary

- 8.10.8. Where site clearance and preparation works are required within suitable habitat for marsh fritillary, works should be undertaken between mid-May – June to coincide with the adult phase of the lifecycle.
- 8.10.9. Prior to vegetation clearance, a pre-construction survey of the areas to be impacted will be undertaken by a suitably licenced ecologist. The survey will aim to identify devil's-bit scabious within the working areas. Each plant will be appropriately marked and investigated for potential egg presence.
- 8.10.10. Following the survey, NatureScot will be consulted on the requirement of a Protected Species Licence. Should a licence be required, no works will be undertaken in those areas until it has been granted.
- 8.10.11. To prevent accidental damage or harm to marsh fritillary present onsite, working areas within suitable marsh fritillary habitat will be demarcated by suitable fencing. Fencing should ensure that construction activities / storage of material or plant machinery that could negatively affect identified fritillary habitat/population does not occur out with of the identified area.

Mitigation during construction phase

- 8.10.12. A CMS will provide guidance to facilitate the implementation of best practice to prevent or minimise effects on sensitive habitats and species. This will prevent alterations to the drainage of mire and flush habitats and will also contain information regarding handling and storage of peat on site, as well as its restoration and aftercare; further details are provided in Chapter 9: Hydrology, Geology and Hydrogeological Assessment.
- 8.10.13. The details for protecting watercourses/waterbodies are outlined in Chapter 9: Hydrology, Geology and Hydrogeological Assessment.
- 8.10.14. An Ecological Clerk of Works (ECoW) will be present on Site to oversee enabling works and construction. They will be a suitably experienced individual, whose role will be to oversee that works are carried out in accordance with a produced CEMP and to advise regarding compliance with legislation (See 'Legislation and Guidance' above). They will also review results of protected species searches prior to commencement of works in different areas within the site and contribute to all relevant CMS documents. Once work has commenced, their role will be to work on site providing ecological, pollution control advice, water quality monitoring and supervision for all relevant mitigation measures (see also Chapter 9: Hydrology, Geology and Hydrogeological Assessment). The ECoW will have the authority to stop any construction activity that is having or likely to have a significant environmental impact. It is recommended that the ECoW role and their responsibilities is secured via an appropriately worded Planning Condition.
- 8.10.15. The ECoW will ensure that any micro-siting of infrastructure during construction does not impact on the most sensitive habitats and any other identified ecological constraints. This is particularly important when working in close proximity to waterbodies and sensitive habitats such as potential GWDTE/hydrologically influenced areas or blanket bog. Micro-siting will be used within a maximum limit deviation of 50 m where it does not affect other constraints. If this cannot be achieved and micro-siting has the potential to effect sensitive habitats or species, the ECoW will discuss and agree additional required mitigation to ensure impacts are minimised – this will require formal approval via the appropriate authority.
- 8.10.16. Contractors will be made aware of the ecological sensitivities on site through regular toolbox talks, including the presence of European and nationally protected species and habitats. Contractors will report any signs or sightings of protected species to the ECoW in the event any ecological interests are observed within the area of works.
- 8.10.17. Any disturbance to ground / areas around permanent infrastructure during construction would be temporary, and areas reinstated or restored before the construction phase ends. Best site management practices will be implemented on site to minimise the risk of encroachment of the construction corridor into adjacent habitats.
- 8.10.18. To prevent accidental mortality of protected species during construction, deep excavations, foundations and pipe openings etc. should be covered when not active to prevent entrapment of animals, or alternatively a temporary ramp installed to enable them to exit any steep-sided excavation.

- 8.10.19. In addition, a speed limit of 15 mph will be enforced for any vehicle within the Proposed Development to reduce the risk of collision with protected species.
- 8.10.20. Prior to the construction of the watercourse crossing at Hewke Burn, fish rescues will be undertaken prior to any instream work to reduce the risk of impacting sensitive fish populations

Operational mitigation measures

- 8.10.21. With the exception of the operation of the wind turbines and general maintenance of the turbines, there will be little on-site activity during the operational phase and therefore embedded mitigation requirements during operation are minimal.
- 8.10.22. Where potential effects exist, construction phase control measures will continue during the operational phase. In particular, the potential for pollution incidents during routine maintenance activities or turbine malfunction will be minimised by adoption of SEPA best practice guidance (see Chapter 9: Hydrology, Geology and Hydrogeological Assessment).
- 8.10.23. Vehicles coming on site will be checked for oil leaks to avoid the risk of pollution.
- 8.10.24. Permanent features of the Proposed Development, which include six wind turbines, crane pads, permanent access tracks and ancillary infrastructure (i.e. BESS, substation and control rooms), are not predicted to have any continuing effects on habitats once they have been completed and the areas surrounding these will be reinstated, following current best practice guidance. However, regular monitoring of runoff control (i.e. silt traps) and erosion control will be carried out (see Chapter 9: Hydrology, Geology and Hydrogeological Assessment for further details).
- 8.10.25. Any routine maintenance works will, where practically possible, take place during the day to minimise the potential for disturbance to protected species on site (since these are mostly nocturnal) and a speed limit of 15 mph will be enforced for any vehicle going on site, in order to reduce the risk of collision with protected species.

Bats

- 8.10.26. All turbine locations have been sited to be outside of the recommended buffers for both woodland edge habitat and waterbodies. Subsequently, this should be sufficient in reducing potential effects to common pipistrelle and soprano pipistrelles during the operation phase.
- 8.10.27. Areas of open ground around turbines will be managed to ensure that they remain free of tree and tall shrub growth to maintain a calculated buffers between potential bat features and the rotor blade tips.
- 8.10.28. Due to the potential for Turbine 6 to be located close to / adjacent to a noctule commuting route, further mitigation will be adopted to reduce potential impacts to this open habitat species. Curtailment during the autumn period (September – November) will be implemented. Curtailment will use Supervisory Control and Data Acquisitions (SCADA) to tailor the pausing/feathering of blades in response to specific wind speeds and temperatures. Curtailment will be implemented when wind

speeds are between 5.0 and 6.5m/s and at temperatures above approximately 10 or 11°C following guidance⁴.

Decommissioning mitigation measures

- 8.10.29. Best practice mitigation measures as described in the construction stage will be followed. New guidance available at the decommissioning phase will be adopted if appropriate.

8.11 Residual Effects

- 8.11.1. Even in the absence of mitigation, it is predicted that significant effects will be limited to noctule bats, and fen and basin mire habitat. For all other IEF's no significant effects were determined. Embedded mitigation measures are expected to reduce the magnitude of residual effects for all IEFs to which they apply, in the short and long-term. Further details are provided in Table 8.18 below.
- 8.11.2. The implementation of a HMP has the potential to have a significant positive effect on the marsh fritillary population at the Site. The enhancement / restoration of existing suitable habitat, and expansion of suitable habitat within the Site will reduce fragmentation and increase available food resources. This in turn will increase the resilience of fritillary populations both within the Site and potentially for any smaller disjunct populations within the wider area. Additionally, increased food resource and connectivity could result in population increases within the site, particularly in areas where fritillary are found in low densities.

8.12 Summary of Effects

- 8.12.1. It is expected that embedded mitigation measures will protect potentially highly dependent GWDTEs including during the construction phase of the Proposed Development, as required by the WFD. Furthermore, by applying embedded mitigation measures throughout the design process, potential residual effects on IEF's including common pipistrelles, soprano pipistrelles and fish the magnitude of effects have been reduced to negligible. Adoption of operational mitigation measures for noctules at Turbine 6 will reduce magnitude of effects and overall significance for noctule bats.
- 8.12.2. Adoption of a HMP has the potential to positively effect marsh fritillary populations and restore degraded peatland within the Site, contributing to an overall positive gain to biodiversity.
- 8.12.3. Effects after mitigation on all IEF's is detailed below in Table 8.18.

Table 8.18: Overview of IEFs and residual effect post mitigation.

IEF	Conservation Value within the Proposed Development	Potential pre-mitigation effect	Magnitude of pre-mitigation effect	Significance of pre-mitigation effect	Embedded mitigation measures	Magnitude of residual effect	Residual significance	Comments
Construction and commissioning								
<i>Species</i>								
Marsh Fritillary	National	Loss of suitable marsh fritillary habitat & potential loss of larval webs / food plant. Disturbance during construction phase	Negative Minor	Not significant	- Avoidance of basin mire and core marsh fritillary habitat during construction / micro-siting where possible. - Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use of cross drains and/or waterbars (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas - Timing of site preparatory works - Demarcation of working zones within suitable marsh fritillary habitat	Positive - Moderate	Significant	Increased habitat within the Site range and quality within the Site could increase the resilience of the species.

					- Appointment of ECoW to monitor objectives of the SPP, CMS and HMP. Adoption of HMP: - Restoration and enhancement of suitable marsh fritillary habitat - Increase marsh fritillary habitat & food plant density - Connect fragmented areas of suitable habitat across Site.			
Bats	Local	Loss of foraging habitat Disturbance to bat roosts & bat foraging habitat.	Negative Negligible	Not significant	- Pre-construction surveys for potential bat roosts in areas of woodland to be felled / directly impacted. - Production of a SPP prior to construction – to be implemented in full. - Appointment of ECoW to monitor compliance with the CMS, SPP etc. and other species-specific mitigation.	Negligible	Not significant	No bat roosts or potential bat roosts features were identified within 362 m of the proposed turbine locations, and loss of habitat which could support roost is minimal. Measurable residual effects at any level are considered unlikely.
Fish	Local	Contamination of watercourse, through	Negative Moderate	Not significant	Pre-construction and construction fish monitoring programme;	Negligible	Not significant	Propose mitigation measures will limit the potential for

		increased sedimentation, or pollution events. Potential fish mortality.			• Best practice during design of watercourse crossings; • 50 m buffer maintained between proposed infrastructure and watercourses where possible; • Fish rescues undertaken prior to instream works. • Appointment of ECoW to monitor ecological and hydrological aspects of the project throughout the construction duration. Protection of watercourses and water quality (see Chapter 9: Hydrology, Geology and Hydrogeological Assessment)			effects to occur during the construction phase. A fish and macroinvertebrates monitoring scheme will determine any impacts and provide a baseline for which potential impacts can be assessed from.
Habitats								
Broadleaved woodland – semi-natural	Local	Loss of 0.001ha of habitat – likely restricted to ground flora	Negative Negligible	Not significant	Mitigation by design, including: • Use of existing access tracks where possible to minimise land take and impacts on habitats. Best practice measures during construction including: • Keeping within clearly defined construction areas;	Negligible	Not significant	N/A

					• Use of suitable storage areas for materials;			
Marshy Grassland	Regional	Loss of 3.779 ha of marshy grassland Indirect hydrological effects; and impacts from dust.	Minor negative	Not significant	Mitigation by design including: • The layout of turbines, access track and associated infrastructure has minimised impact on the most sensitive vegetation communities where possible; • Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use measures such as permeable access tracks and regular cross track drains (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas • Use of existing access tracks where possible to minimise land take and impacts on habitats; • Implementation of a HMP including restoration of marshy grassland, supplementary seeding and implementation of a sustainable grazing	Minor positive	Not significant	Mitigation measures will minimise hydrological impacts and risk of impacts from dust. Potential to enhance the quality of grassland habitat within the site.

					regime (largely to positively impact marshy fritillary)			
Wet dwarf shrub heath	Local	Direct habitat loss of 0.028 ha (0.67%) Indirect hydrological effects	Negative Negligible Negative Minor	Not significant Not significant	Mitigation by design including: - The layout of turbines, access track and associated infrastructure has minimised impact on wet heath; and - Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use measures such as permeable access tracks and regular cross track drains (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas - Use of existing access tracks where possible to minimise land take and impacts on habitats	Negligible	Not significant	Mitigation measures will minimise indirect hydrological impacts.
Blanket bog	Local	Direct habitat loss of 0.206 ha (0.67%) Indirect hydrological effects	Negative Minor	Not significant	Mitigation by design including: The layout of turbines, access track and associated infrastructure has minimised impact on the blanket bog; and	Minor positive	Not significant	Mitigation measures will minimise indirect hydrological impacts.

					- Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use measures such as permeable access tracks and regular cross track drains (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas - Use of existing access tracks where possible to minimise land take and impacts on habitats; - oBHMP investigating the potential for peatland restoration of degraded blanket bog (up to 7.116 ha)			Restoration of degraded blanket bog likely to have a positive effect. Effects are unlikely to be significant due to extent of peatland restoration proposed, which is limited by the habitats availability on Site.
Dry modified bog	Local	Indirect hydrological effects	Negative Negligible	Not significant	Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use measures such as permeable access tracks and regular cross track drains (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas	Negligible	Not significant	Mitigation measures will minimise indirect hydrological impacts.

Flush and spring - basic flush	Local	Loss of 0.248 ha (1.93%) Indirect hydrological effects	Negative Moderate	Not significant	Adoption of pollution prevention measures (see Chapter 9 Hydrology, Geology and Hydrogeological Assessment) Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use measures such as permeable access tracks and regular cross track drains (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas Implementation of a HMP and management of existing marsh fringing habitat area will potential benefit NVC communities and species richness.	Negligible	Not significant	Mitigation measures will minimise indirect hydrological impacts.
Fen – basin mire	National	Indirect hydrological effects	Negative High	Significant	Adoption of pollution prevention measures (see Chapter 9 Hydrology, Geology and Hydrogeological Assessment) Design of infrastructure (access road to west) to maintain hydrological connectivity between M10 and surrounding habitat, Through the use of permeable access tracks and regular cross track drains.	Negligible	Not significant	Mitigation measures will minimise indirect hydrological impacts.
Open water –	Local	Indirect hydrological effects	Negative Moderate	Not significant	Adoption of best practice pollution prevention measures (see Chapter 9 Hydrology,	Negligible	Not significant	Mitigation measures will minimise potential

mesotrophic Lake					Geology and Hydrogeological Assessment) Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use measures such as permeable access tracks and regular cross track drains (See Chapter 9: Hydrology, Geology and Hydrogeological Assessment) in hydrologically influenced areas Layout of turbines, and associated infrastructure to be a minimum of 50 m from Hallhills Loch			for indirect impacts. A measurable effect at a local level is unlikely.
GWDTE	N/A	No further assessment for GWDTE required, it was concluded that habitats are unlikely to be supported by groundwater	Negligible	Not significant	Adoption of measures to retain hydrological connectivity between hydrologically influenced habitats	Negligible	Negligible	N/A
Operational Effects								
Species								
Marsh fritillary	National	Indirect hydrological effects	Negative Minor	Not significant	Continued pollution control and adoption of standard good practice measures.	Moderate (positive)	Positive Significant	Restoring areas of current suitable habitat within the site which currently support low densities of adult

					• Continued management of run-off / erosion control in applicable habitats. • HMP proposal to enhance existing marsh fritillary habitat through the implementation of a sustainable cattle grazing scheme, supplementary seeding / plug planting of devil's-bit scabious. Extending the species range within the bounds of the RLB. • Monitoring of the species to be implemented across the operational lifespan of the project and review of HMP objectives to be taken accordingly.			butterflies and larval webs but are dominated by tall rank grasses has the potential to increase the resilience of the Site's population. Increasing population density and overall distribution within the development area and also providing a safeguard to the population should environmental conditions change significantly for the habitat communities along Whitehill.
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Bats	Local	Mortality through collision with turbine blades and barotrauma	Negative Moderate (Common e & soprano pipistrelle)	Not Significant	Mitigation by design including: - The layout of turbines, and adoption of calculated bat buffers for all turbine locations for both woodland and watercourse features. - Vegetation management throughout operation period to retain open ground habitat.	Negligible	Not significant	Mitigation measures will limit the potential for bat mortality through direct collision or barotrauma. Curtailment of Turbine 6 during the autumn period will reduce the potential impact on the potential noctule commuting routes. Subsequently, a measurable residual negative effect at a local level is considered to be unlikely as foraging and commuting habitat within the
		Loss / disturbance to commuting route	Negative Moderate (noctules)	Significant	Targeted mitigation including: Adoption of a curtailment scheme for Turbine 6 in the Autumn period (September – November)			

		Loss of foraging habitat from BESS	Negative Negligible	Not significant				development area will be retained.
Fish	Local	Contamination of watercourses via sediment, run-off or pollution event. Fish mortality impacting brown trout fisheries.	Negative Minor	Not significant	Operational phase control measure will be adopted, which will include continued run-off management, and pollution prevention measures.	Negligible	Not significant	Embedded distance between turbines and watercourse and the adoption of best standard practices and pollution prevention measures will limit the potential for effects to occur.
Habitats	Local / regional / National	Indirect hydrological effects Risk of pollution incidents during ongoing site maintenance or necessary repair works.	Negative Moderate	Not significant	Continued pollution control and adoption of standard good practice measures Continued management of run-off / erosion control in applicable habitats BHMP proposal (oBHMP provided see Appendix 8.5) to enhance regionally important	Minor (positive)	Not significant	Permanent features of the proposed Balgray Wind Farm are not expected to have any continuing effects following construction and

					and protected / priority habitats within the Site.			re-instatement habitats. The HMP has the potential to positively impact habitats within the site, including the restoration of degraded bog and agriculturally improved habitats.
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8.13 Cumulative Impacts

- 8.13.1. The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question.
- 8.13.2. Of species observed, bats, principally, common pipistrelle, soprano pipistrelle and noctules, are most likely to be affected by cumulative risks to populations presented by additional wind farm development because of the distances travelled by some species of foraging bat, and their vulnerability to collision / mortality. Bat activity within the Site was generally low in areas of open habitat which had limited connectivity to more suitable areas of foraging habitat. Deployment locations situated closer to woodland edges or watercourses recorded higher levels of activity, however, following implementation of specific mitigation measures (such as maintaining a minimum buffer of 114 m between turbine locations woodland edge and 54 m between turbines and watercourses/bodies, and targeted curtailment of specific turbines during high periods of activity (T6 during autumn) a residual impact during operation is considered to be of negligible magnitude and not significant.
- 8.13.3. With negligible residual effects predicted for all bats, these have been scoped out of the cumulative assessment. There are not any IEFs for which a greater than negligible residual impact is predicted and hence, there is no real possibility of meaningful contribution to a cumulative impact with other relevant projects. Therefore, no further cumulative impact assessment has been undertaken for any of the IEFs.

8.14 Statement of Significance

- 8.14.1. An assessment has been made of the potential for significant effects of the Proposed Development on habitats and non-avian species. This assessment identified in the absence of mitigation only highly dependent GWDTEs (e.g. basin mire) required specific mitigation measures to ensure their protection during the construction phase of the Proposed Development.
- 8.14.2. The assessment identified that in the absence of targeted mitigation, there could be significant impacts to noctule and a potential commuting route. Implementation of curtailment of Turbine 6 during autumn will ensure that the commuting route will retain ecological functionality during the operational phase of the development.
- 8.14.3. By applying effective embedded mitigation measures, mainly through the design process, the proposed fish monitoring programme, timing of works, and following best practice guidelines during construction including pre-construction surveys and the production of SPP, the magnitude of residual effects of the Proposed Development are assessed as being reduced to negligible in terms of magnitude, and thus is determined to have no significant adverse effect on any identified receptors in terms of the EIA Regulations.
- 8.14.4. However, the Proposed Development has the potential to have a significant positive effect on the marsh fritillary populations within the Site. With measures proposed in the oBHMP seeking to increase the overall range of suitable habitat by 38%, reducing habitat fragmentation and increasing the overall density of devils bit scabious.

Furthermore, management measures will be adopted to enhance / improve the condition of the current suitable habitat to increase population resilience.



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