Chapter 7
Ecology

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7.1 Executive Summary

7.1.1 An assessment has been undertaken of the potential impacts of the Proposed Development on terrestrial ecology (non-avian) features and reaches conclusions as to the predicted likely significance of residual effects. The assessment is based on best practice guidance, and its scope determined through a combination of desk study, field surveys, and consultation with relevant organisations. A separate chapter has been prepared to assess the potential impacts of the Proposed Development on ornithology features (**Chapter 6**).

7.1.2 Potential impacts of the Proposed Development are largely related to the construction and decommissioning phases, with a small number of potential impacts expected during operation.

7.1.3 There will be no direct loss of habitats within Muirkirk Uplands Site of Special Scientific Interest (SSSI) from any works associated with the Proposed Development, including the laying of cables along the B743 as the cable works will all take place within the carriageway of the existing road. There are also no indirect impacts predicted from any works associated with the Proposed Development to the SSSI habitats as a result of embedded mitigation measures (see **Chapter 8**). Habitat enhancement works are considered to result in a **minor/moderate** beneficial effect on the SSSI habitats over the longer-term as a result of the Proposed Development.

7.1.4 Impacts will however arise from direct habitat loss within the Proposed Development site under turbine foundations, permanent access tracks, substations, energy storage facilities and buildings etc. There will also be temporary loss of habitat under temporary access tracks and compounds. Some of the habitats within the site are considered to be regionally important and include some Annex 1 habitats. However, the overall losses of habitats are relatively small in the context of the overall available resource, and mitigation and enhancement commitments include the restoration of approximately 56 hectares (ha) of peatland habitats and the management of c. 592 ha of habitat for raptor species and c. 147 ha of habitat for wader species as detailed in **Appendix 7.5**. Impacts to habitats are assessed as a **minor/moderate** beneficial (not significant) effect overall.

7.1.5 There is potential for disturbance to otter during construction; there are confirmed resting sites and potential holts identified within the study area. Further assessment to determine their status (natal holt/non-natal holt) will be carried out prior to commencement of construction to inform mitigation proposals and, where needed, a licence for disturbance will be obtained from NatureScot. With the mitigation measures in place there would be a **negligible** adverse (not significant) effect.

7.1.6 There will be loss of foraging and commuting habitat for bats during construction however felling of woodland and the Proposed Development Landscape Strategy Plan (**Figure 5.26**) may also create additional suitable foraging habitat for bats by increasing the amount of edge habitat available. Overall construction is considered to have a **negligible** adverse (non-significant) effect on foraging and commuting bats.

7.1.7 Construction of new watercourse crossings has the potential to impact fish spawning habitat and could cause habitat fragmentation if not appropriately designed. Additional survey of habitats around each crossing point will be carried out ahead of construction, and in-channel works may need to avoid spawning season. New watercourse crossings will be designed to ensure safe fish passage. Post-mitigation the construction of new watercourse crossings will be a **negligible** adverse (not significant) effect.

7.1.8 Great crested newt, water vole, and pine marten are considered likely to be absent and therefore **no effects** to these species are anticipated. Impacts to badger, common amphibians, reptiles and priority mammal species are considered to be avoided by the embedded mitigation measures, and there would be **no significant effect**.

7.1.9 Embedded mitigation relevant to identified ecological receptors include the iterative design process (which sought to minimise impacts on sensitive habitats), and the development and implementation of a site-specific Construction Environmental Management Plan (CEMP). Furthermore, a suitably

experienced Ecological Clerk of Work (ECoW) would be appointed to undertake pre-construction surveys for protected species and oversee construction works to minimise any potential effects on nature conservation interests.

7.1.10 Operational impacts are principally related to impacts to foraging and commuting bats. Due to the way different species of bat fly, some species are considered to be at higher risk of collision with wind turbines than others. Of the species recorded, common pipistrelle, soprano pipistrelle and Nyctalus species are considered to have a high risk of collision with wind turbines. The NatureScot Collision Risk Tool determined that the overall collision risk level for each species at the Proposed Development was low. Embedded mitigation will mitigate for potential impacts to bats during operation however due to the number of wind farms in the area it is considered that there is a cumulative **moderate** adverse effect during operation for bats. Additional monitoring surveys will be carried out prior to the commencement of construction to inform a Bat Protection Plan which may incorporate additional mitigation measures such as blade feathering if considered necessary. Implementation of the Bat Protection Plan will reduce the cumulative effect to foraging and commuting bats to **minor** and not significant**.**

7.1.11 Decommissioning impacts are considered to be similar to, or less than, those of construction. Surveys for protected species will be carried out to prevent disturbance of protected species during decommissioning. Overall decommissioning effects are considered to be not significant.

7.2 Introduction

7.2.1 This chapter considers the potential impacts, including cumulative, of the Proposed Development on terrestrial (non-avian) ecology including designated sites, terrestrial and aquatic habitats and protected species during construction, operation, and decommissioning, and assesses the significance of likely predicted residual effects. The assessment is based in best practice guidance including the Chartered Institute for Ecology and Environmental Management's (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

7.2.2 The assessment is based on the Proposed Development described in **Chapter 3.** The Proposed Development includes 18 wind turbines, solar PV panels, Battery Energy Storage Systems (BESS) which will produce approximately 415 megawatts (MW) of renewable energy generation and energy storage output capacity. Supporting infrastructure elements include turbine foundations, crane hardstandings, solar photovoltaic panels, BESS units, inverters and transformers, access tracks, compounds, substations and buildings.

7.2.3 In particular, this chapter:

- sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation undertaken to date;
- presents the potential environmental impacts and effects on all aspects of (non-avian) ecology arising from the Proposed Development, based on the information gathered and the analysis and assessments undertaken to date;
- identifies any assumptions and limitations encountered in compiling the environmental information;
- highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process; and
- highlights where enhancement measures are proposed.

7.2.4 The assessment presented is informed by the following supporting figures and appendices:

- **Figure 7.1: Study and Survey Areas**;
- **Figure 7.2: Designated Sites**;
- **Figure 7.3: Habitat Surveys**;

- **Figure 7.4: Static Bat Detector Locations**;
- **Appendix 7.1: Habitat Technical Report**;
- **Appendix 7.2: Protected Species Technical Report CONFIDENTIAL**;
- **Appendix 7.3: Bat Survey Report**;
- **Appendix 7.4: Fish Survey Report**; and
- **Appendix 7.5: Outline Habitat Management and Enhancement Plan**.

7.2.5 This chapter should be read in conjunction with, and is supported by, the following other chapters which are signposted as necessary throughout:

- **Volume 1, Chapter 3: Project Description**;
- **Volume 1: Chapter 6: Ornithology**; and
- **Volume 1, Chapter 8: Geology, Peat, Hydrology & Hydrogeology**.

7.3 Legislation, Policy and Guidelines

7.3.1 This assessment has been undertaken with reference to relevant national and local legislation, policy and guidance

Legislation

7.3.2 Relevant legislation and guidance documents have been reviewed and taken into account as part of this assessment. Of particular relevance are:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (*i.e*. the Habitats Directive) (European Commission, 1992);
- Environmental Impact Assessment Directive 85/337/EEC, as amended (EIA Directive) (as subsequently codified by Directive 2011/92/EU, as amended by Directive 2014/52/EU);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Wildlife and Countryside Act 1981 (as amended (WCA) (UK Government, 1981);
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) (*i.e*. the Habitats Regulations) (UK Government, 1994);
- Conservation of Habitats and Species Regulations 2017 (in relation to certain specific activities (reserved matters) including consents granted under Sections 36 and 37 of the Electricity Act 1989) (UK Government, 2017);
- The Wildlife and Natural Environment (Scotland) Act 2011 (as amended) (WANE Act) (Scottish Government, 2011);
- Nature Conservation (Scotland) Act 2004 (as amended) (NCA) (Scottish Government, 2004); and
- The Protection of Badgers Act 1992 (as amended) (UK Government, 1992).

Planning Policy

7.3.3 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to the EIA. This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes, the South Lanarkshire Local Development Plan (LDP)2 (2021), East Ayrshire Council (EAC) LDP2 (2024), and other relevant guidance. Of relevance to the assessment presented within this chapter, regard has been had to the following policies:

- NPF4 Policy 3 (Biodiversity);
- NPF4 Policy 4 (Natural Places);
- EAC LDP Policy NE4 Nature Crisis;
- EAC LDP Policy NE5 Protection of Areas of Nature Conservation Interest;
- EAC LDP Policy NE5 Vulnerable, Threatened and Protected Species;
- South Lanarkshire Council (SLC) LDP Policy NHE47 Natura 2000 Sites;
- SLC LDP Policy NHE8 National Nature Reserves and Sites of Special Scientific Interest;
- SLC LDP Policy NHE9 Protected Species;
- SLC LDP NHE11 Peatland and Carbon Rich Soils;
- SLC LDP Policy 12 Water Environment and Biodiversity;
- SLC LDP Policy NHE13 Forestry and Woodland;
- SLC LDP NHE14 Tree Preservation Orders;
- SLC LDP NHE15 Local Nature Reserves; and
- SLC LDP NHE20 Biodiversity.

Guidance

7.3.4 Recognisance has been taken of the following best practice guidelines/guidance etc:

- Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition) (Bat Conservation Trust, 2023);
- Guidance for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine Version 1.2 Updated April 2022 (CIEEM, 2018);
- Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (Scottish Environmental Protection Agency (SEPA), 2017);
- South Lanarkshire Biodiversity Strategy 2024-2030 (SLC, 2024); and
- The Scottish Biodiversity List (SBL) (Scottish Government, 2013).

7.4 Consultation

7.4.1 Details of who has been consulted and what information has been provided are set out in **Table 7.1** below.

Table 7.1 – Summary of Consultations (Responses to 2024 Scoping Update Report)

Consultees	Scoping Comment	Responses to Consultee
EAC 13/03/2024	Due to the significant biodiversity enhancement measures set out in NPF4, Policy 3, the Planning Authority would expect that mitigation / habitat management measures would need to be ambitious and go beyond mitigation of impacts but deliver substantially improved habitats / biodiversity on site and this should be taken into account when detailing what biodiversity enhancement measures are proposed to be delivered as part of the Proposed Development.	The Outline Habitat Management & Enhancement Plan (OHMEP) (**Appendix 7.5)** submitted with the application goes beyond mitigation requirements and includes large scale biodiversity enhancements for peatland habitats, raptors and waders.
	Consultation should also be undertaken with the River Ayr Salmon Fisheries Board and the Ayrshire Rivers Trust, in addition to Marine Scotland Science to agree on the appropriate methodologies and scope of assessment relating to aquatic biota.	Fish surveys have been undertaken and are reported in **Appendix 7.4**. The design of the Proposed Development incorporates measures to protect and safeguard fish populations.
SLC -Biodiversity Officer 19/03/2024	Welcome the changes to the original proposal to remove the turbines from the designated sites.	N/A
	Considering the scale and proximity of the solar panels to the Greenock Water and other watercourse, SLC would like to see more information on the potential impact on the aquatic biodiversity. Noting report entitled, 'Potential ecological impacts of ground mounted photovoltaic solar panels' (BSG Ecology, 2019).	The conclusion of the BSG Ecology literature review cited by SLC states that: *"From the body of research reviewed it is likely that the majority of concerns that have been discussed in the media are not well-founded, or are based on scientific experiments that were not specifically designed to evaluate ecological impacts of ground mounted solar PV sites"* (paragraph 3.1) and that *"the installations of solar PV [should be seen as] as an opportunity for biodiversity enhancement".* No further surveys for invertebrates were carried out and this was verbally agreed on a call with the SLC Planning Officer. The OHMEP (**Appendix 7.5)** will provide large scale biodiversity enhancements that will benefit a range of species.
Fisheries Management Scotland 07/03/2024	The Proposed Development falls within the district of the Ayr District Salmon Fishery Board, and the catchment relating to the Ayrshire Rivers Trust and Clyde River Foundation. It is important that the proposals are conducted in full consultation with these organisations.	Fish surveys have been undertaken and are reported in **Appendix 7.4**.

Consultees	Scoping Comment	Responses to Consultee
Nature Division Scottish Government 25/03/2024	Having reviewed both Chapters 6 and 7 [of the Scoping Update Report], we are content that the scope of the proposed study to inform the EIA is appropriate, as are the suggested survey methodologies for the different species groups associated with this site.	N/A
NatureScot 20/03/2024	While we note that a blade lifter is to be used during transport along the A70, should any road works be required to facilitate delivery of development components impacts on Ree Burn & Glenbuck Loch Site of Special Scientific Interest (SSSI) may also require to be considered in the EIA Report.	The abnormal load route has now been amended to avoid the stretch of the A70 near Glenbuck Loch therefore this is not included within this assessment.
	Development should endeavour to avoid undoing previous restoration, compensation or enhancement work where possible, and new habitat management proposals should seek to build on existing management commitments.	Detailed consideration of the impact of the Proposed Development on the Dungavel Wind Farm Habitat Management Plan is set out within **Chapter 6** (Ornithology), with coordinated habitat management proposals set out within the OHMEP (**Appendix 7.5**) which seek to build upon habitat management work being carried out at neighbouring renewable energy projects in the local area.
	The Proposed Development overlaps with, or is close to, existing wind farm sites where Habitat Management Plans (HMP) are in place (notably Dungavel Wind Farm, but also Kype Muir Extension and areas within the existing Hagshaw Cluster). The implications of this – for both the species/habitats being manged under these plans and their function in relation to the relevant consents - will require to be addressed in the iterative development of the proposal and within the EIA Report. In particular, the relationship between the Proposed Development and the commitments to habitat enhancement for hen harrier within the Dungavel Wind Farm HMP will require robust consideration, given that there appears to be both potential conflict and duplication between the proposal and this HMP.	Detailed consideration of the impact of the Proposed Development on the Dungavel Wind Farm Habitat Management Plan is set out within **Chapter 6** (Ornithology), with coordinated habitat management proposals set out within the OHMEP (**Appendix 7.5**) which seek to build upon habitat management work being carried out at neighbouring renewable energy projects in the local area. Consideration of potential impacts on the Kype Muir Extension HMP is also covered in **Chapter 6**.
	The survey area for potential bat roosting features should extend to 200m plus rotor radius of the boundary of the proposed wind energy elements of the proposal.	Surveys have covered the turbine locations and an appropriate buffer to adequately assess the potential for roosting bats in proximity to the Proposed Development.

Consultees	Scoping Comment	Responses to Consultee
	For all turbines, a buffer of at least 50m should be maintained between turbine blade tips and key habitat features for bats. Additionally, we recommend that mitigation proposals include a commitment to 'feathering' turbine blades to reduce their rotation speed during periods when the turbines are idling.	Noted. The buffer from blade tips to woodland is included as embedded mitigation and the requirement for blade feathering will be determined by the Bat Protection Plan to be agreed prior to commencement of construction.
	We note that there is limited detector placement/coverage in the western side of northern development area in comparison with the area to the east. This is a potential limitation on the survey, the implications of which will require to be addressed in the EIA Report.	Addressed in **Appendix 7.3.**
	NS advise that the following receptors should also be scoped into the assessment: Habitats of conservation importance (e.g. those listed on Annex 1 of the EC Habitats Directive or UK Biodiversity Action Plan Priority Habitats) occurring outside protected areas, or which may occur within protected areas but do not form part of the notified features. Groundwater Dependent Terrestrial Ecosystems. Other protected species as appropriate following completion of survey work (i.e. water voles and red squirrel). Important plant species identified during survey work.	Included within this chapter where relevant.
	NS advise that: Development proposals should clearly set out the type and scale of enhancement they will deliver, ensuring that applications clearly distinguish between those elements mitigating or compensating for adverse effects and those delivering enhancement. Developers should prioritise on-site enhancement before off-site delivery. Where purely on-site enhancement is not possible, the Scottish Government draft guidance sets out further considerations for offsite delivery. It is also important that applications demonstrate that the enhancement is to be secured within a reasonable timescale and with reasonable certainty, including appropriate management and monitoring arrangements, and	Details of biodiversity enhancements are set out in **Appendix 7.5.** Information on mitigation, compensation and enhancement are also set out in this chapter.

Consultees	Scoping Comment	Responses to Consultee
	sustained for the future (preferably in perpetuity) in order to deliver a lasting legacy. Information on predicted losses, and the proposed mitigation, compensation and enhancement should be clearly set out, and also concisely summarised, in any application, so that this can be easily understood by decision makers.	

7.5 Assessment Methodology and Significance Criteria

7.5.1 Both desk studies and field surveys have been undertaken to inform this assessment. Field surveys commenced in 2022, and the initial survey areas were based upon a site boundary that has been through several revisions. In the following sections, references are made to which site boundary is used where necessary. Figures showing individual survey areas for different receptors are presented in the relevant technical appendix**.** The main desk study areas are shown in **Figure 7.1** along with the main variations in site boundary.

Study Area

7.5.2 The study area for ecology varies with the receptor. The specific study areas used to inform each survey are detailed in the relevant technical appendix.

Desk Study

7.5.3 Information on biodiversity and terrestrial ecology was collected through a detailed desktop review of existing studies and datasets. For designated sites of ecological importance and data requests completed the following buffer areas were used:

- 10 km for statutory sites of international importance (*i.e.*, Special Areas of Conservation (SACs) and National Nature Reserves);
- 2 km for statutory sites of national importance (*i.e.*, Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs)), statutory sites of local importance (*i.e.*, Local Nature Reserves (LNRs)) and non-statutory sites such as woodland listed on the Ancient Woodland Inventory (AWI) and the South West Scotland Environmental Information Centre (SWSEIC) data search. *Note: the search area would include the Glasgow Museums Biological Records Centre recording area however they are not active at the time of writing and therefore no records are available from that area.*

7.5.4 Nearby wind farm planning applications were reviewed with regard to the bat surveys completed and the species and bat activity levels recorded. This information provides a comprehensive overview of bat activity across the wider landscape.

Site Visit

7.5.5 A number of site visits have been undertaken to carry out surveys. Surveys completed are as follows:

- Habitat survey (Phase 1, National Vegetation Classification (NVC) and potential Ground Water Dependent Terrestrial Ecosystems (GWDTE) (2022);
- Additional NVC surveys August 2023;
- Protected species surveys (2022-2024);
- Bat activity surveys (2022); and
- Bat Potential Roost Assessment surveys (2022 and 2024).

7.5.6 A summary of the baseline field surveys is outlined in **Table 7.2.**

7.5.7 The survey areas for the field surveys are illustrated within the individual technical appendices. The site boundary or additional survey areas listed in **Table 7.2** are shown on **Figure 7.1**, but the individual buffers applied are not.

Table 7.2 – Summary of Surveys Undertaken

Survey	Survey area (refer to Figure 7.1)	Overview of survey	Survey contractor	Date
Habitat survey	2022 site boundary	Recording and mapping of habitats within the survey area using Phase 1 and NVC system to establish the extent of important/sensitive habitats and their value. The survey also identified potential GWDTE habitats.	Whytock Ecology Ltd	2022
	Additional Lightshaw, Burnfoot and Dungavel survey areas	NVC system surveys to establish the extent of important/sensitive habitats and their value.	ITPEnergised	2023
Great crested newt (*Triturus cristatus*)	Within 300 m of 2022 site boundary	Habitat suitability index survey (HSI) of waterbodies found during mammal surveys, following Oldham *et al*. (2000)	ADT Ecology	2022
	Within 300 m of additional survey areas Lightshaw, Burnfoot, and Dungavel		ADT Ecology	2023
Badger (*Meles meles*) survey	Within 150 m of 2022 site boundary	Identification of areas suitable for commuting, foraging and sett building and search for badger signs indicating presence including setts, prints, latrines, hair and scratching posts.	ADT Ecology	2022
	Within 150 m of additional survey areas Lightshaw, Burnfoot, and Dungavel		ADT Ecology	2023
Pine marten (*Martes martes*)	Within 150 m of 2022 site boundary	Identification of areas of suitable pine marten habitat such as woodland and rocky hillsides and search for signs indicating presence such as scats (droppings), prints and dens.	ADT Ecology	2022
	Within 150 m of additional survey areas Lightshaw, Burnfoot, and Dungavel		ADT Ecology	2023
Otter (*Lutra lutra*)	Within 300 m of 2022 site boundary	Identification of watercourses and waterbodies and searches for signs indicating otter presence including resting sites (*e.g*. holts and couches), spraints, prints and feeding remains.	ADT Ecology	2022
	Within 300 m of additional survey areas Lightshaw, Burnfoot, and Dungavel		ADT Ecology	2023
	Within 300 m of B743 road through adjoining forest area		RPS	2024
Water vole (*Arvicola amphibus*)	Within 300 m of 2022 site boundary	Identification of watercourses and waterbodies and searches for signs indicating water vole presence including feeding stations, burrows, prints, latrines and runways.	ADT Ecology	2022
	Within 300 m of additional survey areas Lightshaw, Burnfoot, Dungavel, and B743 through adjoining forest area		ADT Ecology	2023
Fish	2022 site boundary Further fish surveys of the additional Dungavel area were not carried out as the upper reaches of the minor watercourses in	Fish habitat assessments and electric-fishing surveys of 31 locations to cover representative habitats on the watercourses identified.	Waterside Ecology	2022

Survey	Survey area (refer to Figure 7.1)	Overview of survey	Survey contractor	Date
	the forestry area were largely found unsuitable for fish in the 2022 surveys and it was considered that watercourses in this area were broadly similar, therefore, additional surveys were not undertaken.			
Bats	2022 site boundary	Ground level identification of potential roost features (PRAs)	MacArthur Green	2022
	Site boundary (current)		RPS	2024
Bats	2022 site boundary, noting that some detector locations lay within the Dungavel Additional Survey Area (refer to **Appendix 7.3**). Static monitoring surveys in the Burnfoot Additional Survey Area were not required under current survey guidance (southern development area).	Static monitoring to assess the site's value for foraging and commuting bats.	MacArthur Green	2022

Assessment of Potential Effect Significance

Sensitivity/ Importance

7.5.8 A key consideration in assessing the effects of any development on flora is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by biophysical changes caused by project activities, however remote from a site.

7.5.9 In identifying these receptors, it is important to recognise that a development can affect flora and fauna directly (*e.g*. the land-take required) and indirectly, by affecting land beyond the development site (*e.g*. through noise generation or hydrological impacts). The approach that has been undertaken for this assessment is to identify 'important ecological features' (IEFs) (species and habitats that are both valued and could be affected by the Proposed Development) and separately, to consider legally protected species. The factors influencing the categorisation of how a receptor is valued is explained in more detail below, with examples provided in **Table 7.3** below.

7.5.10 It is impractical for an assessment of the effects of a development to consider every species and habitat that may be affected; instead, it should focus on valued ecological receptors. CIEEM guidelines (2018) state that detailed assessment is not required for ecological features that are "*sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable*".

7.5.11 The sensitivity of species populations and habitats is assessed with reference to:

- their importance in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations);
- any social benefits that species and habitats deliver (*e.g*. relating to enjoyment of flora and fauna by the public); and
- any economic benefits that they provide.

7.5.12 Both species' populations and habitats have been valued using the following scale: very high, high, medium, low, very low and negligible.

7.5.13 The approach taken in this assessment is that a species population that is considered to be of medium or greater importance in biodiversity conservation terms is considered to be a sensitive receptor. If a species population is considered to be of low or very low value, the Proposed Development will not have a significant effect on the receptor in question. Exceptions are if the species population has been identified as having high social or economic value or if the species is legally protected. A similar approach is adopted for habitats. In addition, the role that these ecological features play in the wider ecosystem is also considered when attributing value, for example the Eurasian beaver (*Castor fiber*) plays an important role in modifying the environment around them, resulting in increased habitat for other wetland species and reduced flooding risk.

7.5.14 Ecological features have been valued using the scale set out in **Table 7.3** below, with examples provided of criteria used when defining the level of value.

Table 7.3 – Approach Taken in Evaluating Importance of Ecological Features

Value of Receptor	Examples
International (**Very High**)	An internationally important site in a European context *e.g*. Special Protection Area (SPA), SAC, Ramsar (or a site proposed for, or considered worthy of such a designation). A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive).

Value of Receptor	Examples
National (**High**)	A nationally designated site *e.g*. SSSI, or a site proposed for, or considered worthy of, such designation and important in Great Britain. A viable area of a habitat type listed in Annex 1 of the Habitats Directive or smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring substantial population of a nationally important species, *e.g*. listed on Schedules 5 and 8 of the 1981 Wildlife and Countryside Act.
Regional (**Medium**)	Regional areas of internationally or nationally important habitats which are degraded but are considered readily restored, and which are important within the South Lanarkshire and East Ayrshire context. A regularly occurring, locally significant population of a species listed as being nationally scarce. A regularly occurring, locally significant population of a species listed as being nationally scarce.
Local (**Low**)	Viable areas of priority habitat identified in the Local Biodiversity Action Plan (LBAP) or smaller areas of such habitat which are essential to maintain the viability of a larger habitat as a whole, and which are important in the South Lanarkshire context. Non-statutory designated areas *e.g*. Local Nature Reserve (LNR), Environmentally Sensitive Area (ESA), Scottish Wildlife Trust (SWT) reserve or areas of woodland listed on the AWI as being of plantation origin. A regularly occurring, substantial population of a nationally scarce species, including species listed on the UK and Local BAPs. Areas of nationally important habitats which are degraded and have little or no potential for restoration. Areas of GWDTE habitats such as flushes (such as M6 and M23), which are uncommon within the local area. A good example of a common or widespread habitat in the local area, *e.g.* those listed as broad habitats on the LBAP. Species of national or local importance, but which are only present very infrequently or in very low numbers within the subject area.
Less than Local (**Very Low**)	Areas of habitat which have value to the local environment, or populations of regularly occurring common species of local conservation interest, and which are important at the site level. Areas of GWDTE habitats which are common within the local area, such as MG10 rush pasture. Local areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest. Common and widespread species. Areas of limited ecological value, which are not representative of semi-natural habitat and do not support wildlife of conservation interest.

Characterising Potential Ecological Impacts

7.5.15 When describing potential impacts (and where relevant the resultant effects) reference is made to the following characteristics:

- **beneficial/ adverse**:
  - beneficial (*i.e*. positive) - a change that improves the quality of the environment, or halts or slows an existing decline in quality *e.g*. increasing the extent of a habitat of conservation value; or
  - adverse (*i.e*. negative) - a change that reduces the quality of the environment. *e.g*. destruction of habitat or increased noise disturbance.
- **magnitude:** the 'size', 'amount' or 'intensity' of an impact - this is described on a quantitative basis where possible;
- **spatial extent:** the spatial or geographical area or distance over which the impact/ effect occurs;
- **duration:** the time over which an impact is expected to last prior to recovery or replacement of the resource or feature. The likely duration of the impact should be quantified (*e.g*. two weeks duration; five to ten years). Consideration has been given to how this duration relates to relevant ecological characteristics such as a species' lifecycle. However, it is not always appropriate to report the duration of impacts in these terms. The duration of an effect may be longer than the duration of an activity or impact;
- **reversibility:** *i.e*. is the impact temporary or permanent. A temporary impact is one from which recovery is possible or for which effective mitigation is both possible and enforceable. A permanent effect is one from which recovery is either not possible, or cannot be achieved within a reasonable timescale (in the context of the feature being assessed); and
- **timing and frequency:** *i.e*. consideration of the point at which the impact occurs in relation to critical life-stages or seasons.

7.5.16 Impacts can be permanent or temporary; direct or indirect; adverse or beneficial and can be cumulative. Impacts can vary according to scales of size, extent, duration, timing and frequency of impacts. These factors are brought together to assess the magnitude of the impact on the 'conservation status' of the particular valued receptors, and on the 'integrity' of the habitats that support them:

- **integrity** is the coherence of the ecological structure and functions of a site or habitat that enables it to sustain its plant and animal communities and populations; and
- **conservation status** is the ability of a habitat, a plant or animal community or population to maintain its distribution and/ or extent / size.

7.5.17 Conservation status is therefore largely determined by the extent to which integrity is maintained. It follows that habitats may or may not be valued ecological receptors in their own right. Wherever possible, the magnitude of the impact is quantified. Professional judgement is then used to assign the effects on the receptors to one of four classes of magnitude, as defined in **Table 7.4**.

Table 7.4 – Magnitude of Impact

Magnitude	Definition
High	A permanent or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/ community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.
Medium	A permanent or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/ community, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial; this is likely to be sustainable but is unlikely to enhance its conservation status.
Low	A short-term but reversible impact on the integrity of a site or conservation status of a habitat, species assemblage/ community, population or group that is within the range of variation normally experienced between years.
Negligible	A short-term but reversible impact on the integrity of a site or conservation status of a habitat, species assemblage/ community population or group that is within the normal range of annual variation.

Significance of Effect

7.5.18 The significance of an effect is determined through a standard method of assessment based on professional judgement and available evidence, considering the sensitivity (nature conservation and conservation status) of the ecological receptor and the characterisation of the impact, in a reasoned way.

7.5.19 For each ecological feature only those characteristics relevant to understanding the ecological consequences (effect) of the impact and its relative significance are described, based on the project description and the assumption that standard industry best practice would be applied (*e.g*. implementation of standard dust suppression and pollution prevention measures).

7.5.20 Significant effects include those which result from impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). CIEEM (2018) states that: "*For the purposes of Ecological Impact Assessment (EcIA) a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' (i.e. relevant ecological features) or for biodiversity in general … In broad terms, significant effects encompass impacts on the structure and function of defined application sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)*."

7.5.21 In considering effects on conservation status, reference is made to relevant available guidance on the current conservation status of the ecological feature under consideration. Effects will either be:

- not significant (*i.e*. no ecologically meaningful effect on conservation status); or
- significant (*i.e*. an ecologically meaningful effect on conservation status).

7.5.22 Such judgments will be based, wherever possible, on quantitative evidence. However, where necessary the professional judgment of an experienced ecologist has been applied and explained.

7.5.23 **Table 7.5** below details the significance criteria that have been used in assessing the effects of the Proposed Development. **Major** and **moderate** effects are considered significant in the context of the EIA Regulations.

Table 7.5 - Significance of Effect

Significance	Definition
Major	Significant effect, as the impact is likely to result in a long term significant negative effect on the conservation status of the feature.
Moderate	Significant effect, as the impact is likely to result in a medium term or partially significant negative effect on the conservation status of the feature.
Minor	The impact is likely to have a negative effect on the feature at an insignificant level by virtue of its limited duration and/or extent, but there will probably be no effect on its conservation status. The level of effect would be minor and not significant.
Negligible	No material effect. The effect is assessed to be not significant.

Requirements for Mitigation

7.5.24 The identification and specification of mitigation proposals in this assessment has been undertaken with regard to the principles of the mitigation hierarchy *i.e.*:

- avoid ecological features where possible;
- reduce (minimise) the magnitude of the potential impact *e.g.* through iterative design and/ or advance commitment to sensitive methods or timing of working (sometimes termed as embedded mitigation or mitigation by design);
- mitigate the potential effect through the application of additional proven measures, such that the residual effect realised is reduced in magnitude (non-embedded mitigation);
- compensate for significant residual effects, *e.g.* by providing suitable habitats elsewhere. Proposals should achieve appropriate compensation in a reasonable timeframe and be legally enforceable; and,
- provide additional biodiversity enhancement where possible.

7.5.25 This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered. Where it is reasonably practicable to do so then attempts have been made to avoid potential impacts.

Assessment of Residual Effect Significance

7.5.26 Where impacts cannot be avoided then efforts have been made to limit the magnitude of the potential impact and to mitigate the resultant effects through the provision of appropriate measures. Where effects cannot be mitigated to a level where they are not significant, then compensatory measures have been employed to (as far as is reasonably possible) offset any remaining adverse effects.

Limitations to Assessment

7.5.27 Due to changes in the site boundary of the Proposed Development some surveys were undertaken outside of the site boundary. The following lists constraints relating to areas where full survey coverage was not achieved due to the change in the site boundary following completion of the surveys:

- For bat surveys, static detector locations were based on the 2022 Site Boundary (and associated buffer area) and turbine layout. Therefore, data was collected for habitats located outside of the site boundary (to the north of the southern development area) (**Figure 7.4**), in similar but more elevated habitats. A precautionary approach has therefore been taken to assessing bat activity within the southern development area due to the lower elevation and presence of

Greenock Water adjacent to the site boundary. Current advice for bats around solar farms does not require activity surveys therefore this is not considered to be a significant limitation to the assessment (NatureScot, 2024).

- As noted above, static detector locations for bat activity surveys were based on the 2022 Site Boundary (and associated buffer area) and turbine layout (refer to **Figures 7.1** and **7.4**). In respect of the northern development area, it is noted that whilst the survey area was based on the 2022 Site Boundary some bat detectors were deployed in the Dungavel Additional Survey Area to the north in order to ascertain a more complete picture of bat activity within the forest. Given there was coverage of part of the Dungavel Additional Survey Area in the original bat activity survey, and that it is the same habitat (coniferous plantation) as the remainder of the northern development area, no additional surveys were considered necessary. It is therefore not considered to be a significant limitation to the assessment.
- There are small watercourses in the northern development area that were not included in the fish habitat surveys in 2022. Further fish surveys of the Dungavel Additional Survey Area were not carried out as the upper reaches of the minor watercourses in this part of the forest were largely found unsuitable for fish in the 2022 surveys and it was considered that watercourses in this area were broadly similar, therefore, additional surveys were not undertaken. Nonetheless, a precautionary approach has been taken to the assessment in this area as well. It is therefore not considered to be a significant limitation to the assessment.

7.5.28 As required by the relevant professional guidance (CIEEM, 2018), the precautionary principle has been adopted when undertaking the assessment to ensure that conclusions on predicted residual effects are robust and realistic. Any assumptions made regarding effects to IEFs are based on current guidance, scientific knowledge, and the expert professional opinion of the author of this Chapter and are therefore deemed appropriate in the context of the site.

7.6 Baseline Conditions

Designated sites

7.6.1 The Muirkirk and North Lowther Uplands SPA, and Muirkirk Uplands SSSI is located between the northern development area and the southern development area. The site boundary passes through the SPA and SSSI along the existing B743 public road. The SPA is designated for ornithology features and is therefore considered within **Chapter 6**. Locations of designated sites relevant to this assessment are shown in **Figure 7.2.**

7.6.2 Blood Moss and Slot Burn SSSI lies directly adjacent to the western side of the site boundary along the B743.

7.6.3 A summary of the designated sites relevant to this assessment within 10 km of the site boundary is shown in **Table 7.6** below. Geological sites have been excluded as they are not relevant to this chapter.

Table 7.6 – Relevant Designated Sites within 10 km of the Proposed Development

Site name	Designation	Reason for Designation	Distance and Direction from Proposed Development	Scoped In?
Muirkirk and Lowther Uplands	SPA	Muirkirk and North Lowther Uplands SPA was designated under Article 4.1 for regularly supporting populations of European importance of the following Annex 1 species: - hen harrier (*Circus cyaneus*) (between 1994 and 1998, an average of 29.2 breeding females, 6% of the Great Britain (GB) population and between 1991 and 1995, an average of 12 individuals, 2% of the GB population); -short-eared owl (*Asio flammeus*) (between 1997 and 1998, an average of 26 pairs, 3% of the GB population); -merlin (*Falco columbarius*) (between 1989 and 1998, an average of 9 pairs, 0.7% of the GB population and selected as one of the most suitable sites for merlin in GB); -peregrine (*Falco peregrinus*) (between 1992 and 1996, an average of 6 pairs, 0.5% of the GB population and selected as one of the most suitable sites for peregrine in GB); and, -golden plover (*Pluvialis apricaria*) (1999, an estimated minimum of 154 pairs, 0.7% of the GB population and selected as one of the most suitable sites for golden plover in GB).	0 km- within the Proposed Development (along B743 road only)	No – covered in **Chapter 6.**
Airds Moss	SAC	The Annex I habitat is the primary reason for selection of this site is for blanket bog. The site is one of a few remaining areas of relatively low altitude blanket bog in south-west Scotland.	2.3 km south-west	No – there are no potential pathways to impacts. The designated site is located over 2 km away from the Proposed Development and there are no hydrological links that could impact the habitats present within the SAC.

Site name	Designation	Reason for Designation	Distance and Direction from Proposed Development	Scoped In?
Muirkirk Uplands	SSSI	An area of low-lying blanket bog. The protected natural features include localised exposures of fossiliferous rock, upland habitats and blanket bog, an associated assemblage of birds.	0 km – within the Proposed Development (along B743 road only)	Yes
Blood Moss and Slot Burn	SSSI	An area of upland moorland dissected by the Slot Burn and several tributaries. The protected natural features include fossil-bearing rocks (yielding fossil fish and water scorpions) alongside the Slot Burn, and blanket bog. Blood Moss, lying in the extreme north-eastern section of the site, is an excellent example of blanket bog vegetation and one of the best of its type in south-west Scotland. The bog surface is gently undulating and has numerous pools and runnels providing a variety of different hydrological conditions which is reflected in the vegetation. A number of species rare or uncommon in southern Scotland occur, including tall bog-sedge (*Carex magellanica)*, few-flowered sedge (*Carex pauciflora)* and two species of bog moss, *Sphagnum imbricatum* and *Sphagnum fuscum*.	0 km – directly adjacent to the west of the Proposed Development (along B743 road only)	No - standard construction mitigation will address any potential risk as the only pathway to impacts is through indirect pollution
Muirkirk and Lowther	IBA	The site includes the largest remaining continuous block of unforested moorland in south-west Scotland. The main habitats include heather and grass moorland and blanket bog. It qualifies as an IBA due to its population of the following bird species: short-eared owl, peregrine, merlin and golden plover.	0 km – within the Proposed Development (along B743 road only)	No – covered in **Chapter 6.**
Ancient woodland – Unnamed	Ancient woodland inventory	Long-established (of plantation origin)	0 km – within Proposed Development (southern development area)	No - Indirect impacts through soil compaction and run-off. Standard construction mitigation will address any potential risk.
Marchhouse Hill	LNCS	The site contains two areas of wet modified bog which grades through acid grassland to marshy grassland.	0.6 km south	No – there are no pathways by which the LNCS

Site name	Designation	Reason for Designation	Distance and Direction from Proposed Development	Scoped In?
				could be impacted.
Kirk Plantation	LNCS	Woodland habitat.	1.3 km south	No – there are no pathways by which the LNCS could be impacted.
Abbreviations used: SPA, Special Protection area; SSSI, Site of Special Scientific Importance; LNCS, Local Nature Conservation Site; IBA, Important Bird and Biodiversity Areas.				

Habitats

7.6.4 The habitats are noticeably different in nature in the northern development area compared to the southern development area. Detailed descriptions of the habitats present within the site boundary are provided in **Appendix 7.1** and shown on **Figure 7.3**. The northern development area is dominated by coniferous plantation woodland, with areas of blanket bog (M17a (*Scirpus cespitosus-Eriophorum vaginatum* blanket mire, *Drosera rotundifolia-Sphagnum* spp. sub-community) and M19a (*Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community)), rush pasture/marshy grassland (M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community), M25 *Molinia caerulea-Potentilla erecta* mire and M25a *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community. Bracken and wet woodland are also present.

7.6.5 The southern development area contains a wider range of habitats however they were largely dominated by different grassland types. The dominant habitat is a MG7 *Lolium perenne leys* and related grasslands. This is a species poor grassland that is dominated by perennial ryegrass (*Lolium perenne*). Other species such as greater plantain (*Plantago major*), common daisy (*Bellis perennis)* and annual meadow grass (*Poa annua)* were recorded within this habitat though they were often found in low frequency. Other grassland types recorded include M23a *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community and MG6b *Lolium perenne-Cynosurus cristatus* grassland, *Anthoxanthum odoratum* sub-community, with smaller areas of other similar grassland types with varying sub-communities. Other habitats include M25 *Molinia caerulea-Potentilla erecta mire*, mixed plantation woodland, game crop and bare ground.

7.6.6 A high level summary of the habitats present within the site is presented in **Table 7.7** below.

Table 7.7 - Summary of Habitats in the Site Boundary

Habitat	Area (ha)	Nature Conservation Value	Scoped in?
Plantation woodland (including felled areas) (no NVC category)	449.33	Less than local (very low)	No
Dominated by plantation woodland with associated rides (no NVC category)	201.87	Less than local (very low) (assumed)	No
Improved grasslands (MG6a, MG6b, MG6b/MG10a, MG7, MG7a, MG9, MG9a, MG7a/MG10a)	99.14	Less than local (very low)	No
Mire communities (M17a, M17a/b, M17a/M19a, M19a, M20b, M20b/M6c, M23b/M25, M25, M25a, M28a, M4, M6, M6c)	57.22	Regional (medium)-National (high) where occur in Muirkirk Uplands SSSI	**Yes**

Habitat	Area (ha)	Nature Conservation Value	Scoped in?
Heath communities (H12, H12, H9)	37.59	Regional (medium) -National (high) where occur in Muirkirk Uplands SSSI	**Yes**
Rush pasture (M23, M23a, M23a/b, M23b, MG10)	40.88	Regional (medium)	**Yes**
Bracken (U20c)	3.41	Less than local (very low)	No
Wet woodland (W4b, W7a)	2.30	Regional (medium)	**Yes**
Acid grasslands (U5a, U5b, U4a/MG10a)	0.09	Local (low)	**Yes**
Rush pasture and mire (M23a/MG6b, U5b/M25/M23b, M25/M23b/U5a, M23a/M25)	34.59	Regional (medium)	**Yes**
Mire and other habitats (MG7a/M23b, U5b/M25/M23b, M20b/H12/, M25, M23b/U5a, U5b/M6c)	5.90	Regional (medium) -National (high) where occur in Muirkirk Uplands SSSI	**Yes**
Rush pasture and other habitats (M23b/U5, M23a/MG9 M23a/MG9a, MG10a/U4a, MG10/J12)	2.29	Regional (medium)	**Yes**
Arable	0.38	Less than local (very low)	No
Standing water	0.19	Less than local (very low)	No
Bare ground	1.22	Less than local (very low)	No
Heath and rush pasture	4.94	Regional (medium) -National (high) where occur in Muirkirk Uplands SSSI	**Yes**
Bracken mixed with other habitats (U20c/H12a/M23b, U20c/M23b/H12a, U20c/W4)	21.27	Local (low)	**Yes**
Calcareous grassland	0.01	Regional (medium)	**Yes**
Total	**962.62**[1]		

7.6.7 As discussed in further detail in **Chapter 8** none of the habitats identified are considered to be GWDTE, they are all considered to be rain-fed. The site boundary includes areas of habitat along the western verge of the B743 that lie within the Muirkirk Uplands SSSI. Where blanket bog, wet or dry heath habitats have been recorded within the SSSI they are considered to be of national importance. This area equates to approximately 48.24 ha of mire habitats. This area has been included within the site boundary for potential abnormal load transport oversail purposes only and no works will be carried out in this area.

Protected species

7.6.8 The desk study records from SWSEIC were obtained from a data search within 2 km of the Proposed Development. Only a small number of records of protected species (excluding birds) were returned. A summary of the protected species records and nature conservation valuation is provided in **Table 7.8.** This table also identifies the IEFs that have been taken forward for ecological impact assessment. Further desk study, field survey methods and survey results are provided in **Appendices 7.2, 7.3** and **7.4.**

1.1.1

[1] *Differences in areas have arisen through drawings being of different scales. The area listed here area resulting from precise habitat mapping and use of the OS10k site boundary. The OS25k site boundary shows the site area as 965ha.*

Table 7.8 – Summary of Protected Species Baseline and Evaluation

Species	Desk Study Summary	Field Survey Summary	Nature Conservation Value	Technical Appendix	Scoped in?
Great crested newt	No records of great crested newt were received.	Six ponds subject to HSI were all assessed as having poor suitability for great crested newt and the species is therefore considered likely absent.	Less than local (very low)	**Appendix 7.2**	No - likely absent
Other amphibians	Two records of common frog (*Rana temporaria*) were returned. The closest record was 1.7 km south-west from the southern development area.	Habitats within the site boundary are likely suitable to support common amphibians such as common frog, as there are a range of grassland habitats and watercourses present.	Local (low)	N/A	No -standard construction mitigation will address any potential risk to these common and widespread species
Reptiles	Two records of common lizard (*Zootoca vivipara*) and a single record of adder (*Vipera berus*) were returned. The adder record is located 1.1 km south of the southern development area. The records of common lizard do not have an accurate grid reference but are associated with the Muirkirk and North Lowther Uplands SPA.	Habitats within the site boundary are considered suitable for both adder and common lizard, however the overall amount of suitable habitat is relatively limited. These species are UK BAP Priority species but are likely to be widespread and relatively common given the abundance of suitable upland habitats both within and adjacent to the Proposed Development.	Local (low)	N/A	No -standard construction mitigation will address any potential risk to these common and widespread species
Badger	A single record of badger was returned from the desk study. The location is confidential.	Habitats within the site boundary are suitable for badger foraging, commuting and for sett creation. Eight badger setts were recorded during the field surveys, however, only one is located within the site boundary and all the others are over 30 m from the site boundary. The single sett within the site boundary is location is located over 180 m from the nearest element of the Proposed Development and is therefore not expected to be impacted.	Less than local (very low)	**Appendix 7.2**	No -standard pre-commencement update surveys and construction mitigation will address any potential risk to this common and widespread species

Species	Desk Study Summary	Field Survey Summary	Nature Conservation Value	Technical Appendix	Scoped in?
Otter	The desk study returned two records of breeding otter. The precise location is confidential however they were over 1.6 km from the site boundary.	Two confirmed resting sites were recorded. These are OTT5 and OTT6. OTT5 was a spraint recorded by a potential holt. OTT6 was a hover with spraint and staining. A number of other potential otter holts, hovers and resting sites were recorded within the survey area along with spraints. It is assumed that otter is widespread along Greenock Water, Powbrone Burn and Slot Burn and the other tributaries and watercourses in the wider local area.	Regional (medium)	**Appendix 7.2**	**Yes**
Water vole	No records of water vole were returned in desk study search.	No water vole signs were recorded during the surveys. Sub-optimal habitat was present throughout many of the watercourses present and suitable habitat was considered to be limited in extent and fragmented.	Local (low) - if present	**Appendix 7.2**	No – species is likely absent. Pre-construction surveys to be carried out at the location of the 16 watercourse crossings on existing watercourses.
Pine marten	No records of pine marten were returned by the local records centre in the desk study search	No evidence of pine marten was found during the surveys and a single suitable den site was identified. The pine marten population in Scotland is expanding and there are known populations in Strathclyde, and reintroductions have taken place in Dumfries and Galloway, therefore the presence of the species cannot be ruled out in areas of suitable habitat *e.g.* woodland.	Regional (medium) - (if present)	**Appendix 7.2**	No – species concluded likely absent. Pre-construction surveys will be carried out to confirm.
Other notable terrestrial mammals:	Four records of mountain hare were returned in the desk study search. All four were located to the south of the Proposed Development. The closest record is 0.8 km from the southern	No specific survey has been carried out for mountain hare, brown hare, or hedgehog. Based on the habitats present in the site boundary it is possible that the species is present.	Local (low) - (if present)	N/A	No -standard construction mitigation will address any

Species	Desk Study Summary	Field Survey Summary	Nature Conservation Value	Technical Appendix	Scoped in?
mountain hare (*Lepus timidus*), brown hare (*Lepus europaeus*) and Western European hedgehog (*Erinaceus europaeus*)	development area. Habitats within the site boundary and the locations of the records appear broadly similar. Two records of brown hare were returned. The closest record is 1.9 km south-east of the southern development area. Four records of Western European hedgehog were returned. The closest record is 1.6 km south of the southern development area.				potential risk to these species.
Bats (roosting)	A soprano pipistrelle (*Pipistrellus pygmaeus*) roost with more than 200 individuals was identified within 2 km of the Proposed Development.	Eleven buildings with bat roost potential were identified. Of these, one had high potential, four had moderate potential, three had low potential and three had negligible potential to support roosting bats. Fifty-five trees with bat roost potential were recorded. Of these 14 were classed as having potential to support maternity roosts (PRF-M), 20 as having potential to support only individual or small numbers of bats (PRF-I) and 21 as potentially having features but no specific features could be identified during the survey (potential roost feature(PRF)).	Local (low) - (if present)	**Appendix 7.3**	No – no features with bat roost potential are to be lost. Standard pre-works surveys will address any residual risk to roosting bats.
Bats – (foraging and commuting)	Seven species of bat and three genus groups were recorded during surveys undertaken for wind farms within 10 km of the Proposed Development. Nathusius pipistrelle (*Pipistrellus nathusii*), Leisler's bat (*Nyctalus leisleri*) and *Nyctalus* species were recorded. Low bat activity levels were observed, except for *Nyctalus*	Five bat species and one genus were recorded. These were: common pipistrelle (*Pipistrellus pipistrellus*); soprano pipistrelle*; Nyctalus* sp.; brown long-eared bat (*Plecotus auritus*); Daubenton's bat (*Myotis daubentonii*) and Natterer's bat (*Myotis nattereri*). Overall, the surveys recorded low bat activity levels for common pipistrelle, soprano pipistrelle and *Nyctalus* sp, low to moderate levels for Daubenton's bats, and	Regional (medium)	**Appendix 7.3**	**Yes**

Species	Desk Study Summary	Field Survey Summary	Nature Conservation Value	Technical Appendix	Scoped in?
	species at Kennoxhead Extension and Douglas West Extension.	Natterer's bats; and moderate levels for brown long-eared bat. Due to the way different species of bat fly, some species are considered to be at higher risk of collision with wind turbines than others. Of the species recorded, common pipistrelle, soprano pipistrelle and Nyctalus species are considered to have a high risk of collision with wind turbines. The NatureScot Collision Risk Tool determined that the overall collision risk level for each species at the Proposed Development was low.			
Fish	No records of fish were returned in the desk study search.	Juvenile salmon (*Salmo salar*) were identified at all locations surveyed on Greenock Water. Other fish species recorded were stone loach (*Barbatula barbatula*), common minnow (*Phoxinus phoxinus*) and lamprey (probably brook lamprey (*Lampetra planeri*)). Salmon parr were recorded on downstream locations of Dippal Burn but fry were absent. Brown trout *(Salmo trutta)* were recorded on Dippal Burn. Stone Loach, common minnow and European eel (*Anguilla anguilla*) were also recorded on these watercourses. Netherwood Burn, Back Burn, Lamon Burn, and Harwood Burn drain from the southern development area into Greenock Water. Trout were recorded in all four burns. Trout were also recorded in Powbrone Burn, Self Grain, Middle Grain, and Little Grain located in the northern development area. Stone loach was the other species recorded in these watercourses.	Regional (medium)	**Appendix 7.4**	**Yes**

7.7 Scope of the Assessment

Spatial Scope

7.7.1 In identifying these receptors, it is important to recognise that a development can affect flora and fauna directly (*e.g*. the land-take required) and indirectly, by affecting land beyond the development site (*e.g*. through noise generation or hydrological impacts). The approach that has been undertaken for this assessment is to identify 'IEFs that are both valued and could be affected by the Proposed Development) and separately, to consider legally protected species. The spatial scope of the ecological impact assessment is within the site boundary and the different desk/survey areas for each of the ecological receptors.

Temporal scope

7.7.2 Surveys were conducted from 2022 to 2024. The construction of the Proposed Development will take two years, and the Proposed Development will be operational for 40 years. In the absence of the Proposed Development, it is likely that any identified ecological receptors would largely remain unchanged. Areas of commercial forestry within the Study Area would continue to mature until a time when they would be subject to a future felling plan, which may create temporary localised changes.

7.7.3 Other changes over time may occur as a result of climatic change. These changes are likely to involve increased precipitation and risk of severe weather events as well as gradual increases in average temperatures. Some change in the vegetation assemblage is likely to occur as a result of these changes.

Receptors Requiring Assessment

7.7.4 This chapter considers the potential impacts of the Proposed Development, including cumulative effects with other relevant developments, on the ecological features in **Table 7.9.**

Table 7.9 - Receptors Requiring Assessment

IEF	Nature Conservation Value	Justification
Muirkirk Uplands SSSI	National	Potential for direct and indirect habitat loss, change and / or damage during construction and decommissioning. Potential for localised habitat disturbance/ damage during small-scale maintenance operations during operation.
Dungavel HMA	Local -Regional	Potential for direct and indirect habitat loss during construction.
Upland assemblage habitats (mire communities, rush pasture, wet woodland, calcareous grassland and heath)	Local-Regional	Potential for direct and indirect habitat loss, change and/ or damage during construction and decommissioning. Potential for localised habitat disturbance/ damage during small-scale maintenance operations during operation.
Otter	Regional	Potential for loss of / damage to otter habitats during construction and decommissioning. Potential for disturbance to otter during construction and operation and decommissioning.
Bats (foraging and commuting)	Regional	Wind: Potential for habitat loss and habitat disturbance during construction and decommissioning. Potential mortality through collision with turbines and barotrauma during operation.

IEF	Nature Conservation Value	Justification
		Solar: Potential for habitat loss and habitat disturbance during construction and decommissioning. Potential loss of foraging resource during operation from effect of solar panels causing habitat change.
Fish	Regional	Potential for habitat fragmentation during construction of new water crossings. Embedded mitigation (outlined below) is considered sufficient to prevent other impacts to fish.

Environmental Measures Embedded into the Proposed Development

7.7.5 Embedded mitigation proposals are those mitigation measures that are inherent to the Proposed Development. Embedded mitigation includes all mitigation usually assumed to be in place during construction, operation and decommissioning, and is generally regarded as industry standard or Best Practice. Construction and environmental management plans are introduced in **Chapter 3** with an outline Construction Environmental Management Plan (CEMP) provided in **Technical Appendix 3.1**. An Ecological Management Plan (EMP) would also be included as part of the CEMP, which would include relevant information on habitats and protected species local to the Proposed Development, requirements for pre-construction surveys and toolbox talks (TBTs), reference to relevant species protection plans (SPPs), and information on licensing requirements and procedures.

Pre-construction Surveys

7.7.6 Pre-construction surveys for protected species will be undertaken no more than six to twelve months in advance to identify any new ecological constraints and to ascertain the activity status of previously identified features within proximity of planned works as per NatureScot Guidance (NatureScot, 2024b).

Ecological Clerk of Works (ECoW)

7.7.7 To ensure all reasonable precautions are taken to avoid negative effects on habitats and protected species, a suitably qualified ECoW will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological matters. The ECoW will be required to be present onsite as appropriate during the construction phase and will carry out monitoring of works and briefings with regards to any ecological sensitivities to the relevant staff of the Principal Contractor and subcontractors.

Micrositing of Infrastructure

7.7.8 Any micrositing of infrastructure will be based on a review of existing ecological data and the completion of pre-construction surveys, to take into consideration the potential for direct encroachment onto protected species features and sensitive habitats.

Cable Routing

7.7.9 Cabling linking the northern and southern development areas (within the Muirkirk Uplands SSSI) will be laid within the tarmac carriageway of the existing B743 road, avoiding the need for any excavation/habitat loss or disturbance within the road verges.

Watercourse Crossings

7.7.10 Watercourse crossings have been designed to maintain safe passage for fish.

Bat Buffer

7.7.11 Current NatureScot (NatureScot, 2021) guidance recommends that wind turbine blade tips should be more than 50 m away from features likely to be used by foraging and commuting bats, such as trees, watercourses and waterbodies.

7.7.12 Bat buffer distances for the Proposed Development have been calculated using the mathematical formula below, to maintain separation of turbines and bat habitat.

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

7.7.13 Where b = buffer distance, bl = blade length; hh = hub height; fh = feature height (all in metres).

7.7.14 Refer to **Chapter 13** (Forestry) for the specific bat buffer distances calculated with this formula and utilised in the finalised wind turbine layout for the northern development area.

Habitat Management and Enhancement Plan

7.7.15 An Outline Habitat Management and Enhancement Plan (OHMEP) has been produced for the Proposed Development (**Appendix 7.5**). The aims of the OHEMP are:

- to mitigate for the effects of the Proposed Development on ecological and ornithological receptors from both the wind and solar/BESS elements;
- to provide a strategy to increase the value of the biodiversity present at the Proposed Development site and within the surrounding landscape to meet the requirements of NPF4; and
- to substitute some (largely yet to be implemented) hen harrier enhancement areas proposed within Dungavel Forest with a long-term pilot project on a much larger area of more suitable habitat within the neighbouring Muirkirk and North Lowther Uplands SPA and SSSI where hen harrier and other SPA qualifying species used to breed.

7.7.16 In addition, a Landscape Strategy Plan has been produced for the southern development area that will provide additional habitat creation and enhancement around the solar PV area (**Figure 5.26**).

7.8 Assessment of Potential Effects

7.8.1 Potential impacts of the Proposed Development are largely related to the construction and decommissioning phases, with a small number of potential impacts expected during operation. Potential impacts of the Proposed Development on IEFs are considered to comprise:

- temporary or permanent direct or indirect habitat loss within Muirkirk Uplands SSSI alongside the B743;
- temporary or permanent habitat loss within Dungavel HMA;
- temporary or permanent direct or indirect damage, change and/ or fragmentation of other sensitive/notable habitats;
- disturbance of otter resting sites or holts, disturbance of foraging and commuting otter;
- loss of foraging and commuting habitats for bats; and
- fragmentation if fish habitat.

Construction

Muirkirk Uplands SSSI

7.8.2 Construction of the cable route between the northern and southern development areas has potential to cause direct and indirect loss of habitat within the SSSI if the cable works were to take place in the soft verge alongside the B743. The cable(s) is therefore proposed to be laid within the existing tarmac surfaced B743 carriageway and, as such, there will be no impacts to the constituent habitats of the SSSI as a result of these works. A suitably worded planning condition can be used to ensure the cabling works along the B743 are caried out within the existing tarmac surfaced carriageway of the B743 to ensure these works will have **no effect** on the habitats within the Muirkirk Uplands SSSI.

7.8.3 There are no anticipated indirect impacts from the northern development area to the SSSI through changes in groundwater and surface water, or construction operations causing pollution of wetland and terrestrial habitats due to embedded mitigation and best practice measures (see ***Chapter 8***).

Dungavel HMA

7.8.4 Part of the proposed Dungavel HMA lies within the northern development area. This component of the Dungavel HMA was proposed to mitigate for potential impacts on ornithological receptors from the Dungavel Wind Farm, with habitat improvements primarily aiming to benefit breeding hen harrier and black grouse. The areas of habitat enhancement proposed for black grouse on Dungavel Hill will not be impacted by the Proposed Development and can be implemented as planned, so impacts only relate to the loss of habitat proposed in the hen enhancement areas which lie within the northern development area. However, as outlined in **Chapter 6** (Ornithology) it is important to note that only a relatively small proportion of the Dungavel HMA within the northern development area has been implemented to date (approx. 28 ha out of a total of 208 ha proposed), therefore, any impact on this element of the Dungavel HMA is more of a theoretical impact than an actual impact at this stage.

7.8.5 Large areas of the HMA are intended to benefit raptors, and therefore consideration of these impacts is covered in **Chapter 6**. The HMA was proposed to enhance blanket bog where conditions are amenable, and to increase the extent of native woodland along Powbrone Burn and Hall Burn. The OMHEP for the Proposed Development has been developed with consideration of the losses of proposed habitat within the Dungavel HMA alongside impacts to other habitat areas on site. The extent of habitat enhancement is discussed in relation to habitats below, but the areas proposed will be a substitution for the Dungavel HMA hen harrier enhancement areas (in so far as they lie within the northern development area) as well as providing additional habitat enhancements.

7.8.6 The Proposed Development OHEMP addresses the loss of this part of the proposed Dungavel HMA and will provide management and enhancement of a much larger alternative area of better habitat that will fulfil the same (improved) function. When considering all of the above circumstances in the round it is considered that the overall effect of the proposed habitat management substitution will result in a **beneficial minor/ moderate** effect to the habitats involved.

Habitats

7.8.7 The potential effects during construction include direct permanent habitat loss within the site boundary (*i.e*. under turbine foundations, access tracks or buildings), and temporary habitat loss (*i.e*. under temporary construction compounds, borrow pits or temporary access tracks).

7.8.8 Habitat loss calculations have been completed for the Proposed Development (**Table 7.10** and **Table 7.11**) The parameters for the calculations are based on the physical land take required as set out in **Chapter 3**. The following parameters have been used to determine the type of loss/change occurring:

- Habitats within 15 m of permanent elements of infrastructure (*e.g*. access tracks, substations, turbine foundations) are counted as - indirect permanent/ hydrological loss.

- Habitats directly under temporary construction features such as construction compounds, and temporary hardstanding are counted as temporary loss.
- Habitats directly under the footprint of the Proposed Development, excluding solar PV modules, are counted as permanent loss.
- Habitat under solar panels is counted as change (covered under operational impacts).

7.8.9 Of the habitats identified as IEFs in the northern development area, there will be loss of mire, wet woodland, rush pasture and wet woodland habitats. Of these the mire/ blanket bog and heath habitats are Annex 1 habitats which all have European legislation pertaining to them but are common and widespread in a regional context; consequently, their conservation value is assessed as regional. The rush pasture, upland calcareous grassland, and wet woodland habitats are listed within the SBL and contribute to the mosaic of upland habitats and are therefore their conservation value is also assessed as regional. The other habitats affected are not particularly rare or notable and are not considered to be IEFs. The area of the IEF habitats lost in the northern development area is relatively small in the context of the overall available resource (permanent loss 1.46 ha, temporary loss 0.36 ha and indirect permanent hydrological loss 1.5 ha).

Table 7.10 - Habitat Loss within the Northern Development Area

Habitat Description	Indirect Permanent/ Hydrological Loss due to Habitat Change	Direct Permanent	Temporary Loss	Total	Scoped in?
Coniferous Plantation Woodland		22.43	5.68	28.11	No
Unconfirmed (likely forestry)		6.21	1.42	7.63	No
Bare Ground		1.80	0.27	2.07	No
Mire habitat – blanket bog (M19a)	0.54	0.52	0.11	1.17	**Yes**
Mire habitat – Molinia grassland/ wet heath (M25a)	0.57	0.44	0.14	1.15	**Yes**
Bracken, heath and mire habitat (U29c/H12/M23b)		0.38	0.11	0.49	**Yes**
Mire habitats – blanket bog (M17a)	0.24	0.09		0.32	**Yes**
Rush Pasture (M23b)	0.09	0.03		0.12	**Yes**
Wet woodland (W4d)	0.11			0.11	**Yes**
Bracken (U20c)		0.05		0.05	No
Mire habitat – Molinia grassland/ wet heath (M25)	<0.01			<0.01	**Yes**
Grand Total	**1.55**	**31.95**	**7.73**	**41.22**	
Habitats in **bold** identified as IEFs					

7.8.10 In the southern development area, there will also be losses of habitats identified as IEFs. The main loss will be of rush pasture habitats, with small areas of mire habitat also lost. The area of permanent habitat loss of rush pasture habitats is 7.2 ha.

Table 7.11 - Habitat Loss in Southern Development

Habitat	Change	Indirect Permanent/ Hydrological	Permanent	Temporary	Grand Total	Scoped in?
Improved grassland (MG7)	14.17	23.49	2.31	0.98	40.95	No
Rush pasture (M23a/MG6b)	7.80	10.71	6.00		24.52	**Yes**
Rush pasture (M23a/b)	7.39	11.12	0.57		19.08	**Yes**
Improved grassland (MG6b)	4.79	7.92	1.61		14.32	No
Improved grassland (MG7a/MG10a)	3.50	4.02	0.14		7.66	No
Improved grassland (MG7a) / rush pasture (M23b)		0.57	1.28		1.85	No
Rush pasture (M23b/U5)	0.50	0.83			1.33	**Yes**
Improved grassland / rush pasture (MG6b/MG10a)		0.74	0.47		1.20	No
Rush pasture (MG10a)	0.22	0.84	0.05		1.11	**Yes**
Mixed plantation woodland		0.60	0.08		0.68	No
Rush pasture (M23b)		0.24	0.38		0.62	**Yes**
Rush pasture (M23a/b)		0.19	0.20		0.38	**Yes**
Bare ground		0.30	0.04		0.34	No
Improved grassland (MG9a)	<0.01	0.22	0.02		0.24	No
No data	<0.01	0.20	0.01	0.01	0.22	No
Improved grassland (MG6a)		0.10	0.02		0.13	No
Mire habitat - Molinia grassland/ wet heath (M25)		0.09			0.09	**Yes**
Coniferous plantation woodland		0.04	0.01		0.05	No
Mire habitat - Molinia grassland/ wet heath (M25, M23b, U5a)		0.05			0.05	**Yes**
Improved grassland (MG7a)		0.03			0.03	No
Arable		<0.01			<0.01	No
Total	**38.37**	**62.33**	**13.19**	**0.99**	**114.85**	

7.8.11 The OHMEP will compensate for the predicted 2.8 ha of peatland habitats to be lost from construction of the Proposed Development (refer to **Appendix 7.5**). Overall, the measures outlined in the OHMEP will lead to the restoration of approximately 56 ha of peatland habitats, bringing forward 28 ha as compensation for the predicted 2.8 ha loss, with a further 28 ha of peatland restoration implemented as enhancement over and above the compensation provided. These proposals comply with NatureScot's requirements for a 1:10 ratio of peatland habitat loss to restoration along with the requirements of NPF4 for the Proposed Development to provide significant enhancement for biodiversity. Significant other habitat compensation and enhancement measures are also set out within the OHMEP which will bring under long-term management c. 592 ha of habitat for raptors and c. 147 ha of habitat for waders. Consequently, the magnitude of impact is assessed as low, as the direct habitat losses are very small in context of the entire site

boundary and wider area, and the resulting overall effect on habitats when taking account of the OHMEP is **minor/ moderate** beneficial (non-significant in terms of the EIA Regulations).

Otter

7.8.12 Construction has potential to cause disturbance to otter resting sites. The status of the features recorded as potential resting sites was not confirmed during surveys therefore it cannot be concluded that there will no disturbance to breeding otter. On a precautionary basis this assessment assumes that the three potential holts are active breeding sites (natal holts) (refer to **Appendix 7.2**). Construction works would have the potential to disturb two of the potential holts; OTT5 in the southern development area and OTT7 in the northern development area. The pre-construction surveys will determine the status of the resting sites and where required a licence for disturbance will be obtained from NatureScot. Disturbance of otter is therefore considered to be a **negligible** non-significant effect in terms of the EIA Regulations.

7.8.13 Construction of new watercourse crossings has potential to create short-term, small-scale disturbance to foraging and commuting otter however the new crossings are located in areas of plantation forestry or open grassland and therefore there is no potential for otter to be forced out of watercourses into areas of unsuitable habitat such as roads during construction of the crossings.

7.8.14 No night-time working would be undertaken, and therefore there is negligible potential for noise or visual disturbance to foraging / commuting otter. The magnitude of impact is assessed as negligible, and the resulting effect is **negligible** and not significant in terms of the EIA Regulations.

Bats

7.8.15 Construction impacts to bats relate to the loss of foraging and commuting habitat. Within the northern development area there will be felling and replanting of large areas of conifer plantation woodland, considered to be a low-quality habitat for bat foraging, and the creation of more open areas may increase the amount of foraging habitat available. Creation of new access tracks through retained woodland habitat may also provide new foraging or commuting routes for bats through the creation of additional edge habitat compared to dense commercial conifer forest. Due to the generally low levels of bat activity recorded in the northern development area (see **Appendix 7.3**) this is considered to be a low magnitude impact with a **minor** adverse effect that is not significant in terms of the EIA Regulations.

Within the southern development area there will also be small scale loss of habitat under new access roads and compounds during construction. Habitat change, including coverage of habitats by solar PV modules in this area will also affect the amount of foraging and commuting habitat available to bats. Research into the effect of solar panels on bat foraging is ongoing, but there is some evidence to suggest that they may attract insects to them which may deplete the available invertebrate foraging resource around the margins of the site. As this is an evolving area of study it is not considered to be a negative effect at the time of writing. The habitats around watercourses were found to support higher levels of bat activity and the design includes a significant buffer around the majority of these features. The proposed landscaping in the southern development area will also increase the amount of commuting habitat though planting of new hedgerows. The habitats lost are largely open and of lower value for foraging and commuting bats compared to areas of scrub and watercourses (refer to **Appendix 7.3**). This is considered to be a low magnitude impact, and the resulting effect is **negligible** and not significant in terms of the EIA Regulations.

Fish

7.8.16 Indirect impacts to fish through pollution/sedimentation will be avoided through the embedded mitigation.

7.8.17 Construction of new water crossings has potential to cause temporary or permanent habitat fragmentation (through temporary coffer dams, or impassable culverts etc.) and may damage or destroy fish spawning habitat. New crossings in the southern development area cross Back Burn, Harwood Burn, Lamon Burn and other unnamed tributaries of Greenock Water. The new water crossings of Harwood Burn and Lamon Burn in the southern development area, and Powbrone Burn

in the northern development area are currently proposed to be oversized bottomless culverts which will avoid potential habitat fragmentation.

7.8.18 The named tributaries are considered to have important spawning habitat for trout and flow into Greenock Water which supports salmon and lamprey (see **Appendix 7.4** for survey results). In the northern development area, there is a new crossing on Powbrone Burn and Self Grain and other unnamed watercourses. Water crossings could prevent fish passage if not designed correctly, however, the outline design of crossings has taken fish passage into account to maintain connectivity. The area of each new crossing is relatively small, and each crossing has been designed with safe fish passage in mind, therefore, the magnitude of impact is low. In the absence of further mitigation, habitat fragmentation and damage or destruction of spawning habitat would be a **minor** adverse effect, not significant in terms of the EIA Regulations.

Operation

Habitats

7.8.19 Impacts to habitats are largely related to the construction phase, however during operation, solar panels will have a shading effect on the grassland habitats in the southern development area and this may result in habitat change resulting in lower species diversity or increased dominance of more shade tolerant species. This is considered to be a low magnitude impact. The change in habitats from shading is considered to be a **minor** adverse effect and not significant in terms of the EIA Regulations.

Bats

7.8.20 Operational impacts to bats are considered to primarily relate to the risk of mortality or injury through collision or barotrauma with wind turbines in the northern development area, and loss of foraging habitat in the southern development area.

7.8.21 Of the species recorded during surveys, those considered to be species with high collision risk potential were common pipistrelle, soprano pipistrelle and Nyctalus species. Of these species, the median level of activity recorded was low and therefore the overall risk level for these species was also considered to be low. Due to the low levels of activity recorded in the northern development area and the embedded mitigation of ensuring there is a buffer between the blade tip and key areas of habitat (woodland edge for example), the magnitude of any potential impact to the species, but most notably through mortality/injury through collision or barotrauma, is assessed as a **minor** adverse effect, not significant in terms of the EIA Regulations.

Decommissioning

Muirkirk Uplands SSSI

7.8.22 Removal of cables, if applicable, could lead to temporary habitat loss within the SSSI if works were to take place in the soft verge alongside the B743. As noted in **paragraph 7.8.2**, the cable(s) is proposed to be laid within the existing tarmac surfaced B743 carriageway and, as such, there will be no impacts to the constituent habitats of the SSSI as a result of their installation or removal (if applicable). Site roads will be retained post-operation, and the majority of foundations will be left in place, which will minimise further ground disturbance. These works will therefore have **no effect** on the habitats within the Muirkirk Uplands SSSI.

Habitats

7.8.23 Decommissioning effects on habitats are considered to be broadly similar to, or less than, construction effects. In the southern development area where land is reverted to its previous use there will be a relatively small element of permanent habitat loss/change as a result of retained roads, however, habitat beneath solar panels is expected to return to a condition similar to present day. Site roads in the northern development area will be retained for use by forestry operations on site. In this regard, it is noted that new forestry roads would be required to be constructed in many of these areas to facilitate timber removal in the absence of the Proposed Development in any event. The magnitude of the impact is at most low.

7.8.24 Habitat loss /change during decommissioning is therefore assessed as **minor** beneficial in the southern development area and not significant in terms of the EIA Regulations, and there will effectively be **no effect** in the northern development area.

Protected species

7.8.25 Loss or change of habitat may lead to loss of foraging and commuting habitat for bats, badger and otter, or any other protected species that become established in the site boundary during the operational period. The overall loss or change in habitats associated with decommissioning is anticipated to be minor and therefore the magnitude of change is considered to be low. Loss or change of habitat which may affect protected species is therefore considered to be a **minor** adverse effect and not significant in terms of the EIA Regulations.

7.8.26 There is also potential for injury, killing or disturbance of protected species within the site boundary during decommissioning. Surveys will be carried out prior to decommissioning to identify any protected species that may be affected. It is assumed that best practice measures will be implemented during decommissioning and surveys will establish the requirements for any protected species licensing. The magnitude of the impact is therefore expected to be low and the effect **negligible** and not significant in terms of the EIA Regulations.

7.9 Mitigation

Otter

7.9.1 Pre-construction monitoring surveys of the potential otter holts will be carried out to establish the status of the features (natal, non-natal). Where natal holts are identified, a licence from NatureScot for disturbance will be required as elements of the Proposed Development are present within the 200 m disturbance buffer around each potential holt.

Fish

7.9.2 Pre-construction surveys for fish spawning habitat will be carried out at the location of each new water crossing and if possible, crossings will be micro-sited to avoid impacting spawning habitat. Where spawning habitat is identified and cannot be avoided, in-stream works will need to avoid spawning and incubation periods (October to April).

7.9.3 New water crossings will be designed to avoid creating obstacles to fish passage.

Bats

7.9.4 Additional monitoring surveys will be carried out prior to the commencement of construction to inform a Bat Protection Plan which may incorporate additional mitigation measures such as blade feathering if considered necessary (refer to **paragraphs 7.11.7 – 7.11.10**).

7.10 Residual Effects

7.10.1 After mitigation it is considered that there are **no significant residual effects**.

7.11 Cumulative Assessment

7.11.1 The purpose of the assessment of cumulative effects is to identify situations where effects on IEFs that may be non-significant from individual developments, are judged to be significant when combined with nearby existing or proposed projects. In the interests of focusing on the potential for similar significant effects, this assessment considers the potential for cumulative effects with other similar infrastructure developments in the area, including those that are under construction, consented or at application stage (operational developments are considered part of the baseline). Developments at pre-application or scoping stage generally do not have sufficient information on potential effects to be subject to detailed cumulative effects assessment, as the baseline survey period is ongoing, and/ or the results and impact assessments have not been published. However, an assessment of likely/ potential cumulative effects with the Proposed Development has been undertaken where possible, informed by any relevant information available in the public domain

with professional judgement applied. Developments that have been refused or withdrawn have been scoped out.

7.11.2 Cumulative effects with other wind farms were initially considered within a 10 km buffer as listed in **Table 7.12**. From initial review it was determined that only projects within 5 km of the Proposed Development had the potential to give rise to any significant cumulative effects, hence the assessment in **Table 7.13** considers cumulative effects with other wind farms up to 5 km. It is considered that there are no large scale solar or BESS developments in the vicinity of the site that need to be considered for cumulative effects (refer to **Chapter 4**).

Table 7.12- Wind Farm Developments within 10 km

Development name	Status	No. of turbines
West Browncastle	Operational / under construction	12
Calder Water	Operational / under construction	14
South Brownhill Wind Farm	In application	3
Mossmulloch	In application	5
Low DrumClog	Approved	3
West Dykehead	Approved	2
Hawkwood Hill	In Application	5
East Merkland Wind Farm	Operational / under construction	3
Kype Muir	Operational / under construction	26
Kype Muir Extension	Operational / under construction	15
Auchrobert	Operational / under construction	12
Hallsburn Farm	Approved	1
Dungavel	Operational / under construction	13
Mill Rig	Approved	6
Bankend Rig II	Approved	3
Bankend Rig	Operational / under construction	11
Bankend Rig III	In application	10
Cumberhead West	Operational / under construction	21
Hare Craig	Approved	8
Cumberhead	Operational / under construction	12
Nutberry	Operational / under construction	6
Dalquhandy	Operational / under construction	10
Douglas West	Operational / under construction	13
Douglas West Extension	Operational / under construction	13
Hagshaw Hill and Extension	Operational / under construction	20
Hagshaw Hill Repowering	Operational / under construction	14
Galawhistle	Operational / under construction	22
Kennoxhead Extension I	In application	22
Kennoxhead	Operational / under construction	13

Development name	Status	No. of turbines
Kennoxhead Extension II	In application	9
The Drum Wind Farm	In application	8

7.11.3 The potential for cumulative effects with the Proposed Development on IEFs scoped into this assessment for each of the projects listed in **Table 7.12** within 5 km of the Proposed Development has been assessed (see **Table 7.13**).

7.11.4 Bankend Rig III has potential to lead to cumulative effects within Muirkirk Uplands SSSI as its proposed location is adjacent to the designated site. The Proposed Development and Bankend Rig III are located outwith the designated site, therefore, are likely to only have potential for indirect effects that can be avoided through best practice mitigation, so it is therefore reasonable to conclude that there would be **no significant cumulative effects** on the designated site.

7.11.5 Although habitat loss associated with the Proposed Development alone is minor, and not considered significant, it is acknowledged that cumulative impacts with other projects may result in a greater magnitude impact on habitats in the wider context. Each of the projects alone has / will have its own HMP to compensate for habitat losses and one of the objectives of the OHEMP for the Proposed Development is to engage with surrounding developments to coordinate information sharing and learning which has potential to deliver landscape-scale enhancements to habitats within the area. The overall cumulative effects on habitats scoped in as IEFs (upland and mire assemblages) is therefore assessed as **minor/moderate** beneficial, not significant in terms of the EIA Regulations.

7.11.6 There are a large number of existing and proposed wind farms within 5 km. While bat activity levels within the Proposed Development and within many of the developments considered were low, it is considered that due to the overall area of habitat affected there is an overall **moderate adverse** cumulative effect to foraging and commuting bats.

7.11.7 Due to potential cumulative effects on foraging and commuting bats additional mitigation will be implemented. This will include additional bat activity surveys prior to commencement to further establish the baseline, coupled with carcass monitoring of turbine locations through the first two years of the operational phase of the Proposed Development. Checks should be completed on a monthly basis between May and September by trained operations staff.

7.11.8 Based on findings, it may then be necessary to implement additional measures such as blade feathering while idling. The current guidance states there is evidence that bat casualties at wind farms is reduced by pitching the blades out of the wind ('feathering') to reduce rotation speeds below 2 rpm while idling, and in some cases increasing the cut-in speed during high-risk periods (i.e. warm evenings in summer with low wind speeds) (NatureScot, 2020). It has been found that the reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50%. The full scope of any additional mitigation steps deemed necessary based on the outcomes of the above noted surveys will be set out in a Bat Protection Plan and will take into account which of the proposed neighbouring cumulative wind farms are approved/operational by that point in time.

7.11.9 Considering the cumulative impacts detailed above and the mitigation proposed to be implemented, it is assessed that the residual cumulative effects to bat species will be reduced to a **minor** adverse level. This is not significant in terms of the EIA Regulations.

Table 7.13 - Summary of Potential Cumulative Effects with Other Wind Farms within 5 km

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
Dungavel	Nearest built element over 2 km away from the designated site and therefore no potential for cumulative effects with the Proposed Development.	Design process to avoid impacts to blanket bog. The proposed hen harrier enhancement area for Dungavel is within the northern development area of the Proposed Development, however much of the habitat management work has not yet taken place. The Proposed Development OHEMP addresses the loss of this area and will provide management and enhancement of a much larger alternative area of better habitat that will fulfil the same (improved) function. It is therefore considered that the overall cumulative effect of the proposed habitat management substitution will result in a beneficial **minor/ moderate** effect.	As the site is already operational it is considered that there is no cumulative effect on otter (only disturbance effects were predicted).	Bats were not considered in the assessment of the development. There will be an increased number of turbines within the local area that will have a low magnitude adverse **minor** cumulative effect on foraging and commuting bats.	As the site is already operational it is considered that there is no cumulative effect on fish
Kype Muir	No impacts to the SSSI due to distance and therefore there is no potential for cumulative effects with the Proposed Development.	Loss of 8.66 ha blanket bog, blanket bog/coniferous woodland plantation, and dry modified bog of moderate negative significance. Restoration of 134.92 ha of bog and heathland habitats. Given this project and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no	As the site is already operational it is considered that there is no cumulative effect on otter (only disturbance effects were predicted).	Common pipistrelle, soprano pipistrelle, Leisler's bats and Nathusius' pipistrelle were recorded and considered to be a low to high risk of collision, however due to clear felling the distance between turbines and watercourses and woodland edge and therefore the collision	All upgraded watercourses were designed to maintain fish passage. It is therefore considered that the cumulative effect is low in magnitude and is **negligible**.

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
		adverse cumulative effect on habitats.		risk was considered non-significant. There will be an increased number of turbines within the local area that will have a low magnitude adverse **minor** cumulative effect on foraging and commuting bats.	
Kype Muir Extension	No impacts on SSSI anticipated and therefore there is no potential for cumulative effects with the Proposed Development.	Direct and indirect loss of 47.45 ha of dwarf shrub heath and blanket bog habitat. Creation of 13.8 ha of blanket bog and restoration of an additional 2.39 ha of blanket bog. Enhancement of 33.9 ha for hen harrier which was considered likely to represent blanket bog. Given this project and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no adverse cumulative effect on habitats.	As the site is already operational it is considered that there is no cumulative effect on otter (only disturbance effects were predicted).	Nyctalus species recorded at low frequencies. Overall, very low levels of activity. There will be an increased number of turbines within the local area that will have a low magnitude adverse **minor** cumulative effect on foraging and commuting bats.	Impacts to fish were considered to be minor and related to potential pollution during operation. Best practice measures should prevent these impacts. It is therefore considered that the cumulative effect is low in magnitude and is **negligible**.
Bankend Rig II	Loss of 0.06ha of the existing SSSI however 95.5% of that area is not composed of habitats listed on the SSSI	Direct loss of 0.44 ha of dwarf heath (wet and dry) and indirect loss of 1.21 ha.	Site usage by otter was low. Potential for habitat fragmentation and disturbance. Best practice mitigation will be used and	Nyctalus species were recorded but overall bat activity levels were low and impacts from operation were not	No impacts to fish were considered and therefore it is considered that

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
	citation. Indirect impacts to 1.69ha of habitat. The Proposed Development is not predicted to have any adverse effects on the SSSI with the implementation of standard mitigation measures, therefore, there is considered to be no cumulative effect on the SSSI habitats.	Direct loss of 3.05 ha of blanket bog, and indirect impacts to 11.39 ha of blanket bog. No additional habitat management area created as area created for Bankend Rig I was oversized. Given the Bankend Rig projects and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no adverse cumulative effect on habitats.	therefore it is considered unlikely that cumulative effects of a significant level would result.	considered to have a significant effect. The proposed turbines for Bankend Rig II will extend the overall area of habitat with turbines present to the south-west of the Proposed Development and it is therefore considered that there is likely to be a cumulative effect on foraging and commuting bats, although level of activity in the area are low. It is considered that there is the potential for a low magnitude adverse **minor** cumulative effect on foraging and commuting bats.	there is **no effect**.
Bankend Rig I	No information available. Effects not considered significant	No information available. Effects not considered significant	No information available. Effects not considered significant	No information on bats available. There will be an increased number of turbines within the local area that will have a low magnitude adverse **minor** cumulative effect on foraging and commuting bats.	No information available. Effects not considered significant

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
Bankend Rig III	No impacts beyond potential for pollutants during construction, considered low impact, temporary and unlikely. Similarly, the Proposed Development is not predicted to have any adverse effects on the SSSI with the implementation of standard mitigation measures, therefore, there is considered to be no cumulative effect on the SSSI habitats.	Loss of montane blanket bog, *Juncus* and/ or *Molinia* dominated meadows (GWDTEs), northern wet heath, loss of *Vaccinium-Calluna* heaths Improving condition of blanket bog. There is loss of upland and peatland habitats but also restoration of degraded habitats that mitigates for the losses between the developments. Given this project and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no adverse cumulative effect on habitats.	Site usage by otter was low however they were recorded on Powbrone Burn. Potential for habitat fragmentation and disturbance. Best practice mitigation will be used and therefore it is considered unlikely that cumulative effects of a significant level would result.	Site classified as low risk for common and soprano pipistrelle. A location near to a watercourse had medium-high risk seasonally but impacts would be at the site level. Cumulative operational effects are considered to be **moderate** (significant).	Effects not considered significant.
Mill Rig	Direct loss of 0.06 ha and indirect loss of 1.83 ha of habitat. Habitat restoration to be undertaken outwith the SSSI. The Proposed Development is not predicted to have any adverse effects on the SSSI with the implementation of standard mitigation measures, therefore, there is considered to be no cumulative effect on the SSSI habitats.	Direct loss of 0.81 ha if dwarf shrub- heath, and 1.12 ha of blanket bog. Indirect loss of 4.19 ha of blanket bog and 1.83 ha of dwarf shrub. Improving the condition of blanket bog south of the Mill Rig development and resorting bog in the Slouch Moss complex. There is loss of upland and peatland habitats but also restoration of degraded habitats that mitigates for the losses.	Site usage by otter was low. Potential for habitat fragmentation and disturbance. Best practice mitigation will be used and therefore it is considered unlikely that cumulative effects of a significant level would result.	Low levels of bat activity were recorded. *Nyctalus* species were recorded passing through the site. The proposed turbines for Mill Rig will extend the overall area of habitat with turbines present to the south-west of the Proposed Development and it is therefore considered that there is likely to be a cumulative effect on	No impacts to fish were considered and therefore it is considered that there is no cumulative effect.

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
		Given this project and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no adverse cumulative effect on habitats.		foraging and commuting bats It is considered that there is the potential for a medium magnitude adverse **moderate** cumulative effect on foraging and commuting bats.	
Hawkwood Hill	No information available however the proposed Hawkwood Hill development separated from the SSSI by distance and other operational wind farms. It is considered that there would be no cumulative effect.	No information available however has potential to impact blanket bog and heath habitats. There is a potential cumulative impact but it would be expected that there would also be habitat management to improve the condition of retained areas of habitat.	No information available however has potential to impact the same population of otter but it is considered that the potential magnitude of cumulative effects is low, and the significance of the effect would be adverse **minor** (not significant).	No information is available however as the proposed Hawkwood Hill is adjacent to the existing Dungavel and Kype Muir wind farms there will be an additional impact to the amount of habitat available to foraging and commuting bats in the immediate area although due to the scale of the Hawkwood Hill development the magnitude of impact is minor adverse and a **minor** (no significant) cumulative effect on foraging and commuting bats.	No information available however impacts are likely to be minor and related to potential pollution during operation. Best practice measures should prevent these impacts. It is therefore considered that the cumulative effect is low in magnitude and is negligible.

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
Hare Craig	Due to distance and limited hydrological connection the SSSI was not considered an IEF. It is considered that there would be no cumulative effect	There is loss of upland and peatland habitats but also enhancement and compensation for habitats lost or changed. Given this project and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no adverse cumulative effect on habitats.	Impacts to otter were considered to be minor or negligible following best practice mitigation measures. Due to distance from the Proposed Development any potential cumulative effect would be low in magnitude and is considered to be **negligible** (not significant)	Moderate levels of bat activity were recorded, and high species were also recorded. The Hare Craig site is located further from the Proposed Development but is likely to affect the same local bat population. It is considered that there is the potential for a minor magnitude adverse **minor** cumulative effect on foraging and commuting bats.	Impacts to fish was considered to be minor and related to potential pollution. Best practice measures should prevent these impacts. It is therefore considered that the cumulative effect is low in magnitude and is **negligible**.
Cumberhead West	SSSI adjacent to Cumberhead West indirect effects on peatlands avoided due to distance of infrastructure and best practice construction measures. It is considered that there would be no cumulative effect.	Loss of poor quality blanket bog. Total of 0.76 ha would be directly lost due to permanent infrastructure, with a further loss of 2.4 ha located within areas of temporary infrastructure. Habitat restoration areas proposed as compensation and enhancement. Given this project and the Proposed Development are both providing significant habitat enhancement, above minimum compensation requirements, that there will be no adverse cumulative effect on habitats.	No impacts were considered and therefore it is considered that there is no cumulative effect.	Activity surveys undertaken in 2019 and 2020 identified four species: soprano pipistrelle, common pipistrelle, Daubenton's bat, and brown long-eared bat. Two genus classifications were also recorded *Myotis* spp, and *Nyctalus* spp. The Cumberhead West site is located further from the Proposed Development but is likely to affect the same local bat population. It is	No impacts to were considered and therefore it is considered that there is no cumulative effect.

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
				considered that there is the potential for a minor magnitude adverse **minor** cumulative effect on foraging and commuting bats.	
East Merkland Wind Farm	No cumulative effects considered due to distance.	No cumulative effects considered due to distance.	No cumulative effects considered due to distance.	No information available. It is considered that there is the potential for a minor magnitude adverse **minor** cumulative effect on foraging and commuting bats.	No cumulative effects considered due to distance.
Hallsburn Farm	No cumulative effects considered due small nature of the development and distance from SSSI.	No cumulative effects considered due small nature of the development	No cumulative effects considered due small nature of the development	No cumulative effects considered due small nature of the development	No cumulative effects considered due small nature of the development
Auchrobert	No cumulative effects considered due to distance.	No cumulative effects considered due to distance.	No cumulative effects considered due to distance.	Surveys undertaken in 2012 identified three species: (common pipistrelle, soprano pipistrelle and Nathusius' pipistrelle), three genus groups (*Nyctalus, Myotis* and *Pipistrellus*) and a small number were identified as *Plecotus/Myotis*.	No cumulative effects considered due to distance.

Wind Farm Name	Muirkirk Uplands SSSI	Habitats	Otter	Bats	Fish
				It is considered that there is the potential for a minor magnitude adverse **minor** cumulative effect on foraging and commuting bats	

7.12 Summary

7.12.1 The majority of impacts on ecology (non-avian) are from the construction phase. There will be no direct or indirect impacts to the Muirkirk Uplands SSSI following the application of standard mitigation measures during construction. Habitat enhancement in the area delivered through the OHMEP will result in a **minor-moderate** beneficial effect to the SSSI and not significant in terms of the EIA Regulations.

7.12.2 Impacts will arise from direct habitat loss under turbine foundations, permanent access tracks, substations and buildings etc. There will also be temporary loss of habitat under temporary access tracks and compounds. Some of the habitats on site are considered to be regionally important and include a number of Annex 1 habitats. However, the overall losses of habitats are relatively small in the context of the overall available resource, and the restoration of approximately 56 ha of peatland habitats as detailed in **Appendix 7.5** will mitigate for the impact as well as provide additional enhancement**.** Overall impacts to habitats are therefore assessed as a **minor/moderate** beneficial and not significant in terms of the EIA Regulations.

7.12.3 There is potential for disturbance to otter during construction, and there are potential holts that require further assessment to determine their status (natal holt/non-natal holt). Where needed, a licence for disturbance will be obtained from NatureScot, therefore, there is negligible potential for noise or visual disturbance to foraging/commuting otter. Construction effects on otter are therefore considered to be **negligible** not significant in terms of the EIA Regulations.

7.12.4 Pre-construction checks will be carried out for roosting bats, and no known roosts will be lost during construction There will be loss of foraging and commuting habitat for bats during construction however felling of woodland may also create additional suitable foraging habitat by increasing the amount of edge habitat. Overall construction is considered to have a **minor** adverse effect on foraging and commuting bats, not significant in terms of the EIA Regulations.

7.12.5 Construction of new watercourse crossings may impact fish spawning habitat. Additional surveys of habitats around each crossing point are required, and in-channel works may need to avoid spawning season. New watercourse crossings will be designed to ensure fish passage is possible. Post-mitigation the construction of new watercourse crossing will be a **negligible** effect, not significant in terms of the EIA Regulations.

7.12.6 Embedded mitigation relevant to identified ecological receptors include the iterative design process (which sought to minimise impacts on sensitive habitats), and the development and implementation of a site-specific CEMP. Furthermore, a suitably experienced ECoW would be appointed to undertake pre-construction surveys for protected species and oversee construction works to minimise any potential effects on nature conservation interests.

7.12.7 Operational impacts are principally related to impacts to foraging and commuting bats. Low levels of bat activity were recorded in the northern development area. Embedded mitigation will minimise any impacts, and effects from the Proposed Development in isolation are considered to be not significant. It is, however, considered that there is a cumulative adverse moderate effect from operation to foraging and commuting bats, due to the number of existing and proposed wind farms in the area. Additional mitigation will be implemented to reduce impacts to a level which will not significantly affect the local bat population. The full scope of mitigation will be set out in a Bat Protection Plan and will take into account which of the proposed wind farms are approved/ operational prior to construction commencing. Therefore, the overall residual cumulative effect to bats of mortality/injury through collision or barotrauma is reduced to a **minor** (not significant) adverse effect.

7.12.8 Decommissioning impacts are considered to be similar to those of construction. Surveys for protected species will be carried out to prevent killing/injury and disturbance of protected species during decommissioning and therefore decommissioning effects are considered to be **negligible**, not significant in terms of the EIA Regulations. There will be temporary and permanent habitat loss/change during decommissioning; as the southern development area is reverted to agriculture however the effect is assessed as **minor** beneficial (non-significant).

7.12.9 No significant cumulative effects were identified for otter or fish.

7.12.10 There will be a cumulative **minor/moderate** beneficial effect to Muirkirk Uplands SSSI and upland habitats from the habitat enhancement measures undertaken in association with the developments in the area.

Table 7.14 – Summary Table

Description of Effect		Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
		Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
During Construction						
Loss of habitat within Muirkirk Uplands SSSI.		None	N/A	Implementation of Habitat Management and Enhancement Plan (HMEP).	Minor/ Moderate	Beneficial
Loss of habitat within Dungavel HMA.		Minor	Adverse	Implementation of HMEP.	Minor/ Moderate	Beneficial
Loss of assemblage of upland habitats.		Minor	Adverse	Implementation of HMEP.	Minor/ Moderate	Beneficial
Disturbance of otter holts and foraging/commuting otter.		Negligible	Adverse	Pre-construction surveys and obtaining licence for disturbance from NatureScot (if required).	Negligible	Adverse
Loss of roosts, foraging and commuting habitat for bats.	Northern development area	Minor	Adverse	Bat Protection Zones embedded in design mitigation. Implementation of landscape strategy.	Negligible	Adverse
	Southern development area	Negligible	Adverse			
Habitat fragmentation and destruction of spawning habitat for fish during construction of new watercourse crossings.		Minor	Adverse	Pre-construction surveys of spawning habitat. Avoiding in-stream works during spawning and incubation periods (October to April) where spawning habitat identified upstream of the watercourse crossing. Design of new watercourse crossings to maintain connectivity.	Negligible	Adverse
During Operation						
Injury or mortality of bats through collision with turbines or barotrauma		Minor	Adverse	Embedded mitigation with buffers around turbines to key habitat features to be calculated and implemented.	Negligible	Adverse

Description of Effect		Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
		Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
Shading effect on grassland habitats from solar panels in southern development area		Minor	Adverse	None	Minor	Adverse
Decommissioning						
Impacts to Muirkirk Uplands SSSI		No effect	N/A	N/A	No effect	N/A
Loss of infrastructure during reversion to farmland	Southern development area	Minor	Beneficial	N/A	Minor	Beneficial
Roads and hardstanding retained	Northern development area	No change	N/A	N/A	No change	N/A
Loss or change of habitat which may affect protected species, potential injury, killing or disturbance of protected species during decommissioning		Negligible to Minor	Adverse	Pre-decommissioning surveys and application of best practice measures.	Negligible	Adverse
Cumulative Effects						
Impacts to upland assemblage habitats from other developments within 2 km.		Minor	Adverse	Each development has a mitigation enhancement area that will improve the condition or restore large areas of these habitats. Minor losses are therefore compensated for, and additional habitat created or improved.	Minor/ Moderate	Beneficial
Otter - Nearby developments may affect the same otter population as they are located on watercourses that also run through the Proposed Development. Impacts may be through noise and disturbance and		Minor	Adverse	Each development will implement best practice measures to reduce or eliminate impacts and where resting sites/ holts needs to be closed licences will be obtained from NatureScot. Each development should consider the impacts from the others when	Negligible	Adverse

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect	
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse
may need to close resting sites or holts.			determining mitigation for licences to ensure that otters conservation status is maintained.		
Fish – the fish population in nearby developments may be affected through runoff and sedimentation or through habitat fragmentation however all nearby developments will adhere to best practice mitigation measures and design watercourse crossings to maintain fish passage.	Negligible	Adverse	N/A	Negligible	Adverse
Bats -operational impacts through injuring and mortality resulting from collision with wind turbines. There are a large number of wind farms in the local area, and while they are generally located in areas where low levels of bat activity have been recorded and development adhere to NatureScot guidance to keep standoff distances to key habitat areas there is an overall cumulative impact due to the area of the landscape occupied by wind turbines.	Moderate	Adverse	Bat Protection Plan to be agreed prior to construction, additional mitigation to include monitoring and if required, feathering based on results of monitoring.	Minor	Adverse

7.13 References

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