7. Ecology and Nature Conservation

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7. Ecology and Nature Conservation

7.1 Abstract

7.1.1 This chapter considers and provides an assessment of the potential effects of the Proposed Development on the Ecology and Nature Conservation resource in terms of the Proposed Development ('the site') and the surrounding area ('the Study Area'). In particular, this chapter considers the potential effects of the Proposed Development on habitats and protected and/or notable species, with particular focus on Valued Ecological Receptors (VERs). The potential effects on birds are considered separately in Chapter 8 (Ornithology).

7.1.2 Should the Proposed Development not be consented, the "do-nothing scenario" will apply to the current baseline environment, in that the Applicant will construct the Consented Development. The Consented Development was environmentally assessed and consented in 2015 and the assessment is reported within the Sandy Knowe Wind Farm Environmental Statement (2015).

7.1.3 This chapter (and its associated figures and appendices) is not intended to be read as a standalone assessment. As such, reference should be made (where applicable) to the other chapters of this EIA Report.

7.1.4 The baseline data used to inform the assessment for this application was collected in 2011 and 2012, with update bat surveys undertaken in 2015. Consultation with Scottish Natural Heritage (SNH) has confirmed the suitability of this data for this assessment.

7.1.5 This chapter outlines the potential ecological effects of the Proposed Development and an assessment is provided based on the value of the receptor and the magnitude of the impact giving the significance of the effect. Where appropriate, mitigation measures to enhance, prevent, minimise or control identified ecological effects are presented. These include both generic mitigation (such as the appointment of an Ecological Clerk of Works and repeat ecological surveys prior to construction) and specific mitigation (such as habitat restoration and creation of roost habitats and hibernacula). Following the implementation of the mitigation measures there would be residual ecological beneficial effects of minor/moderate significance on habitats, and all adverse effects would be reduced to negligible significance.

7.1.6 The predicted residual significant effects for the Proposed Development are exactly the same as those which would arise from the 'do-nothing scenario', which would result in the implementation of the Consented Development.

7.1.7 The EIA Regulations, at Schedule 4, require the EIA Report to provide a

"description of the likely significant effects of the development on the environment resulting from, inter alia:

… (e) the cumulation of effects with other existing and/or approved development, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;"

7.1.8 In this regard, the Proposed Development would be indiscernible from the Consented Development.

7.2 Legislation, Policy and Relevant Guidance

Legislation

7.2.1 Relevant legislation documents have been taken into account as part of this ecological assessment. Of particular relevance are:

- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended);
- The Wildlife and Countryside Act 1981 (as amended);
- Salmon and Freshwater Fisheries Act 2003 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011 (as amended); and
- Nature Conservation (Scotland) Act 2004 (referencing the Convention on Biological Biodiversity (1992) and the Scottish Biodiversity Strategy which are implemented through Biodiversity Action Plans (BAP), namely the UK Biodiversity Action Plan (UKBAP) and Local BAP).

Planning Policy

7.2.2 Chapter 5 of the EIA Report sets out the planning policy framework that is relevant to the EIA process. The policies set out include those from the Dumfries and Galloway Local Development Plan (LDP) (2014), those relevant aspects of Scottish Planning Policy (SPP), Planning Advice Notes and other relevant guidance. Of relevance to the ecology and nature conservation assessment presented within this chapter, regard has been had to the following policies:

- Scottish Planning Policy (SPP) 2014 (Scottish Government, 2014);
- Planning Advice Note (PAN) 60; and
- LDP Policy:
  - IN1 Renewable Energy;
  - NE5 Sites of National importance for Biodiversity and Geodiversity;
  - NE6 Forestry and Woodland; and
  - NE7 Trees and Development.

Best practice Ecological Guidance

7.2.3 Relevant guidance documents have been taken into account as part of this ecological assessment. Of particular relevance are:

- IEEM (2006) Guidelines for Ecological Impact Assessment (Institute of Ecology and Environmental Management);
- IEMA (2005) Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment); and
- Technical Information Note TIN051: Bat and Onshore Wind Turbines Interim Guidance (Natural England, 2009).

7.3 Methods

7.3.1 This section identifies the 'key ecology and nature conservation issues' to be considered as part of the Ecological Impact Assessment (EcIA) and with an understanding of these issues, describes the methods used to establish baseline conditions and assess the magnitude and significance of the ecological effects of the Proposed Development.

Consultation

7.3.2 Statutory consultees and other relevant non-statutory organisations were consulted as part of Environmental Impact Assessment (EIA) scoping process to identify the key ecology and nature conservation matters to be assessed as part of and to obtain existing data/information to supplement and inform the ecological assessment. Responses were sought from the following organisations:

- Statutory:
  - Dumfries and Galloway Council;
  - Scottish Government Energy Consents Unit (ECU);
  - Scottish Environment Protection Agency (SEPA); and
  - Scottish Natural Heritage (SNH).
- Non-statutory:
  - Botanical Society of the British Isles (BSBI);
  - Dumfries and Galloway Amphibian and Reptile Group;
  - Dumfries and Galloway Badger Group;
  - Dumfries and Galloway Bat Group;
  - Dumfries and Galloway Environmental Resources Centre;
  - International Otter Survival Fund;
  - Red Squirrels in South Scotland;
  - Scottish Borders Biological Resource Centre; and
  - Scottish Wildcat Association.

Desk Study

7.3.3 A desk study was undertaken of web-based resources to identify baseline data for the Proposed Development site and wider area. Where relevant, the desk study was supplemented by consultation with relevant non-statutory organisations for a 2 km radius of the Proposed Development site, as recommended in the Institute of Environmental Management and Assessment's (IEMA's) Guidelines for Baseline Ecological Assessment (1995) and supported by the Institute of Ecology and Environmental Management (IEEM), with the exception of bats where the study area was specifically extended to 5 km as recommended by Mitchell-Jones, A.J. (2004).

Baseline Methods

7.3.4 A full description of survey methods pertinent to the ecological receptor are presented in the relevant technical appendix, and in respect to Phase 1 Habitats, National Vegetation Classification (NVC), otter (*Lutra lutra*), water vole (*Arvicola amphibious*), red squirrel (*Sciurus vulgaris*) and badger (*Meles meles*) surveys, in Appendix 7.2. All surveys were undertaken by suitably qualified ecologists with membership/affiliation to the relevant professional body.

7.3.5 Consultation with Scottish Natural Heritage (SNH) has confirmed the suitability of this data for this assessment, with the exception of bats, where further bat surveys were undertaken in 2015. For the purposes of this application, the data presented within this chapter and used to inform the assessment was collected in 2012 (with the exception of bats which was undertaken in 2011 and 2015):

- Extended Phase 1 Habitat survey: WSP / Findlay Ecology Services / Irene Tierney (Independent Consultant and University Lecturer);
- NVC survey: Findlay Ecology Services Ltd;
- Badger survey: WSP;
- otter survey: WSP;
- water vole survey: WSP;
- red squirrel survey: WSP;
- bat survey: Wild Surveys Ltd (2011) and ITPEnergised (2015); and
- freshwater fish electro-fishing survey: Nith District Salmon Fishery Board.

Study Area

7.3.6 As outlined, field surveys applicable to the pertinent ecological receptor were undertaken within all suitable areas of the Proposed Development and a wider Study Area outside the Proposed Development, which varied in width relevant to the considered ecological receptor (Figure 7.1). Further information regarding the extent of the pertinent study area is presented below:

- extended Phase 1 Habitat and NVC survey (the Proposed Development and any immediately adjacent botanically high value areas);
- badger and red squirrel survey (the Proposed Development and adjacent area up to 100 m from the site);
- otter and water vole survey (the Proposed Development and adjacent area up to 250 m from the site);
- bat survey (the Proposed Development and adjacent area up to 250 m from the site); and
- freshwater fish electro-fishing survey (the Proposed Development and adjacent area up to 1.5 km from the site).

7.3.7 It should be noted that, where applicable, the relevant study area was extended to provide a greater level of ecological understanding regarding the presence of an ecological receptor.

Identification and Assessment of Valued Ecological Receptors (VERs)

7.3.8 Current IEEM guidelines support the focus of an ecological assessment on VERs, that is, those ecological receptors assessed as being of greatest value/sensitivity present within a 'Proposed Development'. For the purpose of this ecological assessment, VERs were identified and assigned an ecological value in accordance with the criteria presented in Table 7.1.

Table 7.1 – Ecological Value Criteria

Scale of Ecological Value	Examples
International/European	An internationally designated area (as described in Appendix 7.1) meeting the criteria for a Special Protection Area (SPA) or provisional SPA, a Special Area of Conservation (SAC) or candidate SAC, or Ramsar site. Considerable extents of a priority habitat type listed in Annex 1 of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora or smaller areas of such habitat that are essential to maintain the viability of a larger whole. A river and/or other freshwater receptor classified as excellent and known to support a substantial salmonid population. Any regularly occurring population of an internationally important species, which is threatened or rare in the UK, i.e. a UK Red List species or listed as occurring in 15 or fewer 10 km squares in the UK (Categories 1 and 2 in the UKBAP) or of uncertain conservation status or of global conservation concern in the UKBAP. A regularly occurring, nationally important population of any internationally important species.
National	A nationally designated site or area fulfilling the criteria for designations at a national level, for example, SSSI, National Nature Reserve, or a discrete area, which meets the published selection criteria for a national designation (e.g. SSSI designation guidelines). A viable area of a priority habitat as identified in the UK Biodiversity Action Plan (UKBAP) or of smaller areas of such habitat that are essential to maintain the viability of a larger whole. A river and/or other freshwater receptor classified as excellent and likely to support a substantial salmonid population. A regularly occurring, regionally or county significant population of an internationally/nationally important species. A population of more than 1 % of the UK population of a European or nationally protected species (e.g. otter or badger), or an otherwise important population (e.g. a population on the edge of its natural range). A species identified as a priority species listed in the UKBAP
Regional / Authority Area	Sites which exceed the Local authority level designations but fall short of SSSI selection criteria e.g Regional Country Park. A viable area of habitat identified within the Regional and/or Authority Area BAP. Semi-natural woodland (not of plantation origin) greater than 0.25 ha in size. A river and/or other freshwater receptor classified as good and/or fair and likely to support a salmonid and/or cyprinid/coarse fish population. Species populations identified as being of Regional/Authority Area importance, e.g. populations of red squirrel (*Sciurus vulgaris*) in priority woodlands. Regular occurrence of a European or nationally protected species.

Scale of Ecological Value	Examples
	Any regularly occurring population of a nationally important species which is threatened or rare in the Region and/or Authority Area.
Local	A viable area of semi-natural ancient woodland smaller than 0.25 ha. Sites that are protected through inclusion within local authority plans, for example, Sites of Importance for Nature Conservation (SINC) or equivalent sites selected on local authority criteria e.g. Local Nature Reserves (LNR). A river and/or other freshwater receptor classified as fair and/or poor and unlikely to support a coarse fish population. Areas of habitat or species considered to appreciably enrich the ecological resource within the local context e.g. species rich flushes.
Less than local	Habitats and species that are of low to no ecological value and enrich the habitat resource at a site level due to their size, extent, species composition and other factors. A river and/or other freshwater receptor classified as impoverished and unlikely to support a fish population.

7.3.9 It should be noted that assigning a value to an ecological receptor is often more straightforward for designated areas, due to the fact that the designations in their own right imply a value level in accordance with the scale of the designation. As part of this ecological assessment professional judgment was exercised and other criteria consulted and considered (where applicable) such as the National Guidelines for the Selection of Biological Sites of SSSI, where appropriate, with explanations provided of how a receptor has been valued.

Assessment of Potential Ecological Effects

7.3.10 The magnitude of any impact on VERs was categorised according to the criteria outlined in Table 7.2, which is based on a table presented in the IEEM (2006) guidelines. The concept of integrity refers to coherence of ecological structure and function and includes both temporal and spatial considerations.

7.3.11 The significance of the ecological effect was determined as a function of the sensitivity of the VER (value level) and the magnitude of the impact. The matrix presented in Table 7.2 outlines how these criteria are combined to determine ecological significance. This table is adapted from the matrix provided in IEEM (2006). As outlined above, a degree of professional judgment was exercised to attribute ecological significance within the ranges in the matrix.

Table 7.2 – Ecological Magnitude / Significance Criteria

Magnitude of change/ effect	Change / effect Characterisation	Level of Ecological Value			
		International/ National	Regional/ Authority Area	Local	Less than Local
High	A permanent or long-term effect on the distribution and/or abundance of a habitat, species assemblage/community or population. If negative this would have implications for	Major	Major - Moderate	Moderate - Minor	Minor

Magnitude of change/ effect	Change / effect Characterisation	Level of Ecological Value			
		International/ National	Regional/ Authority Area	Local	Less than Local
	the integrity of the receptor and its conservation status, and if positive would result in an improvement to the conservation status of the receptor.				
Medium	A permanent or long-term effect on the distribution and/or abundance of a habitat, species assemblage/community or population. If negative this would have negligible implications for the integrity of the receptor and its conservation status, and if positive would result in an improvement to the conservation status of the receptor.	Major	Moderate	Minor	Negligible
Low	A short-term reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population and within normal fluctuations observed within the ecology of the receptor.	Moderate - Minor	Minor	Minor - Negligible	Negligible
Negligible	A short-term reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population unlikely to be detectable by monitoring.	Negligible	Negligible	Negligible	Negligible

7.3.12 For the purpose of this assessment, adverse effects which are assessed to be from major to moderate will be considered significant ecological effects). Minor to negligible effects are not assessed to be significant such that bespoke detailed mitigation would be typically required.

Requirements for Mitigation

7.3.13 Following the determination of ecological value and assessment of potential ecological effects, professional judgement was used, coupled with an understanding of the legal requirements of the statute outlined in Section 7.2 (Legislation, Policy & Guidance), to assess and determine the requirements for appropriate mitigation.

Residual Effects

7.3.14 Residual effects have been assessed using the same methodology as the potential effects but taking into consideration the proposed mitigation.

Limitations to Assessment

7.3.15 The survey timing for all required baseline surveys was optimal and as a consequence there are no identified limitations to the baseline information upon which this ecological assessment is based.

7.3.16 In the course of undertaking the baseline surveys of the Proposed Development, access to some areas was not possible, for example, where the plantation forestry was too dense to gain access for survey and/or areas of windblown trees or dense areas of scrub vegetation prevented access. Where this was the case, woodland rides in the area were walked in systematic fashion in order to search for field signs of protected species.

7.4 Consultation

8.1.1 As outlined, statutory consultees and other relevant organisations were consulted as part of EIA Scoping. Responses from the key stakeholders are outlined in Table 7.3.

Table 7.3 – Consultation Responses

Consultee	Response to Consented Development Application	Scoping Response 2017	Applicant Action
DGC (Biodiversity Officer)	Concur with the findings of the Environmental Statement and does not object to the development on the condition that a CDEMP and OEMP are prepared and agreed with the Council and an Ecological Clerk of Works is employed to oversee their implementation.	No response.	This EIA Report contains the same assessment and mitigation measures
SNH	Note that additional bat surveys are required. Note that pre-construction surveys will be undertaken and mitigation will be overseen by an Ecological Clerk of Works. Note the intention to prepare a CEMP and request that measures to protect Polnote and Polneul Burns SSSI should	Do not require additional ecological/ornithological surveys above those already presented in the Consented Development ES and those to be undertaken prior to construction.	No additional surveys have been undertaken for this EIA Report.

Consultee	Response to Consented Development Application	Scoping Response 2017	Applicant Action
	be included alongside measures to protect peat, water quality and aquatic habitats and species. Confirmed that SNH is satisfied that the 2015 survey shows a similar level of activity as the 2011 survey.		
Marine Scotland	No response,	Recommends that up to date baseline surveys of aquatic biota and hydro chemical parameters be undertaken. Suggest that the uninhabited passage of fish is considered in the design of all watercourse crossings. Similar conditions as those imposed on the Consented Development should be imposed on the Proposed Development.	Baseline aquatic biota and hydrochemical surveys will be undertaken prior to construction commencing. The detailed design of watercourse crossings will take into consideration the passage of fish. The Applicant is content for the conditions of the Consented Development to be applied to the Proposed Development.
SEPA	The measures outlined in the ES regarding mitigation for groundwater dependent ecosystems are acceptable.	Maps and assessment of impacts upon groundwater dependent terrestrial ecosystems should be provided. Would prefer a layout which would avoid large scale felling of forestry.	The EIA Report contains the same assessment and proposed mitigation measures for groundwater dependent terrestrial ecosystems as the ES for the Consented Development. The design of the Proposed Development has aimed to avoid large scale felling.
Forestry Commission Scotland	No response	If the Applicant can confirm that the felling and re-planting for the Proposed Development is the same as the Consented Development the Forestry Commission Scotland is comfortable with the proposals.	The Applicant can confirm that the felling and re-planting of the Proposed Development is the same as the Consented Development.

7.4.1 Consultation has also previously been undertaken with non-statutory stakeholders to gain baseline information (refer to Table 7.4).

Table 7.4 – Baseline Consultation

Consultee	Consultation Response	Applicant Action
Botanical Society of British Isles (BSBI)	The Group responded stating that the society held a 10 km data set for the Proposed Development. However, following completion	N/A

Consultee	Consultation Response	Applicant Action
	of the NVC survey it was decided that adequate data had been gathered to inform the assessment.	
Buglife	The Group stated they do not hold any site specific records for the site; however, they noted the site will have potential value for invertebrates and drew attention to the many upland streams that would likely hold interesting assemblages of invertebrates such as the declining upland summer mayfly (*Ameletus inopinatus*) or the endemic subspecies Widow stonefly (*Capnia vidua anglica*) which are only found in upland streams in the UK. Buglife additionally noted that upland moorland can be important for a number of moths such as the Emperor moth (*Saturnia pavonia*) or beetles such as Oil beetle (*Meloe*) species. On the basis of their response, Buglife suggested that an invertebrate survey is undertaken by a competent entomologist to investigate both the aquatic and terrestrial fauna of these sites and that the results of these surveys are used to assist with the drawing up of plans for any development.	Following consultation with SNH an invertebrate survey was not undertaken.
Dumfries and Galloway Amphibian and Reptile Group	The Group responded stating that DGERC should be contacted regarding the existence of previous ecological data for the Proposed Development site and wider Study Area.	Records from DGERC were acquired.
Dumfries and Galloway Badger Group	The group did not provide a response to the consultation request.	N/A
Dumfries and Galloway Bat Group	The Group responded stating that DGERC should be contacted regarding the existence of previous ecological data for the Proposed Development and wider Study Area.	Records from DGERC were acquired.
Dumfries and Galloway Environment Resource Centre	The Resource Centre provided notable flora and fauna data for the Proposed Development and wider Study Area.	The records provided are detailed in Section 7.5 (Baseline).
International Otter Survival Fund (IOSF)	The Group provided a number of records of otter; however, none of the records provided occurred within the Proposed Development and wider Study Area.	N/A
Red Squirrels in South of Scotland	The Group provided records of red squirrel sightings for the south of Scotland including Dumfries and Galloway.	The records provided are detailed in Section 7.5 (Baseline).
Scottish Borders Biological Record Centre	The group did not provide a response to the consultation request.	N/A
Scottish Wildcat Association	Consultation with Jason Hain of the Association confirmed that there are no pure wildcats or high value hybrids within the area around the Proposed Development and highlighted that research strongly indicates that actual wildcats	On the basis of the consultation no assessment of Scottish wildcats was undertaken.

Consultee	Consultation Response	Applicant Action
	/ high value hybrids cannot cross the central belt into southern Scotland. As a consequence, any remnants of past viable populations would have firstly interbred and then cross bred with domestic feral cats.	

7.4.2 Relevant information was also obtained from a review of various on-line information sources, including the UK Biodiversity Action Plan (UKBAP) (1992) and Dumfries and Galloway LBAP (2010).

7.5 Baseline Conditions

Statutory Designated Sites

7.5.1 A single SSSI (Polhote and Polneul Burns) was recorded within and immediately adjacent to the north-west boundary of the Proposed Development site (Figure 7.2a). However, in respect to other statutory designated sites for wildlife and natural heritage, for example, SAC and/or Ramsar site, no further sites were identified within or adjacent to the Proposed Development site. In addition, the Proposed Development is not located partially or wholly within the boundary of a National Park or any local designation for wildlife, for example, Local Nature Reserve.

7.5.2 Table 7.5 presents a summary of the desk study results including details of the identified sites and their respective distances from the Proposed Development

Table 7.5 – Statutory Designated Sites

Site Name	Designation	Distance from Proposed Development	Reason for Designation
Polhote and Polneul Burns	SSSI	Occurs partially within the Proposed Development site	Geological SSSI which lies 4 km west of Kirkconnel in upper Nithsdale. The site is designated for its upper carboniferous (Namurian (Part)-Westphalian) stratigraphy and is not considered further within this chapter.
Fountainhead	SSSI	2.63 km west	Geological SSSI which lies on the northern slopes of Hare Hill approximately 4 km south-east of New Cumnock. The site is designated for its mineralogy and is a former antimony mine and is not considered further within this chapter.
Lagrae Burn	SSSI	2.71 km north	Geological SSSI located 3 km north-west of Kirkconnel in Upper Nithsdale. The site is designated for its upper carboniferous stratigraphy

Site Name	Designation	Distance from Proposed Development	Reason for Designation
			and is not considered further within this chapter.
The North Lowther Uplands / Muirkirk Uplands	SSSI	4.01 km north 4.9 km north-west	Geological/Biological SSSI which collectively also form part of Muirkirk and North Lowther SPA. These sites are designated for their geological importance and blanket bog habitat, and for birds (refer to the Chapter 7).
Back Wood	SSSI	6.97 km east	Biological SSSI which lies 2 km to the north of Sanquhar. The site is designated as one of the best remaining examples in Nithsdale District of semi-natural broad-leaved woodland.
Mennock Water	SSSI	9.15 km east-south-east	Biological SSSI which lies 4 km to the south-east of Sanquhar. The site contains one of the most extensive and varied areas of semi-natural woodland, and one of the best examples of wet meadow and species-rich upland grassland within Nithsdale District.
Nith Bridge	SSSI	9.92 km north-west	Geological SSSI which lies 10 km to the south-east of Cumnock provides an important exposure in the glacial deposits of south-west Scotland and is a key reference site.
Upper Nithsdale Woods	SAC	The SAC is divided into two sites with the closest site 6.94 km to east. This SAC covers same areas as Back Wood and Mennock Water SSSIs	This SAC is designated for Annex 1 habitats Tilio-Acerion forest on slopes, screes and ravines. The SAC is located on the River Nith and its tributaries and represents Tilio-Acerion forests in south-west Scotland. The component parts of the SAC are small but are of Regional importance due to the highly fragmented nature of remnant semi-natural woodland in this part of Scotland. The woods are ash (*Fraxinus excelsior)* dominated with a dense hazel (*Corylus avellana*)

Site Name	Designation	Distance from Proposed Development	Reason for Designation
			understorey, and a rich herbaceous ground flora characteristic of the habitat type.

Non-Statutory Designated Sites

7.5.3 The Proposed Development does not occur within the boundary of any known non-statutory designated site. However, consultation with DGERC established the presence of two Red Squirrel Priority Woodlands within the wider Study Area at High Cairn and Euchanhead. These are located 625 m to the west and 916 m to the south of the Proposed Development respectively. Consultation also identified the presence of the North Lowther Hills Important Bird Area approximately 2.5 km to the north of the Proposed Development (Figure 7.2b). The presence of these designated sites and the significance of effects is discussed in the Ornithology Chapter (Chapter 8).

Ancient Woodland Inventory

7.5.4 Category (1) 'ancient woodlands (of semi-natural origin)' appear as semi-natural woodlands on maps from 1750 or the mid-1800s, or c.1860 as part of the Ordnance Survey (OS) First Edition maps. These sites include woodlands that were missed by the Roy Survey or may have arisen between 1750 and 1860.

7.5.5 Category (2) 'long-established woodlands (of plantation origin)' appear as plantations on maps from 1750 or on maps from c.1860 as part of the OS First Edition maps. These sites have been continuously wooded to the present day, and some may have developed semi-natural characteristics.

7.5.6 No areas of ancient woodland were identified within or immediately adjacent to the Proposed Development (refer to Figure 6.7b). However, 127 areas of ancient woodland were identified within the wider study area (up to 10 km from the boundary of the Proposed Development), and of these the following were recorded within 500 m of the Proposed Development:

7.5.7 Two Category 1 Woodlands (un-named woodland and Rig Burn) were recorded 521 m and 134 m to the north of the Proposed Development respectively; and

7.5.8 Three Category 2 Woodlands (un-named woodland, Croserig Plantation and part of Libry Moor Plantation) were recorded 314 m to the south-east, 310 m south-east and 134 m to the north of the Proposed Development respectively.

Biodiversity Action Plan Species and Habitats

United Kingdom Biodiversity Action Plan (UKBAP)

7.5.9 The UKBAP was created by the United Kingdom's Government Bodies in 1994 in response to the Convention on Biological Diversity and describes the biological resources and biodiversity of the UK in addition to providing detailed objectives and plans for conservation of these resources. Action Plans were created for the UK's most threatened species and habitats in order to provide protection and to aid in their recovery; these are detailed within the UKBAP Priority List. This list includes 1150 species and 65 habitats which were selected

under specific criteria based on international importance and international obligations, rapid decline, high risk and importance for key species (habitats only).

7.5.10 In 1995, 116 Species Action Plans (SAPs) and 14 Habitat Action Plans (HAPs) were produced; additional SAPs and HAPs were produced in 1998 and 1999 and were divided into a further six volumes. Site specific SAPs and HAPs can be found in detail within the Joint Nature Conservation Committee (JNCC) website (wwww.jncc.gov.uk).

Dumfries and Galloway Local Biodiversity Action Plan

7.5.11 The Dumfries and Galloway LBAP was first published in 2009 and outlines the key strategies, targets and goals for protecting and enhancing the region's biodiversity. The LBAP contains a number of key overall aims, central objectives and actions, local habitats action plans and species statements.

7.5.12 Of relevance to the Proposed Development are habitat action plans for River Headwaters, Upland Springs and Flushes, Fens, Raised Bogs, Blanket Bogs, Purple Moor Grass and Rush Pasture, Calcareous Grasslands, Neutral Grasslands, Acid Grasslands, Inland Rock Outcrops, Upland Heaths, Native Woods, Scrub Woods, Montane Scrub, Conifer Plantations, Broadleaved and Mixed Plantations, Forest Roads and Rides, Forest Ponds, Agriculturally Improved Grasslands, and Traditional Field Boundaries.

7.5.13 In terms of species (referred to as species statements) those of relevance to the Proposed Development include:

- Fungi and Lichens – The purpose of the plan is to manage fungi and lichen habitats appropriately, which includes minimum disturbance to soils, minimising nutrient enrichment and pollution, and retaining a full range of dead wood habitats. The plan highlights that habitat management is the only secure, long term way of ensuring the conservation of most species.
- Non-Flowering Plants – The plan's intent is to raise awareness of the importance and sustainable uses of non-flowering plants through training ecologists and amateur naturalists in the identification and recording of non-flowering plants, and encourage non-flowering plant experts to visit and record in Dumfries & Galloway. The plan notes that the requirements of non-flowering plants should be taken into account in habitat management works, which should reduce, and ultimately stop, the use of horticultural peat.
- Flowering Plants – The purpose of the plan is to raise the awareness of the importance and sustainable uses of flowering plants, and increase the recording of flowering plants in the region by training people in identification and recording methods, utilising the DGERC. The plan further recommends an amendment to the management of road verges to recognise their important contribution to plant diversity and the attractiveness of the area. In addition, the plan recognises the importance of encouraging participation in the government-funded agri-environment schemes, and promotes developers, land managers and planners to recognise the importance of biodiversity and develop a unified approach to the natural environment.
- Invertebrates – The plan requires stakeholders to take the requirements of invertebrates into account in habitat management works. The plan recommends the management of sites to create a mosaic of habitats and a varied vegetation structure

and training of ecologists and amateur naturalists in the identification and recording of invertebrates, and encourage entomologists to visit and record in Dumfries & Galloway.

- Fishes – The purpose of the plan is to improve habitat management of river catchments and coastal areas. This should include habitats that are some distance from water, but may have an impact. The plan notes that it is important to improve fisheries management to ensure that decisions are taken that benefit a wide range of species and the wider environment, rather than just the target fish species, and to encourage fisheries managers and anglers to take all necessary precautions to prevent the introduction or transfer of diseased fish.
- Reptiles and Amphibians – The plan recommends the creation of ponds and wetlands in gardens, farms and forests. Together with associated habitat management, these significantly boost local populations of some amphibians. The plan also outlines a need to raise the public profile of amphibians and reptiles, and their role in ecosystems.
- Birds and Mammals – The purpose of the plan is to promote the creation of new habitats such as wetlands and native woodlands, as most bird species respond to habitat creation much quicker than other species groups. Stakeholders are further encouraged to participate in the government-funded agri-environment schemes, and encourage public participation in web-based surveys such as RSPB's Garden BirdWatch, BTO surveys or BBC surveys.

7.5.14 Of relevance to the Proposed Development are species action plans for Atlantic salmon (*Salmo salar*), European eel (*Anguilla Anguilla*), adder (*Vipera berus*), water vole, common pipistrelle (*Pipistrellus pipistrellus*), brown long-eared bat (*Plecotus auritus*), whiskered bat (*Myotis mystacinus*), noctule bat (*Nyctalus noctula*), soprano pipistrelle (*Pipistrellus pygmaeus*), Daubenton's bat (*Myotis daubentonii*), Natterer's bat (*Myotis nattere*ri), Leisler's bat (*Nyctalus leisleri*), red squirrel, brown hare (*Lepus europaeus*), otter, and badger.

7.5.15 Detailed descriptions of any site specific habitat and species action plans can be found within the following website: www.dumgal.gov.uk/index.aspx?articleid=1978.

Scottish Biodiversity List (SBL)

7.5.16 The Scottish Biodiversity List (SBL) was created by Scottish Ministers in 2005 in order to satisfy the requirements under Section 2(4) of the Nature Conservation Act (Scotland) 2004 and assist public bodies in carrying out conservation of biodiversity and to provide the general public with information regarding conservation within Scotland. The list contains habitats, plants and species which are deemed to be of principal importance within the Scottish population and meet the Social Criteria (Blake, 2005), defined by the following: "important for any reason including for conservation reasons, for their own personal enjoyment, as economically important, simply their favourites, as symbols of Scottish identity or just that they are nice to see."

7.5.17 The SBL contains a total of 177 land based habitat types, 109 marine habitats, 20 terrestrial mammal species, three herpetofaunal species, 93 species of bird, 289 invertebrate species, ten freshwater fish, 236 vascular plants, 208 Bryophytes, eight Charophytes, 176 fungi species, 523 lichen species and 240 freshwater algae species. Species details including a list of scientific criteria and reasoning for inclusion to the list can be located within the Scottish Biodiversity List: Technical Report (2005).

Habitats and Vegetation

Site Description

7.5.18 The Proposed Development lies south of the A74, approximately 1.5 km south-west of Kirkconnel, Dumfries and Galloway. The site is bisected by the steep, sometimes gorge-like Polneul valley, most of which lies within the site boundary and is designated as a SSSI. The Polneul valley is the most botanically rich area within the site and comprised steep gorges, rock exposures and thin soils supporting heath and grassland communities.

7.5.19 The site itself is very typical for this geographic area, supporting a limited range of modified habitats. The predominant habitat on the site is modified bog on the upper hill with some areas of intact bog remaining in the wettest areas.

Desk Study

7.5.20 Information regarding priority plant species was retrieved from the National Biodiversity Network (NBN) Gateway for the 10 km Grid Squares which coincide with the Proposed Development (NS61, NS71, NS60 and NS70); however, only those which have been recorded within the last 10 years were considered.

7.5.21 One recent species of National and Regional value was returned during the search (lesser butterfly-orchid (*Platanthera bifolia*)) which was identified within 10 km north-west of the Proposed Development boundary and is listed as a priority species within the UKBAP.

Extended Phase 1 Habitat Survey

7.5.22 Fifteen Phase 1 Habitat classes were recorded by the survey within the site and wider Study Area. The type and extent of habitats recorded by the survey is presented in Figure 7.3. A baseline description of the dominant habitat types recorded is provided below; referenced target notes are presented in Appendix 7.3, in addition to a botanical species list.

Woodland, Scrub and Scattered Trees

7.5.23 A large section of coniferous plantation woodland (A.1.2.2) (New Libry Moor Plantation) was recorded within the north-east section of the Proposed Development. This habitat was dominated by dense semi-mature sitka spruce (*Picea sitchensis*) with very little understory vegetation. Although no more coniferous plantation was recorded within the Proposed Development boundary, further coniferous woodland was identified within the wider Study Area adjacent to the eastern, south-eastern and southern boundary of the Proposed Development, which were noted to be similar in characteristic to New Libry Moor Plantation.

7.5.24 Throughout the coniferous plantation woodland a number of woodland rides were recorded which supported ungrazed rank vegetation comprising marshy grassland. These habitats are described in further detail below.

7.5.25 In addition to the large areas of conifer plantation described above, a number of small stands of broadleaved plantation woodland were recorded by the survey. These stands were noted to have been recently planted (owing the presence of poly-tubes) in particular along the western boundary of New Libry Moor Plantation and in the vicinity of Polneul Burn, in addition to other isolated areas throughout the Proposed Development.

7.5.26 Other isolated stands of scattered mature woodland/scrub were recorded throughout the Proposed Development and were mainly recorded in association with gorges. The stands were dominated birch (*Betula*) species.

Grassland, Marsh and Heathland

7.5.27 Marshy grassland (B5) habitats were variable throughout the site and due to the effects of grazing, drainage and other management practices commonly formed a mosaic with other habitat types such as acid grassland, semi-improved acid grassland, semi-improved grassland and wet modified bog. However, marshy grassland was identified as a commonly occurring habitat type throughout the Proposed Development.

7.5.28 The western part of the site which lies to the west of Polnuel Burn was dominated by soft rush (*Juncus effuses*) and sharp-flowered rush (*Juncus acutifloris*). However, within this area sections of marshy grassland were identified within close proximity to the southern boundary of the site and eastern edge of the SSSI, which is differentiated by the inclusion of areas of wet modified bog. These habitats were typically sphagnum poor but support other blanket bog species such as hare's-tail cotton-grass, various billberry (*vaccinium*) species and occasionally cross-leaved heath (*Erica tetralix*).

7.5.29 The SSSI was largely classified as comprising marshy grassland with a mosaic of both acid grassland and bracken habitats. Within the extent of the SSSI, marshy grassland habitats were largely recorded within flatter areas of the landscape, with acid grassland on the sloping banks and water course edge. Within these grassland areas, species recorded included wavy-hair grass (*Deschampsia flexuosa*), tormentil (*Pontentilla erecta*), heath bedstraw (*Galium saxatile*) and mat-grass (*Nardus stricta*).

7.5.30 The eastern part of the site which lies to east of Polneul Burn largely comprised a mosaic of marshy grassland and semi-improved neutral grassland habitats with a noted transition towards a mosaic of semi-improved acid grassland moving southwards through the site, in particular, within the vicinity of the northern slopes of White Hill where swards of wavy-hair grass and tormentil became increasingly abundant. Two large areas of juncus dominated marshy grassland habitats were also identified at the southern slopes of White Hill and along the southern boundary of the site.

7.5.31 One area of acid grassland (B1) was identified within the Proposed Development which was recorded along the eastern slopes of White Hill.

7.5.32 Two small areas of semi-improved neutral grassland (B2.2) were recorded in close proximity to the south-east boundary of the site. One of the areas was located on the slopes of a small hill (the peak of this hill was intensively grazed by livestock) which was classified as poor semi-improved neutral grassland as it had little botanical interest.

7.5.33 A further area of marshy grassland / neutral grassland mosaic was recorded in the north-east of the site adjacent to New Libry Moor Plantation.

Mire and Bog

7.5.34 The section of the site east of Polneul Burn was largely comprised of blanket bog (E1.6.1), wet modified bog (E1.7) dry modified bog (E.1.8), and overall was the most dominant habitat type recorded within the Proposed Development. Two additional sections were located west of Polneul Burn, at the peak and western slopes of White Hill. Within these areas hare's-tail cotton-grass (*Eriophorum vaginatum*) was typically the most abundant species recorded together with sphagnum species, commonly *Sphagnum magellanicum*, *S. papillosum* and *S. capillifolium* which were typically the principal peat forming species within this habitat category. Bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigrum*), cranberry (*Vaccinium oxyoccos*) and cross-leaved heath were also frequently observed, with occasional

presence of species such as bog asphodel (*Narthecium ossifragum*) and heath milkwort (*Polygala serpyllifolia*).

7.5.35 Given the ecological value of the above mosaic additional NVC surveys were undertaken to provide a higher level of detail regarding the floristic composition of this habitat; the results of the NVC surveys are presented and discussed in more detail below.

Acid/Neutral Flush (E2.1)

7.5.36 Flushes of juncus species and sphagnum species were occasionally identified on the bank slopes of various water courses that were recorded throughout the Proposed Development; however, it should be noted that only sizeable areas were mapped. The most notable flush area was identified on a tributary water course to the south-east of Polneul Burn.

Tall Herb and Fern

7.5.37 Areas of bracken (*Pteridium aquilinum*) were recorded throughout the site, particularly where dryer conditions were prevalent and were typically associated with mosaics of marshy/acid grassland.

Running / Standing Water

7.5.38 The site is crossed by a network of field drains and watercourses. The largest of these comprises the Polneul Burn which as reported bisects the site from south to the north and is fed by a number of substantial tributaries including Red Sike and Macan's Burn. The botanical composition of these watercourses and other field drains throughout the Proposed Development is reported above.

7.5.39 In addition to watercourses, a small duck flighting pond was recorded to the south-west of New Libry Moor Plantation, which is fed by two recently maintained field drains that flow into the pond from the south-west. The pond and its margins were noted to have a poorly developed flora comprising soft rush which is of limited botanical value.

Boundary Features

7.5.40 Stone walls were recorded occasionally within the site, most noticeably in the south of the site which formed the southern boundary to the Proposed Development. The remainder of the site was crossed by a network of post and wire fences.

Habitat Areas

7.5.41 Table 7.6 presents the estimated total area of each Phase 1 Habitat category recorded within the Proposed Development. These summary statistics are presented to give context to the assessment of habitat loss presented in Section 7.8 (Potential Ecological Effects).

Table 7.6 – Estimated Total Area and Percentage Area of Phase 1 habitat Categories within the Proposed Development

Habitat Code	Phase 1 habitat description	Total Area (m^2)	Total Area (ha)	Percentage Area (%)
A1.1.2	Broadleaved Plantation	59284.92	5.92	1.23%
A1.2.2	Coniferous Plantation	1044651.67	104.47	21.65%
A1.3.1	Semi-natural Mixed Woodland	9452.50	0.95	0.20%
A3.2	Scattered Coniferous Trees	5201.57	0.52	0.11%
A3.3	Scattered Mixed Trees	5853.42	0.59	0.12%
B1.1	Unimproved Acid Grassland	165395.67	16.54	3.43%

Habitat Code	Phase 1 habitat description	Total Area (m^2)	Total Area (ha)	Percentage Area (%)
B1.2	Semi-improved Acid Grassland	7305.49	0.73	0.15%
B2.1	Unimproved Neutral Grassland	10261.78	1.03	0.21%
B2.2	Semi-improved Neutral Grassland	132182.7	13.22	2.74%
B4	Improved Grassland	457935.19	45.79	9.49%
B5	Marshy Grassland	1267348.67	126.73	26.26%
B6	Semi improved Grassland	37466	3.75	0.78%
C1.1	Continuous Bracken	58776.39	5.88	1.22%
C3.1	Tall Ruderal	22628.30	2.26	0.47%
D5	Dry Heath/Acid Grassland Mosaic	17160.15	1.72	0.36%
E1.6.1	Blanket Bog	197603.73	19.76	4.10%
E1.7	Wet Modified Bog	26668.57	2.67	0.55%
E1.8	Dry Modified Bog	1101447.11	110.14	22.83%
E2.1	Acid/Neutral Flush	73787.08	7.38	1.53%
G1	Standing Water (pond)	1144.90	0.11	0.02%
G2	Running Water (rivers and ditches)	54758.56	5.48	1.14%
G2.2	Mesotrophic running water	54753	5.48	1.14%
J1.2	Amenity Grassland	2872.92	0.29	0.06%
J3.6	Buildings	446.27	0.04	0.01%
J4	Bare Ground	10808.45	1.08	0.22%

National Vegetation Classification (NVC) Surveys

7.5.42 An NVC survey was undertaken throughout the Proposed Development (excluding the area of coniferous plantation woodland comprising New Libry Moor Plantation due to its low ecological value) in recognition of the potential presence of rare botanical species and to provide greater resolution in respect to species composition within higher value habitats identified by the Extended Phase 1 Habitat survey.

Overview

7.5.43 As outlined above, the predominant habitat within the site comprised modified bog, the majority of which was recorded on the upper part of the site with some areas of intact bog recorded in the wettest areas of the site. All of the dry modified blanket bog falls within the M20 community which was dominated by hare's tail cotton grass, although the quality of this community varied throughout the site (most likely in response to differences in peat depth). Cotton grasses are a peat-forming species, and therefore this M20 community could be classed as active blanket bog which is an Annex 1 habitat of the EU Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive, 1992). However, nearly all the bog surface was regularly covered by moor grips (drainage channels) and therefore it is unlikely this habitat qualifies as an Annex 1 habitat due to an absence of forming peat.

7.5.44 Species-poor acid flushes dominated by rushes Juncus species punctuated the modified bog habitats which occurred above expanses of rush-pasture. The rush pasture was botanically limited, verging on species-poor. To the west of the Polneul valley, on the lower slopes, the rush dominated vegetation has been subject to a great level of improvement/modification and comprised a species-poor sward with tufts of rushes.

7.5.45 Habitats likely to comprise or contribute towards Ground Water Dependant Terrestrial Ecosystems (GWDTEs) were considered during the survey. Issues related to GWDTEs are address within Chapter 9: Hydrology.

7.5.46 A total of 11 NVC communities were recorded by the survey, these comprised:

- Neutral Grassland:
  - MG10a *Holco-Juncetum effusus* rush-pasture.
- Acid Grassland:
  - U6 *Juncus squarrosus-Festuca ovina* grassland;
  - U5a *Nardus stricta-Galium saxatile* grassland, species-poor sub community; and
  - U5b *Nardus stricta-Galium saxatile* grassland, *Agrostis canina-Polytrichum* commune sub community.
- Marshy grassland:
  - M23a *Juncus effusus/acutiflorus-Galium palustre* rush-pasture; and
  - M25a *Molinia caerulea-Potentilla erecta* mire.
- Acid Flush:
  - M6c *Carex echinata-Sphagnum recurvum/auriculatum* mire, *Juncus effusus* sub community ; and
  - M6d Carex *echinata-Sphagnum recurvum/auriculatum* mire, *Juncus acutiflorus* sub community.
- Dry Modified Bog and Blanket Bog
  - M20 *Eriophorum vaginatum* mire.
- Dry Heath:
  - H10c *Calluna vulgaris-Erica cinerea* heath, *Festuca ovina-Anthoxanthum odoratum* sub-community.
- Other Communities:
  - U19 *Thelypteris limbosperma-Blechnum spicant* community.

7.5.47 A full description of the NVC baseline is provided below and is shown in Figure 7.4a-b, target notes and a botanical species list is presented in Appendix 7.4.

Neutral Grassland

MG10a Holco-Juncetum effuses rush-pasture

7.5.48 MG10a was often recorded as a mosaic with purple moor-grass (*Molinia caerulea*) grassland and areas of acid flush in the north of the site, to the west of the Polneul Burn. The community was represented as neutral grassland in terms of Phase 1 nomenclature and is likely to have resulted due to modification of acid/marshy grassland habitats. Within the site, these stands were especially species-poor and may have been modified through past burning or ploughing. Tufts of soft rush dominate in a patchwork of creeping buttercup (*Ranunculus repens*), Yorkshire fog (*Holcus lanatus*) with scattered sheep's sorrel (*Rumex acetosa*), cuckooflower (*Cardamine pratensis*), creeping bent (*Agrostis stolonifera*) and

tufted hair grass (*Deschampsia cespitosa*) with areas of bare ground and poor bryophyte cover.

Acid Grassland

U6 Juncus squarrosus-Festuca ovina grassland

7.5.49 This community is present in small stands on drier areas rising on raised topography or marking the zone of thinning peat between dry grassland and peaty habitats. Heath rush (*Juncus squarrosus*) dominated this community with varying amounts of sheep's fescue (*Festuca ovina*). Often the stands contained some purple moor grass and/or hare's tail cotton grass, which ran though this community tending towards M25 and M20. Heath bedstraw was frequent and tormentil was scattered as was bilberry and common sedge (*Carex nigra*). Heath woodrush was notably frequent in addition to common haircap moss (*Polytrichum commune*). The main sub community was noted to be U6d (*Agrostis capillaris-Luzula multiflora*).

U5a Nardus stricta-Galium saxatile grassland, species-poor sub community

7.5.50 This grassland community was present as unimproved acid grassland on the steep dry valley slopes with the largest stand on the upper Polneul burn which is south-facing, dry and consequently was more species-rich.

U5b Nardus stricta-Galium saxatile grassland, Agrostis canina-Polytrichum commune sub community

7.5.51 U5b sub community was recorded on the steep, north-facing valley sides and comprised a mix of mat grass and common haircap moss, with bilberry, wavy hair grass, sweet vernal grass (*Anthoxanthum odoratum*), tormentil and heath bedstraw.

Marshy Grassland

7.5.52 Marshy grassland was common throughout the site and was generally considered fairly average to species-poor with the exception of stands of M23a viewed in the upper Polneul valley, which contained some areas of flushing and mild base input where species such as flea sedge (*Carex pulicaris*), ribwort plantain (*Plantago lanceolata*), selfheal (*Prunella vulgaris*), fairyflax (*Linum catharticum*) and common sedge were recorded, in additional to the usual suite of indicator species for this community type.

M23a Juncus effusus/acutiflorus-Galium palustre rush-pasture

7.5.53 This community was the most widespread type of marshy grassland recorded within the site and was quite variable; however, the majority of areas were considered very ordinary and without any particular merit. Sharp flowered rush dominated (over large areas) with soft rush and tufted hair grass. Yorkshire fog and red fescue (*Festuca rubra*) were not frequently recorded and marsh bedstraw (*Galium palustre*) was present but was noted to be patchily distributed. Species such as broad-leaved dock (*Rumex obtusifolius*) and sheep's sorrel were frequent; however, fen species marking out the more rich stands of M23a were virtually absent, for example, ragged robin (*Lychnis floscuculi*), meadowsweet (*Filipendula ulmaria*), marsh marigold (*Caltha palustris*), common valerian (*Valerian officinale*) and bugle (*Ajuga reptans*).

M25a Molinia caerulea-Potentilla erecta mire

7.5.54 Small areas of M25 were present where the peat was recorded to be less than 0.5 m deep; however, these have been mapped as marshy grassland.

Acid Flush

7.5.55 This habitat was frequently recorded throughout the site, in particular along moor grips and in wetter areas of the rush pasture where *Sphagnum* species formed hummocks in the rushes.

M6c Carex echinata-Sphagnum recurvum/auriculatum mire, Juncus effusus sub community

7.5.56 Soft rush dominated this community in addition to Yorkshire fog and tufted hair grass, which were frequent suggesting a transition to M23. The sphagnum component comprised mounds of Sphagnum palustre with areas of S. fallax together with star sedge (*Carex echinata*) and marsh violet (*Viola palustre*).

M6d Carex echinata-Sphagnum recurvum/auriculatum mire, Juncus acutiflorus sub community

7.5.57 Sharp flowered rush dominated this sub community which was noted to be slightly more diverse than the M6c. Purple moor grass was regularly noted in addition to sharp flowered rush and species such as marsh violet, which was more frequent in amongst the sphagnum layer.

Dry Modified Bog and Blanket Bog

7.5.58 Modified bog formed the largest stands of vegetation within the site, particularly to the east of the Polneul Burn.

M20 Eriophorum vaginatum mire

7.5.59 M20 accounted for virtually all of the modified bog habitats within the site. The surveys noted a degree of variability within this community, with some stands being extremely species-poor while other stands have some bog character remaining. These latter stands tended to be located on the flatter/wetter areas of deeper peat. Hare's tail cotton grass dominated in tussocks throughout with a very reduced heath component of cross-leaved heath and heather (*Calluna vulgaris*) if present, and frequently sprouts of bilberry coming through on the tussocks; cranberry persisted in some areas.

7.5.60 Sphagnum cover was generally poor, with S.fallax and S.subnitens noted to occur most frequently while the indicators of high value bog habitat (*S.capillifolium and S.papillosum*) were restricted to the wetter areas. Moor grips cut through all these areas of bog which were generally dry and hard-grazed. Better areas of blanket bog were mapped as mosaics with intact blanket bog and are commented upon in target notes.

Dry Heath

H10c Calluna vulgaris-Erica cinerea heath, Festuca ovina-Anthoxanthum odoratum sub-community

7.5.61 Small stands of this community were recorded on the steep valley slopes and were dominated by heather with lesser amounts of bell heather (*Erica cinerea*) and a diverse mix of grasses and small herbs including: common bent, mat grass, thyme (*Thymus polytrichus*), bird's foot trefoil (*Lotus corniculatus*), tormentil and heath bedstraw.

Other Communities

U19 Thelypteris limbosperma-Blechnum spicant community

7.5.62 U19 was recorded in small areas on the steep valley slopes and was represented by open stands of lemon scented fern (*Oreopteris limbosperma*) with lesser amounts of hard fern (*Blechnum spicant*) which were relatively species rich and appeared as stands of fern with a grass-heath matrix. Species recorded included hairy woodrush (*Luzula pilosa*), wavy hair grass, tormentil, heath bedstraw, heather, sheep's fescue, bilberry, milkwort (*Polygala*) species and the bryophytes *Rhytidiadelphus loreus*, *Pleurozium schreberi*, common haircap moss, *Dicranum scoparium* and sphagnum species.

Protected Species

Badger

7.5.63 Baseline information in respect to badgers is presented in Confidential Appendix 7.5 and Confidential Figure 1.

Otter

Consultation and Desk Study

7.5.64 Consultation with Dumfries and Galloway Environmental Records Centre (DGERC) (who hold records of protected species for the Dumfries and Galloway authority area) did not identify any historic records of otter (including road traffic accidents) from within the site or wider Study Area.

7.5.65 A search of NBN Gateway and SNHi provided records of otter for a number of freshwater catchments throughout the Nith District; however, none of the returns provided were recorded within the last 10 years and of these, no records were recorded within the site. In respect to records recorded within the wider Study Area, the nearest record was recorded 650 m to the south of the site along the upper reaches of the Kello Water.

Habitat Assessment

7.5.66 An assessment of suitable habitat within the Proposed Development and wider Study Area identified an extensive network of burns, streams and field ditches which collectively form part of the River Nith catchment located to the north of the site. The River Nith is classified by SEPA's River Water Quality Classification as being A2 (Good) and as confirmed by the fisheries habitat survey, supports a range of regionally important population of salmonids and other fish species which present a highly valuable resource to otters in terms of foraging and provision of resting places.

7.5.67 In addition, the network of freshwater habitats within the Proposed Development site collectively provide a valuable link between a number of watercourses within the wider River Nith catchment to the north and south of the Proposed Development.

Field Survey

7.5.68 The otter surveys identified evidence of otter in the form of resting places and spraint (faeces) along four watercourses (Polneul Burn, Polhote Burn, Polbroc Burn and Polmeur Burn) which occur within the site and wider Ecological Study Area.

7.5.69 In respect to spraint, the heaviest concentration of marking was recorded along the Polneul and Polmeur Burns which form tributaries to the River Nith which flows along the Nith Valley

to the north of the Proposed Development. Further evidence of sprainting was recorded along the Polhote Burn where one single spraint site was recorded in addition to one location along the Polbroc Burn where it enters the Polbroc Plantation. In all instances both fresh and old spraint were recorded suggesting frequent use of the above watercourses by otter populations.

7.5.70 A total of seven resting places were recorded throughout the site and Wider Ecological Study Area by the surveys comprising two couches, two holts, one hover and two temporary resting places. The largest number of resting places (comprising two couches and one single holt) were recorded along the Polneul Burn while one hover and two temporary shelters were recorded along the Polhote Burn.

7.5.71 The presence of the River Nith catchment to the north of the Proposed Development and Kello Water (the nearest significant watercourse to the south of the site) coupled with the greatest concentration of field signs along the Polneul Burn suggests possible overland passage of otter from the Polneul Burn to the Kello Water as part of wider use of the Nith catchment by otters. Consequently, the Polneul Burn stands as an important watercourse for otters based on the number of resting places and spraint recorded.

7.5.72 The results of the surveys are presented in Table 7.7 below and are shown in Figure 7.5.

Table 7.7 – Otter Survey Results

ID	Date	Grid Reference	Location	Feature	Description
1	18/01/12	NS 69607 12186	Polneul Burn	Spraint	One recent spraint on boulder; to the west of the burn.
2	18/01/12	NS 69581 12148	Polneul Burn	Spraint	One recent spraint on boulder; to the east of the burn.
3	18/01/12	NS 69540 12109	Polneul Burn	Spraint	One fresh spraint; on east of burn.
4	18/01/12	NS 69562 11959	Polneul Burn	Spraints, run and resting place (couch)	Staining evident with one fresh and four recent to old spraints, together with scratch marks and odour. A well-used shelter with overhang and well used run was recorded on the west of the burn.
5	18/01/12	NS69586 11893	Polneul Burn	Spraints, footprints and resting place (hover)	One fresh and one recent spraint, in addition to recent footprints and odour on the west of the burn.
6	18/01/12	NS 69600 11824	Polneul Burn	Spraint	Fresh spraint on east side of the burn. Suitable habitat for resting up.

ID	Date	Grid Reference	Location	Feature	Description
7	18/01/12	NS 69504 11721	Polneul Burn	Spraint and resting place (hover)	Signs recorded to the west of the burn. Staining was evident in addition to the area appearing to be well used. Two fresh and four old spraints were recorded in addition to footprints. The recorded holt had a narrow entrance with secure, out-of-reach shelter at back of resting place.
8	18/01/12	NS 69591 11676	Polneul Burn	Spraint	One fresh spraint and suitable habitat for resting up.
9	18/01/12	NS 69604 11550	Polneul Burn	Spraint	Fresh spraint on boulder.
10	18/01/12	NS 69710 11371	Polneul Burn	Spraint	Fresh spraint on boulder.
11	18/01/12	NS 69694 11330	Polneul Burn	Spraint	Fresh and old spraint.
12	18/01/12	NS 69622 11285	Polneul Burn	Spraint	Fresh spraint although no staining evident.
13	18/01/12	NS69606 11174	Polneul Burn	Spraint	Very old spraints with the same amount of staining under two rocks.
14	18/01/12	NS 69669 11073	Polneul Burn	Spraint	Fresh spraint on boulder.
15	18/01/12	NS 69727 10623	Polneul Burn	Spraint	Fresh spraint.
16	18/01/12	NS 69711 10365	Polneul Burn	Spraint	Old spraint.
17	18/01/12	NS 69722 10385	Polneul Burn	Spraint	Overhang of suitable habitat for resting up with staining and one recent and three old spraints.
18	18/01/12	NS 69661 10250	Polneul Burn	Spraint and resting place (couch)	Probable resting up site.
19	18/01/12	NS 69405 09625	Polneul Burn	Spraint	Fresh spraint.
20	19/01/12	NS 69549 11884	Polneul Burn Tributary	Spraint	Fresh spraint on tributary to burn.
21	19/01/12	NS 69625 11519	Polneul Burn Tributary	Spraint	Fresh spraint on tributary to burn.
22	19/01/12	NS 69551 11255	Macan's Burn (a tributary to Polneul Burn)	Spraint and resting place (couch)	Fresh spraint approximately 10 m upstream on south bank of tributary to Polneul Burn. Shelter present in the form of overhang with fresh spraints,

ID	Date	Grid Reference	Location	Feature	Description
					staining and small carnivore skull.
23	19/01/12	NS 68959 10804	Macan's Burn (a tributary to Polneul Burn)	Spraint	Fresh spraint on grass mound on tributary to burn.
24	19/01/12	NS 69715 10627	Red Sike (a tributary to Polneul Burn)	Spraint	Fresh spraint by boulder on bank of burn.
25	28/02/12	NS 69100 11984	Polhote Burn	Spraint	Old spraint under overhanging rock; west side of the burn.
26	28/02/12	NS 68944 11482	Polhote Burn	Spraint	Old spraint on boulder in centre of the burn.
27	28/02/12	NS 68872 11380	Polhote Burn	Spraint	Old spraint on boulder in centre of the burn.
28	28/02/12	NS 68815 11309	Polhote Burn	Spraint	Fresh spraint on boulder on east side at bottom of waterfall.
29	28/02/12	NS 68600 10808	Polhote Burn	Spraint	Recent, large spraint on west side of grass bank.
30	29/12/12	NS 70526 10970	Polmeur Burn	Spraint	Four recent to old spraints on a boulder at east side of burn.
31	29/02/12	NS 70426 10909	Polmeur Burn	Spraint	Recent spraint with fox scat on top of a boulder at west side of burn.
32	29/02/12	NS 70376 10904	Polmeur Burn	Spraint	Old spraint on boulder on west side of burn.
33	29/02/12	NS 70266 10775	Polmeur Burn Tributary	Spraint	Fresh spraint on a mound of washed up banking in centre of burn.
34	29/02/12	NS 71500 10249	Polbroc Burn	Spraint	Fresh, recent and old spraints under bridge.
35	01/03/12	NS 71380 11353	Polmeur Burn	Spraint	Fresh spraint on northern track leading through woodland. Spraint contained undigested frog spawn.
36	01/03/12	NS 71008 11452	Polmeur Burn	Spraint	Old spraint and likely anal jelly on west side of the burn bank
37	01/03/12	NS 71015 11398	Polmeur Burn	Spraint	Old spraint on boulder on west side of the burn.

ID	Date	Grid Reference	Location	Feature	Description
38	01/03/12	NS 71020 11377	Polmeur Burn	Spraint	Old spraint on boulder on west side of the burn.
39	01/03/12	NS 70967 11355	Polmeur Burn	Spraint	Two old spraints on boulder on west side of the burn.
40	01/03/12	NS 70914 11285 NS 70911 11283	Polmeur Burn	Slide and resting place (holt)	Otter holt and slide. Two holes were recorded which appeared to be well used.
41	01/03/12	NS 70826 11205	Polmeur Burn	Spraint	Old spraint on east side of the burn on boulder.
42	01/03/12	NS 70817 11199	Polmeur Burn	Spraint	Old spraint on east side of the burn on boulder.
43	01/03/12	NS 70791 11176	Polmeur Burn	Spraint	Fresh spraint and staining on boulder on west side of the burn.
44	01/03/12	NS 70790 11195	Polmeur Burn	Resting place (hover)	Possible temporary shelter due to evidence of recent digging at the very back of an overhanging rock. However, no spraint was recorded.
45	01/03/12	NS 70781 11157	Polmeur Burn	Resting place (couch)	Temporary shelter recorded under rock overhang at east side of burn. Recent spraint was present.
46	01/03/12	NS 70775 11154	Polmeur Burn	Resting place (hover)	Temporary shelter with old spraint under rock overhang.

Determination as Valued Ecological Receptor (VER)

7.5.73 Due to the identification of otter activity within and adjacent to the Proposed Development, as evidenced by the presence of historical records, spraint, resting places and other field signs, coupled with the presence of suitable foraging and resting up habitat, otter is assessed as a VER and therefore is considered further as part of the subsequent assessment.

Water Vole

Consultation and Desk Study

7.5.74 Consultation with DGERC provided two records of water vole dated from 2007 within the wider Study Area. The records were recorded approximately 2.4 km and 2.5 km respectively to the south of the Proposed Development.

7.5.75 A search of NBN Gateway and SNHi did not provide any records of water vole for either the site or wider Study Area.

Habitat Assessment

7.5.76 As reported above, an assessment of habitats within the Proposed Development and wider Study Area identified an extensive network of burns, streams and field ditches which as reported, collectively form part of the River Nith catchment. Although the watercourses within the Proposed Development were confirmed by the Fisheries Habitat Survey and otter survey to support a range of high value habitats for otter, the upland nature of the watercourses provide habitat of low value to water vole.

Field Survey

7.5.77 No evidence of water vole was recorded as part of the surveys, either within the Proposed Development or wider Study Area.

Determination as Valued Ecological Receptor (VER)

7.5.78 As field surveys did not identify any water vole activity within the Proposed Development and given the distance of the nearest record, coupled with the low value of habitats within the site for this species, water vole is not assessed as a VER and therefore is not considered further as part of the subsequent assessment.

Red Squirrel

Consultation and Desk Study

7.5.79 A search of NBN Gateway did not provide any recent records of red squirrel for the search area. However, two records were provided between 1993 and 1999 which were recorded 9 km to the south of the Proposed Development along the upper reaches of the Water of Ken.

7.5.80 Consultation with DGERC did not provide any records of red squirrel for the search area; however, the organisation provided two records of grey squirrel (*Sciurus carolinensis*) which were recorded between 2005 and 2007 approximately 731 m and 2.1 km respectively to the east and north-east of the Proposed Development.

7.5.81 Red Squirrels in the South of Scotland provided records for Dumfries and Galloway and the Scottish Boarders. However, none of the records provided were identified within 2 km of the Proposed Development, with the nearest records provided for the Euchan Water and Afton Water 4.5 km and 6.5 km to the west and south-east of the Proposed Development respectively.

Habitat Assessment

7.5.82 An assessment of suitable habitat for red squirrel within the Proposed Development identified the presence of coniferous plantation woodland within the north-east of the site (New Libry Moor Plantation). This area of immature plantation woodland affords direct connectivity to other areas of mature woodland habitats to the east, south and west of the site which are all directly connected. However, the majority of New Libry Moor Plantation is semi-mature and densely planted and therefore (until it matures and reaches cone bearing age) is currently of low to negligible value to red squirrel. In addition to the presence of coniferous woodland, areas of immature broadleaved plantation woodland were recorded by the habitat surveys; however, as above, these areas of woodland are immature and therefore are currently unsuitable for red squirrel.

Field Survey

7.5.83 Field surveys undertaken of the main access track into the Proposed Development identified squirrel feeding remains within an area of plantation mixed woodland located to the immediate west of the entrance to the site, to the south of the A76, at NS 71998 12206. It was not possible to determine if the feeding remains were attributed to either red or grey squirrel. However, given the existence of records of grey squirrel to the north-east of the Proposed Development, coupled with an absence of red squirrel records from within a reasonable distance of the site, which if present would have been outcompeted by grey squirrel, the recorded feeding remains are likely to be solely attributed to grey squirrel and as a consequence, no further surveys were undertaken.

Determination as Valued Ecological Receptor (VER)

7.5.84 Due to the presence of unsuitable woodland habitat for red squirrel within the Proposed Development, coupled with a presence of grey squirrel (as confirmed by the current surveys and historical records within close proximity to the site), red squirrel is not assessed as a VER and is not considered further as part of the subsequent assessment.

Pine Marten

7.5.85 Neither the desk study nor consultation provided any historical records of pine marten within the site and wider Study Area. In addition, no evidence of this species was recorded by the protected species surveys. Similarly, an assessment of habitats within the Proposed Development and wider Study Area identified limited opportunities for this species.

7.5.86 Given the low suitability, and hence value, of coniferous woodland habitats within the site, and absence of field signs recorded during the protected species survey, it is considered that pine marten are absent from the Proposed Development. Consequently, this species is not assessed as a VER.

Wildcat

7.5.87 Neither the desk study nor consultation with DGERC provided of any historical records of wildcat from within the site and wider Study Area. Furthermore, initial consultation with Jason Hain of the Scottish Wildcat Association reported an unlikely presence of pure wildcats or high value hybrids in Dumfries and Galloway due to the barrier effects of the central belt preventing movement of this species into southern Scotland. This, together with the effects of interbreeding between any remnant populations, would have resulted in any remaining population being unable to sustain any viable population.

7.5.88 An assessment of suitable habitats within the Proposed Development and wider Study Area identified a limited number of resting-up sites suitable for occupation by wildcat. Resting sites were limited due to the immaturity and density of plantation woodland and the height of the water table within wooded areas.

Determination as Valued Ecological Receptor (VER)

7.5.89 Given the low suitability, and hence value, of coniferous woodland habitats within the site and absence of field signs recorded during the protected species survey, coupled with the responses obtained through consultation, it is considered that wildcat are absent from the Proposed Development site. Consequently, this species is not assessed as a VER and no further assessment has been undertaken.

Bats

Consultation and Desk Study

7.5.90 Consultation with Dumfries and Galloway Bat Group recommended contacting DGERC who hold bat records on behalf of the group. DGERC provided five records of bat from the wider Ecological Study comprising one record of common pipistrelle from 2007 approximately 1.6 km to the north-east at Knowe Farm and four records of a pipistrelle species, recorded between 2004 and 2006, approximately 2 km to the east of the Proposed Development at Kirkconnel.

7.5.91 Consultation with John Haddow (John Haddow, pers. comm., Helen Lundie, 12 December 2011) identified the closest record of Leisler's and noctule bat approximately 17 km and 46 km respectively from the boundary of the Proposed Development at Enterkin Burn (NS 857 043) and Culzean Castle (NS 236 103).

7.5.92 A search of NBN Gateway and SNHi provided records of brown long-eared bat, natterer's bat and Daubenton's bat from the 10 km grid within which the site and wider Study Area is located. However, the records, which date from 1980 (brown long-eared) and 2000 (natterer's and Daubenton's), are not recent and are considered to be dated.

7.5.93 In addition, the search of NBN Gateway identified a further two different bat species (soprano pipistrelle and whiskered bat) within 5 km of the Proposed Development, in addition to a record of noctule bat which was provided through personal communication to Wild Surveys.

7.5.94 Of the species recorded by the desk study, both soprano pipistrelle and brown long-eared bat species are listed as UK Biodiversity Action Plan Priority species, whilst common pipistrelle, soprano pipistrelle, brown long-eared bat, Daubenton's bat, whiskered bat and Leisler's bat are listed as a priority species in the Dumfries and Galloway Local Biodiversity Action Plan.

Habitat Assessment

7.5.95 The habitat suitability assessment survey recorded four main habitat types within the Proposed Development site and wider Study Area (plantation coniferous woodland, open moorland, standing water and running water) all of which were considered to offer medium value habitat to bats following Bat Conservation Trust Guidelines (BCT, 2007), with the exception of open moorland which was assessed as being of low value (Figure 7.7a).

7.5.96 The survey further noted that the coniferous plantation woodland provided potential commuting and foraging routes along the woodland edges and rides, and around ponds and along watercourses; however, in terms of roosting potential the survey noted that all areas of woodland within or adjacent to the site had a very low suitability/potential due to the lack of features suitable for roosting and planting density. Similarly, and in respect to hibernation, the site offered no potential opportunities for hibernating bats.

Field Survey

7.5.97 Two surveys have been undertaken for bats, one in 2011 and one in 2015. The results of these surveys are presented below.

2011 Survey

7.5.98 Field studies comprised of the following elements:

- an initial habitat assessment of features within the Proposed Development and 250 m Study Area to potentially support roosting bats (refer to Figure 7.7a);
- bat activity transects (refer to Figure 7.7b); and
- monitoring of bat activity along known flightpaths using automated bat activity monitoring equipment (refer to Figure 7.7c).

7.5.99 Dawn and dusk emergence and re-entry surveys within the main Proposed Development site and 250 m Study Area were not undertaken due to an absence of buildings suitable for roosting bats.

7.5.100 Following field surveys to determine the baseline bat activity, three species of bat were recorded, these comprised of: common and soprano pipistrelles and a Daubenton's bat.

7.5.101 The bat activity transects identified that both common and soprano pipistrelle were active throughout the Proposed Development site and wider Study Area. Activity was focussed along the Polneul Burn and woodland edge which borders the south boundary of the Proposed Development creating a link between the linear riparian habitats of the Polneul Burn and edge habitats of the New Libry Moor Plantation in the east of the site. However, activity was considered to be low comprising a relatively small number of bat passes. The highest number of bat passes was recorded along Transects 1, 2 and 4 where 20, 12 and 17 passes were recorded respectively and comprised observations of common pipistrelle. In comparison, even lower soprano pipistrelle bat passes were recorded comprising two and eight passes respectively.

7.5.102 A single pass of Daubenton's bat was recorded along Transect 5 and comprised one single pass.

7.5.103 Automated monitoring of bat activity was undertaken by means of the placement of four automated recorders throughout the Proposed Development. Surveys were undertaken between June 2011 and September 2011. As with the transect surveys, the same three species of bat were recorded in addition to Nyctalus species, noctule bat and Leisler's bat. The automated surveys, as with the activity surveys, recorded a low number of passes by common and soprano pipistrelle bats which peaked at 491 combined passes at Location 1 during June 2011. Daubenton's bat peaked at 316 passes in June at Location 1. Activity levels dropped by more than 50% during August and September 2011.

7.5.104 Noctule and Leisler bat activity (which were recorded outside the Proposed Development at Locations 1 and 2) amounted to 16 passes in total with only a single confirmed Leisler bat pass during September 2011. Fifteen of the noctule passes took place during June and August 2011 and were recorded in the early hours of the morning. Nyctalus species only had five passes which occurred during August 2011 at Location 1.

7.5.105 Activity levels were low at Locations 3 and 4 during all three survey periods.

7.5.106 Full details of the survey and results can be found in Appendix 7.7.

2015 Survey

7.5.107 A total of six static detectors were distributed for a minimum of five consecutive nights per month during May to September 2015 within the site boundary, resulting in approximately 14,290 overall sample minutes (238.1 hours) completed per location, recording a total of 2,287 bat passes. Throughout this period, a total of two species and two genus were

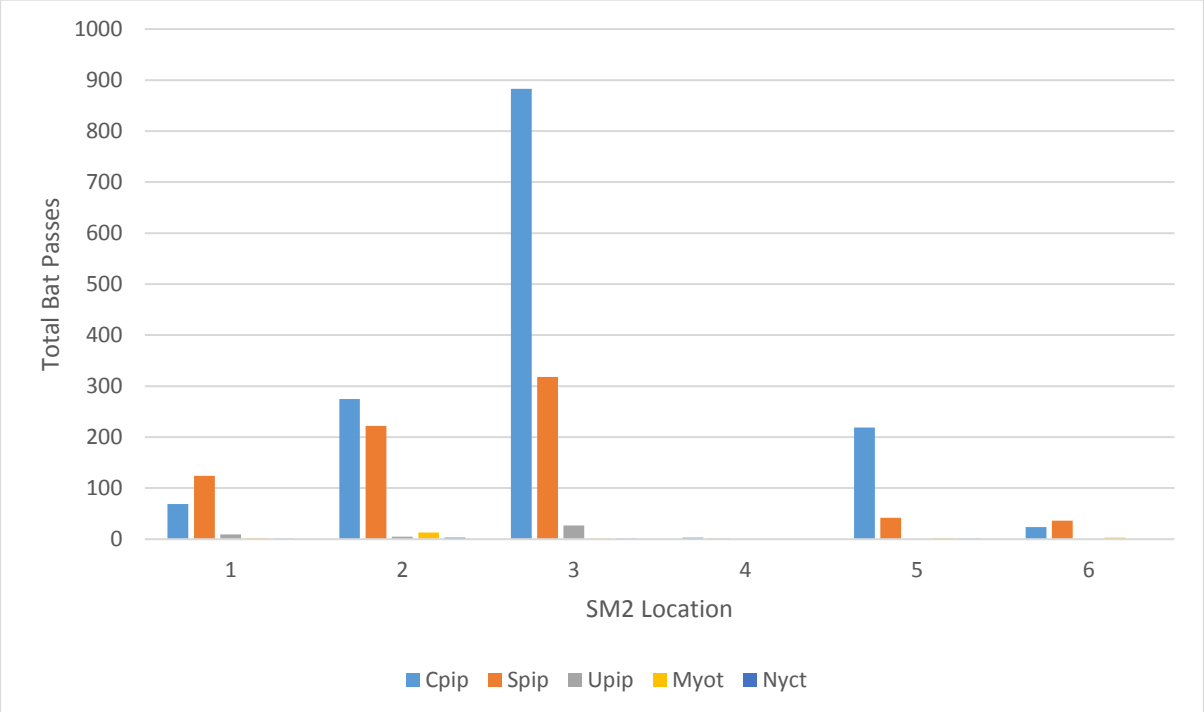
identified, which were: common pipistrelle (64.4%), soprano pipistrelle (32.5%), Myotis species (0.9%) and Nyctalus species (0.3%).

7.5.108 The largest proportion of bat activity was recorded at SM2 Location 3, which was located within linear habitat in close proximity to a small pond and plantation woodland (refer to Figure 7.8 and Graph 7.1). The data received from this location equalled to 53.9% of the overall SM2 sample data. Data collected from other locations were substantially lower than that of Location 3. Location 2, situated within a linear/ water habitat recorded the second highest number of passes with 22.7% of the total number of bats. Location 5 follows with 11.5% of the total and was situated along plantation edge habitat. The remaining locations respectively recorded 9%, 2.7% and 0.2% of overall bat activity and were situated within linear/water (Location 1), edge (Location 6) and open habitat (Location 4).

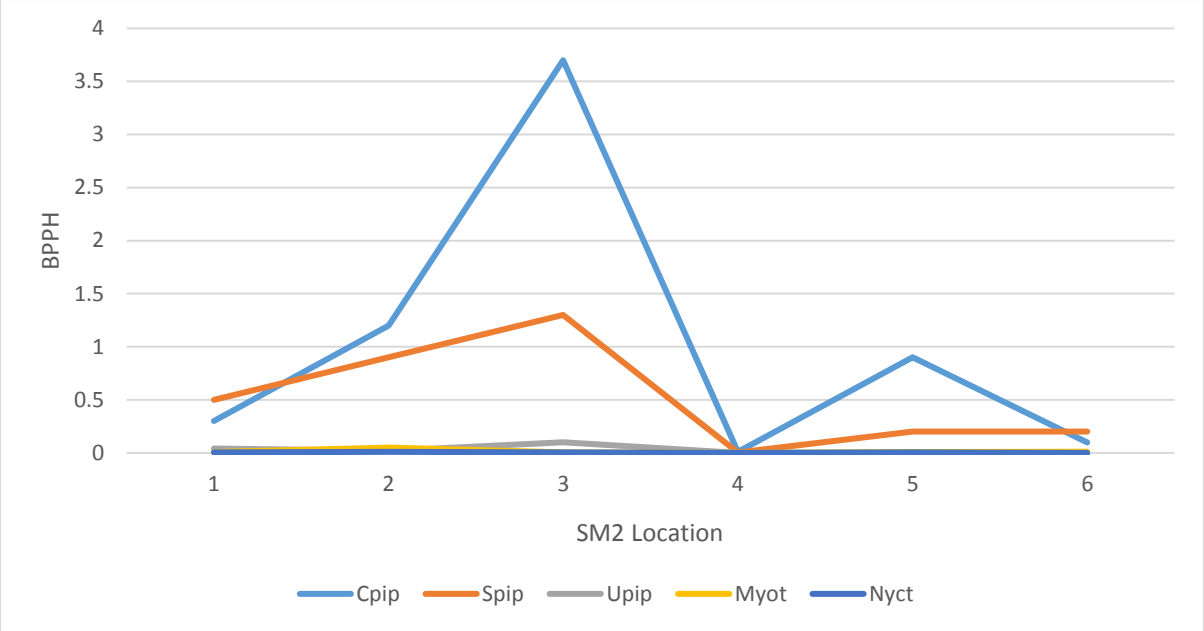
7.5.109 From the total number of bat passes recorded by the SM2s throughout the activity season, 99.7% of these bat species were assessed as being of a low impact risk from wind turbines at a population level (Mitchell-Jones and Carlin (2012). The remaining 0.3% of passes were recorded as Nyctalus species (a high risk species); however, only six records of Nyctalus were recorded throughout the survey period which were recorded at Locations 1, 2, 3 and 5.

7.5.110 The rate of bat passes per hour calculated for each location (Graph 2) suggests that passes made by soprano and common pipistrelle bats were most frequent at Location 3 and passes were estimated to be recorded at 3.7 and 1.3 (respectively) times per hour at this location. Locations 1, 2, 3 and 5 recorded Nyctalus species during the survey period; however, it was calculated that this species was recorded at a rate of 0.01 Bat Passes Per Hour (BPPH) at Location 2 and 0.004 at the remaining locations. The highest BPPH rate for Myotis bats was recorded at Location 2 having 0.5 BPPH.

Graph 7.1 - Bat species passes at each SM2 location in 2015 surveys



Graph 7.2 - Total bat species passes per hour per SM2 location



Determination as Valued Ecological Receptor (VER)

7.5.111 Due to their recorded presence within and adjacent to the site coupled with their legislative status as European protected species and/or conservation status of UKBAP and LBAP species, all bat species are assessed as VERs and therefore no further justification as a VER is required.

Other Mammal Species

Consultation and Desk Study

7.5.112 Consultation with DGERC provided additional records of west European hedgehog (*Erinaceus europaeus*), roe deer (*Capreolus capreolus*) and brown hare (*Lepus europaeus*) dating from 2005 to 2007 for the Kirkconnel and Euchan Valleys located to the north-east and south-west of the Proposed Development.

Field Survey and Determination as Valued Ecological Receptor (VER)

7.5.113 Due to their relatively common and widespread distribution within lowland Scotland, no further surveys for the above species were undertaken. As a consequence, none of the species identified by the desk study are assessed as a VERs.

Reptiles and Amphibians

Consultation and Desk Study

7.5.114 A search of NBN Gateway and SNHi did not provide any recent records of amphibian and reptile species from within the Proposed Development or wider Study Area. However, records of adder, slow worm (*Anguis fragilis*), common lizard (*Zootoca vivipara*) and common toad (*Bufo bufo*) were identified from within the 10 km grid (NS61) within which the site is located; however, these records were dated from 1975 (common toad) to 1992 (all other species) and are therefore ecological dated.

7.5.115 Consultation with DGERC provided a single record of common frog (dated 2007) from near Kirkconnel approximately 1.6 km to the north-east of the Proposed Development. As above, this record is considered to be ecological dated.

Field Survey

7.5.116 A single common lizard (*Zootoca vivipara*) was recorded at NS 71002 10006 as part of the NVC Surveys (Appendix 7.4: Target Note 18). However, due to the upland characteristics of the Proposed Development and the likely low density of amphibians and reptiles, further surveys were considered unlikely to obtain an accurate baseline of amphibian and reptile populations for the purpose of the ecological assessment. Consequently, an assessment of suitable habitat was undertaken as part of the Extended Phase 1 Habitat survey.

Habitat Assessment

7.5.117 An assessment of suitable habitat undertaken as part of the Extended Phase 1 Habitat survey highlighted the presence of suitable habitats within the Proposed Development site and wider Study Area comprising freshwater and mire habitats. These habitats are likely to offer suitable shelter and foraging opportunities for amphibians while areas of acid grassland, scrub and woodland edges are likely to offer suitable shelter and foraging opportunities for reptiles. In addition, defunct stone walls are likely to offer suitable hibernacula for both amphibians and reptiles.

Determination as Valued Ecological Receptor (VER)

7.5.118 Given the potential suitability of habitats within the Proposed Development site and wider Study Area to support reptile and amphibian populations, coupled with the identification of a single common lizard during the NVC and other anecdotal evidence indicating the presence of amphibian and reptile species, both reptiles and amphibians are assessed as VERs.

Invertebrates

7.5.119 No further assessment of the entomological interests at the Proposed Development was undertaken (following consultation with SNH). Consequently, invertebrates are not assessed as VER and are not considered further as part of the subsequent assessment.

Freshwater Fish

Consultation and Desk Study

7.5.120 Consultation with the Nith District Salmon Fishery Board (NDSFB) identified the River Nith as a river of major importance for Atlantic salmon and sea trout (*Salmo trutta*). They also highlighted the river as being the largest river system in south-west Scotland with a total catchment area of 1200 square kilometres.

7.5.121 The Proposed Development is completely located within the water catchment of the River Nith which contains tributaries that drain the catchment area of the Proposed Development site. Existing information for the Nith catchment has identified records of fish within some of these watercourses. A major tributary of the River Nith is the Polneul Burn which has previously been identified as an important nursery stream for salmonids. Due to its value to salmonids, the Polneul Burn has undergone enhancement works to improve the habitat utilised by salmonid and other species of fish, which include installation of a fish pass immediately downstream of the A76 trunk road bridge and installation of riparian fencing.

Habitat Assessment

7.5.122 The majority of watercourses and locations sampled offered moderate to good in-stream cover with clear water clarity and either uniform or simple bank face vegetation. The only exception was Polneul Burn: Location 2 and an unnamed tributary to Polneul Burn: Location

8 where in-stream cover was assessed as being poor. In respect to buffer zone vegetation, four locations (Locations 5, 6, 12 and 13) were assessed as being complex through supporting four or more vegetation types; all other locations were assessed as being either simple or uniform.

7.5.123 An abundance of invertebrates which were recorded during the surveys was considered to be due to the general good quality of both in-stream and bank/buffer vegetation habitat.

Field Survey

7.5.124 A summary description of the results of the survey is provided below; a full report of the survey is presented in Appendix 7.7.

7.5.125 Electrofishing surveys were undertaken on seven watercourses within and adjacent to the Proposed Development within the wider River Nith catchment, these comprised:

- the Polneul Burn (six locations);
- the Polbroc Burn (one location);
- the Polmeur Burn (three locations);
- unnamed tributary of Polneul Burn (one location);
- the Polstacher Burn (one location);
- Kello Water (two locations); and
- the Polhote Burn (one location).

7.5.126 The surveys confirmed the presence of salmon fry in the Kello Water and salmon parr in the Polneul Burn, Polstatcher Burn and Kello Water. The density of parr caught ranged from 71 (/100 m^2) on the Polneul Burn: Location 1, to three (/100 m^2) on the Kello Water: Location 14. In comparison, salmon fry were caught at only one location on the Kello Water (Location 14) where 37 (/100 m^2) individuals were recorded.

7.5.127 Trout fry were recorded at three locations along the Polneul, Polmeur and Polhote Burns where the number of fry recorded ranged from eight (on the Polmeur Burn: Location 10) to 30 (on the Polhote Burn: Location 15). Trout parr were recorded in lower numbers along the Polneul, Polmeur and Polhote Burns and ranged between eight (/100 m2) (on the Polneul Burn: Location 4 and Polmeur Burn: Location 10) and 25 (/100 m2) on the Polhote Burn: Location 15.

7.5.128 Other species recorded included a single European eel measuring 440 mm in length and stone loach (*Barbatula barbatula*) along the Polneul Burn at Locations 1 and 4 respectively.

Determination as Valued Ecological Receptor (VER)

7.5.129 Fish were found to be present in many of the watercourses in the vicinity of the Proposed Development. However, where fish were found to be absent it was considered this was due to the watercourses either being unviable due to their inability to be maintained during prolonged dry periods or due to a barrier to fish migration. Given the presence of Atlantic salmon, brown trout, European eel and their value as a food source for otters, the recorded assemblage of fish species are considered to be a VER. However, due to their favourable conservation status, stone loach is not assessed as a VER and is not considered further as part of the subsequent assessment.

7.6 Nature Conservation Evaluation

7.6.1 This section provides the evaluation of the baseline terrestrial and freshwater habitat and species populations within the Study Area and has been undertaken in accordance with the methods described in Section 7.3. A total of nine habitats and six animal species/groups were identified as Valued Ecological Receptors (VERs). Table 7.8 outlines the justification for the ecological valuation with specific reference to the criteria set out in Section 7.3.

Table 7.8 – Evaluation of VERs

Area/Habitat Name	Features of Interest	Evaluation
Terrestrial Habitats (Figure 7.3 and 7.4a & b)		
Coniferous/ broadleaved woodland and scrub	This community was recorded within the north-east section of the Proposed Development and was dominated by dense semi-mature sitka spruce which lacked any structure or biodiversity value. Additional areas of young broadleaved plantation were recorded; however, due to their age, these stands also lacked a biodiversity value. Other isolated stands of scattered mature woodland/scrub were recorded throughout the Proposed Development and were mainly recorded in association with gorges which enriched the habitat resource at the local level.	Local
Marshy grassland (NVC community: M23a/b & M25a)	This habitat was recorded throughout the site and constituted the most common type of grassland habitat recorded within the Proposed Development boundary. Marshy grassland develops where the underlying soils are wet, along watercourses and around the edges of mire and flush communities. Although broadly listed as a LBAP Priority Habitat, the marshy grassland habitats recorded throughout the site in terms of species richness were average to poor with the exception of stands of vegetation in the upper Polneul valley which supported a more diverse but nevertheless common assemblage of indicator species. Consequently, these habitats collectively enrich the habitat resource in the context of the local area.	Local
Unimproved acid grassland (NVC community: U5a)	This community was recorded in small stands on drier areas rising on raised topography or marking the zone of thinning peat between dry grassland and peaty habitats. A common range of species was recorded which included purple moor grass. This habitat is of nature conservation value and qualifies as supporting a viable area of a LBAP Priority Habitat (Acid Grasslands) which is additionally listed on the Scottish Biodiversity List and enriches the habitat resource in the context of the local area.	Local
Running water (NVC community: n/a)	Within the Proposed Development and wider study area there are a number of water courses which include the Polneul Burn and its tributaries (principally Macan's Burn and Red Sike) and Polmeur Burn, in addition to numerous, grips, small feeder field drains and ditches. These watercourses qualify as supporting a viable area of a LBAP Priority Habitat (Lowland River and Backwaters) and support regionally important salmonids (Atlantic salmon and brown trout) and European eel populations. In addition, the identified watercourses form tributaries to the River Nith which is	Regional

Area/Habitat Name	Features of Interest	Evaluation
	classified by SEPA's River Water Quality Classification as being A2 (Good). Furthermore, invertebrates and other forms of aquatic life were recorded which in addition to being an ecologically valuable resource, provide a food source for a range of animal species. These burns and their connectivity to the wider River Nith catchment also provide potentially suitable habitat for otters and water voles (although no evidence of water vole was recorded during field surveys).	
Standing water (NVC community: n/a)	This habitat type is represented by a single man-made duck flighting pond recorded along the southern boundary of New Libry Moor Plantation. Despite potentially qualifying as a LBAP Priority Habitat (Forest Ponds), the duck pond was noted to have a poorly developed flora comprising soft rush which is of limited botanical value. Consequently, this habitat enriches the habitat resource in the context of the site only.	Less than local
Acid/neutral flushes (NVC community: M6c/d)	Acid/neutral flushes were frequent throughout the site in particular along moor grips and in wetter areas of the rush pasture where *Sphagnum* species formed hummocks in the rushes. A number of the flushes were noted to be species rich and are of nature conservation value. This community qualifies as supporting a viable area of a LBAP Priority Habitat (Upland Spring and Flushes) and is listed on the Scottish Biodiversity List as habitats of principal importance to biodiversity conservation.	Authority Area
Blanket bog (including areas of dry and wet modified bog) (NVC community: M20)	Dry modified bog formed the largest stands of vegetation within the site, particularly to the east of the Polneul Burn. However, due to the effects of over-grazing and physical management, for example, the cutting of grips throughout much of bog habitats to improve drainage, this habitat is considered to be in a degraded state. It should be noted that if intact and unmodified, this community could be classed as active blanket bog which is of European importance. Regardless, this community qualifies as supporting a viable area of a LBAP Priority Habitat (Blanket Bog) and is listed on the Scottish Biodiversity List as habitats of principal importance to biodiversity conservation and enriches the habitat resource at the Authority Area level.	Authority Area
Dry heath/acid grassland (NVC community: H10c)	Small stands of this community were recorded on the steep valley slopes of the Polneul Burn with a largest stand recorded adjacent to Polmeur Burn in the north-east of the site and were dominated by heather with lesser amounts of other ericaceous species and a diverse mix of grasses and small herbs. The species comprising this habitat are common and widespread through north-east Scotland and despite qualifying as supporting a viable area of a LBAP Priority Habitat (Upland Heaths), only enriches the habitat resource in the context of the local area.	Local
Non-ruderal Herb (NVC Community: U19)	This community was recorded in small areas on the steep valley slopes and was represented by open stands of fern which were relatively species rich and appeared as stands of fern with a grass-heath matrix. In addition, the Polneul Burn is notified as a geological SSSI which qualifies as supporting a viable area of a LBAP Priority Habitat (Inland Rock Outcrops) and enriches the habitat resources at the Authority Area level.	Authority Area

Area/Habitat Name	Features of Interest	Evaluation
Badger (Confidential Figure 7.6) **Badgers are fully protected within the UK by the Protection of Badgers Act 1992 (as amended) and the Wildlife and Countryside Act 1981 (as amended). Further protection is afforded by the Nature Conservation (Scotland) Act 2004 (as amended).**		
	See Confidential Appendix 7.5	Local
Bats (Figure 7.7a, b and c) **All species of bat within the UK are afforded protection at a European level through inclusion within the Habitats Directive (92/43/EEC) 1992 (as amended) which is transposed into UK domestic legislation by the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended). In addition, the common pipistrelle, soprano pipistrelle, brown long-eared, Daubenton's bat, whiskered bat and Leisler's bat are subject to a dedicated Species Action Plan. Soprano pipistrelle and brown long-eared bat are also UKBAP Priority Species.**		
Coniferous plantation woodland	The majority of the coniferous plantation on the Proposed Development was deemed to be of low potential for tree roosts, due to lack of features and the cluttered environment of plantation woodland, which was considered to prevent access to the trunks due to the amount of branches present and close planting of trees. Nevertheless, the plantation woodland offered foraging and commuting opportunities for bats, especially along the woodland edges where activity was recorded, although was considered to be low level.	Local
Open moorland	Although open moorland was identified as offering potential foraging habitat, a relatively low number of passes were recorded.	Less than local
Standing and running water	Standing and running water habitats were assessed as providing suitable foraging and commuting habitats for bats. However, although activity was recorded along running water habitats such as the Polneul Burn, the level of activity recorded was low. Nevertheless, the above features do provide linkage with other higher value habitats within the wider landscape and therefore are assessed to be of higher value.	Authority area
Otter (Figure 7.5) **Otter is a European Protected Species under the Habitat Directive (92/43/EEC) 1992 which is transposed into UK domestic legislation by the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended). Otter is also subject to a species action plan under the UK Biodiversity Action Plan. Although this species receives protection at a European level, the Scottish otter population is in recovery and is considered to be increasing.**		
Polneul Burn Polhote Burn Polmeur Burn	Considerable levels of otter activity were recorded along the Polneul Burn, Polhote Burn and Polmeur Burn comprising spraint and a number of resting places. The presence of the River Nith catchment to the north of the Proposed Development and Kello Water (the nearest significant watercourse to the south of the site) coupled with the greatest concentration of field signs along the Polneul Burn suggests possible overland passage of otter from the Polneul Burn to the Kello Water as part of wider use of the Nith catchment by otters. Consequently, the Polneul Burn stands as an important watercourse for otters based on the number of resting places and spraint recorded.	Regional
Polbroc Burn	Low levels of otter activity were recorded along the Polbroc Burn comprising spraint suggesting this watercourse is not	Local

Area/Habitat Name	Features of Interest	Evaluation
	used as frequently as the Polneul, Polhote and Polmeur Burns.	
Amphibians **Amphibians receive legal protection under the Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004 (as amended). Taken together both acts make it an offence to intentionally and/or recklessly kill or injure these animals.**		
Standing water	A small man made duck pond was recorded within the Proposed Development to the south-west of New Libry Moor Plantation. Although the pond flora was noted to be poorly developed comprising soft rush which is of limited botanical value, the pond still provides suitable habitat for common frog, common toad and palmate newt which are common and widespread and do not receive any legal protection on account of their conservation status.	Local
Reptiles **Reptiles receive legal protection under the Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004 (as amended). Taken together both acts make it an offence to intentionally and/or recklessly kill or injure these animals.**		
n/a	A single common lizard was recorded during the NVC Surveys. However, as outlined no surveys for reptiles were undertaken. Due to the presence of suitable habitats within and adjacent to the Proposed Development it is assumed reptiles such as common lizard and adder are present although are likely to be in low density populations. Adder is listed as priority species in the UKBAP and LBAP.	Local
Freshwater Fish **All freshwater fish species are protected under the Salmon and Freshwater Fisheries Act (2003), Atlantic salmon are EC Habitats Directive Annex II listed. Brown trout and European eel are species of conservation concern in the UK BAP and have a significant commercial importance.**		
Polneul Burn and Polmeur Burns (The River Nith Catchment)	Within the Proposed Development and wider study area there are a number of water courses which include the Polneul Burn and its tributaries (principally Macan's Burn and Red Sike) and Polmeur Burn. These watercourses qualify as supporting a viable area of a LBAP Priority Habitat (Lowland River and Backwaters) and support regionally important salmonids (Atlantic salmon and brown trout) and European eel populations. In addition, the identified watercourses form tributaries to the River Nith, which is classified by SEPA's River Water Quality Classification as being A2 (Good). Furthermore, invertebrates and other form of aquatic life were recorded which in addition to being an ecologically valuable resource, provide food for a range of animal species. These burns and their connectivity to the wider River Nith catchment also provide potentially suitable habitat for otters and water voles (although no evidence of water vole was recorded during field surveys).	Regional

7.7 Assessment of Do-Nothing Scenario

7.7.1 Should the Proposed Development not be consented, the "do-nothing scenario" will apply to the current baseline environment, in that the Applicant will construct the Consented Development.

7.7.2 The Consented Development was environmentally assessed and consented in 2015 and the assessment is reported within the Sandy Knowe Wind Farm Environmental Statement (2015).

7.8 Assessment of Proposed Development Potential Effects

Introduction

7.8.1 While the do-nothing scenario is construction of the Consented Development, ECU have requested that the EIA assess the Proposed Development against the current baseline. As the reader will see this assessment confirms that the effects of Proposed Development and Consented Development are identical.

7.8.2 The development of wind farms can result in a range of researched and well documented ecological effects associated with their construction, operation and decommissioning. This section assesses the potential ecological effects of the Proposed Development to terrestrial and freshwater VERs identified in Table 7.8. As outlined, effects are considered for the construction, operation and decommissioning phases of the Proposed Development.

7.8.3 The assessment of ecological effects, in particular habitat loss, has been informed based on the assumption that a 10 m buffer will be required around all infrastructure including temporary construction compounds in order to undertake and complete construction works. As outlined, reinstatement of temporary areas will be undertaken following construction reducing the footprint of the Proposed Development to permanent areas of hard-standing and infrastructure. However, it should be noted that the above areas of temporary access will be dependent upon ground conditions throughout the Proposed Development site and therefore may require to be increased where required.

7.8.4 For the purpose of the assessment it is assumed that ecological effects associated with decommissioning will be comparable to construction effects although of a shorter duration. Consequently, decommissioning effects are assessed alongside construction.

Generic Effects

Terrestrial Habitats

7.8.5 Potential ecological effects on habitats including those during construction include damage to vegetation from the movement of construction vehicles and staff and permanent and temporary loss of habitat through installation of turbine foundations, hard standings and access tracks.

7.8.6 The creation of access tracks and hard standings may lead to changes in the hydrological conditions specifically through the dewatering of wetland and peatland habitats, such as areas of blanket bog due to changes in site drainage and alteration of surface flows. In addition, the creation of access tracks across the Proposed Development may lead to habitat fragmentation and potential pollutant effects on vegetation and freshwater habitats.

Terrestrial Protected Species

7.8.7 Potential ecological effects during construction include the risk of injury or direct mortality as a result of collision with site traffic or protected wildlife becoming trapped in site excavations. There would also be a risk of disturbance to VER species, including the impacts of noise and lighting.

7.8.8 The construction of turbines and access tracks may result in habitat fragmentation impacts which in turn could create a barrier effect to the movement of species across the Proposed Development site, in particular for less mobile species. The development of the site may also lead to a reduction in foraging resources through habitat loss or due to pollution effects. There may also be a loss of sheltering opportunities for protected species such as the loss of suitable locations for otter holts, badger setts, water vole burrows or reptile habitat.

Freshwater Habitat and Species

7.8.9 Construction activities may also lead to potential ecological effects on the aquatic habitat and species present within and downstream of the Proposed Development. The Proposed Development could lead to changes in water quality and therefore result in impacts upon freshwater fish species, in particular salmonids and European eel, which are identified VERs and are important fisheries in the context of the River Nith catchment. Potential impacts include point source or diffuse organic and inorganic pollution of water courses. Disturbance to ground and transportation of materials across the Proposed Development may increase the risk of sedimentation of watercourses through soil erosion leading to effects on river morphology (e.g. changes in gravel beds and increased suspended solids in the water).

7.8.10 Changes in vegetation and profile could lead to decreased bankside habitat complexity, while the construction of access tracks and hard standings could lead to habitat fragmentation and potentially significant changes in the discharge regime. There is also a risk of construction activities resulting in direct mortality and disturbance to riparian and freshwater species, in particular, those identified as VER, during any engineering works such as water crossings.

Specific Effects

7.8.11 For the purpose of this assessment significant effects are assessed to be those that are either major or moderate. Mitigation is therefore proposed (where practicable) to avoid, reduce or offset identified potential significant effects (Section 7.8).

7.8.12 It is important to recognise that potential ecological effects may interact, e.g. habitat loss during construction could potentially result in disturbance and habitat fragmentation, and the resulting combination of effects may, through synergistic effects, increase the overall adverse effect of the proposed scheme (Luell *et al*., 2003).

7.8.13 Specific effects that are likely to occur during construction, operation and de-commissioning of the Proposed Development and the influence these effects could potentially have on VERs is outlined below and summarised in Table 7.12 and Table 7.13. The potential effects described below are all considered to be negative unless otherwise stated.

Terrestrial Habitats

7.8.14 The main impact on habitats identified within the Proposed Development by the field surveys will be through direct habitat loss during the construction, operation and de-commissioning of the Proposed Development. For the purpose of clarity, habitat loss during construction and de-commissioning is considered to be a temporary impact as former construction/de-construction areas will be reinstated following a completion to works. In direct comparison, habitat loss during operation is considered to be a permanent impact due to the loss of habitats for permanent areas of hard-standing, access track, sub-station and/or turbine foundations.

7.8.15 Table 7.9 provides an estimate of the loss of terrestrial habitats within the Proposed Development, including a 10 m buffer around all infrastructure and 10 m buffer around all turbine locations, which includes all areas of habitat that will be lost permanently and temporarily. Note: only the loss of habitats assessed as being VER's is discussed and subsequently assessed.

Coniferous/Broadleaved Woodland

7.8.16 A single area of coniferous woodland (New Libry Moor Plantation) was recorded in the north-east of the Proposed Development and was associated with stands of newly planted broadleaved plantation woodland. Construction of one turbine and associated infrastructure would result in the permanent loss of 4.03 ha of this community which, in the absence of mitigation, would represent an impact of **medium** magnitude and an effect of **minor** significance.

Marshy and Unimproved Acid Grassland

7.8.17 Areas of marshy grassland were recorded throughout the Proposed Development; however, the largest concentration of these habitats were recorded to the west of the Polneul Burn, which formed a mosaic with dry modified bog, blanket bog, unimproved/semi-improved acid grassland and improved grassland. At these locations, construction of turbine foundations and associated infrastructure comprising access track and hard-standing would result in the temporary loss of 9.33 ha of marshy grassland and 0.07ha unimproved acid grassland and permanent loss of 3.34 ha of marshy grassland and 0.01 ha unimproved acid grassland respectively. Consequently, and in the absence of mitigation, the loss of these habitats would represent an impact of Low magnitude and an effect of **minor/negligible** significance.

Acid/Neutral Flushes

7.8.18 Seven acid/neutral flushes were recorded throughout the Proposed Development and were commonly associated with areas of dry modified and blanket bog. At four of these locations, construction of turbine foundations and associated infrastructure comprising access tracks and hard-standing would result in the temporary loss of 0.33 ha and permanent loss of 0.08 ha of this habitat respectively. Consequently, and in the absence of mitigation, the loss of these habitats would represent an impact of **medium** magnitude giving an effect of **moderate** significance.

Running and Standing Water

7.8.19 As outlined in the Evaluation (Section 7.5), Polneul Burn and its tributaries (principally Macan's Burn and Red Sike) and Polmeur Burn drain the Proposed Development site. Within the site, these burns are fed by a series of grips, small feeder field drains and ditches which drain the Proposed Development in a south to north/north-east direction (refer to Chapter 9 for further information). With the addition of a man-made 'duck flighting' pond adjacent to New Libry Moor Plantation, these aquatic interests collectively form the Proposed Development's freshwater receptor.

7.8.20 Potential impacts during construction include increased sedimentation of aquatic habitats as a result of runoff from construction areas and access tracks and increased erosion of bog habitats, bankside substrate and vegetation leading to changes in river bed morphology, which could in turn lead to the loss of floral and faunal diversity. These impacts would be in some instances temporary and in others longer-term and are assessed as being of high magnitude and an effect of major/minor significance.

7.8.21 Other potential ecological impacts during operation include modification and loss of bankside and in-channel habitat to accommodate site infrastructure and water crossings, and potential realignment of field drains which in respect to permanent infrastructure would result in the long-term loss and fragmentation of 0.04 ha of riparian habitat. This impact is assessed as being of **high** magnitude leading to an effect of **major/minor** significance.

7.8.22 At present, and in respect to the duck flighting pond, no impacts are predicted.

Blanket and Dry Modified Bog

7.8.23 Four discrete areas of blanket bog were recorded within the Proposed Development and were commonly associated with areas of dry modified bog which dominated the site to the east of Polneul Burn and/or the mosaic of grassland/bog habitats described above under 'Grassland' to the west of Polneul Burn. At two of these locations, construction of two turbine foundations, hard-standing and a works compound would result in the temporary loss of 1.74 ha and permanent loss of 0.65 ha of blanket bog habitat respectively. In addition, construction of associated infrastructure comprising a series of access tracks would result in the temporary loss of 9.09 ha and permanent loss of 4.01 ha of dry modified bog respectively. Consequently, and in the absence of mitigation, the loss of these habitats would represent an impact of **high** magnitude leading to an effect of **major/moderate** significance.

Dry Heath/Acid Grassland

7.8.24 A single stand of dry heath/acid grassland was recorded adjacent to the north-east boundary of the Proposed Development between New Libry Moor Plantation/Polmeur Burn and the application boundary. In addition, small stands of this habitat were recorded on the steep slopes of the Polneul Burn. As these habitats are not located within close proximity to any areas of construction/operation no impacts are anticipated.

Non-Ruderal Herb

7.8.25 Small stands of non-ruderal herb were recorded on the steep slopes of the Polneul Burn and were represented by open stands of fern which were relatively species rich and appeared as stands of fern with a grass-heath matrix. It is possible that construction and operation of one permanent crossing in the upper reaches of the Polneul Burn may result in the loss of this habitat which would represent an impact of **medium** magnitude and an effect of **moderate** significance.

Table 7.9 – Summary of approximate Habitat Loss by Phase 1 Habitat Category within the Proposed Development incorporating a 5m buffer around all infrastructure and 10m buffer around all turbine locations

Habitat Code	Description	NVC Equiv.	Total Area Development Site (Ha)	Habitat Loss (Ha)	
				Temporary	Permanent
A1.1.2	Broadleaved Plantation	n/a	5.93	0.19	0.3
A1.2.2	Coniferous Plantation	n/a	104.57	0	3.73
A1.3.1	Semi-natural Mixed Woodland	n/a	0.95	0.11	0.00
A3.2	Scattered Coniferous Trees	n/a	0.52	0.27	0

Habitat Code	Description	NVC Equiv.	Total Area Development Site (Ha)	Habitat Loss (Ha)	
				Temporary	Permanent
A3.3	Mixed scattered trees	n/a	0.59	0	0
B1.1	Unimproved Acid Grassland	U5 / U5a	1.38	0.01	0
B1.2	Semi improved acid grassland	U5a	13.22	1.65	0.6
B2.1	Unimproved neutral grassland	M6d	45.79	0.37	0.06
B2.2	Semi improved neutral grassland	MG10 / MG10a	13.22	1.65	0.60
B4	Improved Grassland	n/a	45.79	0.37	0.06
B5	Marshy Grassland	M23a / M23b / M25a	130.47	9.33	3.34
B6	Poor Semi Improved Grassland	n/a	3.75	0.69	0.24
C3.1	Tall Ruderal	n/a	2.26	0	0.1
E1.6.1	Blanket Bog	M20	19.76	1.74	0.65
E1.7	Wet Modified Bog	M20	2.67	0	5
E1.8	Dry Modified Bog	M20	110.14	9.09	4.01
E2.1	Acid/Neutral Flush	M6c / M6d	7.38	0.33	0.08
G1	Standing water (pond)	n/a	0.11	0	0
G2	Running Water (rivers and ditches)	n/a	5.48	0.14	0.04
G2.2	Mesotrophic running water	n/a	0.12	0	0

Badger

7.8.26 An assessment of potential effects on badger is provided in Confidential Appendix 7.5.

Otter

7.8.27 Evidence of otter (comprising spraint and seven resting places) was recorded by the field surveys along four watercourses (Polneul Burn, Polhote Burn, Polbroc Burn and Polmeur Burn) which occur within the Site and wider Study Area. The results of the surveys confirmed information provided through consultation in respect to the recorded presence of otters within the wider River Nith catchment and the importance of the catchment for this species, which was assessed by the surveys as providing good to excellent habitats for otter.

Habitat Loss

7.8.28 Five watercourse crossings are currently anticipated (Figure 1.2).

7.8.29 Due to the requirement to cross a number of watercourses any impacts arising as a result of construction are likely to be temporary and limited to a small area representing approximately 0.14 ha of riparian habitat for each crossing. Similarly, operation of the Proposed Development will impact an even smaller area of riparian habitat (0.04 ha) that although suitable for this species are not located in close proximity to any identified resting places or evidence of otter. Both construction and operational impacts can therefore be considered to be of low magnitude and will have an effect of **minor** significance.

Disturbance

7.8.30 Potential direct impacts from disturbance which in turn may result in fragmentation of otters as a result of noise during construction of the Proposed Development have the potential to occur; however, any impact would be temporary and short-term and therefore of medium magnitude leading to an effect of **moderate** significance.

Pollution

7.8.31 As outlined above, road runoff could occur during construction due to increased traffic movements throughout the Proposed Development, which are assessed as being impacts of medium magnitude giving rise to effects of **moderate** significance. However, as described above, potential pollution from petrochemicals and other substances during construction is considered to be unlikely.

Direct Mortality

7.8.32 Impacts by means of direct mortality are assessed as being unlikely during both construction and operation due to none of the nine recorded resting places within the Proposed Development being recorded in proximity to construction areas. As a result, impacts are assessed as being of **negligible** magnitude, giving effects of **negligible** significance.

Bats

7.8.33 Seven species of bats were recorded by the field surveys, these included: common and soprano pipistrelle, Daubenton's bat, noctule bat, Nyctalus sp., Myotis sp. and Leisler's bat. However, only the first three species were regularly recorded within or immediately adjacent to the Proposed Development with the exception of two noctule passes recorded in August 2011. Of the species above, noctule and Leisler's bat are classed at being of greatest risk of collision with turbines and turbine blades, with common and soprano pipistrelle classed as being at medium risk, whereas Daubenton's bat are classed as being of low risk. In terms of effects on these species at the population level, the UK population of common and soprano pipistrelle and Daubenton's bat are deemed to be of low risk to wind farm development; however, Leisler's and noctule bat are considered to be at high risk.

Habitat Loss and Disturbance

7.8.34 In the absence of mitigation, the Proposed Development could result in potential effects upon bats through the direct loss of suitable foraging habitat and/or roosts, loss and/or disruption (disturbance) of commuting routes due to barrier effects and through collision with turbines and barotrauma (mortality due to damage to the lungs of bats caused by sudden change in air pressure close to the turbine blades). For the purpose of the assessment and given an absence of recorded passes within the Proposed Development site, Leisler's bats have been excluded from the assessment.

7.8.35 Both common and soprano pipistrelles were actively recorded throughout the Proposed Development; however, the numbers of passes recorded were considered to be low and in respect to common and soprano pipistrelle and Daubenton's bat, were exclusively constrained to linear features such as watercourse or woodland edge. Similarly, a low number of noctule bat passes were recorded in August 2011 at Location 2 in addition to, a low number of Daubenton's bat pass. Activity was focussed along the Polneul and Polmeur Burns and woodland edge which boarders the south boundary of the Proposed Development which creates a link between the linear riparian habitats of the Polneul and Polmeur Burns and edge habitats of the New Libry Moor Plantation in the east of the site. Similarly, the 2015

surveys recorded the largest volume of bat activity within a variation of linear/water and edge habitats associated with Libry Moor (predominantly recorded pipistrelle species) Myotis bats were exclusively recorded within linear/water and edge features in the 2015 surveys, including; Macan Burn, Polneul Burn, Polnagrie Hill plantation and Polbroc Burn/plantation with no passes recorded within open grassland (White Knowe). As a consequence, these habitats are considered to be of higher value to bats due to the potential increased prey abundance in and around water bodies and along woodland edges.

7.8.36 In respect to access tracks and other infrastructure, the loss of habitat and resulting disruption of bat flightlines as a result of the Proposed Development is likely to be minimal and therefore impacts are assessed as being of negligible magnitude and effects of **negligible** significance. However, in respect to New Libry Moor Plantation, felling of this area of woodland (comprising 3.73 ha of woodland) would result in the increase of woodland edge habitat which was confirmed by the field surveys as being used by the above two species of pipistrelle and therefore is an impact of medium magnitude and an positive effect of **minor** significance

Direct Mortality, Habitat Fragmentation and Pollution

7.8.37 Due to the citing of turbines away from key bat areas, impacts during construction by means of direct mortality, habitat fragmentation and pollution are assessed as being unlikely and therefore are of **negligible** magnitude and negligible effect significance.

7.8.38 Bats which are assessed to be of high mortality risk by turbines such as Nyctalus species have been recorded utilising the site. Although very few bat passes (total 6 in 2015) by this genus were recorded at the sample locations, they were recorded exclusively within linear or edge habitat types, direct mortality to this genus of bat would be an impact of high magnitude giving an adverse effect of **moderate/ minor** significance.

7.8.39 None of the field surveys undertaken in 2011 or 2015 identified the presence of bat roosts, either within the Proposed Development or wider Study Area. Consequently, no effects on bat roosts are predicted.

7.8.40 Following Natural England guidance (2009) all turbines should be placed a minimum of 50 m from any linear features or features deemed to be high value to bats (Section 7.6). As such, the felling of trees for the construction of turbine T24 would create a linear feature; a new woodland edge and in respect to direct mortality, it is therefore considered there would be an effect of **high** magnitude and **moderate/ minor** significance.

7.8.41 In respect to habitat fragmentation and disturbance it is considered that there will be an impact of low magnitude leading to an effect of **minor/negligible** significance.

Reptiles and Amphibians

7.8.42 As outlined in the Baseline Section (Section 7.5), no formal field surveys for reptiles and amphibians were undertaken within the Proposed Development however a single observation of common lizard was recorded during the NVC Surveys. Notwithstanding, suitable habitat for both species groups was identified both within and adjacent to the Proposed Development. In addition, consultation provided records of adder, slow worm, common lizard and common toad for the 10 km square grid within which the Proposed Development is located. Consequently, the precautionary principle has been applied whereby it has been assumed that reptile and amphibian populations are present within the

Proposed Development and wider Study Area and as such mitigation appropriate to the scale of potential ecological effects will be incorporated into the development proposals.

7.8.43 Construction of the Proposed Development could potentially result in direct mortality and loss and fragmentation of potentially suitable habitat for both amphibians and reptiles.

Direct Mortality

7.8.44 Direct mortality by means of disturbance could occur as a result of ground breaking activities which in the absence of mitigation would result in the death and/or injury of hibernating animals or through direct contact with construction vehicles. These impacts would be of low magnitude and lead to effects of **minor/negligible** significance.

Habitat Loss and Fragmentation

7.8.45 Construction and operation of the Proposed Development would result in the temporary and permanent loss of suitable habitat for both amphibians and reptiles as described under habitat loss. However, it is anticipated that any such loss of habitat would be minimal particularly as there is no proposal to remove any higher value habitats such as ponds or drystone walls. It is therefore considered that the overall impact will be of low magnitude, giving an effect of **minor/negligible** significance due to the short-term nature of the impact. In addition, the creation of the above areas of hard infrastructure could potentially create new basking habitats for reptiles which would represent a beneficial impact and effect.

7.8.46 Habitat fragmentation could also occur through the construction of access tracks, turbine and their associated concrete slabs and areas of hard standing. However, once these structures are constructed any impact will be temporary and short-term and therefore of negligible magnitude, giving an effect of **negligible** significance.

7.8.47 Impacts due to fragmentation/isolation during operation is assessed as being unlikely and therefore of negligible magnitude, giving an effect of **negligible** significance.

Pollution

7.8.48 Limited road runoff into freshwater habitats could occur during construction due to increased traffic movements throughout the Proposed Development, which are assessed as being impacts of medium magnitude which will lead to effects of minor significance. However, as described above, potential pollution from petrochemicals and other substances during construction is considered to be unlikely. Impacts due to pollution during operation are considered unlikely and are assessed as being of negligible magnitude leading to effects of **negligible** significance.

Freshwater Fish

7.8.49 The Proposed Development could potentially result in impacts upon freshwater ecology and in particular freshwater fish both during the construction and operational phases of the Proposed Development.

7.8.50 During construction potential impacts would include noise and vibration disturbance, siltation of Polmeur Burn, Polneul Burn and Macan's Burn, hydrological changes within the Proposed Development affecting in stream habitats, pollution of the above water courses and the blocking or hindrance of upstream movement of fish, all of which could result in mortality.

7.8.51 During operation impacts would comprise changes in stream habitats due to habitat loss, for example, gravel beds which are important for spawning, siltation as a result of run off from access tracks, accelerated levels of erosion and the poor maintenance of silt traps and culverts. All of these impacts could result in mortality.

7.8.52 Given the presence of migratory salmonids and European eel, the potential impacts listed above would be of medium magnitude and have an effect of **moderate** significance in the case of noise and vibration disturbance to fish stocks and potential increased siltation, sedimentation, increased risk of pollution incidents and resulting mortality. Longer term impacts of a high magnitude and effects of **major/moderate** significance would include changes to in stream morphology leading to blockage and hindrance to fish movement, loss in gravel beds removing potential spawning grounds and mortality.

7.9 Mitigation

7.9.1 This section outlines the mitigation measures that will be implemented to ameliorate identified effects associated with the construction, operational and decommissioning phases of the Proposed Development. These measures are aimed to prevent, reduce or offset any likely significant effects of the Proposed Development on identified ecological receptors. This approach is in accordance with best practice guidance and UK, Scottish and Local Government environmental impact, planning and sustainability policies.

7.9.2 The principles and objectives for mitigation associated with the Proposed Development have been developed through an iterative process with the Applicant's design team and through discussion with SNH, SEPA and other stakeholders.

7.9.3 Mitigation will follow a hierarchical approach that should, where possible, be adopted in the following order:

- avoid adverse impacts in the first instance;
- where avoidance is not possible, reduce the adverse impacts with the aim of avoiding or reducing effects; and
- where significant adverse residual effects remain, measures to offset the adverse effects at a site specific level will be required.

7.9.4 Mitigation includes best practice methods and principles applied to the Proposed Development as a whole (generic measures), as well as site specific mitigation measures applied to individual locations (specific measures).

7.9.5 All ecological mitigation will be incorporated into a Construction and Decommissioning Environmental Management Plan (CDEMP) and the Operational Environmental Management Plan (OEMP). The CDEMP and OEMP will outline all required mitigation and provide details on timelines for undertaking mitigation for each identified ecological receptor. The CDEMP and OEMP will also outline a timetable of actions and form part of the contract documents to ensure delivery of mitigation specified in this EIA Report. In addition, the CDEMP and OEMP will incorporate the provision of an Ecological Clerk of Works (ECoW) to oversee the implementation of recommended mitigation.

Generic Mitigation

7.9.6 Generic mitigation measures that apply to all ecological receptors across the Proposed Development are outlined below:

- Not more than 12 months prior to construction of the Proposed Development, the Applicant will engage a Suitably Qualified Ecologist (SQE) to undertake a series of repeat ecological surveys to update the baseline information reported in this chapter. The aim of these surveys will be to provide up to date information in order to finalise the mitigation proposals, in addition to completing a final check prior to construction for protected species.
- Adherence to SEPA Pollution Prevention Guidance (PPG) in respect to working in and around watercourses.
- Avoidance of unnecessary disturbance to habitats by minimising the extent of ground clearance and other construction practices as far as practicable.
- Plant and personnel will be constrained to a prescribed working corridor through the use of temporary barriers, thereby minimising damage to habitats and potential direct mortality and disturbance to species.
- Works compounds, storage sites and access tracks will avoid, as far as practicable, areas of woodland and wetland or any other habitat identified as being of ecological value by the ECoW.
- Reduction of in-channel works and translocation of channel substrate.
- Adherence to best practice guidance with respect to culvert design.
- Any trenches dug during construction operations will be covered at the end of each day and/or mammal ramps will be positioned in such a way that trapped mammals may be allowed to escape.
- Regular ecological toolbox talks will be given to all construction personnel on the potential presence of protected species and any measures that need to be undertaken should such species be discovered during construction activities.

7.9.7 As part of the Proposed Development, it will be necessary to develop and implement a site Restoration Plan (SRP) as part of the CDEMP to ensure those areas of habitat that have been temporarily lost through development can regenerate.

7.9.8 In order to facilitate restoration, disturbed ground will be restored as soon as practicably possible using materials removed during the construction of access tracks, excavation of cable trenches and turbine foundations. To achieve this any excavated soil will be stored in such a manner that is suitable to facilitate retention of the seed bank. This will aid site restoration and help conserve the pre-construction floristic interests at the site.

7.9.9 Where re-seeding is required then seed mixes of local provenance will be used.

7.9.10 A Habitat Management Plan (HMP) within the CDEMP will be produced prior to construction. Detailed Species Management Plans will accompany the HMP prior to construction and it is proposed that this will be addressed through an appropriately worded condition.

Specific Mitigation

7.9.11 In addition to the provision of generic mitigation measures outlined above, the following specific measures designed to avoid, reduce and offset identified ecological effects will be implemented. These are outlined and discussed below under the respective ecological receptor headings.

Terrestrial Habitats

7.9.12 The temporary loss of habitat during construction and permanent loss of habitat during operation is unavoidable as part of the Proposed Development proposals. The majority of the habitat lost will comprise coniferous plantation woodland (New Libry Moor Plantation), bog (blanket and dry modified), acid/neutral flush, grassland (marshy, unimproved and semi-improved acid and unimproved and semi-improved grassland) and running water habitats. A summary of habitat loss to the Proposed Development is presented in Table 7.8.

Woodland and Scrub

7.9.13 As reported in the assessment of ecological effects, 3.73 ha of coniferous woodland will be permanently lost to the Proposed Development. In recognition of these losses and in order to ensure compliance with The Scottish Government's Policy on Control of Woodland Removal (Forestry Commission Scotland, 2009), and in response to concerns raised by the Forestry Commission Scotland, it is proposed, to replant approximately 10.47 ha of low canopy species within the Libry Moor plantation and approximately 0.3 ha of new broadleaved woodland within the remaining Proposed Development site in proximity to the Polneul Burn where there is already a small mix of woodland species.

7.9.14 Further details of the indicative forestry proposal are found within Chapter 17 of this ES and associated figures. These areas will be planted at a density of 400-800 stems per hectare and be designed unevenly, and will include a proportion of open habitats to encourage a mosaic of woodland/scrub and grassland habitats to develop which are of value to priority species such as reptiles, bats and birds, in particular black grouse.

7.9.15 As part of the enhancement proposals, the following species of local provenance will be used:

- downy birch (15-30%)
- rowan (15-20%)
- hawthorn (40-50%);
- willow (15-30%);
- alder (15-20%);
- aspen (15%); and
- Scots pine and larch (5%).

Grassland

7.9.16 In respect to the temporary and permanent loss of grassland during construction and operation, no additional specific mitigation is proposed due to the limited value of these habitats (in respect to marshy grassland) and small area affected (in respect to all other grassland habitats), coupled with the extent of similar unaffected habitats both within the Proposed Development site and wider area. Notwithstanding this, the preservation of the

seed bank through the appropriate storage and re-instatement of soil as part of site remediation works following a conclusion to construction will ensure the regeneration of acid and neutral grassland habitats although it is accepted these habitats will remain of a semi-improved character.

Running Water

7.9.17 Construction of access tracks will additionally result in the loss of riparian and freshwater habitat at identified proposed water crossings. These habitats are considered to be sensitive to development and will be directly affected by the Proposed Development. Mitigation to ameliorate impacts to these habitats is proposed below under Freshwater Fish.

Flush, Blanket Bog and Dry Modified Bog

7.9.18 As outlined in the assessment, the construction of infrastructure within habitats assessed as being of highest ecological value (including VERs) was minimised as far as practicable during the Design Stage of the Proposed Development and as a result the majority of turbines and other infrastructure were moved outside these higher value habitats. However, in respect to the loss of three of the highest value habitats within the Proposed Development (comprising acid/neutral flush, blanket bog and dry modified bog), it was not possible to address all identified impacts and therefore additional mitigation will be proposed to ameliorate these effects.

7.9.19 In order to mitigate the loss of the above habitats and achieve a significant beneficial conservation/biodiversity gain through construction and operation of the Proposed Development, at least 25 ha of dry modified and blanket bog habitat will be subject to extensive habitat and wider hydrological management. Detailed proposals in this respect will be included as an integrated Habitat Management Plan (HMP) within the CDEMP for the Proposed Development, following discussion and agreement with stakeholders including SNH and SEPA. As part of the HMP, habitat enhancement/management proposals within the Proposed Development will include the management and control of the water table, and control of burning and grazing.

7.9.20 As outlined in Section 7.5, bog habitats within the Proposed Development have been extensively modified through a combination of drainage and over-grazing with likely historical burning (although no evidence of burning was recorded during any of the field surveys). These activities have resulted in the drying and resultant degradation of former blanket bog and flush habitats. As part of the above proposals, efforts will be made to elevate the water table within the Proposed Development through the installation of artificial dams, weirs and sluices. Although similar efforts on other operational wind farm sites have obtained mixed results (Peter Robson, Scottish Power, pers. comm. Graham Rankin, 12 September 2012), such proposals to raise and control the water table will need to be carefully considered to ensure the structural integrity of access tracks and other infrastructure (such as turbine foundations) are not compromised. As a consequence, a detailed hydrological assessment of the ecological proposals will be undertaken as part of the HMP to ensure infrastructure is not compromised. In addition, the assessment will also provide hydrological information to ensure that habitat management proposals are focussed in areas where greatest achievement is feasible.

7.9.21 In addition to efforts to manage the Proposed Development site's hydrology and re-wet former blanket bog habitats, the control of grazing, and to a lesser extent burning will be undertaken within the above 12 ha management area as part of the above proposals.

Monitoring and Management

7.9.22 The HMP will outline a programme and methods for the regular monitoring and management of restored/created habitats, and review of the HMP to allow for adjustments in management proposals. These measures will ensure the long-term effectiveness of the above mitigation proposals, in addition to ensuring that new areas of woodland/scrub do not counter-affect the productivity of the Proposed Development through, for example, reduced wind yield.

Badger

7.9.23 Proposed mitigation for badger is provided in Confidential Appendix 7.5.

Otter

7.9.24 No specific mitigation is outlined in respect to mortality effects due to an absence of recorded otter resting places within 100 m of any construction area within the Proposed Development. However, in respect to identified disturbance and fragmentation effects, construction will avoid periods of peak otter activity which are largely taken to include the hours between dusk and dawn.

7.9.25 Given the period of time that will elapse between the current surveys and construction of the Proposed Development, a pre-construction survey of all suitable habitats for otter (including riparian and terrestrial habitats) will be undertaken both within and up to 250 m outside the Proposed Development boundary prior to construction in order to determine whether any new resting places (holts, couches and/or hovers) have been created and are in active use by otters, in particular for breeding. The results of this survey will be communicated to the contractor by the ECoW and feed into the CDEMP for the Proposed Development. This recommendation will ensure compliance with the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). In addition, should any resting sites be identified within 50 m of any working areas during the construction period, all works must cease until the ECoW is contacted and a licence is obtained from SNH.

7.9.26 No obstacles/obstructions will be placed either in stream or bankside that may impede the safe passage of otters throughout the site outside of construction periods, or obstruct access to any potential resting sites.

7.9.27 A Construction Method Statement (CMS) will be produced. This CMS will include plans and procedures incorporating drainage management, accident management, water quality monitoring and waste storage plan to ensure that water quality is a priority during the construction.

7.9.28 All excavations will be covered at the end of the working day and/or escape ramps incorporated to allow any trapped animals who might fall into trenches escape on their own accord. All exposed pipes and trenches will be checked each morning prior to starting construction activities. If trapped animals are found an experienced ecologist or specialist animal handler will be contacted to remove any distressed animals.

7.9.29 Mitigation proposals outlined for the loss of terrestrial and freshwater habitats will fulfil mitigation requirements in respect to the loss of habitat for otters.

Bats

7.9.30 An assessment of the Proposed Development for its importance to bat populations determined that the site supported habitats that were assessed as being of low to medium

value. This initial assessment was supported by the bat activity surveys which recorded relatively low levels of activity within and immediately adjacent to the Proposed Development. In addition, surveys did not identify any bat roosts either within the Proposed Development (such as within suitable trees) or wider Study Area (within suitable buildings). Nevertheless, given the period of time that will elapse between the current surveys and construction of the Proposed Development, an assessment of any trees or suitable structure for bats will be undertaken prior to felling/removal to determine whether any new roost features have developed and are in use by bat species. The results of this survey will be communicated to the contractor by the ECoW and feed into the CDEMP for the Proposed Development. This commitment will ensure compliance with the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

7.9.31 In respect to impacts resulting from direct mortality and disturbance/disruption of commuting routes, as outlined under the assessment of potential ecological effects, a hierarchy approach to mitigation provision was undertaken to ensure that turbines and other infrastructure avoided high value areas for bats, especially edge and freshwater habitats. This mitigation measure was implemented during the Design Stage of the Proposed Development and as a result and where practicable, turbines and other infrastructure were moved at least 70 m away from edge habitats, with the exception for Turbine T24, thereby reducing but not wholly avoiding identified impacts. This distance was informed by Natural England's Interim Guidance 'Bats and Onshore Wind Turbines Interim Guidance, Technical Information Note TIN051' with an understanding of the proposed turbine specifications in which the risk of bat collision can be minimised by locating turbines so that the blade tip is at least 50 m from the nearest feature at its closest point, as bat activity beyond this will decline significantly with increasing distance (Natural England, 2009).

7.9.32 It is proposed to undertake addition felling of the coniferous plantation around Turbine T24 such that a woodland edge is established at least 70m for the turbine. The loss of the coniferous plantation was accounted for in the calculation of habitat loss (Table 7.8) and consideration of mitigation for this loss is presented above.

7.9.33 The effect of fragmentation and disruption of flightlines around the boundary of New Libry Moor Plantation will be mitigated through the retention of existing trees along the eastern boundary of the plantation and where this is not practicable, the re-enforcement, enhancement and creation of new woodland edge habitats as outlined above under Terrestrial Habitats (Woodland and Scrub). These measures will ensure the continuity of bat flightlines from the north of the Proposed Development along the eastern boundary of the Proposed Development south to Polbroc Plantation and the Polbroc Burn.

7.9.34 The use of lighting will be minimised as far as practicable but if required directional lighting will minimise disturbance associated with light spillage along woodland edge and into woodland blocks or other high value habitats such as freshwater features located adjacent to the working area.

7.9.35 Mitigation measures outlined for the loss of terrestrial and freshwater habitats will fulfil mitigation requirements in respect to the loss of foraging habitat for bats. Additional creation of roosting habitats will be undertaken through the provision of bat boxes within areas identified by the HMP at approximately a ratio of ten boxes per sq. km. The location of these will be confirmed within the HMP.

Amphibians and Reptiles

7.9.36 Specific mitigation for amphibians and reptiles will aim to reduce the potential for any mortality or other harm to these species as a result of the Proposed Development and ensures that sufficient habitat of suitable quality, quantity and connectivity is maintained to accommodate the populations of reptile and amphibians. It is considered that translocating animals is not a viable option for the Proposed Development and as such animals will be encouraged to move to other undeveloped areas of the Proposed Development on their own accord through improving the suitability of these areas for such species coupled with a reduction in suitability of habitats to be developed through the removal or sequential reduction in vegetation height.

7.9.37 Measures to enhance the habitats within the Proposed Development for amphibian and reptiles will include the creation of log and stone piles to create new hibernacula to compensate for the loss of existing structures within the site. Mitigation will be discussed and developed prior to construction through detailed consultation with SNH and will be outlined within the integrated HMP.

7.9.38 An ecological watching brief will be provided during the hibernation period (October to March - dependent upon temperature) to ensure that ground breaking works (if undertaken at this time of year) minimise disturbance and mortality effects to reptiles and amphibians and therefore are legally compliant under the Wildlife and Countryside Act 1981 (as amended). If ground breaking works do occur during the hibernation period then measures to reduce impacts will be considered such as the use of bog mats to reduce ground pressure limiting potential to cause injury to subterranean animals. Any habitat considered as being of higher value for reptiles will be clearly demarcated (i.e. with clearly visible tape) to prevent any construction vehicles accidently straying into these habitats.

7.9.39 Mitigation proposals outlined for the loss of terrestrial and freshwater habitats will fulfil mitigation requirements in respect to the loss of habitat for amphibians and reptiles.

Freshwater Fish

7.9.40 Specific mitigation for freshwater fish and habitats will focus on reducing disturbance and fragmentation and loss and/or a reduction/deterioration of riparian habitats, particularly in respect to works within the Polneul and Polmeur Burns and their tributaries. Consequently, construction works at the identified watercourse crossings will be undertaken in such a way that freshwater fish will be able to move up and downstream of the proposed crossing during construction and operation of the Proposed Development.

7.9.41 Where bridging is not feasible and culverts are required, the length of culverts will be kept to a practical minimum and should not alter the gradients markedly from existing conditions so as to avoid altering flow patterns and resulting habitat loss and to avoid excessive siltation or erosion. Similarly, culverts will be bottomless to allow natural bed and bank profiles to remain, where practicable, which will assist in the reduction of the risk of erosion through increased water velocities. Culverts will be maintained to an adequate level thereby ensuring continual operation during operation of the Proposed Development. Blocked or poorly screened culverts may impede the migration of fish leading to greater fragmentation effects. In addition, culverts will remain unobstructed at night.

7.9.42 In-channel works will avoid the salmonid spawning and salmonid egg incubation periods (October - May inclusive) which co-insides with the majority of the European eel migration period (late winter to early summer).

7.9.43 In addition, run-off will be intercepted and treated according to SEPA PPG guidelines as detailed above under generic measures. The CDEMP and HMP will include measures to prevent sedimentation of watercourses and reduce potential for pollution incidents, provision of spill kits, and outline on-going monitoring of water quality and fish stocks.

7.10 Assessment of Proposed Development Residual Effects

Introduction

7.10.1 Table 7.11 present an assessment of the residual ecological impacts after the implementation of mitigation outlined in Section 7.9. The assessment of effects are considered for construction, operation and decommissioning of the Proposed Development.

7.10.2 As described in Section 7.3 of this chapter, the significance of the ecological effect is a product of the value of the ecological receptor (within a geographical context) and the magnitude of the impact in relation to the resource that has been evaluated.

7.10.3 In order to fully assess and appreciate the significance of residual ecological impacts, further consideration is given to two additional criteria, these being: the type of impact, i.e. whether it is beneficial, adverse, neutral or uncertain and the probability of the effect occurring using a scale of certain/near-certain, probable, unlikely or extremely unlikely (IEEM, 2006).

Habitats

7.10.4 A significant beneficial residual effect will remain in respect to the creation, enhancement, management and restoration of flush, bog and woodland/scrub habitats that collectively will provide a habitat mosaic of greater ecological and biodiversity value than currently present. In addition, the management of bog and creation of native woodland/scrub habitats will also contribute to the targets and objects in the LBAP. In respect to the proposed mitigation, the residual impact magnitude is assessed as being beneficial and therefore the effect significance is **minor/moderate beneficial**.

7.10.5 All remaining identified significant impacts will be ameliorated by the proposed mitigation to a magnitude of negligible resulting in effects of **negligible** significance.

Protected Species

7.10.6 With regards to protected species, due to the restoration and management of flush and bog habitats, and provision of broadleaved plantation woodland (which will have a secondary value in terms of adding to the foraging, resting and roosting resource) a significant beneficial residual impact and **minor beneficial** effect will remain in respect to habitat loss for bats, amphibians and reptiles.

7.10.7 However, residual impacts of low magnitude and effects of minor significance would remain for otter and freshwater fish in respect to habitat fragmentation and disturbance during construction. Similarly, short to medium term impacts of low magnitude and effects of minor/negligible significance would remain in respect fragmentation during operation for bats until proposed woodland/scrub planting reaches maturity.

7.10.8 All remaining identified significant impacts have been ameliorated by the proposed mitigation to a negligible magnitude, resulting in effects of **negligible** significance.

7.11 Assessment of Proposed Development Cumulative Effects

7.11.1 The assessment of effects to receptors taking into consideration other operational, under construction and in planning developments. The assessment does **not** assess developments in scoping. The assessment should take into consideration all types of developments, not just other wind farms.

7.11.2 This section provides an assessment of the potential cumulative ecological residual effects on ecology and nature conservation resulting from construction, operation and decommission of the Proposed Development in-combination with other developments proposed, consented or operational within 10 km of the Proposed Development.

7.11.3 Seventeen wind farm developments were identified within 10 km of the Proposed Development, as follows:

- Hare Hill Wind Farm (operational);
- Hare Hill Extension (operational);
- Sunnyside Wind Farm (operational);
- Whiteside Hill Wind Farm (operational);
- Afton Wind Farm (consented);
- Glenmucklock Wind Farm (consented);
- Sanquhar Community Wind Farm (consented)
- Sanquhar Six Wind Farm (consented);
- High Park Farm (consented);
- Twentyshilling Hill Wind Farm (consented);
- Lethans Wind Farm (in planning);
- Ulzieside Wind Farm (in planning);
- High Park Farm Extension (in planning);
- Ashmark Farm Wind Farm (in planning);
- Pencloe Wind Farm (in planning);
- Lorg Wind Farm (in planning); and
- Enoch hill Wind Farm (in planning).

7.11.4 Of these the ecology assessment of the EIA was not available for the following wind farms:

- Hare Hill Wind Farm;
- Lethans Wind Farm;

- Ulzieside Wind Farm;
- High Park Farm Extension; and
- Pencloe Wind Farm.

7.11.5 None of the ecological assessments for the above wind farms (where available) identify any significant residual ecological effects.

7.11.6 The main residual non-significant construction effects identified are habitat loss (in particular bog) and disturbance effects to bats, otters, salmonids. During operation the main residual effect identified was collision resulting in mortality for bats. Full details are provided in Table 7.10.

Table 7.10 – Cumulative Assessment of Potential Ecological Effects: Wind Farm Development within 10 km of the Proposed Development.

Site Name	Distance from Proposed Development	Stage	Details / Description of Significant Residual Effects
Afton Wind Farm	7.5 km south-west	Consented	Afton Wind Farm comprises a development of 27 turbines. No significant residual ecological effects are anticipated, with non-significant residual construction effects including loss of acid grassland and wet modified habitat, disturbance to otter, and pollution to fish during construction.
Glenmuckloch Wind farm	4.0 km north	Consented	Glenmuckloch Wind Farm consists of eight turbines. No significant residual ecological effects were reported as part of the ES however 5.05ha of mire bog and 0.49ha of acid grassland would be permanently lost with a further 1.20ha disturbed by construction activities.
Sanquhar Community Wind Farm	1.8 km south-west	Consented	Sanquhar Community Wind Farm comprises of 12 turbines. No significant residual ecological effects upon floral and faunal species were predicted as a result of the proposed development.
Hare Hill	1.6 km west	Installed	The wind farm has been operational since 2000 and comprises a development of 20 turbines. The EIA for the original wind farm is no longer publicly available and therefore no information regarding the assessment of significant residual ecological effects is available
Hare Hill Extension	1.8 km south-west	Operational	The extension would increase the size of the development to 59 turbines. The ES does not identify any significant ecological effects, with non-significant effects identified to blanket bog, wet heath/acid grassland, bats, otters, reptiles, brown hare and migratory salmonids.
High Park Farm	6.0 km west	Consented	High Park Farm consists of two turbines. The Ecological assessment identified no significant ecological effects with non-significant effects identified to otters, bats, breeding and wintering birds due to loss of habitat and to bats and birds through mortality due to turbine collisions.
Lethans Wind farm	3.5 km north	In planning	The development comprises 26 wind turbines - 12 with a maximum tip height of 132m, 14 with a maximum tip height of 152m. The ecological chapter of the ES is not currently available on the Local Authority website.
Sunnyside Wind farm	6.3 km east	Operational	The development comprises 2 turbines with maximum height of 62 m to tip. The ecological assessment identified no significant ecological effects with non-significant effects identified to bats through construction disturbance, to great crested newts due to loss of habitat, and to improved grasslands through loss of habitat.
Twentyshilling Hill Wind farm	9.2km south-east	Consented	The development comprises 9 turbines with a maximum height of 125 m to tip. The ecological assessment identified no significant ecological effects, low effects are anticipated to bats though collision risk, to wet modified bog due to habitat loss and to open water habitats due to the construction of watercourse crossings.
Ulzieside Wind farm	4.3km south-east	In planning	Ulzieside Wind Farm comprises t of 12 turbines. The ES is not currently available on the Local Authority website.

Site Name	Distance from Proposed Development	Stage	Details / Description of Significant Residual Effects
Whiteside Hill Wind farm	4.4km south	Operational	Whiteside Hill Wind Farm comprises of 10 turbines. The main ecological effects identified included direct habitat loss and disturbance to otter and effects on fish from run off and sedimentation of water courses during construction. However, it was predicted that any residual ecological effects will be non-significant.
Sanquhar Six Wind Farm	2.7 km south	Consented	Sanquhar Six Wind Farm consists of six turbines. The ecological assessment identifies no significant residual ecological effects with disturbance effects on otters and bats from construction, and collision effects to bats during operation assessed as being of negligible or low significance.
High Park Farm Extension	5.2km west	In planning	High Park Farm Extension consists of two turbines. The ecological chapter of the ES is not currently available on the Local Authority website.
Ashmark Farm	7.5 km north-west	In planning	Ashmark Farm Wind Farm consist of seven turbines. No significant residual ecological effects were identified, with non-significant residual ecological effects predicted on dry and wet modified bog due to habitat loss, bats due to disturbance and otters and reptiles due to disturbance or injury during construction.
Pencloe	7.5 km south-west	In planning	The development comprises 21 wind turbines. The ecological chapter of the ES is not currently available on the Local Authority website.
Lorg	7.5 km south	In planning	Lorg Wind Farm consists of nine turbines. The ecological assessment identified no significant residual effects, with non significant residual effects anticipated to bats, salmonids and otters from construction.
Enoch Hill	8.4 km south-west	In planning	Enoch Hill Wind Farm consists of 16 turbines. The ecological assessment identified no significant residual effects, with non-significant residual effects anticipated on bats, salmonids and otters from construction

7.11.7 As outlined in this chapter, a significant beneficial residual impact was predicted in respect to the creation, enhancement, management and restoration of flush, bog and woodland/scrub habitats. Therefore, no cumulative adverse effects are anticipated due to the Proposed Development in conjunction with other wind farm developments on bog habitats.

7.11.8 It is anticipated that the Proposed Development will have non-significant residual effects on otter and freshwater fish during construction, similar to some of the other wind farm developments within 10 km. However, as it is unlikely that construction of the wind farm developments will occur simultaneously and due to the short duration of construction period, it is not anticipated that a cumulative significant effect would arise on otters and fish due to construction.

7.11.9 The Proposed Development identified residual beneficial operation effects for bats, salmonids and reptiles due to habitat creation, with adverse residual non-significant effects of fragmentation remaining for bats until the new habitat is mature. A number of the wind farm developments within 10 km identify non-significant residual mortality effects to bats due to collision during operation. Although the Proposed Development will have also have residual mortality effects to bats, there is not anticipated to be a cumulative significant effect on bat populations.

7.11.10 As outlined in table 7.11 below three developments of open cast mines (in planning, consented and operational) are present within 5 km of the Proposed Development. All three developments predict no long term residual effect as a result of restoration plans post operation. However, during the operational phases of the schemes and lengthy period following the implementation of restoration there is likely to remain a significant effect of habitat loss especially for the loss of bog habitats. Cumulatively a loss of 15.96 ha of bog habitat (blanket, dry modified and wet modified inclusively) from the figures provided by the Rigg South OCCS ES and the Proposed Development. Although the ES is no longer available for the Glenmuckloch Surface Coal Mine, the habitat types described in brief within the NTS suggest the development would also result in a loss of bog habitats.

7.11.11 Therefore, there is considered to be a cumulative effect of high magnitude and major – moderate significance at a Local level for the loss of bog habitat to development. This cumulative effect is likely to be of minor significance and of low magnitude within Dumfries and Galloway Authority area as a result of the high abundance of this habitat type throughout the region.

7.11.12 There is unlikely to be any cumulative effects to protected species as all development are unlikely to have any significant effects in the long term.

Table 7.11 – Cumulative Assessment of Potential Ecological Effects: Open Cast Developments within 5 km of the Proposed Development

Site Name	Distance from Proposed Development	Developer	Stage	Details / Description of Significant Residual Effects
The Rigg OCCS	Immediately adjacent to site north site boundary	ATH Resources PLC	Consented (not operational)	The proposed scheme is an opencast coal development that will occupy a total site area of about 146 ha. The proposal has been granted planning consent however construction and operation has not yet commenced. No effects have been predicted on the Muirkirk and Lowther Uplands SPA. Impacts on habitat within the site include the loss of 1 km^2 semi improved grassland, 10 ha of semi improved acid grassland, 12 ha of improved grassland and a minimal area of marshy grassland. After operation the restoration of the site has been predicted to improve biodiversity and there for there is predicted to be no long term residual impacts. The operation of the mine will result in the loss of 5 ha of wet modified bog which cannot be restored after operation. The losses of all other habitats are considered to be not significant. There is not predicted to be any significant impacts on any protected species including badger, bats, otter and water vole.
Rigg North, Kirkconnel	1.8 km / north	ATH Resources PLC	Planning application	The Rigg North, Kirkconnel surface mine comprises an area of approx. 167 ha. The surface mine is currently operational and the Environmental Statement can be reviewed at http://eaccess.dumgal.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=_DUMF_DCAPR_99102 The majority of the area comprises of semi-improved and improved grassland, in addition to rush pasture and flushes. Short term minor significant impacts were predicted for all habitat types due to habitat loss as a result of the operational stage. Bats and otter were predicted to be impacted by disturbance and loss of habitat during the operational stage. Both species were predicted to experience a probable minor significance of effect. After operation there is likely to be a restoration programme which will result in a neutral effect on all receptors in the long term.
Glenmuckloch Surface Coal Mine	4km	ATH Resources PLC	Operational	Glenmuckloch surface coal mine is an operational surface mine north of the Proposed Development. The original ES is no longer publically available however the non-technical summary for the proposed extension of the mine is still available at :

Site Name	Distance from Proposed Development	Developer	Stage	Details / Description of Significant Residual Effects
				Glenmuckloch20surface20mine20-20proposed20east20extension20nts20june20202010.pdf The extension site was noted to be covered by a range of heath, mire and grassland habitats over peat of varying depths, with limited larger areas of standing water present towards the centre, eastern and western boundaries of the site. Smaller bog pools and wet flushes are also present throughout the wetter areas of the site, particularly towards the south-east. To the west, habitats are dominated by acid grassland; such habitats are common within upland and northern Britain and widespread within the Muirkirk uplands. No significant impacts were predicted for protected species. The site was considered to be of local value for the bird population however the NTS does not provide information on the significance of impacts on birds pre or post mitigation. It was considered that no adverse impact on the integrity of the SPA would result from the development.

7.12 Conclusion

7.12.1 The ecology assessment covers the site of the Proposed Development and up to 1.5 km from the site (dependent on animal or habitat surveyed).

7.12.2 The site is mainly covered by commercial coniferous plantation, dry modified bog and marshy grassland with smaller areas of semi-natural habitats represented by unimproved acid grassland and blanket bog. Specialised surveys indicated that four species of bat, as well as badger, otter, amphibians and reptiles are currently utilising the site. In addition, fish surveys indicated that the burns within, and adjacent to the Proposed Development, support salmon, trout, European eel and stone loach populations.

7.12.3 The potential effects of the Proposed Development will be mitigated through the application of best practice guidance together with specific measures such as the creation and enhancement of habitats through replacement and additional planting and grazing management. An Ecological Clerk of Works will oversee the implementation of recommended mitigation and a Habitat Management Plan will set out habitat management and enhancement proposals for the Proposed Development site.

7.12.4 A significant **beneficial** residual effect is predicted due to the habitat and water management of the mire and bog and the planting of 10.47 ha of mixed woodland/scrub. All other effects will be reduced to negligible with the application of appropriate mitigation with the exception of minor adverse effects to otter and freshwater fish, and minor/negligible adverse effects to bats, due to habitat fragmentation and disturbance during construction.

7.12.5 Taking into consideration other wind farm developments, the Proposed Development is not expected to result in cumulative ecological effects greater than those predicted for the Proposed Development alone.

7.12.6 There is considered to be a significant cumulative effect as a result of habitat loss at a local level of the Proposed Development in combination with the Glenmuckloch Surface Coal Mine and proposed Rigg North and Rigg South Surface Coal Mines, which reduces to non-significant at an Authority Area level. No cumulative effects to protected species are anticipated.

7.12.7 The predicted residual significant effects for the Proposed Development are exactly the same as those which would arise from the 'do-nothing scenario', which would result in the implementation of the Consented Development.

7.12.8 The EIA Regulations, at Schedule 4, require the EIA Report to provide a

"description of the likely significant effects of the development on the environment resulting from, inter alia:

… (e) the cumulation of effects with other existing and/or approved development, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;"

7.12.9 In this regard, the Proposed Development would be indiscernible from the Consented Development.

Table 7.12 – Summary of Proposed Development Effects

VER	Description of Effect	Potential Effect		Mitigation	Residual Effect	
		Significance	Adverse / Beneficial		Significance	Adverse / Beneficial
Construction and decommissioning						
Habitats	Marshy grassland (NVC community: M23a/b & M25a)	Minor - negligible	Adverse	Generic mitigation Preservation of the seed bank through the appropriate storage and re-instatement of soil as part of site remediation works.	Negligible / Negligible	Adverse
	Unimproved acid grassland (NVC community: U5a)	Minor - negligible	Adverse	Generic mitigation. Preservation of the seed bank through the appropriate storage and re-instatement of soil as part of site remediation works.	Negligible / Negligible	Adverse
	Running and standing water (NVC community: n/a)	Major - minor	Adverse	Generic mitigation.	Negligible / Negligible	Adverse
	Acid/neutral flushes (NVC community: M6c/d)	Moderate	Adverse	Generic mitigation. Extensive habitat and wider hydrological management of 25 ha of dry modified and blanket bog habitat.	Positive / Moderate	Beneficial
	Blanket bog (including areas of dry modified bog) (NVC community: M20)	Major - moderate	Adverse	Generic mitigation. Extensive habitat and wider hydrological management of 25 ha of dry modified and blanket bog habitat.	Positive / Moderate	Beneficial
	Dry heath/acid grassland (NVC community: H10c)	No effect	Neutral	None proposed.	No effect	-
	Non-ruderal Herb (NVC Community: U19)	Moderate	Adverse	Generic mitigation.		-
Otter	Direct Mortality	Negligible	Neutral	Generic mitigation. Pre-construction survey in advance of construction; exclusion of resting places under terms of development licence if avoidance and reduction mitigation strategies are not practicable.	Negligible / Negligible	Adverse
	Habitat Loss	Minor	Adverse		Negligible / Negligible	Adverse
	Fragmentation	Moderate	Adverse		Low / Minor	Adverse
	Disturbance	Moderate	Adverse		Low / Minor	Adverse

VER	Description of Effect	Potential Effect		Mitigation	Residual Effect	
		Significance	Adverse / Beneficial		Significance	Adverse / Beneficial
	Pollution	Moderate	Adverse	No works to be undertaken within 50m of identified resting places unless under the terms of a development licence. Removal of in-stream obstacles outside construction periods. Daily check of works area with specific reference to pits or other deep excavation by the ECoW.	Negligible / Negligible	Adverse
Bats	Direct Mortality	Moderate/minor	Adverse	Generic mitigation. Implementation of avoidance strategies as part of the Design Stage comprising a stand-off of 70m form features deemed to be of higher value to bats e.g. woodland edge and water course. Pre-construction survey in advance of construction; exclusion of roosts under terms of development licence if avoidance and reduction mitigation strategies are not practicable. Watching brief by EcoW during clearance of areas of woodland which	Negligible / Negligible	Adverse
	Habitat Loss	Negligible	Neutral		Negligible / Negligible	Adverse
	Fragmentation	Negligible	Neutral		Negligible / Negligible	Adverse
	Disturbance	Minor - negligible	Adverse		Negligible / Negligible	Adverse
	Pollution	Negligible	Neutral		Negligible / Negligible	Adverse
Amphibian and Reptiles	Direct Mortality	Minor – Negligible	Adverse	Generic mitigation. Management of habitats to displace reptiles and amphibians away from works areas. No ground breaking works to be undertaken during the hibernation season. Where works during hibernation cannot be avoided low pressure matting is to be used to reduce the likelihood of crushing animals. Identification and protection of higher value reptile and amphibian habitat.	Negligible / Negligible	Adverse
	Habitat Loss	Minor - Negligible	Adverse		Negligible / Negligible	Adverse
	Fragmentation	Negligible	Adverse		Negligible / Negligible	Adverse
	Disturbance	Minor - Negligible	Adverse		Negligible / Negligible	Adverse
	Pollution	Minor	Adverse		Negligible / Negligible	Adverse
Freshwater Fish	Direct Mortality	Moderate	Adverse	Generic mitigation. Removal of in-stream obstacles outside construction periods. Avoidance of in-channel works during spawning, incubation and migration periods.	Negligible / Negligible	Adverse
	Habitat Loss	Negligible	Neutral		Negligible / Negligible	Adverse
	Fragmentation	Moderate	Adverse		Low / Minor	Adverse

VER	Description of Effect	Potential Effect		Mitigation	Residual Effect	
		Significance	Adverse / Beneficial		Significance	Adverse / Beneficial
	Disturbance	Moderate	Adverse	Design and installation of bridges and where this is not practicable, installation of bottomless culverts in order to retain bankside profiles. EMP and HMP must include measures to prevent sedimentation of water courses and reduce potential for pollution incidents, provision of spill kits, and outline on-going monitoring of water quality and fish stocks.	Low / Minor	Adverse
	Pollution	Moderate	Adverse		Negligible / Negligible	Adverse
Operation						
Habitats	Coniferous/ Broadleaved Woodland	Minor	Adverse	Generic mitigation. Creation and management of 10.47 ha of mixed woodland/scrub to enhance and re-enforce existing areas of low value coniferous plantation woodland adjacent to the Proposed Development's eastern and southern boundary.	Positive / Minor	Beneficial
	Marshy grassland (NVC community: M23a/b & M25a)	Minor - negligible	Adverse	Generic mitigation.	Negligible / Negligible	Adverse
	Unimproved acid grassland (NVC community: U5a)	Minor - negligible	Adverse	Generic mitigation.	Negligible / Negligible	Adverse
	Running and standing water (NVC community: n/a)	Major - minor	Adverse	Generic mitigation.	Negligible / Negligible	Adverse
	Acid/neutral flushes (NVC community: M6c/d)	Moderate	Adverse	Generic mitigation. Extensive habitat and wider hydrological management of 25 ha of dry modified and blanket bog habitat.	Positive / Moderate	Beneficial
	Blanket bog (including areas of dry modified bog) (NVC community: M20)	Major - moderate	Adverse	Generic mitigation. Extensive habitat and wider hydrological management of 25 ha of dry modified and blanket bog habitat.	Positive / Moderate	Beneficial

VER	Description of Effect	Potential Effect		Mitigation	Residual Effect	
		Significance	Adverse / Beneficial		Significance	Adverse / Beneficial
	Dry heath/acid grassland (NVC community: H10c)	No effect	Neutral	None proposed.	No effect	-
	Non-ruderal Herb (NVC Community: U19)	Moderate	Adverse	Generic mitigation.	Negligible / Negligible	Adverse
Badger Confidential Appendix 7.5						
Otter	Direct Mortality	Extremely unlikely	Negligible	Generic mitigation. Restriction of working to daylight hours to minimise disturbance. Felling of low value plantation coniferous woodland and creation and management of 10.47 ha of mixed woodland/scrub to enhance and re-enforce existing areas of low value coniferous plantation woodland adjacent to the Proposed Development's eastern and southern boundary.	Negligible / Negligible	Adverse
	Habitat Loss	Unlikely	Minor		Negligible / Negligible	Adverse
	Fragmentation	Unlikely	Negligible		Negligible / Negligible	Adverse
	Disturbance	Unlikely	Negligible		Negligible / Negligible	Adverse
	Pollution	Unlikely	Negligible		Negligible / Negligible	Adverse
Bats	Direct Mortality	Unlikely	Minor - negligible	Generic mitigation Provision of replacement roosting opportunities in suitable donor sites e.g. bat boxes in trees outside the developed areas but within the Proposed Development boundary at a ratio of ten boxes per sq. km. Felling of low value plantation coniferous woodland and creation and management of 10.48 ha of mixed woodland/scrub to enhance and re-enforce existing areas of low value coniferous plantation woodland adjacent to the Proposed Development's eastern and southern boundary.	Negligible / Negligible	Adverse
	Habitat Loss	Certain/near-certain	minor		Positive / Minor	Beneficial
	Fragmentation	Probable	minor – negligible		Low / Minor - Negligible	Adverse
	Disturbance	Unlikely	minor - negligible		Negligible / Negligible	Adverse
	Pollution	Unlikely	Negligible		Negligible / Negligible	Adverse
Amphibian and Reptiles	Direct Mortality	Extremely unlikely	Negligible	Generic mitigation. Enhancement of existing habitat through the installation of log piles or other structures that can be used during the hibernation season. Identification and protection of higher value reptile and amphibian habitat.	Negligible / Negligible	Adverse
	Habitat Loss	Certain/near-certain	Minor - negligible		Positive / Minor	Beneficial
	Fragmentation	Unlikely	Negligible		Negligible / Negligible	Adverse

VER	Description of Effect	Potential Effect		Mitigation	Residual Effect	
		Significance	Adverse / Beneficial		Significance	Adverse / Beneficial
	Disturbance	Unlikely	Negligible	Specific mitigation for loss and enhancement of mire and flush habitats and creation of broadleaved woodland habitats.	Negligible / Negligible	Adverse
	Pollution	Unlikely	Negligible		Negligible / Negligible	Adverse
Freshwater Fish	Direct Mortality	Certain/near-certain	Moderate	Generic mitigation. Avoidance of in-channel works during spawning and incubation periods. Inspection and maintenance of culverts during operation to ensure barriers to migration and movement are removed.	Negligible / Negligible	Adverse
	Habitat Loss	Probable	Major - moderate		Negligible / Negligible	Adverse
	Fragmentation	Unlikely	Negligible		Negligible / Negligible	Adverse
	Disturbance	Unlikely	Negligible		Negligible / Negligible	Adverse
	Pollution	Unlikely	Moderate		Negligible / Negligible	Adverse

Table 7.13 – Summary of Cumulative Effects

Construction, Operation or decommissioning	Description of Effect	Development	Cumulative Effect	
			Significance	Adverse/Beneficial
Construction, Operation and Decommissioning	Effects on ecology and nature conservation.	Proposed, consented and operation wind farm developments.	Negligible	Adverse
	Loss of bog habitats	Glenmuckloch Surface Coal Mine, Rigg North Surface Coal Mine and Rigg South OCCS and Glenmuckloch Wind farm	Major/ moderate locally and minor at authority area.	Adverse
	Protected species		No effect.	N/A

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