Technical Appendix 6.1: National Vegetation Classification & Habitats Survey Report

M74 West Renewable Energy Park

National Vegetation Classification & Habitats Survey Report

Technical Appendix 6.1

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1 INTRODUCTION

MacArthur Green was commissioned by M74 West Limited (the Applicant) to carry out a National Vegetation Classification (NVC) and habitats survey at the M74 West Renewable Energy Park, hereafter referred to as the 'Proposed Development'.

The aim of the NVC survey is to identify and map the vegetation communities present within the Site (defined by the application boundary on **Figure 6.1** (EIAR Volume 3a) to identify those areas of greatest ecological interest (i.e., Annex I habitats[1]; potential Groundwater Dependent Terrestrial Ecosystems (GWDTE)[2]; and Scottish Biodiversity List (SBL) priority habitats[3]). This information is used to inform the Proposed Development siting and design process and the ecological assessment for the Proposed Development.

This report details the findings of the NVC surveys together with an evaluation of those communities described.

2 THE SITE AND SURVEY AREA

2.1 Overview

The Site is located immediately north and northwest of Abington, South Lanarkshire. The Site predominantly occupies open moorland, acid, improved, semi-improved and marshy grassland, and small areas of forestry. The Site contains an active quarry and is intersected by the M74 motorway and the B7078 and B740 roads. There are numerous minor watercourses on and around the Site which drain into the Duneaton Water and River Clyde.

This Technical Appendix reports on the habitats recorded within the survey area, i.e., the entire area covered by NVC field surveys, covering a total of 1,497 hectares (ha). The survey area in some cases extends beyond the Site (which covers 1,400 ha) which reflects earlier and larger areas of interest which have been refined down during the iterative design process, and to also provide sufficient survey buffers to account for the possible presence of potential GWDTE (where land access allowed). The appropriate scale and 'study area' for the assessment of effects with regards habitat loss has been deemed to be the Site (as defined in **Chapter 6: Ecology** (EIAR Volume 2)).

2.2 Designated Sites

Designated sites within 5 km of the Site, and the relevant habitat related, or botanical, qualifying features relevant to this Technical Appendix are detailed in **Table 2-1** (see also **Figure 6.1** (EIAR Volume 3a)).

[1] As defined by the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive).
[2] As per SEPA (2017a). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017 and SEPA (2017b). Land Use Planning System SEPA Guidance Note 4: Planning guidance on on-shore windfarm developments. Version 3. Issue date: 11/09/2017.
[3] https://www.nature.scot/scotlands-biodiversity/habitat-definitions.

Table 2-1 Designated Sites with Botanical Qualifying Features within 5 km of the Site

Designated Site	Distance from Application boundary	Distance from nearest Proposed Infrastructure	Qualifying Feature	Last Assessed Condition & Date
Red Moss SAC	Within Site	125 m to turning head for Turbine 18	Active Raised Bog	Unfavourable Recovering 25/08/2015
Red Moss SSSI	Within Site	125 m to turning head for Turbine 18	Raised Bog	Unfavourable Recovering 25/08/2015

2.3 Ancient Woodland

There is a single area of ancient woodland (as present on the Ancient Woodland Inventory (AWI)[4]) within the Site, northeast of Craighead Hill, known as Whitrae Wood. This is categorised as 2b (long-established woodlands of plantation origin). Within 5 km of the Site there are a number of further ancient woodland stands, see **Figure 6.1** (EIAR Volume 3a).

The definition of ancient woodland is land that is currently wooded and has been continually wooded at least since 1750. It is not related to the age of the trees that are currently growing there and they do not have to be ancient or elderly, as it is the historical continuity of the woodland habitat that makes a woodland ancient. The AWI holds information on the location and extent of ancient woodland within Scotland, and categorises each stand as follows:

- **Ancient Woodland (1a and 2a)** - Interpreted as semi-natural woodland from maps of 1750 (1a) or 1860 (2a) and continuously wooded to the present day. If planted with non-native species during the 20th century they are referred to as Plantations on Ancient Woodland Sites (PAWS);
- Long-established woodlands of plantation origin (LEPO) (1b and 2b) - Interpreted as plantation from maps of 1750 (1b) or 1860 (2b) and continuously wooded since. Many of these sites have developed semi-natural characteristics, especially the oldest stands, which may be as rich as ancient woodland; and
- Other woodlands on Roy maps (3) - Shown as un-wooded on the 1st Edition of the Ordnance Survey maps (produced in circa 1850) but as woodland on the Roy maps (produced in circa 1750). Such sites have, at most, had only a short break in continuity of woodland cover and may still retain features of ancient woodland.

2.4 Carbon and Peatland Map 2016

The Carbon and Peatland Map 2016[5] was consulted to determine likely peatland classes present within the Site. The map is a predictive tool that provides an indication of the likely presence of peat at a coarse scale. The Carbon and Peatland map has been developed as a high-level planning

4 NatureScot (2024). Ancient Woodland Inventory. Online. Available: https://opendata.nature.scot/datasets/ancient-woodland-inventory/explore. [Accessed 18 May 2024]
5 SNH. (2016) Carbon and Peatland 2016 map. Online. Available: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map. [Accessed 18 May 2024]

tool and identifies areas of nationally important carbon-rich soils, deep peat and priority peatland habitat[6] as Class 1 and Class 2 peatlands.

Figure 6.2 (EIAR Volume 3a) indicates that, according to this predictive tool and map, the Site contains a relatively small area of Class 1 peatland to the west by Red Moss. The majority of the remaining area is composed of Class 0[7] (mineral) soils (in the east), Class 3[8] soils (to the west, and north of the B7078 road), and Class 5[9] soils (to the west, and south of the B7078 road).

3 SURVEY METHODOLOGY

3.1 National Vegetation Classification (NVC)

Vegetation was surveyed by suitably qualified and experienced botanical surveyors using the NVC scheme (Rodwell, 1991-2000; 5 volumes[10]) and in accordance with NVC survey guidelines (Rodwell, 2006[11]). The NVC scheme provides a standardised system for classifying and mapping semi-natural habitats and ensures that surveys are carried out to a consistent level of detail and accuracy.

Homogeneous stands and mosaics of vegetation were identified and mapped by eye and drawn as polygons on high resolution aerial imagery field maps. These polygons were surveyed qualitatively to record dominant and constant species, sub-dominant species and other notable species present. The surveyors worked progressively across the survey area to ensure that no areas were missed, and that mapping was accurate. NVC communities were attributed to the mapped polygons using surveyor experience and matching field data against published floristic tables[10]. Stands were classified to sub-community level where possible, although in many cases the vegetation was mapped to community level only because the vegetation was species-poor or patches were too small to allow meaningful sub-community determination; or because some areas exhibited features or fine-scale patterns or transitional zones of two or more sub-communities.

Quadrat sampling was not used in this survey because experienced NVC surveyors do not need to record quadrats in order to reliably identify NVC communities and sub-communities[11]. Notes were made about the structure and flora of larger areas of vegetation in many places (such as the abundance and frequency of species, and in some cases condition and evident anthropogenic impacts). It can be better to record several larger scale qualitative samples than one or two smaller quantitative samples; furthermore, qualitative information from several sample locations can be vital for understanding the dynamics and trends in local (survey area) vegetation patterns[11].

Due to small scale vegetation and habitat variability and numerous zones of habitat transitional between similar NVC communities, many polygons can represent complex mosaics of two or more NVC communities. Where polygons have been mapped as mosaics an approximate percentage

[6] Priority peatland habitat is land covered by peat-forming vegetation or vegetation associated with peat formation.
7 Class 0 - Mineral soil - Peatland habitats are not typically found on such soils. No peatland vegetation.
[8] Class 3 - Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat. Indicative soil = Predominantly peaty soil with some peat soil. Indicative vegetation = Peatland with some heath.
[9] Class 5 - Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat. Indicative soil = Peat soil. Indicative vegetation = No peatland vegetation.
[10] Rodwell, J.S. (Ed), et al. (1991 – 2000). British Plant Communities (5 volumes). Cambridge University Press, Cambridge.
[11] Rodwell, J.S. (2006). NVC Users' Handbook. ISBN 978 1 86107 574 1.

cover of each NVC community within the polygon is given so that the dominant community and character of the vegetation could still be ascertained.

3.2 Phase 1 Habitat Characterisation

The NVC and mapping data was correlated to the equivalent habitats according to the Phase 1 habitat classification (JNCC, 2010[12]), considering the species composition and habitat quality. The Phase 1 characterisation has been utilised to allow a broader visual representation of the habitats within the survey area. Polygons or areas where there are mosaic NVC communities have generally been assigned a single Phase 1 classification based on the dominant NVC type (despite some polygons containing multiple Phase 1 types, often in low percentages). Therefore, the Phase 1 characterisation is generally a broader overview, and the NVC data should be referred to for further detail in any specific area.

It should be noted that botanical nomenclature in this report follows that of Stace (2019)[13] for vascular plants, Atherton *et al.* (2010)[14] for bryophytes and Smith *et al.* (2009)[15] for lichens.

4 SURVEY DETAILS AND LIMITATIONS

Surveys were undertaken from 18 September 2023 to 22 September 2023 inclusive and 25 September 2023, which is within the optimal season for habitat surveys. The weather conditions were amenable to survey; bright with broken cloud and relatively light to moderate winds, with infrequent light showers. Some parts of the survey area, around Thirstone Quarry, were inaccessible and could not be surveyed in detail, or were surveyed from a suitable vantage point. However, as this was mostly open active quarry land these constraints are not considered to affect the validity of the survey results, or the robustness of any assessments made from this data.

The NVC system does not cover all possible semi-natural vegetation or habitat types that may be found. Since the NVC was adopted for use in Britain in the 1980's, further survey work and an increased knowledge of vegetation communities has led to additional communities being described that do not fall within the NVC system (e.g., see Rodwell *et al.*, 2000[16]; Averis *et al.*, 2004[17]; Mountford, 2011[18]; and Averis and Averis, 2020[19]). Where such communities are found and recorded, they are given a non-NVC community code and are described.

It should be noted that the results from this survey, and the matches made in describing communities, represent a current community evaluation at the time of survey (as opposed to one

[12] Joint Nature Conservancy Council (JNCC). (2010). Handbook for phase 1 habitat survey – a technique for environmental audit. JNCC, Peterborough.
[13] Stace, C.A. (2019). New Flora of the British Isles. 4th Edition. Cambridge University Press.
[14] Atherton, I., Bosanquet, S. & Lawley, M. (2010). Mosses and Liverworts of Britain and Ireland: a field guide. British Bryological Society.
[15] Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. (Eds.) (2009). The Lichens of Great Britain and Ireland. The British Lichen Society.
[16] Rodwell, J., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, AJ.C., Schaminee, J.H.J. and Dargie, T.C.D. (2000). Review of coverage of the National Vegetation Classification. JNCC Report, No. 302. JNCC, Peterborough.
[17] Averis, A., Averis, B., Birks, J., Horsfield, D., Thompson, D., & Yeo, M. (2004). An Illustrated Guide to British Upland Vegetation. JNCC, Peterborough. ISBN 1 86107 553 7.
[18] Mountford, E. (2011). A compilation of proposed additions and revisions to vegetation types in the National Vegetation Classification, JNCC Report No. 448. JNCC, Peterborough, ISBN 0963-8091.
[19] Averis, B and Averis, A. (2020). Plant Communities found in surveys by Ben and Alison Averis but not described in the UK National Vegetation Classification. http://www.benandalisonaveris.co.uk/wp/wp-content/uploads/2020/11/non-nvc_vegetation_types_found_by_ben_and_alison_averis_2020-06__version_with_image_resolution_reduced_.pdf.

seeking to describe what the community was before any human interference, or what it might become in the future). In light of this, a clear constraint of the vegetation survey and evaluation process as used in these and other surveys is that it offers only a snapshot of the vegetation communities present and should not be interpreted as a static long-term reference.

Ecological surveys are limited by factors which affect the presence of plants such as the time of year and weather. The ecological surveys undertaken to inform the Proposed Development have not therefore produced a complete list of plants. Therefore, the absence of evidence of any particular species during the surveys, should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

5 RESULTS

5.1 Summary of Habitat Types and NVC Communities

Twenty-eight NVC communities and 16 non-NVC communities were recorded within the survey area, and these corresponded to 29 Phase 1 habitat types. These communities and habitat types, and their respective Site-specific correlations are summarised below in **Table 5-1**.

Table 5-1 Phase 1 Habitat Type Equivalents of NVC Communities and other Habitats Recorded

Phase 1 Habitats	NVC Communities and Other Non-NVC Habitats/Features Recorded
A1.1.1 Broadleaved Semi-Natural Woodland	W7 *Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland W10 *Quercus robur – Pteridium aquilinum - Rubus fruticosus* woodland
A1.1.2 Broadleaved Plantation Woodland	W10(p)[20] *Quercus robur – Pteridium aquilinum - Rubus fruticosus* woodland W14(p)[20] *Fagus sylvatica – Rubus fruticosus* woodland YBP Young Broadleaved Plantation (non-NVC type)
A1.2.2 Coniferous Plantation Woodland	CP Coniferous Plantation (non-NVC type) YCP Young Coniferous Plantation (non-NVC type)
A3.1 Scattered Broad-Leaved Tree	SBT Scattered Broadleaved Tree (non-NVC type)
A3.2 Scattered Coniferous Tree	SCT Scattered Coniferous Tree (non-NVC type)
B1.1 Unimproved Acid Grassland	U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland U5 *Nardus stricta – Galium saxatile* grassland U6 *Juncus squarrosus – Festuca ovina* grassland
B1.2 Semi-Improved Acid Grassland	U4b *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland *Holcus lanatus – Trifolium repens* sub-community
B2.1 Unimproved Neutral Grassland	MG1 *Arrhenatherum elatius* grassland MG9 *Holcus lanatus – Deschampsia cespitosa* grassland
B2.2 Semi-Improved Neutral Grassland	HI *Holcus lanatus dominated neutral grassland* (non-NVC type)
B4 Improved Grassland	MG6 *Lolium perenne – Cynosurus cristatus* grassland
B5 Marsh/Marshy Grassland	MG10 *Holcus lanatus – Juncus effusus* rush-pasture M23 *Juncus effusus/acutiflorus – Galium palustre* rush-pasture M25 *Molinia caerulea – Potentilla erecta* mire M27 *Filipendula ulmaria – Angelica sylvestris* mire M28 *Iris pseudacorus – Filipendula ulmaria* mire

[20] The use of '(p)' indicates of plantation origin.

Phase 1 Habitats	NVC Communities and Other Non-NVC Habitats/Features Recorded
	Je *Juncus effusus* acid grassland community Ja *Juncus acutiflorus* acid grassland community JaN *Juncus acutiflorus* neutral grassland community
C1.1 Bracken – Continuous	U20 *Pteridium aquilinum – Galium saxatile* community
C3.1 Tall Herb & Fern: Tall Ruderal	OV24 *Urtica dioica – Galium aparine* community OV25 *Urtica dioica – Cirsium arvense* community OV27 *Chamerion angustifolium* community
D1.1 Dry Dwarf Shrub Heath – Acid	H9 *Calluna vulgaris – Deschampsia flexuosa* heath H12 Calluna vulgaris – Vaccinium myrtillus heath
D2 Wet Dwarf Shrub Heath	M15 *Trichophorum germanicum – Erica tetralix* wet heath
D5 Dry Heath/Acid Grassland Mosaic	Mosaics of D1 and B1 communities
D6 Wet Heath/Acid Grassland Mosaic	Mosaics of D2 and B1 communities
E1.6.1 Blanket Bog	M2 *Sphagnum cuspidatum/fallax* bog pool community M17 *Trichophorum germanicum – Eriophorum vaginatum* blanket mire M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire
E1.7 Wet Modified Bog	M20 *Eriophorum vaginatum* blanket mire M25a^ *Molinia caerulea – Potentilla erecta* mire *Erica tetralix* sub-community[21] M15^ *Trichophorum germanicum – Erica tetralix* wet heath[21]
E2.1 Acid/Neutral Flush/Spring	M4 *Carex rostrata - Sphagnum fallax* mire M6 *Carex echinata - Sphagnum fallax/denticulatum* mire
F1 Swamp	S10 *Equisetum fluviatile* swamp
G1 Open Water	SW Standing Water (non-NVC type)
G2 Running Water	RW Running Water (non-NVC type)
I2.1 Quarry	QY Quarry (non-NVC type)
I1.4.1 Other rock exposure - acid	RK Rock (non-NVC type)
J1.1 Arable	AR Arable (non-NVC type)
J1.2 Amenity Grassland	PG Private Gardens & Lawns, Parks etc (non-NVC type)
J3.6 Buildings	BD Buildings (non-NVC type)
J4 Bare Ground	BG Bare Ground, Tracks, Hardstandings etc (non-NVC type)

The following sections describe each of these Phase 1 habitat types and the communities underpinning these within the survey area. Habitats are described in the order they appear within the Phase 1 classification. The survey results are displayed in **Figure 6.3** (EIAR Volume 3a) which combines Phase 1 symbology with NVC data.

A number of target notes (TNs) were also made during surveys, often to pinpoint areas or species of special interest. These target notes are shown in **Figure 6.3** (EIAR Volume 3a) and detailed within **Annex A** of this report. Target note photographs are included within **Annex B** of this report. Further photographs of a number of the typical habitat types found within the survey area are provided within **Annex C** of this report.

[21] The '^' symbol indicates the vegetation is likely present on peat of 0.5 m in depth, and as such more appropriately classified as modified bog.

5.2 Woodland & Scrub

5.2.1 A1.1.1 Broadleaved Semi-Natural Woodland

Semi-natural broadleaved woodland is very limited within the Site and survey area and of low total extent, generally being restricted to small riparian areas. Most of woodland recorded in the survey area is small, fragmented patches of W7 *Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland and W10 *Quercus robur – Pteridium aquilinum - Rubus fruticosus* woodland.

Areas of W7 were usually dominated by *Salix cinerea* and *S. caprea* over a field layer with a mixed abundance of *Urtica dioica*, *Rubus fruticosus*, and *Filipendula ulmaria*. These areas of woodland were recorded to community level only.

The woodland areas of W10 were most often found along field margins and road verges with a mixed canopy of mature *Acer pseudoplatanus*, *Fagus sylvatica*, *Prunus avium*, and *Crataegus monogyna*. This mixed canopy is underlain by a dry neutral species assemblage often influenced by improved or semi-improved grassland.

5.2.2 A1.1.2 Broadleaved Plantation Woodland

Broadleaved plantation woodland was recorded in a small number of locations, often planted as shelter belts within fields or close to farmhouse buildings. These comprised of a mixed canopy of *Acer pseudoplatanus*, *Ulmus* spp., *Fagus sylvatica*, *Alnus glutinosa*, and *Betula* sp. over existing neutral grassland habitat.

Most of these woodland areas are closely referable to W10(p)[20] *Quercus robur – Pteridium aquilinum - Rubus fruticosus* woodland with the exception of one woodland stand which has a closer affinity to W14(p) *Fagus sylvatica – Rubus fruticosus* woodland. The W10(p) habitat contains a very improved grassland field layer from the grazing of livestock within these areas. The single area of W14(p) habitat consists of a pure stand of *Fagus sylvatica* and improved grassland field layer with some areas consisting of bare ground.

A single area of young broadleaved plantation (YBP) was recorded consisting of *Betula* sp. within a mosaic dominated by *Picea sitchensis* plantation.

5.2.3 A1.2.2 Coniferous Plantation Woodland

The survey area includes a number of blocks of densely planted commercial coniferous plantation woodland (CP), the largest of which dominates an area along the B7078 road to the northeast of Red Moss. There was also some young coniferous plantation woodland (YCP) recorded. These plantation woodlands are mostly dominated by *Picea sitchensis.* These types of plantation woodlands are of negligible botanical value due to over-shading and loss of the field flora.

5.2.4 A3.1 Scattered Broadleaved Tree

Scattered broadleaved trees were recorded within a number of mosaics, forming a minor part of the vegetative composition. These individual or small groups of trees were not of a scale to be mapped as woodland. Instead, all were incorporated into mosaics commonly associated with neutral grassland communities, with the scattered trees including species such as mature *Betula* sp., *Ulmus* spp., *Sorbus aucuparia*, and *Salix* sp.

5.2.5 A3.2 Scattered Coniferous Tree

A number of mosaics contain areas of scattered conifer trees (SCT) formed from a canopy of occasional *Pinus sylvestris* and, more commonly, *Picea sitchensis.*

5.3 Grasslands & Marsh

5.3.1 B1.1/B1.2 Unimproved and Semi-Improved Acid Grassland

Unimproved acid grassland was found to be extensive and scattered widely throughout the survey area, forming one of the largest habitats and was often found closely associated, and in mosaics, with marshy grassland habitat (see Section 5.3.4) and wet modified bog habitat (see Section 5.6.2). To a much lesser extent, there were also clusters of more semi-improved acid grassland, which were more localised to the eastern half of the survey area. The acid grassland within the survey area is of the U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland community, U5 *Nardus stricta – Galium saxatile* grassland community, and U6 *Juncus squarrosus – Festuca ovina* grassland community. U4 and U5 are the most commonplace and extensive of these communities within the survey area, with U6 comprising a much smaller proportion. These grassland communities were recorded as homogenous stands and also within mosaics and transitional zones with several other grassland, mire and bog communities.

As well as community level U4, the following sub-communities were recorded; U4a Typical sub-community, U4b *Holcus lanatus-Trifolium repens* sub-community and to a much lesser extent the U4d *Luzula multiflora - Rhytidiadelphus loreus* sub-community. Overall, the stands of U4 within the survey area were very widespread and common on well-drained slopes. The community often contained a variable mix of *Agrostis capillaris*, *A. vinealis*, *Festuca ovina* and *Anthoxanthum odoratum*. The herbs *Potentilla erecta* and *Galium saxatile* are very common and there can also be small quantities of other vascular species such as *Nardus stricta*, *Avenella flexuosa*, *Juncus squarrosus*, *Achillea millefolium*, *Viola lutea*, *Luzula* sp., *Cirsium* sp., *Carex binervis*, and *C. nigra*. Mosses are common, especially *Hylocomium splendens*, *Pleurozium schreberi*, *Hypnum jutlandicum* and *Rhytidiadelphus squarrosus*.

The areas of the U4d sub-community are similar to U4a above, but the sward contains a noticeable frequency of *Deschampsia cespitosa*.

While the majority of the *Nardus stricta* dominated U5 was recorded at community level, the U5b *Agrostis canina – Polytrichum commune* sub-community was found within a number of areas, often across the more elevated areas. In several locations the U5a Species-poor sub-community was found and in one area the U5d *Calluna vulgaris – Danthonia decumbens* sub-community was recorded where *Calluna vulgaris* becomes more abundant. Many of the grassland species found within the U5 community replicate many of the species found within U4 as described above, but with *Nardus stricta* obviously dominant.

The U6 community was recorded at community level and as the U6a *Sphagnum* sub-community, U6b *Carex nigra – Calypogeia trichomanis* sub-community, and U6d *Agrostis capillaris – Luzula multiflora* sub-community, with the community as a whole being identified by the dominance of *Juncus squarrosus* in the sward. The community appears across the survey area and is common on well-drained to quite wet, level to gently sloping ground; typically, as small areas scattered among

bogs or U4 and U5 acid grasslands. The flora of most of the U6 here has much in common with that of the U4 and U5 acid grassland communities described above, but with *Juncus squarrosus* obviously dominant. The community varied at times and appears both as pure stands of U6 or within mosaics with other mire and grassland communities. The U6a sub-community was the most common sub-community identified, being often conspicuous by the abundance of *Sphagnum fallax* and *S. capillifolium*. The U6b community contained many of the common species found within this community along with a greater abundance of the moss *Plagiothecium undulatum*. The U6d sub-community forms a grassier sward and appears much less than the other two sub-communities.

Areas of semi-improved acid grassland (B1.2) are characterised by the U4b *Holcus lanatus-Trifolium repens* sub-community only and are generally located across the lower slopes of Black Hill and Craighead Hill within the central and eastern areas of the survey area, where there are fields in which there has been some form of historical improvement or a long history of intensive grazing and/or nutrient enrichment. The sward tends to be dominated by a semi-improved assemblage which includes typical species such as *Holcus lanatus, Agrostis* spp., *Cynosurus cristatus, Lolium perenne*, *Trifolium repens* and *Ranunculus repens*.

5.3.2 B2.1/B2.2 Unimproved and Semi-Improved Neutral Grassland

Unimproved neutral grassland is a feature more commonly found within the northeast of the survey area (north of Abington Services). These neutral grasslands are characterised by MG1 *Arrhenatherum elatius* grassland and MG9 *Holcus lanatus – Deschampsia cespitosa* grassland, often forming mosaics with marshy grassland and improved grassland communities. The MG1 community was recorded at community level and as the MG1a *Festuca rubra* sub-community. MG9 was recorded at community level and as the MG9a *Poa trivialis* sub-community.

MG1 was often distinctive by its taller and coarse sward, the vegetation here contains a mix of *Arrhenatherum elatius, Dactylis glomerata*, *Holcus lanatus, Deschampsia cespitosa, Agrostis* spp., *Poa* spp., *Rubus fruticosus, Plantago lanceolata, Lotus corniculatus, Trifolium repens*, *T. pratense, Urtica dioica*, *Chamaenerion angustifolium* and *Cirsium arvense*.

Within MG9, *Deschampsia cespitosa* dominates with other associates such as *Juncus effusus, Poa trivialis* and *Holcus lanatus*. Species diversity was predominantly limited to *Anthoxanthum odoratum*, *Rumex acetosa*, *Galium palustre*, *Ranunculus repens* and *Cirsium palustre*. Moss cover included *Calliergonella cuspidata* and *Rhytidiadelphus squarrosus*. These areas were found to be generally species poor.

A small area of non-NVC type grassland community was recorded within the survey area and denoted as 'HI'. This was categorised as semi-improved neutral grassland. HI being a species poor grassland in which *Holcus lanatus* is completely dominant.

5.3.3 B4 Improved Grassland

Improved grassland dominates many of the fields surrounding the north of Abington village, around Netherton Farm, and to the north of Blackburn. This habitat was recorded as the MG6 *Lolium perenne – Cynosurus cristatus* grassland community, both at community level and as the MG6a Typical sub-community, where the fields and swards have been improved over time through fertiliser application, drainage and grazing/cropping. Species diversity is often limited with the

main dominants being *Lolium perenne, Cynosurus cristatus, Poa* spp., *Trifolium repens* with scattered tufts of *Juncus effusus.* The moss *Rhytidiadelphus squarrosus* can be abundant in small patches. On several occasions, within areas of wetter ground, this habitat often formed a mosaic with marsh/marshy grassland habitats.

5.3.4 B5 Marsh/Marshy Grassland

Marshy grassland is habitat that includes several different sward types in which *Molinia caerulea*, *Juncus* spp. and/or *Carex* spp. can be prominent in mesic conditions. Marshy grassland forms one of the most extensive habitat types found within the survey area and forms mosaics with a number of other habitats such as acid grassland, improved grassland, bracken, dry heath, wet heath, modified bog and acid/neutral flushes.

Within the survey area, the M23 *Juncus effusus/acutiflorus – Galium palustre*, the M25 *Molinia caerulea – Potentilla erecta*, MG10 *Holcus lanatus – Juncus effusus*, M27 *Filipendula ulmaria – Angelica sylvestris*, and the M28 *Iris pseudacorus – Filipendula ulmaria* communities are included within its limits along with the non-NVC communities 'Je', 'Ja', and 'JaN'. In the Phase 1 methodology MG10 can fall within either marshy grassland or neutral grassland classifications, however here due to the abundance of *Juncus* spp. it has been included within marshy grassland.

Generally, areas of M23 are composed of the more abundant M23a *Juncus acutiflorus* sub-community and, to a lesser extent, the M23b *Juncus effusus* sub-community where they are dominated by mixtures of *Juncus effusus* and/or *Juncus acutiflorus*. These areas contain a low diversity of grasses such as *Deschampsia cespitosa*, *Holcus lanatus*, *Anthoxanthum odoratum*, *Molinia caerulea*, *Poa* sp., and *Agrostis* spp. Within the more herb rich areas, a variety of species were frequently to occasionally recorded such as *Galium palustre*, *G. uliginosum*, *Cardamine pratensis*, *Lotus pedunculatus*, *Trifolium repens*, *Epilobium palustre*, *Cirsium palustre, Rumex acetosa*, *Viola palustris*, *Potentilla erecta, Succisa pratensis, Carex nigra, C. echinata, C. panicea,* and *Ranunculus repens*; and more rarely *Achillea millefolium*, *Achillea ptarmica*, *Stellaria graminea* and *Caltha palustris*. Wefts of mosses are also common through M23 between these species including *Calliergonella cuspidata*, *Kindbergia praelonga*, and *Rhytidiadelphus squarrosus*.

Most of the MG10 was recorded at community level and as the MG10a Typical sub-community, and very often found within mosaics with acid grassland and mire communities. This community is dominated by *Juncus effusus*, with often a damp field layer containing *Deschampsia cespitosa* and *Holcus lanatus* in variable amounts. Other species found less frequently in these stands include *Agrostis capillaris*, *Rumex acetosa*, *Festuca rubra*, *Anthoxanthum odoratum, Ranunculus repens*, *Cirsium palustre*, *Poa* spp., *Carex nigra* and the moss *Rhytidiadelphus squarrosus*. The MG10c *Iris pseudacorus* sub-community is distinguished according to the dominance or abundance of *Iris pseudacorus* in a similar vegetation composition to that described above for MG10a.

The M25 mire areas were identified due to *Molinia* dominating the sward. This community mostly appears as the M25a *Erica tetralix* sub-community. The majority of the species found within M25a along with *Molinia caerulea* were *Calluna vulgaris*, *Juncus squarrosus*, *Vaccinium myrtillus*, *Avenella flexuosa*, *Holcus lanatus*, and very occasional *Trichophorum germanicum*. Within the wetter areas of this community, the isolated patches of *Sphagnum* moss became more apparent, particularly *Sphagnum capillifolium* along with other mosses such as *Polytrichum commune* and *Hylocomium*

splendens. The M25b *Anthoxanthum odoratum* sub-community was classified as marshy grassland where the area was dominated by *Molinia caerulea* and accompanied by a mixture of typical upland grassland species. The M25b was dominated by *Molinia caerulea* as a tussocky sward and was found to form mosaics with other rush dominated communities. Where the *Molinia* was not purely dominant, species included variable abundances of *Potentilla erecta, Galium saxatile, Anthoxanthum odoratum, Holcus lanatus, Avenella flexuosa, Rumex acetosa, Agrostis capillaris, Juncus effusus,* and the mosses *Polytrichum commune* and *Pleurozium schreberi*.

The 'Ja' and 'Je' non-NVC acid grassland communities are present here as patches of a *Juncus* spp. dominated calcifuge grassland. This is vegetation in which dominant and tall *Juncus effusus* or *Juncus acutiflorus* grow abundantly among a few shorter 'acid grassland' swards including frequent to occasional *Agrostis capillaris, Holcus lanatus, Rumex acetosa, Potentilla erecta* and *Galium saxatile*. Other occasional species include *Carex nigra*, *Molinia caerulea* and *Ranunculus repens*. Mosses typical of acid communities are also abundant, the most common mosses are *Hylocomium splendens*, *Pleurozium schreberi*, *Polytrichum commune, Pseudoscleropodium purum* and *Rhytidiadelphus squarrosus*. This vegetation does not fit into any NVC community as it lacks the wetland element and key indicators of M6 and M23 *Juncus* spp. mires and has a more acidophilous flora than MG10 *Juncus effusus* rush-pasture; it is therefore classed separately. The 'JaN' non-NVC damp neutral grassland community is essentially similar to the MG10 community but is not so well grazed and *Juncus acutiflorus* replaces *Juncus effusus* as the dominant rush species in this more neutral setting.

Very small patches of the M27 and M28 communities were recorded within the survey area. The M27 NVC community was recorded at community level and as the M27a *Valeriana officinalis – Rumex acetosa* sub-community and, in one location, the M27b *Urtica dioica – Vicia cracca* sub-community. In all locations it appears within a mosaic of communities. *Filipendula ulmaria* is very abundant in these patches with occasional *Epilobium palustre*, *Succisa pratensis*, *Rumex acetosa*, *Holcus lanatus*, *Phragmites australis*, occasional *Deschampsia cespitosa* and *Galium aparine*. The M28 community is recorded at both community level and as the M28b *Urtica dioica – Galium aparine* sub-community as a pure stand and within mosaics with other grassland and mire communities. The swards are dominated by *Iris pseudacorus*, with patches of *Juncus effusus* and, to a much lesser extent, *Galium palustre*, *Ranunculus acris, U. dioica* and *Ranunculus repens*.

5.4 Tall Herb and Fern

5.4.1 C1.1 Bracken: Continuous

Areas of bracken within the survey area are not frequent, the main patches are found to the east and south of Black Hill in the south of the survey area. A number of these areas form part of a mosaic with the U4 grassland community (see Section 5.3.1 above). The habitat was recorded as the U20 *Pteridium aquilinum – Galium saxatile* NVC community. *Pteridium aquilinum* dominates entirely with few other species being present.

5.4.2 C3.1 Tall Ruderal

This habitat type within the survey area is sparse and scattered being mostly found to the east of the survey area. This habitat is made up of the OV24 *Urtica dioica – Galium aparine* community, the

OV25 *Urtica dioica – Cirsium arvense* community and, to a much lesser extent, OV27 *Chamerion angustifolium* community. All stands were recorded to community level only. The OV24 community is entirely co-dominated by *Urtica dioica* and *Galium aparine*. The OV25 community often appears as a component of a mosaic incorporating other grassland communities. As is common with the OV27 community, *Chamerion angustifolium* dominates the sward, and is interspersed with some *Holcus lanatus*, *Holcus mollis*, *Anthoxanthum odoratum*, *Festuca rubra* and *Trifolium repens*.

5.5 Heathland

5.5.1 D1.1 Dry Dwarf Shrub Heath – Acid

Acid dry dwarf shrub heath is very sparse and of low total cover within the survey area. These patches are scattered within mosaics dominated by grassland communities.

The majority of dry heath present is represented by the H9 *Calluna vulgaris – Deschampsia flexuosa* heath, including a single area of the H9c Species-poor sub-community and, to a lesser extent, the H12 *Calluna vulgaris – Vaccinium myrtillus* heath, recorded as the H12a *Calluna vulgaris* sub-community.

The H9 community is dominated by *Calluna vulgaris* with occasional *Avenella flexuosa*, and the mosses *Hylocomium splendens* and *Plagiothecium undulatum*.

H12a has the typical species assemblage of abundant *Calluna vulgaris* with frequent *Vaccinium myrtillus*, with the sward also containing frequent to occasional *Potentilla erecta*, *Galium saxatile*, *Anthoxanthum odoratum*, *Avenella flexuosa, Erica cinerea* and the mosses *Hylocomium splendens, Rhytidiadelphus loreus*, *Rhytidiadelphus squarrosus, Pleurozium schreberi* and *Hypnum jutlandicum*.

5.5.2 D2 Wet Dwarf Shrub Heath

Wet dwarf shrub heath is limited to isolated patches across the survey area, the largest of which can be found northwest of Netherton Farm. It is entirely made up of the M15 *Trichophorum germanicum – Erica tetralix* wet heath NVC community, the majority being recorded as the M15b Typical sub-community, with the M15a *Carex panicea* sub-community being recorded as minor components of mosaics dominated by acid grassland communities. Many of these areas have been poached and grazed by livestock.

The dominant species can be variable within the M15b and M15a sub-communities. The most obvious components present included *Calluna vulgaris, Trichophorum germanicum* and *Vaccinium myrtillus*. Other species present in the sward are *Molinia caerulea, Juncus squarrosus, Avenella flexuosa, Carex echinata*, *Anthoxanthum odoratum, Potentilla erecta* and *Narthecium ossifragum*. The moss layer contained mostly *Pleurozium schreberi, Rhytidiadelphus squarrosus, R. loreus, Hylocomium splendens,* and *Hypnum* sp. The wetter and more flushed assemblage of the M15a sub-community contains varied amounts of *Carex panicea* and *Eriophorum angustifolium,* and the mosses *Sphagnum capillifolium* and *S. cuspidatum*.

5.5.3 D5 Dry Heath/Acid Grassland Mosaic

Mapped mosaics of D1 (Section 5.5.1) and B1.1 (Section 5.3.1) communities.

5.5.4 D6 Wet Heath/Acid Grassland Mosaic

Mapped mosaics of D2 (Section 5.5.2) and B1.1 (Section 5.3.1) communities.

5.6 Mire

5.6.1 E1.6.1 Blanket Bog

Blanket bog is not extensive but is present as generally relatively small and fragmented patches of habitat in the more elevated parts and watershed plateaus of the north and west of the survey area, where it also commonly transitions and mosaics with wet modified bog (see Section 5.6.2). Blanket bog here is mainly represented by the M17 *Trichophorum germanicum – Eriophorum vaginatum* blanket mire community and M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire community. These communities appear both as pure stands and within mosaics with other mire communities. The M2 *Sphagnum cuspidatum/fallax* bog pool community was also infrequently recorded within these blanket bog areas (see **Annex A**).

Areas of M2 were recorded at community level only and comprise of a wet lawn of *Sphagnum fallax*. This community forms a mosaic with the other bog communities, where it occupies the wettest depressions, and forms an unconsolidated surface.

M17 occurs most often as homogenous stands of this community within the survey area. This community forms the largest part of this blanket bog resource within the survey area. While the majority was recorded at community level only, the M17a *Drosera rotundifolia – Sphagnum* spp. sub-community and M17b *Cladonia* spp. sub-community were also recorded. There is a mix of *Trichophorum germanicum* and *Eriophorum vaginatum*, although the densities is variable in places. The sward also contains a mix of other species ranging from frequent and occasional, to locally abundant, species present included *Erica tetralix*, *Eriophorum angustifolium*, *Vaccinium myrtillus*, *Molinia caerulea*, *Empetrum nigrum*, *Calluna vulgaris, Narthecium ossifragum*, *Deschampsia flexuosa* and *Galium saxatile*. The basal layer includes *Sphagnum papillosum*, *S. fallax*, *S. palustre*, *S. capillifolium, Hylocomium splendens*, *Pleurozium schreberi* and *Rhytidiadelphus loreus*. The M17a sub-community contains most of the community constants while the more abundant M17b sub-community is differentiated by the greater presence of the moss *Racomitrium lanuginosum* and *Cladonia* spp.

The M19 community appears within this blanket bog habitat occurring on peat-covered level to gently sloping ground within the survey area. It is represented at community level and as the M19a *Erica tetralix* sub-community. The community is generally distinctive with the bulk of the vegetation consisting of a mixture of *Calluna vulgaris* and *Eriophorum vaginatum*. There is commonly at least a little *Vaccinium myrtillus* and/or *Avenella flexuosa*. The mosses *Hylocomium splendens*, *Polytrichum commune, Pleurozium schreberi*, *Hypnum jutlandicum* and *Sphagnum capillifolium* are collectively very abundant, forming deep and extensive moss carpets.

The blanket bog within the survey area is a degraded resource in relatively poor condition that has been impacted over time in several ways. Historical and ongoing impacts on blanket bog (and wet modified bog) at the Site include livestock grazing and agricultural improvement, extensive moor grip drainage, conifer plantation (direct planting on peatland and also indirect effects, such as drainage and ground disturbance), the presence of an active quarry and associated track and

drainage network (e.g., direct removal of peat, and drainage and disturbance effects) and the presence of the M74 motorway and B7078 road (historically severing and fragmenting larger bog units). Some of the relatively larger patches of bogs also exhibit some hagg and gully features. The overall result is a highly fragmented, impacted, modified, and degraded peatland that would be classified, using NatureScot Peatland Action Condition Criteria[22], as predominantly 'Drained: Artificial' with any remaining areas falling within the 'Modified' or, less so, 'Drained: Hagg/Gully' categories.

5.6.2 E1.7 Wet Modified Bog

Wet modified bog in the survey area encompasses scattered, small and fragmented areas of M20 *Eriophorum vaginatum* blanket mire, M25a^ *Molinia caerulea – Potentilla erecta* mire *Erica tetralix* sub-community[21] (M25a and M25b have been classified as marshy grassland; see Section 5.3.4), and M15d^ *Trichophorum germanicum – Erica tetralix* wet heath *Vaccinium myrtillus* sub-community[21] in the north and west of the survey area (**Figure 6.3** (EIAR Volume 3a)). Much of this wet modified bog borders or transitions with areas of blanket bog (Section 5.6.1).

M20 wet modified bog is most abundant across level to gently sloping peat in the western part of the survey area. It was often found in mosaics with other bog and acid grassland communities. It mainly appears to have been derived from blanket bog through a long history of grazing that has led to the scarcity or absence of *Calluna vulgaris* in the sward. M20 was recorded at community level and as the M20a Species-poor sub-community and the M20b *Calluna vulgaris – Cladonia* spp. sub-community. This is mire vegetation in which tussocks of *Eriophorum vaginatum* are abundant to dominant but with little or no *Calluna vulgaris*, the scarcity or absence of *Calluna vulgaris* precludes its classification as M19. The M20a sub-community identifies the areas where the main vascular component of the sward is dominated by *E. vaginatum* and is otherwise species poor apart from a little *Avenella flexuosa*. Where there is a scattering of *Vaccinium myrtillus* and *Eriophorum angustifolium* along with some sparse *Calluna vulgaris* and patches of *Cladonia* spp., these areas were identified as representing the M20b sub-community. The mosses *Pleurozium schreberi*, *Hypnum jutlandicum* and *Sphagnum capillifolium* were found to be common throughout M20 and its sub-communities in variable amounts.

The M25a^ sub-community forms a very similar species assemblage to that described in Section 5.3.4, except it seemed to be found on peat of 0.5 m depth or more and, as such, was classified as wet modified bog and denoted as 'M25a^'. Similarly, instances where the habitat was recorded as M15d^ indicated a wet heath type vegetation but on peat likely to be 0.5 m depth or more, and therefore more appropriately classified as modified bog.

The condition, and factors, impacting the wet modified bog is as described for blanket bog above (see Section 5.6.1).

5.6.3 E2.1 Acid/Neutral Flush

Acid/neutral flushes appear in a small number of areas across the survey area, particularly within the central and western areas, sometimes appearing within mosaics with other mire communities.

[22] https://www.nature.scot/doc/peatland-action-peat-depth-and-peat-condition-survey-guidance-and-recording-form-guidance

The majority of this habitat is represented by M6 *Carex echinata – Sphagnum fallax/denticulatum* mire, and in a few areas, the M4 *Carex rostrata – Sphagnum fallax* mire.

The majority of the M6 community was recorded fairly equally as the M6c *Juncus effusus* sub-community and the M6d *Juncus acutiflorus* sub-community. These sub-communities are rush mires on wet and mostly flushed ground, often in this case found on steep slopes, whose soils appear to be acidic, as judged by the abundance of *Sphagnum* mosses (especially *Sphagnum fallax* and *S. palustre*) and the moss *Polytrichum commune*. A tall sward of *J. effusus* over a species-poor lawn of *Sphagnum fallax, S. palustre* and *Polytrichum commune* indicates the M6c sub-community; *J. acutiflorus* dominates in M6d. In many stands its extent encompasses little more than these species listed. Where other species were recorded, they tended to be of very low cover, and include typical species such as *Molinia caerulea*, *Rumex acetosa* and *Anthoxanthum odoratum*. Occasionally species such as *Ranunculus repens, Cirsium palustre, Carex* spp. and *Sphagnum capillifolium* were noted. A single area of M6a *Carex echinata* sub-community was recorded within a mosaic dominated by the M23 community (see Section 5.3.4 above) where *Carex echinata* dominates the sward with occasional *Molinia caerulea* and *Eriophorum angustifolium*.

The M4 community forms a minor component of a number of mosaics dominated by M23 rush mire and M20 modified bog. The community was dominated by *Carex rostrata* with a basal layer composed of *Menyanthes trifoliata*, *Succisa pratensis*, *Potentilla palustris* with a thick carpet of *Sphagnum fallax, S. palustre* and *S. capillifolium*.

5.7 Swamp, Marginal and Inundation Habitats

5.7.1 F1 Swamp

A single patch of swamp vegetation was recorded in the survey area, this was recorded as S10 *Equisetum fluviatile* swamp. The sward is dominated by *Equisetum fluviatile* with an occasional appearance of *Filipendula ulmaria*.

5.8 Open Water

5.8.1 G1 Standing Water

The are very few areas of standing water (SW) within the survey area, with some pools and quarry settlement lagoons present.

5.8.2 G2 Running Water

A number of minor watercourses are present within the survey area.

5.9 Rock Exposure & Waste

5.9.1 I1.4.1 Natural Other Exposure – Acid/Neutral

A single area of exposed shingle or rock was recorded along the edge of the Duneaton Water, southwest of Craighead.

5.9.2 I2.1 Artificial – Quarry

A number of areas of exposed and worked ground were recorded as a quarry (QY) non-NVC community, some of which remain active.

5.10 Miscellaneous

5.10.1 J1.1 Cultivated/Disturbed Land – Arable

Cultivated/disturbed land - Arable is a non-NVC community (AR) which represents a number of fields which have been recently ploughed and/or re-seeded.

5.10.2 J1.2 Cultivated/Disturbed Land – Amenity Grassland

Amenity grassland is a non-NVC community used here for private gardens (PG) within the survey area. Most commonly these areas form lawns within the curtilage of private properties and in some instances may include scattered trees and hedges.

5.10.3 J3.6 Buildings

Buildings (BD) is a non-NVC community to identify buildings or built-up structures within the survey area, both inhabited and vacant, such as private dwelling houses and outbuildings/sheds.

5.10.4 J4 Bare Ground

Bare ground (BG) is a non-NVC community within the survey area and includes existing tracks, hardstandings and public roads. Any areas that were devoid of vegetation and that could not be classified as any other habitat are also included here.

5.11 Invasive Non-Native Species

No Invasive Non-Native Species (INNS) were incidentally recorded during the habitat surveys; however, this does not preclude their presence from the survey area.

5.12 Notable Species

No notable or rare species were incidentally recorded during the habitat surveys; however, this does not preclude their presence from the survey area.

6 EVALUATION OF BOTANICAL INTEREST

6.1 Overview

NVC communities can be compared with a number of habitat classifications in order to help in the assessment of the sensitivity and conservation interest of certain areas. The following sections compare the survey results and the NVC communities identified against three classifications:

- SEPA guidance on Groundwater Dependent Terrestrial Ecosystems (GWDTEs)[2];
- Habitats Directive (92/43/EEC) Annex I habitats[1]; and
- Scottish Biodiversity List (SBL) priority habitats[3].

6.2 Groundwater Dependent Terrestrial Ecosystems (GWDTE)

SEPA has classified a number of NVC communities as potentially dependent on groundwater[2]. Wetlands or habitats containing these particular NVC communities are to be considered GWDTE unless further information can be provided to demonstrate this is not the case. Many of the NVC communities on the list are very common habitat types across Scotland, and some are otherwise generally of low ecological value. Furthermore, some of the NVC communities may be considered GWDTE only in certain hydrogeological settings.

Designation as a potential GWDTE does not therefore infer an intrinsic biodiversity value, and GWDTE status has not been used as criteria to determine a habitats respective conservation importance. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys to inform the EIAR (see **Chapter 8: Hydrology, Hydrogeology and Geology (EIAR Volume 2)**).

Using SEPA's guidance[2], **Table 6-1** shows which communities recorded within the survey area may be considered potential GWDTE. Those communities which may have limited (moderate) dependency on groundwater in certain settings are marked in yellow and NVC communities recorded that are likely to be considered high, or sensitive GWDTE in certain hydrogeological settings are highlighted in red.

Table 6-1 Communities within the Survey Area which may Potentially be Classified as GWDTE

NVC Code	NVC Community Name
M15	*Trichophorum germanicum – Erica tetralix* wet heath
M25	*Molinia caerulea – Potentilla erecta* mire
M27	*Filipendula ulmaria – Angelica sylvestris* mire
M28	*Iris pseudacorus – Filipendula ulmaria* mire
MG9	*Holcus lanatus – Deschampsia cespitosa* grassland
MG10	*Holcus lanatus – Juncus effusus* rush pasture
U6	*Juncus squarrosus – Festuca ovina* grassland
Je/Ja/JaN[23]	*Juncus effusus/Juncus acutiflorus* acid/neutral grassland
W7	*Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland
M6	*Carex echinata – Sphagnum fallax/denticulatum* mire
M23	*Juncus effusus/acutiflorus – Galium palustre* rush pasture

The location and extent of all identified potential GWDTE are provided on an appropriate NVC map; see **Figure 6.4** (EIAR Volume 3a).

[23] In light of the SEPA classification on potential GWDTEs the non NVC types Je, Ja and JaN should also qualify for potential GWDTE status. The classification of moderate sensitivity is keeping in line with other similar *Juncus* spp. dominated grassland communities (e.g. MG10).

Within **Figure 6.4** (EIAR Volume 3a) the potential GWDTE sensitivity of each polygon containing a potential GWDTE is classified on a four-tier approach as follows:

- 'Highly – dominant' where potential high GWDTE(s) dominate the polygon.
- 'Highly - sub-dominant' where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon.
- 'Moderately – dominant' where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present.
- 'Moderately - sub-dominant' where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no potential high GWDTEs are present.

Where a potential high GWDTE exists in a polygon it outranks any potential moderate GWDTE communities within that same polygon.

GWDTE sensitivity has been assigned solely on the SEPA listings[2]. However, depending on a number of factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependant on groundwater. Determining the actual groundwater dependency of particular areas or habitat requires further assessment (see **Chapter 8: Hydrology, Hydrogeology and Geology** (EIAR Volume 2)).

6.3 Annex I Habitats

6.3.1 Overview

A number of NVC communities can also correlate to various Annex I habitat types. However, the fact that an NVC community can be attributed to an Annex I type does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its Annex I status can depend on various factors such as quality, extent, species assemblages, geographical setting and substrates.

Using JNCC Annex I habitat listings and descriptions[24], which have then been compared with survey results and field observations, the following NVC communities within the survey area which may constitute Annex I habitat are shown in **Table 6-2**.

Table 6-2 Annex I Habitats and Corresponding NVC Communities

Annex I Habitat	Corresponding NVC Communities & Other Non-NVC Habitats/Features Recorded
4010 North Atlantic wet heaths with *Erica tetralix*	M15 *Trichophorum germanicum – Erica tetralix* wet heath
4030 European dry heaths	H9 *Calluna vulgaris – Deschampsia flexuosa* heath H12 *Calluna vulgaris – Vaccinium myrtillus* heath
7130 Blanket bog	M2 *Sphagnum cuspidatum/fallax* bog pool community M17 *Trichophorum germanicum – Eriophorum vaginatum* blanket mire M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire M20 *Eriophorum vaginatum* blanket mire M25a^ *Molinia caerulea – Potentilla erecta* mire *Erica tetralix* sub-community

[24] https://sac.jncc.gov.uk/habitat/.

Annex I Habitat	Corresponding NVC Communities & Other Non-NVC Habitats/Features Recorded
	M15^ *Trichophorum germanicum – Erica tetralix* wet heath
7140 Transition mires and quaking bogs	M4 *Carex rostrata - Sphagnum fallax* mire

Further details on the inclusion or omission of certain NVC communities/sub-communities and/or Annex I types are also provided below.

6.3.2 7130 Blanket bog

The blanketing of the ground with a variable depth of peat gives the habitat type its name and results in the various morphological types according to their topographical position. Blanket bogs show a complex pattern of variation related to climatic factors, particularly illustrated by the variety of patterning of the bog surface in different parts of the UK. Such climatic factors also influence the floristic composition of bog vegetation.

'Active' bogs are defined as supporting a significant area of vegetation that is normally peat-forming. Typical species include the important peat-forming species, such as *Sphagnum* spp. and *Eriophorum* spp., or *Molinia caerulea* in certain circumstances, together with *Calluna vulgaris* and other ericaceous species. The most abundant NVC blanket bog types are M17, M18, M19, M20 and M25.

Annex I type 7130 Blanket bog therefore correlates directly with a number of NVC communities within the survey area such as the M17, M19 and M20 mires. However, 7130 Blanket bog can also include bog pool communities (M1-M3) where these occur within blanket mires such as M17-M20. As such M2 is within the survey area and is also assigned to the blanket bog Annex I type, as they are often associated with areas of M17, M19 and M20 mire.

As noted above, M15 wet heath and M25 mire can also fall within the blanket bog Annex I type, usually where the underlying peat depth is greater than 0.5 m and the habitat is wet and contains peat forming species. As described in Section 5.6.2, a number of areas of M15 and M25a within the survey area have been classified as wet modified bog (in addition to the areas classified as marshy grassland, see Section 5.3.4 above) due to being recorded on peat likely over 0.5 m in depth (denoted by the codes M15^ and M25a^). To represent a worst-case scenario the M15^ and M25a^ is considered to be of low Annex I quality.

6.3.3 7140 Transition mires and quaking bogs

All examples of M4 *Carex rostrata - Sphagnum fallax* mire within the survey area was assigned to the Annex I type Transition mires and quaking bogs. The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is intermediate between acid bog and alkaline fen.

6.3.4 4010 Northern Atlantic wet heaths with *Erica tetralix*

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures of *Erica tetralix*, *Calluna vulgaris*, grasses, sedges and *Sphagnum* bog-mosses. Examples of M15 wet heath were included within the 4010 Northern Atlantic wet heaths category.

6.3.5 4030 European dry heaths

European dry heaths typically occur on freely-draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf shrubs dominate the vegetation. The most common dwarf shrub is *Calluna vulgaris*.

The dry heath communities recorded – H9 and H12 – both fall within this Annex I type. These NVC types can also be included within the Annex I type H4060 Alpine and Boreal heaths, but only where they are at higher altitudes and include arctic-alpine floristic elements. These communities within the survey area are lower altitudinal examples so they all fall under the 4030 European dry heaths Annex I type.

6.4 Scottish Biodiversity List Priority Habitats

The SBL is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The SBL was published in 2005 to satisfy the requirement under Section 2(4) of The Nature Conservation (Scotland) Act 2004.

The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland: these are termed 'priority habitats'. Some of these priority habitats are quite broad and can correlate to many NVC types.

The relevant SBL priority habitat types (full descriptions of which can be found on the NatureScot website[25]), and associated NVC types recorded within the survey area are as follows:

- Wet woodland: W7;
- Lowland mixed deciduous woodland: W10;
- Blanket bog: M17, M19, M20 and M2 (M2 where associated with M17-M20), and M15d^[26]/M25a^ where peat depth is greater than 0.5 m;
- Upland flushes, fens and swamps: M4, M6, and M23a;
- Upland heathland: M15, H9, and H12; and
- Lowland fens: M27, M28 and S10;

These SBL priority habitats correspond with UK Biodiversity Action Plan (BAP) Priority Habitats[27].

6.5 Sensitivity Summary

Table 6-3 provides a summary of all the NVC communities and non-NVC types recorded within the survey area and any associated habitat sensitivities as described in the sections above.

[25] https://www.nature.scot/scotlands-biodiversity/habitat-definitions.
[26] Excluding the M15a *Carex panicea* sub-community, due to its general flushed nature over shallower substances.
[27] http://jncc.defra.gov.uk/page-5718.

Table 6-3 Summary of survey area communities and sensitivities

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
Mires and Wet Heath			
M2	-	7130 Blanket bogs (examples associated with M17-M20)	Blanket bog
M4	-	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6a, M6c, M6d	High	-	Upland flushes, fens and swamps
M15a, M15b	Moderate	4010 Northern Atlantic wet heaths with *Erica tetralix*	Upland heathland
M15d^	Moderate	7130 Blanket bogs	Blanket bog
M17, M17a, M17b	-	7130 Blanket bogs	Blanket bog
M19, M19a	-	7130 Blanket bogs	Blanket bog
M20, M20a, M20b	-	7130 Blanket bogs	Blanket bog
M23a, M23b	High	-	Upland flushes, fens and swamps (applies to M23a only)
M25, M25a, M25b	Moderate	-	-
M25a^	Moderate	7130 Blanket bogs (where peat depth >0.5 m)	Blanket bog (where peat depth >0.5 m)
M27, M27a, M27b	Moderate	-	Lowland fens
M28, M28b	Moderate	-	Lowland fens
Dry Heaths			
H9, H9c	-	4030 European dry heaths	Upland heathland
H12a	-	4030 European dry heaths	Upland heathland
Calcifugous Grasslands			
U4, U4a, U4b, U4d	-	-	-
U5, U5a, U5b, U5d	-	-	-
U6, U6a, U6b, U6d	Moderate	-	-
U20	-	-	-
Mesotrophic Grasslands			
MG1, MG1a	-	-	-
MG6, MG6a	-	-	-
MG9, MG9a	Moderate	-	-

NVC/Non-NVC Codes Recorded	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat Type
MG10, MG10a, MG10c	Moderate	-	-
Woodland and Scrub			
W7	-	-	Wet woodland
W10, W10(p)	-	-	Lowland mixed deciduous woodland
W14(p)	-	-	-
Swamps and Tall-Herb Fens			
S10	-	-	Lowland fens
Vegetation of Open Habitats			
OV24	-	-	-
OV25	-	-	-
OV27	-	-	-
Non-NVC Types			
AR	-	-	-
BD	-	-	-
BG	-	-	-
CP	-	-	-
HI			
Ja	Moderate	-	-
JaN	Moderate	-	-
Je	Moderate	-	-
PG	-	-	-
QY	-	-	-
RW	-	-	-
SBT	-	-	-
SCT	-	-	-
SW	-	-	-
YBP	-	-	-
YCP	-	-	-

7 SUMMARY

MacArthur Green carried out NVC and habitat surveys within the survey area to identify those areas of vegetation communities with the greatest ecological or conservation interest.

In total 28 NVC communities were recorded within the respective survey area along with various associated sub-communities; a number of non-NVC habitat types are also present (see **Table 6-3**). Only a small number of communities or habitat types account for the majority of the Site and survey area.

The survey area is mainly open upland habitats, the most common and widespread making up the bulk of the landscape is marshy grassland, unimproved acid grassland and modified bog. Interwoven throughout theses are patches and pockets of other habitat types such as woodlands, heaths, neutral and improved grasslands, blanket bog and acid/neutral flashes.

Although some large relatively homogeneous stands of vegetation occur, most of the Site and communities present often form complex mosaics and transitional areas across the survey area.

The survey results have also been compared to several sensitivity classifications, indicating the presence of Annex I, SBL and potential GWDTE habitats, as summarised in **Table 6-3**.

ANNEX A. NVC TARGET NOTES

A number of target notes were made during surveys, often to pinpoint springs/flushes, or an area or species of interest, these target notes are shown on **Figure 6.3** (EIAR Volume 3a) Fand detailed within **Table A.1**. A representative sample of corresponding target note photographs is provided in **Annex B**.

Table A-1 Survey Area Target Notes

Target Note ID	Easting	Northing	NVC Community	Description	Photo Reference
1	288089	626920	N/A	Field drains extend across this area.	
2	293481	625854	W7	*Salix cinerea* with a mix of *Holcus mollis* and *Filipendula ulmaria* dominating the field layer along the bank of the river.	B-1
3	293454	625767	N/A	Single mature tree (*Salix* sp.)	
4	293523	625733	N/A	Two mature trees (*Salix* sp.) along riverbank.	
5	293366	625228	N/A	Semi-mature tree (*Acer pseudoplatanus*) on riverbank, probably self-seeded.	
6	293284	625041	N/A	Mature tree (*Alnus glutinosa*) on riverbank.	
7	293262	624943	N/A	Mature tree (*Salix* sp.)	
8	293297	624705	N/A	Mature tree (*Alnus glutinosa*) on riverbank.	
9	293637	624004	N/A	Mature tree (*Acer* pseudoplatanus) with small stand of *Salix cinerea* shrubs. Field layer mostly bare ground or pure *Holcus mollis* sward along riverbank.	
10	289416	628244	N/A	This area contains a number of field drains which have created a number of different communities between the actual drains with many transitional areas between NVC communities.	
11	291033	626064	N/A	A single spring flows from a brick structure built into hillside, with no characteristic vegetation. This turns into an M23b flushed area downstream. No *Sphagnum* moss present.	
12	289733	625982	M2	Two adjacent *Sphagna*-filled bog pools.	B-2
13	289629	625393	M2	*Sphagna*-filled bog pool.	
14	288050	626042	M2	*Sphagna*-filled bog pool within an area of M20.	
15	288243	626098	M2	Small *Sphagna*-filled bog pool.	

ANNEX B. TARGET NOTE PHOTOGRAPHS

The following photographs correlate to the target notes described within **Annex A, Table A.1.** Photographs are not provided here for all target notes, due to the similarity in many photographs.

Photo B-1 Target Note 2: Small patch of W7 *Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland

Photo B-2 Target Note 12: M2 *Sphagnum cuspidatum/fallax* bog pools

ANNEX C. GENERAL COMMUNITY PHOTOGRAPHS

The following selected photographs are provided to give a visual representation to a number of the community types present within the survey area.

Photo C-1 – M17a *Trichophorum germanicum – Eriophorum vaginatum* blanket mire *Drosera rotundifolia – Sphagnum* spp. sub-community

Photo C-2 – M20 *Eriophorum vaginatum* blanket mire

Photo C-3 – M20 *Eriophorum vaginatum* blanket mire with active drainage

Photo C-4 – M25 *Molinia caerulea – Potentilla erecta* mire

Photo C-5 - M15b *Trichophorum germanicum – Erica tetralix* wet heath Typical sub-community

Photo C-6 – U5 *Nardus stricta – Galium saxatile* acid grassland

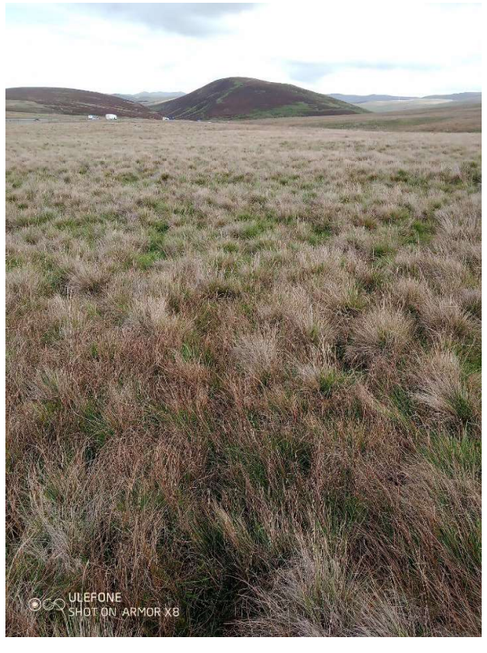

Photo C-7 – W10 *Quercus robur – Pteridium aquilinum - Rubus fruticosus* woodland

Photo C-8 - MG6 *Lolium perenne – Cynosurus cristatus* grassland

Photo C-9 – MG9 *Holcus lanatus – Deschampsia cespitosa* grassland

Photo C-9 – M23 *Juncus effusus/acutiflorus – Galium palustre* rush pasture

Technical Appendix 6.2: Protected Species Survey Report

Document Quality Record

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M74 West Renewable Energy Park

Protected Species Survey Report

Technical Appendix 6.2

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1 INTRODUCTION

MacArthur Green was commissioned by M74 West Limited (the Applicant) to carry out protected species surveys at the proposed M74 West Renewable Energy Park, hereafter referred to as the 'Proposed Development'.

These surveys primarily focussed on otter (*Lutra lutra*), water vole (*Arvicola amphibius*), badger (*Meles meles*), red squirrel (*Sciurus vulgaris*) and pine marten (*Martes martes*).

A watching brief was also kept throughout these surveys and during all ecological surveys at the Site. Signs were recorded for other protected species potentially inhabiting the Site and respective survey areas such as adder (*Vipera berus*), common or viviparous lizard (*Zootoca vivipara*) and slow worm (*Anguis fragilis*).

Surveys for bats and fish were carried out and are reported separately in **Technical Appendix 6.3** (EIAR Volume 4) and **Technical Appendix 6.4** (EIAR Volume 4) respectively.

Protected species surveys were undertaken to aid and inform the design and ecological assessment for the Proposed Development.

2 THE SITE & SURVEY AREA

The Site (see **Figure 6.5** (EIAR Volume 3a) covers an area of approximately 1,400 hectares (ha) and is located immediately northwest of Abington and approximately 4.5 km southeast of Douglas, South Lanarkshire.

The Site predominantly occupies open moorland, acid, improved, semi-improved and marshy grassland, and small areas of forestry. The Site contains an active quarry and is intersected by the M74 motorway and the B7078 and B740 roads. The landscape is typical of the wider location, with the Site positioned in the northern portion of the Southern Upland Hills, with Tinto Hill located approximately 8 km to the north. The Duneaton Water, a tributary of the River Clyde, passes through the eastern part of the Site and forms part of the northern and southern boundary. The River Clyde forms the eastern boundary of the Site.

The survey area in which protected species surveys were undertaken for the Proposed Development incorporated the full red line boundary, including access tracks, i.e. the application boundary. The protected species survey areas are shown in **Figure 6.5** (EIAR Volume 3a).

3 LEGAL PROTECTION

Details of the legal protection of the protected species surveyed are provided in **ANNEX A**.

4 METHODOLOGY

4.1 Desk Study

A desk-based study was undertaken to inform the field surveys and assessment with regards to the presence of designated sites and species of interest within the Site.

The desk-based study consisted consulting various online resources such as the National Biodiversity Network (NBN) Atlas[1], NatureScot Sitelink[2], Saving Scotland's Red Squirrels[3] and the British Deer Society (BDS) Deer Distribution Survey[4]. The desk-study also reviewed the EIAR and associated documents for Bodinglee Windfarm[5].

4.2 Field Surveys

Surveys to record the presence or likely absence of otter, water vole, badger, red squirrel and pine marten have been undertaken, with all habitats suitable for protected species surveyed within the survey area. The respective survey areas for all species are shown in **Figure 6.5** (EIAR Volume 3).

A watching brief for any protected species signs was also undertaken during other survey visits (e.g., ornithology/vegetation/other ecology surveys) throughout the year. The signs found indicate type and intensity of activity and consequently help in the assessment of the importance of a particular area for the protected species. The survey methods used are described below and are in line with NatureScot guidance[6].

4.2.1 Badger

Land with the potential to support badger within the survey area was searched for field signs with particular attention given to areas around woodland and areas underlain by mineral soils. Field signs of badger are described in Scottish Badgers guidance [7]. Field evidence searched for included:

- **Setts:** single and/or groups of holes;
- **Prints:** badgers have characteristic footprints that can be found in soft ground and muddy areas;
- **Latrines and dung pits:** these are small excavated pits in which droppings are deposited. Latrines are a collection of dung pits used as territorial markers;
- **Hairs:** tufts of hair can often be found on fences, or in the entrances to setts;
- **Feeding signs:** small scrapes, also known as snuffle holes, where badgers have searched for insects and plant tubers. Feeding signs can also include dug up wasp or bee nests and ripped up dung of other species including cattle;
- **Scratching posts:** marks on trees (including fallen trees) where badgers have scratched leaving claw marks or ripped at areas of rotten bark to search for food; and
- **Paths:** these are routes that badgers take when moving between setts and foraging areas.

Where setts were recorded, sett type and sett entrance classification were noted in line with the definitions outlined in Scottish Badgers guidance[7], which are reproduced below in **Table 4-1** and **Table 4-2**.

[1] NBN Atlas Scotland (2023). Online. Available at: https://nbnatlas.org/ [Accessed July 2023].
[2] NatureScot (2023). SiteLink. Online. Available at: https://sitelink.nature.scot/home [Accessed July 2023].
[3] Scottish Squirrels (2023). Saving Scotland's Red Squirrels. Online. Available at: https://scottishsquirrels.org.uk/ [Accessed May 2024].
[4] The British Deer Society (2023). Deer Distribution Survey Results. Available online: https://bds.org.uk/science-research/deer-surveys/deer-distribution-survey/ [Accessed May 2024].
[5] https://publicaccess.southlanarkshire.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=RYCKJ9OP07P00 [Accessed May 2024].
[6] NatureScot (2023). Standing Advice for Planning Consultations. Available online: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-standing-advice-and-guidance-documents. [Accessed July 2023].
[7] Scottish Badgers (2018). Surveying for Badgers: Good Practice Guidelines. Version 1.

Table 4-1 Categories of Sett and Associated Descriptions

Category	Description
Main	Main setts usually have several holes with large spoil heaps, and the sett generally looks well used. There are obvious paths to and from the sett and between sett entrances. In the British National Badger Survey the average number of holes for a main sett was twelve, although main setts may be much smaller, even a single hole in exceptional circumstances. Although normally the breeding sett and in continuous use, it is possible to find a main sett that has some disused or dormant entrances.
Annexe	These are often close to a main sett, normally less than 150 m away, and are connected to the main sett by one or more well-worn paths. Usually there are several holes but the sett may not be in use all the time, even if the main sett is very active. The average number of holes per annexe sett in the British survey was eight.
Subsidiary	These are usually at least 50 m from a main sett, and do not have an obvious path connecting with another sett. They are not continuously active. The average number of holes per subsidiary sett in the British survey was four.
Outlier	These often have little spoil outside the holes, have no obvious path connecting them with another sett, and are only used sporadically. When not in use by badgers, they are often taken over by foxes or even rabbits. However, they can still be recognised as badger setts by the shape of the tunnel (not the actual entrance hole), which is at least 25 cm in diameter, and rounded or a flattened oval shape (i.e. broader than high). Fox and rabbit tunnels are smaller and often taller than they are broad. The average number of holes per outlying sett in the British survey was two.
Other	In some cases, it can be difficult to assess the status of a sett, and it is open to interpretation. It is therefore recommended that if there is uncertainty as to the type of sett present, setts should be referred to as 'Other'.

Table 4-2 Sett Entrance Classifications and Associated Descriptions

Classification	Description
Well Used	Are clear of debris and vegetation, sides worn smooth but not necessarily excavated recently.
Partially Used	Are not in regular use and have debris e.g. twigs and leaves in the entrance. They could be used after only a minimal amount of clearance.
Disused	Not in use for some time, are partially blocked and could not be used without considerable effort. Rabbits and foxes may take over part of a sett and keep disused entrances open.
Collapses	Where a tunnel has collapsed.
Air Holes	Where badgers have made a small hole in a tunnel roof from below.

4.2.2 Otter

All accessible watercourses within the survey area were surveyed for otter field signs. Otter field signs and survey methods are described in Bang & Dahlstrøm[8], Sargent & Morris[9] and Chanin[10], and include:

- **Holts:** underground features where otters live. They can be tunnels within bank sides, underneath root-plates or boulder piles, and even man-made structures such as disused drains. Holts are used by otters to rest up during the day and are the usual location of natal or breeding sites. Otters may use holts permanently or temporarily;
- **Couches:** these are above ground resting-up sites. They may be partially sheltered, or fully exposed. Couches may be regularly used, especially in reed beds and on in-stream islands. They have been known to be used as natal and breeding sites. Couches can be very difficult to identify and may consist of an area of flattened grass or earth. Where rocks or rock armour are used as couches, these can be almost impossible to identify without observing the otter *in situ*;
- **Prints:** otters have characteristic footprints that can be found in soft ground and muddy areas;
- **Spraints:** otter faeces may be used to mark territories, often on in-stream boulders. They can be present within or outside the entrances of holts and couches. Spraints have a characteristic smell and often contain fish remains;
- **Feeding signs:** the remains of prey items may be found at preferred feeding stations. Remains of fish, crabs or skinned amphibians can indicate the presence of otter;
- **Paths:** these are terrestrial routes that otters take when moving between resting-up sites and watercourses, or at high flow conditions when they will travel along bank sides in preference to swimming; and
- **Slides and play areas:** slides are typically worn areas on steep slopes where otters slide on their bellies, often found between holts or couches and watercourses. Play areas are used by juvenile otters in play and are often evident by trampled vegetation and the presence of slides. These are often positioned in sheltered areas adjacent to the natal holt.

Any of the above signs (apart from paths) are diagnostic of the presence of otter. However, it is often not possible to identify couches with confidence unless other field signs are also present. Spraints are the most reliably identifiable evidence of the presence of this species.

[8] Bang, P., and Dahlstrøm, P. (2001). Animal Tracks and Signs. Oxford University Press, Oxford.
[9] Sargent, G., and Morris, P. (2003). How to Find and Identify Mammals. The Mammal Society, London.
[10] Chanin, P. (2003). Monitoring the Otter (*Lutra lutra*). Conserving Natura 2000 Rivers Monitoring Series No.10 English Nature, Peterborough.

4.2.3 Pine Marten

Signs of pine marten were searched for within the survey area following guidance from O'Mahony *et al.*[11] and Bright and Smithson[12]. Survey methods included:

- **Scats**: searches for pine marten scats were made along linear features such as fence lines, stone walls or forestry tracks/rides. Also searches for scats on prominent features such as tree stumps, dead logs or stones, and around rock piles and dense scrub where the species could establish a den; and
- **Dens**: identification of features which could be used as a den. Dens can include the utilisation of upturned trees, tree cavities, rocks or manmade structures such as log piles or large bird boxes.

4.2.4 Red squirrel

Areas of woodland that have the potential to support red squirrel were surveyed, following guidance from Gurnell *et al.*[13]. Survey methods included:

- **Sightings**: visual sightings of red squirrels;
- **Dreys**: dreys are usually built close to the main stem of a tree, over 3 m from ground level and over 50x30 cm in size; and
- **Feeding signs**: predated cone (cone cores) searches in areas of woodland.

4.2.5 Reptiles

Targeted reptile surveys were not undertaken, however, incidental records of reptile sightings, or signs such as shed skins and features of particular importance (i.e. potential hibernacula) were recorded using relevant guidance[14, 15].

4.2.6 Water Vole

All watercourses within the survey area were surveyed for water vole field signs following the methodology prescribed in Dean *et al.*[16]. This involved assessing the suitability of the habitat for water vole and searching for the following field signs:

- **Faeces:** recognisable by their size, shape, and content. If not too dried-out these are also distinguishable from rat droppings by their smell;
- **Latrines:** faeces, often deposited at discrete locations;
- **Feeding stations:** food items are often brought to feeding stations along pathways and hauled onto platforms. Recognisable as neat piles of chewed vegetation up to 10 cm long;
- **Burrows:** appear as a series of holes along the water's edge distinguishable from rat burrows by size and position;

[11] O'Mahony D., O'Reilly, C. & Turner, P. (2006). National Pine Marten Survey of Ireland 2005. COFORD, Dublin.
[12] Bright, P.W., and Smithson, T.J. (1997). Ecology of den use by pine martens reintroduced to a commercial coniferous forest. Pages 58-64 in: Species Recovery Programme for the Pine Marten in England: 1995-96. English Nature Research Report No. 240. English Nature, Peterborough.
[13] Gurnell, J., Lurz, P. McDonald, R. & Pepper, H. (2009). Practical Techniques for Surveying and Monitoring Squirrels. Forestry Commission Practice Note.
[14] Edgar, P., Foster, J. and Baker, J. (2010). Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.
[15] Cathrine, C. (2018). ARG UK Advice Note 10: Reptile Survey and Mitigation Guidance for Peatland Habitats. Amphibian and Reptile Groups of the United Kingdom.
[16] Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds. Fiona Mathews and Paul Chanin. The Mammal Society, London.

- **Lawns:** may appear as grazed areas around land holes;
- **Nests:** where the water table is high above ground woven nests may be found;
- **Footprints:** tracks may occur at the water's edge and lead into bank side vegetation. May be distinguishable from rat footprints by size; and
- **Runways in vegetation:** low tunnels pushed through vegetation near the water's edge; these are less obvious than rat runs.

Dean *et al.*[16] states that water vole droppings are the only field sign that can be used to determine water vole presence reliably on their own. Experience is required to distinguish feeding signs, burrows and footprints of water voles from those of other species. A collection of these field signs found in close proximity can indicate water vole presence.

4.2.7 Other Species

A watching brief was maintained for all other protected, notable, and/or invasive species during surveys and presence or field signs recorded as appropriate (e.g., mountain and brown hares (*Lepus* spp.) and American mink (*Neovison vison*)).

4.2.8 Species Scoped Out

Surveys for beaver (*Castor fiber*), wildcat (*Felis sylvestris*) and great crested newt (GCN) (*Triturus cristatus*) were scoped out due to the absence of suitable habitat (wildcat and GCN) or the survey area being located outwith the known range or distribution (beaver).

5 SURVEY DETAILS AND LIMITATIONS/CONSTRAINTS

Surveys for protected species were undertaken on 21, 22, 24 and 25 August 2023. The weather conditions during surveys were mainly overcast with light showers. Sunny spells and moderate to strong winds were also recorded. Watercourse levels remained normal thorough the survey period.

The Black Burn, Wildshaw Burn and West Thirstone Burn through Red Moss were overgrown with dense vegetation; due to the height and density of the vegetation, field signs in these areas could not be observed.

Due to protected species mobile nature, it is possible that new features may be created in the period between surveys and the commencement of construction. It is therefore recommended that pre-construction surveys are undertaken in advance of construction activities progressing across the Site.

6 RESULTS

6.1 Desk Study Results

6.1.1 Designated Sites

There are no ecologically (non-avian) designated sites within 5 km of the Site with qualifying interests for protected species. The designated sites within 5 km of the Site, designated for habitats interests only are discussed in **Technical Appendix 6.1** (EIAR Volume 4).

6.1.2 Online Resources/Data Searches

6.1.2.1 *NBN Atlas Scotland*

A search of the NBN Atlas Scotland (2023)[1] covering a 5 km buffer from the Site in the past 15 years (i.e., from 2008 onwards) returned records of the following protected or notable species:

- Eurasian badger;
- Eurasian red squirrel; and
- Common lizard.

The following invasive non-native species (INNS) were also returned by these search parameters:

- Grey squirrel (*Scirurus carolinensis*); and
- Signal crayfish (Pacifastacus leniusculus).

Details regarding licences and data providers for these records are included in **ANNEX B**.

6.1.2.2 *Saving Scotland's Red Squirrels*

No sightings of red or grey squirrels have been recorded on Saving Scotland's Red Squirrels[3] within 5 km of the Site in the past 13 years (i.e. since 2010).

6.1.2.3 *Deer Distribution Survey*

The Deer Distribution Survey[4] results suggest that the following deer species are likely to be present in the wider local area of the Site:

- red deer (*Cervus elaphus*); and
- roe deer (Capreolus capreolus) .

6.1.2.4 *Adjacent Developments*

Surveys undertaken to inform the EIAR for Boddinglee Wind Farm (adjacent to the Proposed Development) recorded evidence of:

- Otter;
- Badger;
- brown hare (*Lepus europaeus*); and
- reptile sp.

6.2 Field Survey Results

The survey results are summarised in **Table 6-1**, with full detailed results provided within **ANNEX C** and **Confidential Annex D** (EIAR Volume 5). Survey results are displayed on **Figure 6.5C** (EIAR Volume 5).

Table 6-1 Protected Species Survey Results Summary

Species	Survey Results Summary	General Habitat Suitability
Badger	One main sett, one main or subsidiary sett, and five outlier badger setts were located during the surveys. Feeding signs, footprints, dung and a latrine were also recorded.	Areas of open farmland with small woodland pockets within and around the Site provide potentially suitable setting and foraging grounds. Existing tracks with embankments and adjacent open upland habitats also provide potential for badger.

Species	Survey Results Summary	General Habitat Suitability
		Specific data relating to badger is discussed in **Confidential ANNEX D**.
Otter	Signs of otter were recorded along Duneaton Water, with one potential couch also recorded.	Several burns are present on Site which could provide some limited suitability for otter (likely commuting and foraging only). Duneaton Water is of a more suitable size for use by otter, although there are few sections of riparian trees to provide shelter and potential holts. Specific data relating to otter protected features is presented in **Confidential ANNEX D.**
Pine marten	No signs of pine marten were recorded during the surveys.	There is very limited suitable habitat for pine marten within the Site, with areas of woodland small and scattered. The open farmland and moorland may provide some hunting suitability.
Red squirrel	No signs of red squirrel were recorded during the surveys.	Areas of woodland within the Site are small and scattered, offering limited suitability for red squirrel.
Reptiles	Seven features with the potential for use by hibernating reptiles were identified in the course of the surveys, with these attributed to stone piles, drystone walling and stone ruins. No reptile sightings were recorded.	The open moorland sections of the Site provide suitable foraging habitat for reptiles.
Water vole	No signs of water vole were recorded during the surveys.	Several burns are present on Site which could provide some suitability for water vole. Rush vegetation was noted as present along some watercourses, which could provide foraging opportunities for water vole.
General	Numerous mammal holes of various sizes were recorded across the Site. Some were of a size suitable for badger, but no definitive signs of use by badger were found. Others were likely to be in use by rabbits or foxes.	n/a
Other Species	No signs of other notable species were recorded during the surveys.	n/a

ANNEX A. LEGAL PROTECTION

A full list of protected species and the associated legislation can be found on the NatureScot website[17]. The following provides a summary of protected species' legal protection, however the specific legislation should be consulted for the true terminology.

Bats and Otter

All bat species, and **otter** receive protection in Scotland under the Conservation (Natural Habitats, &c.) Regulations (1994) (as amended) (the Habitats Regulations), being classified as European protected species of animals[18].

For European protected species, NatureScot guidance[19] sets out that it is an offence to deliberately or recklessly:

- capture, injure or kill an animal;
- harass an animal or group of animals;
- disturb an animal while it is occupying a structure or place used for shelter or protection;
- disturb an animal while it is rearing or otherwise caring for its young;
- obstruct access to a breeding site or resting place, or otherwise deny an animal use of a breeding site or resting place;
- disturb an animal in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species;
- disturb an animal in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;
- disturb an animal while it is migrating or hibernating;
- take or destroy an animal's eggs (GCN); or
- damage or destroy a breeding site or resting place of such an animal (these sites and places are protected even when the animal is not present)[20].

Regulation 44(2)(e) of the Habitats Regulations allows a licence to be granted for activities ordinarily prohibited, where that purpose is:

> "Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment."

Mountain Hare, Pine Marten and Red Squirrel

Mountain hare, pine marten and **red squirrel** and are protected in Scotland under the Wildlife and Countryside Act 1981[21] (the 1981 Act).

[17] NatureScot (2022). Table of all of Scotland's Protected Species. Online. Available: https://www.nature.scot/doc/table-all-scotlands-protected-species [Accessed September 2023].
[18] Schedule 2.
[19] NatureScot (2023). European protected species. Online. Available: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations/european-protected [Accessed September 2023].
[20] Note that this is a summary of offences. Refer to Regulations 39 and 40 of the Habitats Regulations for legislative context.
[21] Schedule 5.

Under Sections 9(1) and 9(2) of the 1981 Act, it is an offence to intentionally or recklessly kill, injure or take such an animal, or be in possession or control of such an animal (whether live or dead).[22]

Under Section 9(4)(a) and (b), it is an offence to intentionally or recklessly:

- damage or destroy, or obstruct access to, any structure or place which any wild animal included in Schedule 5[23] uses for shelter or protection; or
- disturb any such animal while it is occupying a structure or place which it uses for that purpose.

Further, Section 9(5) sets out that it is an offence to:

- sell, offer or expose for sale, or possess or transport for the purpose of sale, any live or dead wild animal included in Schedule 5, or any part of, or anything derived from, such an animal; or
- publish or cause to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things.

Water Vole

Water vole is protected in Scotland under Sections 9(4) and 10 of the 1981 Act[24].

Under Section 9(4)(a) and (b) of the 1981 Act, it is an offence to intentionally or recklessly:

- damage or destroy, or obstruct access to, any structure or place which any wild animal included in Schedule 5[25] uses for shelter or protection; or
- disturb any such animal while it is occupying a structure or place which it uses for that purpose.

Section 10(3)(c) provides for exceptions under Section 9, such that a person shall not be guilty of an offence where that person shows:

- that each of the conditions specified in subsection (3A) was satisfied in relation to the carrying out of the unlawful act; or
- that the unlawful act was carried out in relation to an animal bred and, at the time the act was carried out, lawfully held in captivity.

Subsection (3A) states those conditions referred to in Section 10(3)(c) are:

a) That the unlawful act was the incidental result of a lawful operation or other activity;
b) That the person who carried out the lawful operation or other activity:
   i. took reasonable precautions for the purpose of avoiding carrying out the unlawful act; or
   ii. did not foresee, and could not reasonably have foreseen, that the unlawful act would be an incidental result of the carrying out of the lawful operation or other activity; and
c) That the person who carried out the unlawful act took, immediately upon the consequence of that act becoming apparent to the person, such steps as were reasonably practicable in the circumstances to minimise the damage or disturbance to the wild animal, or the damage or obstruction to the structure or place, in relation to which the unlawful act was carried out.

[22] See exceptions under Section 9(3).
[23] Animals which are protected under Section 9 of the 1981 Act.
[24] as amended by the Nature Conservation (Scotland) Act 2004.
[25] Animals which are protected under Section 9 of the 1981 Act.

Badger

Badger are protected in Scotland under the Protection of Badgers Act 1992 (the Badgers Act)[26].

Under Section 1(1) of the Badgers Act, "a person is guilty of an offence if, except as permitted by or under this Act, he wilfully kills, injures or takes, or attempts to kill, injure or take, a badger."

Where it can reasonably be concluded that a person had been attempting to kill, injure or take a badger, then it will be presumed that that person had been attempting to do so, unless it can be proven otherwise[27].

Under Section 1(3), unless authorised under the Badgers Act, a person is guilty of an offence where "he has in his possession or under his control any dead badger or any part of, or anything derived from, a dead badger."

Under Section 3(1), unless authorised under the Badgers Act, it is an offence to interfere with a badger set*. The following actions are described as interference:

- damaging a badger sett or any part of it;
- destroying a badger sett;
- obstructing access to, or any entrance of, a badger sett;
- causing a dog to enter a badger sett; or
- disturbing a badger when it is occupying a badger sett,

intending to do any of those things or being reckless as to whether his actions would have any of those consequences.

It is also an offence if a person knowingly causes or permits any of the above actions to be carried out[28].

*Note: A badger sett is defined under the Badgers Act as any structure or place which displays signs of current use by a badger[29].

Reptiles

The three native species of **reptile** to Scotland, **adder**, **slow worm** and **viviparous lizard**, are protected under Section 9(1) (insofar as the action relates to killing or injuring the animal), and Section 9(5) of the 1981 Act.

Under Section 9(5), it is an offence to:

- sell, offer or expose for sale, or possess or transport for the purpose of sale, any live or dead wild animal included in Schedule 5, or any part of, or anything derived from, such an animal; and
- publish or cause to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things.

Section 10(3)(c) provides for exceptions under Section 9, such that a person shall not be guilty of an offence where that person shows:

[26] as amended by the Nature Conservation (Scotland) Act 2004 (as amended).
[27] Section 1(2) of the Badgers Act.
[28] Section 3(2).
[29] Section 14.

- that each of the conditions specified in subsection (3A) was satisfied in relation to the carrying out of the unlawful act; or
- that the unlawful act was carried out in relation to an animal bred and, at the time the act was carried out, lawfully held in captivity.

Subsection (3A) states those conditions referred to in Section 10(3)(c) are:

a) That the unlawful act was the incidental result of a lawful operation or other activity;

b) That the person who carried out the lawful operation or other activity:

   i. took reasonable precautions for the purpose of avoiding carrying out the unlawful act; or;

   ii. did not foresee, and could not reasonably have foreseen, that the unlawful act would be an incidental result of the carrying out of the lawful operation or other activity; and

c) That the person who carried out the unlawful act took, immediately upon the consequence of that act becoming apparent to the person, such steps as were reasonably practicable in the circumstances to minimise the damage or disturbance to the wild animal, or the damage or obstruction to the structure or place, in relation to which the unlawful act was carried out.

Other Protected Species

Freshwater pearl mussel is protected by the 1981 Act and the Nature Conservation Act 2004 (the 2004 Act). They are also listed as endangered on the IUCN/WCMC Red Data List. Offences relevant to development works include to intentionally or recklessly:

- kill, injure, take or disturb a freshwater pearl mussel; or
- damage, destroy or obstruct access to a riverbed supporting freshwater pearl mussels.

Some freshwater pearl mussel populations are qualifying features of Special Areas of Conservation (SACs), and therefore receive further legal protection under The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations).

ANNEX B. NBN ATLAS SCOTLAND DATA PROVIDERS AND LICENCES

Table B-1 Data Providers and Licence Details for NBN Atlas Scotland Records Used

Species	Reason for Inclusion	Data Provider (Recorder)	Licence
Eurasian badger	Protected under the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004 (as amended))	The Mammal Society, and Biological Records Centre (D. Grout, D. Crawley)[30]	CC-BY[31]
Eurasian red squirrel	Protected species (Wildlife and Countryside Act 1981)	Scottish Wildlife Trust (E. Stewart, H. Donaldson, S. Craw)[32]	CC-BY
Common lizard	Protected species (Wildlife and Countryside Act 1981)	Biological Records Centre (T. Stewart)[33]	CC-BY
Invasive Non-Native Species			
Grey squirrel	Invasive species	Scottish Wildlife Trust (A. Willumsen, J. Bramwell, K. Davies, L., N. Hill, P. Goddard, R. Johnson, S. Lee)[32]	OGL[34]
Signal crayfish	Invasive species	Scotland's Environment Web and Biological Records Centre (E. Pitman)[35]	OGL

[30] Mammal Society (2023). Mammal Mapper App Sighting Records [Accessed February 2024].
[31] CC-BY. Creative Commons with Attribution 4.0 (CC-BY) https://creativecommons.org/licenses/by/4.0/ [Accessed February 2024].
[32] Scottish Wildlife Trust (2023). The Scottish Squirrel Database. Occurrence dataset accessed through the NBN Atlas [Accessed February 2024].
[33] Amphibian and Reptile Conservation and Biological Records Centre (2023). Records verified via iRecord.
[34] Licence: OGL. Open Government Licence (OGL) https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ [Accessed July 2023].
[35] Records provided by Invasive non-native species records from SEWeb, accessed through NBN Atlas website.

ANNEX C. SURVEY RESULTS

Table C-1 details the relevant data collected for protected species during surveys for the Site, sorted by species, then survey date (see also **Figure 6.5 (**EIAR Volume 3)). Confidential information relating to badger setts/otter holts is contained within **Confidential Annex D** (EIAR, Volume 5) and shown on **Figure 6.5C** (EIAR Volume 5).

Table C-1 Protected species survey results

Species	Sign	Easting	Northing	Survey date	Notes
General	Mammal Hole	290886	625887	21/09/2022	Incidental record from ornithology surveys. Numerous entrances appearing disused and with rabbit droppings in vicinity. Of a size suitable for badger.
General	Mammal Hole	292687	624679	27/02/2023	Incidental record from ornithology surveys. A minimum of three entrances which appear disused. Rabbit droppings nearby. Of a size suitable for badger.
General	Mammal Hole	290739	627049	21/08/2023	Of a size suitable for badger. No other nearby entrances found. Possible bedding inside but no obvious signs.
General	Mammal Hole	290311	626458	21/08/2023	Small hole in grass, probable fox (shape not typical of badger).
General	Mammal Hole	291471	624879	22/08/2023	Disused mammal hole on embankment with established vegetation across it (width 20 cm). No fresh spoil or bedding. Area covered in small rabbit warren entrances.
General	Mammal Hole	291443	624880	22/08/2023	Disused entrance with established vegetation across it (width 28 cm) on slope beneath Scot's pine. No bedding or spoil.
General	Mammal Hole	291295	625831	22/08/2023	Six entrances with grass growing over them. No signs of current use. Of a size and shape suitable for badger.
General	Mammal Hole	291290	625873	22/08/2023	Three disused entrances that would require digging to be usable again. No signs of active use.
General	Mammal Hole	291129	625927	22/08/2023	Potential fox hole.
General	Mammal Hole	293201	625978	24/08/2023	Five entrances of a size suitable for badger. One well-used entrance but no definitive signs of use by badger. Three part-used entrances and one disused entrance. Spoil heaps outside four entrances, old bedding outside three entrances.
General	Mammal Hole	293426	626025	24/08/2023	Some holes approximately 10 cm in diameter in eroded mud river bank just outside red line boundary. Of a size suitable for water vole.

Species	Sign	Easting	Northing	Survey date	Notes
General	Mammal Hole	293150	625232	24/08/2023	Small mammal hole, likely rabbit or fox.
General	Mammal Hole	293065	625446	24/08/2023	Small mammal hole with rabbit droppings.
General	Mammal Hole	293226	625422	24/08/2023	Potential disused badger sett now in use by rabbits with droppings at entrance and rabbits seen using entrances. Three entrances. No signs of badger activity.
General	Mammal Hole	293356	623628	24/08/2023	Rabbit warren with numerous small entrances with droppings outside.
General	Mammal Hole	293550	623962	24/08/2023	Small mammal hole, probably used by fox.
General	Mammal Hole	292642	624718	25/08/2023	Of a size and shape suitable for badger, but no signs of badger activity. Rabbit droppings in entrance.
General	Mammal Hole	292506	624584	25/08/2023	Mammal hole in field which is likely too small for use by badger.
Otter	Other	291518	624288	22/08/2023	Duneaton Water - potential otter resting up area within embankment on waters edge. No evidence of use.
Otter	Spraint	291547	624614	22/08/2023	Old spraint on stone beside water. Contained some white hairs.
Otter	Feeding Signs	291587	624851	22/08/2023	Potential otter feeding remains - crayfish claws found on stone part of weir of Duneaton Water road bridge (B7078)
Reptile	Potential Hibernaculum	289026	628232	21/08/2023	Stone wall running down NW of site.
Reptile	Potential Hibernaculum	290861	623899	22/08/2023	Old stone ring with loose rocks forming cavities offering potential hibernacula.
Reptile	Potential Hibernaculum	291361	624245	22/08/2023	Stone pile providing cavities which may offer suitable hibernacula.
Reptile	Potential Hibernaculum	290484	625778	22/08/2023	Pile of rocks in field.
Reptile	Potential Hibernaculum	291305	625606	22/08/2023	Pile of rocks in field.
Reptile	Potential Hibernaculum	293004	625375	24/08/2023	Pile of rocks in field.
Reptile	Potential Hibernaculum	292301	625019	25/08/2023	Pile of rocks in field.

Technical Appendix 6.3: Bat Survey Report

M74 West Renewable Energy Park

Bat Survey Report

Technical Appendix 6.3

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1 INTRODUCTION

MacArthur Green was commissioned by M74 West Limited (the Applicant) to carry out bat surveys at the M74 West Renewable Energy Park, hereafter referred to as the 'Proposed Development'.

Bat surveys included:

- Desk-based assessment;
- A Preliminary Roost Assessment (PRA) for Bat; and
- Automated activity surveys.

The aim of the surveys was to quantify the Sites usage by bats and variation in bat activity levels within the Site, and to inform the ecological impact assessment for the Proposed Development.

2 THE SITE AND SURVEY AREA

The Site (see **Figure 6.6** (EIAR Volume 3a)) covers an area of approximately 1,400 hectares (ha) and is located immediately northwest of Abington and approximately 4.5 km southeast of Douglas, South Lanarkshire.

The Site predominantly occupies open moorland, acid, improved, semi-improved and marshy grassland, and small areas of forestry. The Site contains an active quarry and is intersected by the M74 motorway and the B7078 and B740 roads. The landscape is typical of the wider location, with the Site positioned in the northern portion of the Southern Upland Hills, with Tinto Hill located approximately 8 km to the north. The Duneaton Water, a tributary of the River Clyde, passes through the eastern part of the Site and forms part of the northern and southern boundary. The River Clyde forms the eastern boundary of the Site.

The survey area in which bat surveys were undertaken for the Proposed Development incorporated the full red line boundary, including access tracks i.e. the application boundary. The temporal (Anabat) survey area covered the turbine array and consisted of 14 Anabat deployment locations as shown in **Figure 6.6** (EIAR Volume 3a).

The Site does not overlap with any statutory designated sites containing bat related qualifying features and interests.

3 BATS AND WIND FARMS

3.1 Policy and Guidance

All bat species are protected under the following legislation:

- The Habitats Directive 92/43/EEC (as amended);
- The Wildlife and Countryside Act 1981 (as amended); and
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Details pertaining to the legal status of bats are included within **Annex A , Table A-1.**

In the UK and Europe, guidelines have been produced with regards to assessing the ecological impact upon bats from wind farm developments. These guidelines help to inform survey and mitigation strategies.

The following guidance documents have been used in the preparation of this report:

- Collins, J. (ed) (2016)[1]. *Bat Surveys for Professional Ecologists: Good Practice Guidelines*. 3rd Edition. The Bat Conservation Trust, London[2];
- Collins, J. (ed.) (2023)[3]. Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust, London. ISBN-978-1-7395126-0-6[4].
- Andrews, H. (2018)[5] Bat Roosts in Trees: a guide for identification and assessment for tree-care and ecology professionals. Pelagic Publishing, Exeter;
- Reason, P.F., Newson, S.E. & Jones, K.E. (2016)[6]. Recommendations for using automatic bat identification software with full spectrum recordings. Bat Conservation Trust;
- Russ, J. (2012)[7] *British Bat Calls, A Guide to Species Identification*, Pelagic Publishing, Exeter; and
- NatureScot, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & the Bat Conservation Trust (BCT). (2021)[8]. *Bats and Onshore Wind Turbines: Survey Assessment and Mitigation*.

4 METHODS

4.1 Desk-Based Assessment

A desk-based assessment was undertaken with regards to the presence of bat species within the Site and its environs.

A National Biodiversity Network (NBN)[9] Atlas Scotland search was completed to obtain bat records from 2009 to 2024 within 10 km of the Site.

4.2 Field Survey Methods

4.2.1 Preliminary Bat Roost Assessment

The PRA followed the assessment methodology as set out in Collins (2016)[2] and Collins (2023)[3] to identify any Potential Roost Features (PRFs) in trees, buildings and structures, which could support roosting bats and to search for evidence of roosting bats.

[1] Collins, J. (ed) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd Edition. The Bat Conservation Trust, London.
[2] Methods and analysis followed the 3rd edition of the Bat Conservation Trust survey guidelines as surveys were completed before the 4th edition guidelines were published in September 2023.
[3] Collins, J. (ed.) (2023) . Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust, London. ISBN-978-1-7395126-0-6.
[4] This guidance was used to inform work and analysis undertaken following publication of the updated guidance in September 2023.
[5] Andrews, H. (2018). Bat Roosts in Trees: a guide for identification and assessment for tree-care and ecology professionals. Pelagic Publishing, Exeter.
[6] Reason, P.F., Newson, S.E. & Jones, K.E. (2016). Recommendations for using automatic bat identification software with full spectrum recordings. Bat Conservation Trust.
[7] Russ, J. (2012). British Bat Calls: A Guide to species Identification. Pelagic Publishing.
[8] NatureScot, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2021). Bats and Onshore Wind Turbines: Survey Assessment and Mitigation.
[9] NBN Atlas occurrence download at https://nbnatlas.org accessed on 14 February 2024.

Where PRFs were identified, they were assigned a value of low, moderate or high suitability which indicates the likelihood of bats being present and informs the requirement for further survey work, such as a climbing inspection and/or dusk and dawn bat activity surveys. Collins (2016)[2] and Collins (2023)[3], state the following descriptions for assessing PRFs:

- **Negligible** – Negligible habitat features on site to be used by roosting bats.
- **Low** – A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[10] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e., unlikely to be suitable for maternity or hibernation[11]).
  A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential[12].
- **Moderate** – A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[10] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
- **High** – A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions[10] and surrounding habitat.

The PRA was carried out within the survey area in 2023, as shown in **Figure 6.6** (EIAR Volume 3a).

4.2.2 Automated Activity Surveys

NatureScot *et al.* (2021)[8] recommends that, *"Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments."*

The Proposed Development layout at the time of survey in 2023 included 23 turbines, compared to the final design now of 22 turbines. Detectors were placed at potential turbine locations across the Site and deployed seasonally (three deployment periods) from April to September. NatureScot *et al.* (2021)[8] also recommends a minimum of 10 consecutive nights of sampling per seasonal deployment. Detector locations are shown in **Figure 6.6** (EIAR Volume 3a).

Anabat Swift detectors recording full-spectrum files were deployed for a minimum period of 14 consecutive nights across the Site (i.e., exceeding minimum survey requirements of 10 days per season; spring April - May, summer June - mid-August; autumn mid-August - October) and were positioned at a height of 2 m above ground level. Each detector recorded bat activity from dusk to dawn with recording starting 30 minutes before dusk and finishing 30 minutes after dawn.

[10] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.
[11] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten et al., 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.
[12] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Detector operating times and a description of the habitat type at each location is shown in **Annex B , Table B-1**.

The full spectrum detector was deployed with the following settings:

- Sensitively value of 14;
- Minimum frequency of 15 kHz;
- Maximum frequency of 250 kHz;
- Maximum file length of 15 s;
- Minimum event of -2 ms; and
- Sampling rate of 320 kHz.

Data was analysed using Kaleidoscope Pro Auto ID classifier which assigns a species label to a sound file (Reason *et al*, 2016)[6]. To ensure that all bat calls (with the exception of common and soprano pipistrelle which were excluded) were identified correctly by the software, they were manually reviewed by an appropriately trained ecologist using Kaleidoscope Viewer software. This method of analysis is in line with current guidelines for data analysis which recommends the manual checking of all non-*Pipistrellus* calls (excluding Nathusius' pipistrelle) when using automated methods (Collins, 2016). Sound files labelled as noise were also reviewed. Guidance on call parameters was taken from Russ (2012)[7].

At the time of preparing this report (May 2024), the secure online tool Ecobat (Mammal Society, 2017)[13] was not available. Analysis of bat data followed recommendations within NatureScot *et al.* (2021)[8] to use a measure of relative bat activity at the Proposed Development[14].

4.3 Methods for Analysing Bat Activity Levels and Risks

NatureScot *et al.* (2021)[8] details the methodology for analysing bat activity levels. This method is summarised below and involves the following modified steps (due to Ecobat being offline at the time of reporting):

1. Calculating bat passes per hour for Bat Activity Level;
2. Categorising collision risk of the relevant species;
3. Identifying population relevant abundance (size of the populations);
4. Categorising the potential vulnerability of bat populations by combining collision risk with population abundance;
5. Categorising the site risk level; and
6. An assessment of significance and mitigation.

The following sections outline the methods used in each step.

[13] Mammal Society (2017). Ecobat. Available at: http://www.mammal.org.uk/science-research/ costate/.
[14] Section 6.1 of NatureScot 2021 states, "Assessments of bat activity that do not use the online repository must detail how the inferred level of relative bat activity has been derived." Available online: https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation.

4.3.1 Step 1: Calculating Bat Passes Per Hour

To gain a comparison between locations, species and seasons, the number of bat passes per hour was calculated. The data analysis did not include any noise files. The mean Bat Passes Per Hour (BPPH) was used to gain a measure of high numbers of bat species across the Site.

4.3.2 Step 2: Vulnerability to Collision

Appendix 3 of NatureScot *et al.* (2021)[8] presents a generic assessment of vulnerability to collision for UK species, based on species behaviour, flight characteristics and casualties in the UK and Europe. **Table 4-1** provides a summary of the vulnerability of each bat species to collision.

Table 4-1: Vulnerability of Bat Species to Turbine Impact in the UK

Risk of Turbine Impact (Collision Risk)		
Low Risk	**Medium Risk**	**High Risk**
Myotis spp.	Serotine	Common pipistrelle
Long-eared bats	Barbastelle	Soprano pipistrelle
Horseshoe bats		Noctule
		Leisler's bat
		Nathusius' pipistrelle

Habitat characteristics at the location of turbines can have an important influence on the vulnerability of bat species to collision. For example, proximity to key feeding sites and commuting routes such as water features and woodland edge habitats is known to increase the likelihood of bat collision (NatureScot *et al.* 2021)[8].

4.3.3 Step 3: Population Relative Abundance

NatureScot *et al.* (2021)[8] details the sensitivity of a bat species to impact based on their population's relative abundance in Scotland as detailed in **Table 4-2.** Species with the rarest relative abundance are more susceptible to significant effects.

Table 4-2: Population Relative Abundance of Bats in Scotland

Relative Abundance	Species
Common	Common pipistrelle (*Pipistrellus pipistrellus*)
	Soprano pipistrelle (*Pipistrellus pygmaeus*)
Rarer	Brown long-eared bat (*Plecotus auritus*)
	Daubenton's bat *(Myotis daubentonii)*
	Natterer's bat (*Myotis nattereri*)
Rarest	Whiskered bat (*Myotis mystacinus*)
	Brandt's bat (*Myotis brandtii*)
	Nathusius' pipistrelle (*Pipistrellus nathusii*)
	Noctule bat (*Nyctalus noctule*)
	Leisler's bat (*Nyctalus leisleri*)

4.3.4 Step 4: Potential Vulnerability of Bat Populations

Table 4-3, sourced from NatureScot *et al.* (2021)[8], uses the measure of collision risk, in combination with population relative abundance, to indicate the potential vulnerability of populations of British bat species. The overall potential vulnerability of bat populations is identified as: low (yellow), medium (orange) and high (red).

Table 4-3: Level of Potential Vulnerability of Populations of British Bat Species

Relative Abundance of Bats in Scotland	Collision Risk		
	Low collision risk	Medium collision risk	High collision risk
Common species			Common pipistrelle Soprano pipistrelle
Rarer species	Brown long-eared bat Daubenton's bat Natterer's bat		
Rarest species	Whiskered bat Brandt's bat		Nathusius' pipistrelle Noctule bat Leisler's bat

4.3.5 Step 5: Categorise the Site Risk Level

The site risk level is categorised through a combination of habitat risk and project size which is then entered into the table matrix as shown below in **Table 4-4** calculates the overall site risk level. The full matrix table, as provided within NatureScot *et al.* (2021)[8], is shown in **Annex C**, which includes descriptions on how to determine the habitat risk and project size for the Proposed Development.

Table 4-4: Initial Site Risk Level (1-5) Assessment

Habitat Risk	Project Size		
	Small	Medium	Large
Low	1	2	3
Moderate	2	3	4
High	3	4	5

Key: Green (1-2) – low/lowest site risk; Amber (3) – medium site risk; Red (4-5) – high/highest site risk *

* Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

4.3.6 Step 6: Assessment of Significance and Mitigation

The outputs of the BPPH detailed in step 1 above are then used to assess the significance of effect within the EIA. At this stage, other site-specific factors should be considered such as habitat characteristics (and how they may change), behaviour of species at the Site, and location of the Site regarding the natural range of the species and how this could affect favourable conservation status.

Mitigation measures as detailed within section 7.1 of NatureScot *et al.* (2021)[8] are then considered where appropriate.

5 BAT SURVEY LIMITATIONS

The guidance recommends the minimum level of pre-application survey required for ground level static detectors to be 10 nights of recordings in each of spring (April - May), summer (June to mid-August) and autumn (mid-August - October). In Scotland, due to unfavourable weather conditions and low activity levels for bats in April and October, ground-level automated activity surveys commenced in Late-April and were completed in September.

Automated activity surveys should capture a sufficient number of nights (minimum of 10 nights) with appropriate weather conditions for bat activity (i.e., temperatures at or above of 8°C in Scotland at dusk, maximum ground level wind speed of 5 m/s and no, or only very light, rainfall) (NatureScot *et al*, 2021)[8]. To account for the potential limitations of weather on the number of suitable nights recorded, surveys were carried out over longer deployment periods, with a minimum of 14 nights recorded.

Due to unforeseen errors with the detectors, microphones or batteries, it was not always possible to achieve 14 consecutive nights of recordings reliably. Seven detectors had fallen during the deployment period (Location 4, 6, 8, 9 and 13 during Visit 2 and Locations 9 and 13 in Visit 3), although they recorded for the 14 nights, it is unknown when they had fallen. As the majority of locations recorded for more than 10 nights, with a total of 588 complete nights recorded which is beyond the minimum number of nights (14 Anabats*10 nights*3 seasonal deployments = 420 nights of data) required for a Proposed Development of this size, the small loss of data is not considered to have affected the overall assessment of risk. The survey timings can be seen in **Table B-1, Annex B**.

Anabat detectors are a commonly used bat detector for acoustic monitoring at wind farm sites, however all bat detectors have limitations and will only monitor bat activity within a limited area, which for Anabats is usually around 30 m, depending on a variety of environmental factors. Furthermore, due to passive monitoring methodologies depending on sound reaching the microphone, the detection rate of bat calls varies with a bias towards loud bat calls with quieter calls, namely brown long-eared bats (low collision risk species), potentially being under-recorded.

6 SURVEY RESULTS & ANALYSIS

6.1 Desk-Based Assessment

The NBN Atlas data search[9] returned records of the following bat species within 10 km of the Site between 2009 - 2024 inclusive:

- Daubenton's;
- Natterer's;
- *Myotis* spp.;
- Pipistrelle spp.;
- Common pipistrelle;
- Soprano pipistrelle; and
- Brown long-eared bat.

Details regarding licences and data providers for these records are included in **Table 6-1**.

Table 6-1 Data Providers for NBN Atlas Scotland Records Used

Species	Data Provider (Recorder)	Licence
Daubenton's	BCT & NatureScot (Undisclosed & Southern Scotland Bat Survey)	OGL[15]
Natterer's	NatureScot (Southern Scotland Bat Survey)	OGL[15]
Myotis spp.	NatureScot (Southern Scotland Bat Survey)	OGL[15]
Pipistrelle spp.	NatureScot (Southern Scotland Bat Survey)	OGL[15]
Common pipistrelle	NatureScot (Garry Nixon & Southern Scotland Bat Survey)	OGL[15]
Soprano pipistrelle	NatureScot (Southern Scotland Bat Survey)	OGL[15]
Brown long-eared bat	BCT (Undisclosed)	OGL[15]

6.2 Preliminary Bat Roost Assessment

The PRA survey for the Proposed Development was undertaken by MacArthur Green in August 2023. Associated PRF records are shown in **Figure 6.6** (EIAR Volume 3a) with the detailed results (target notes) listed in **Table D-1, Annex D**.

There was a total of 29 features recorded with negligible to high potential suitability for roosting bats. Three features with moderate or high suitability for roosting bats were recorded within 200 m plus rotor radius of a proposed turbine location and as such further surveys were required. Tree climbing surveys were completed in January 2024 by Wild Surveys. Seven features were surveyed to check for further roosting potential. Results are included in **Table D-1, Annex D**.

Through design iterations, a barn considered to offer moderate roosting potential to bat (based on the protected species walkover survey) was to be demolished to facilitate the solar arrays. A ground-based assessment was undertaken by MacArthur Green in June 2024 to assess the roosting potential of the structure, and it was concluded that the structure is of negligible value to roosting bats. Results are included in **Table D-1, Annex D**. The Strand (A farmhouse and outbuildings at NS 90084 25407), which offers moderate roosting potential to bat. It is anticipated that these buildings will be used as a strategic spares store. There are no plans to alter the buildings at the time of submission. It the Applicant considers the need to alter the buildings, the planning position would be re-visited at that stage.

The closest moderate potential features are now within around 280 m from the closest proposed turbine (T12 and T21) (shown in **Figure 6.6** (EIAR Volume 3a)).

[15] Open Government Licence (OGL) https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ [Accessed February 2024].

6.3 Automated Activity Surveys

MacArthur Green deployed detectors at 14 locations on the Site from April to September in 2023 over a total period of 42 days and collecting 588 complete recording nights of data, see **Table B-1**, **Annex B** and **Figure 6.6** (EIAR Volume 3a).

A total of seven bat species were recorded at these locations. The total number of passes recorded for each species across all the detectors within the Site and average (mean) Bat Passes Per Hour are shown below in **Table 6-2**.

Table 6-2 Total Number of Bat Passes for Each Species Across all Locations

Species/Species Group	No of Registrations	Percentage of total (%)	Mean Bat Passes Per Hour*
Soprano pipistrelle	974	21.42	0.17
Common pipistrelle	3310	72.78	0.57
Noctule	51	1.12	0.01
Leisler's	107	2.35	0.02
Daubenton's	93	2.04	0.02
Natterer's	6	0.13	0.001
Brown long-eared	7	0.15	0.001
Total	**4548**	**100**	**1.56**

The summarised results and analysis are presented in Steps 1 – 6 below.

6.3.1 Step 1: Bat Activity Levels (using BPPH)

Bat Activity Levels Across the Site and Through the Seasons

Data on the activity levels for all species across the Site and through the seasons is provided in **Table E-1, Annex E**. Professional judgement was used to assess the site risk.

Average Annual Site Activity Levels

Throughout the survey period, for all species, the highest total bat passes were recorded on the 28th of April, 5th of May and 2nd of August; number of passes was 722, 556 and 506 respectively.

Location 13 had the highest total number of bat passes across (3440) the survey season, with Location 12 recording a total of 12. Location 13 was located along a plantation edge and within a short distance of Duneaton Water. Bats are known to use woodland edges as commuting corridors and the watercourse provides good foraging opportunities (Collins, 2023)[3]. Location 12 was

positioned just over 500 m from Location 13, on top of a hill, with little foraging opportunities and it will be more exposed to the weather.

During Visit 1, the maximum bat passes per hour was at Location 13 with 7.72 BPPH, and the minimum was at Location 10 with 0.00 BPPH (see **Chart 6-1**). Over all locations, common pipistrelle had the highest BPPH with 0.63. There were a total of 1143 bat passes at Visit 1.

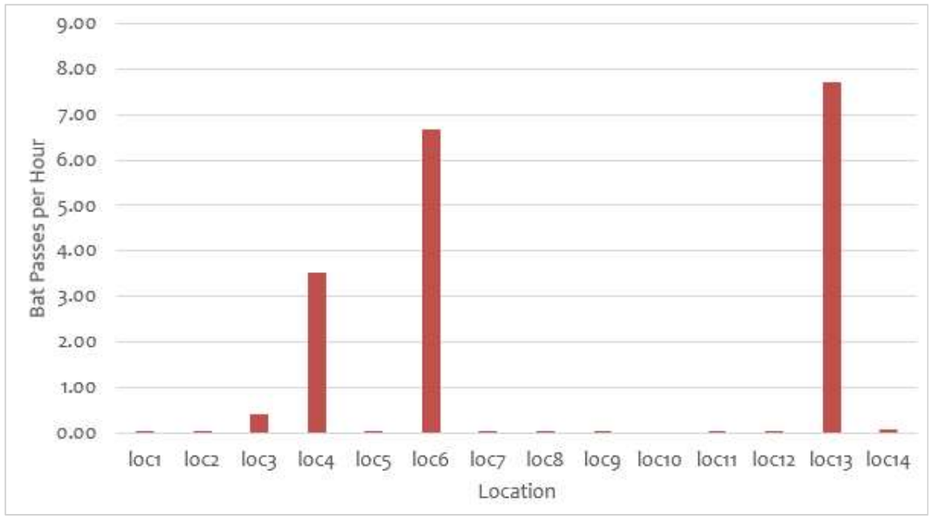

Chart 6-1: Visit 1 Bat Passes Per Hour at each Location

During Visit 2, the maximum bat passes per hour was at Location 13 with 14.51 BPPH, and the minimum was at Location 12 with 0.03 BPPH (see **Chart 6-2**). Over all locations, common pipistrelle had the highest BPPH with 1.12. There were a total of 2430 bat passes at Visit 2.

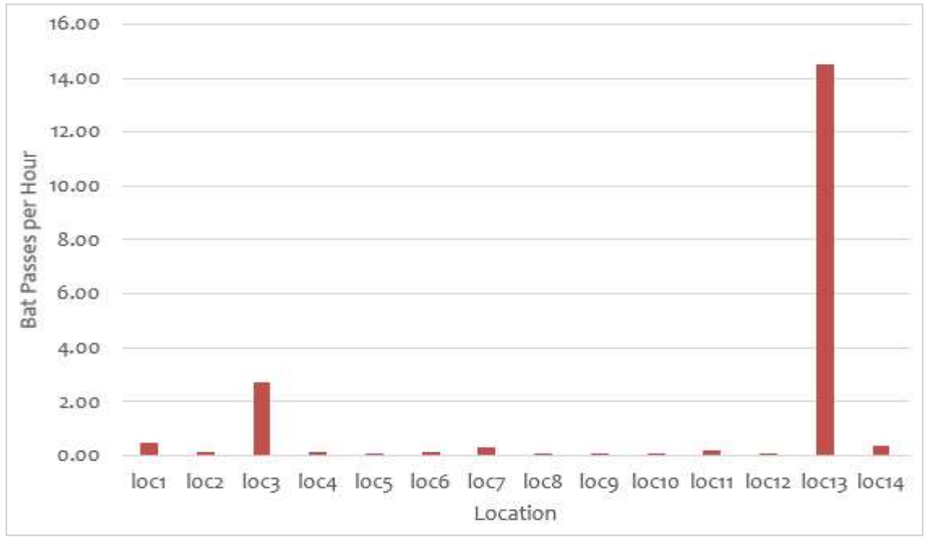

Chart 6-2: Visit 2 Bat Passes Per Hour at each Location

During Visit 3, the maximum bat passes per hour was at Location 13 with 3.41 BPPH, and the minimum was at Location 12 with 0.02 BPPH (see **Chart 6-3**). Over all locations, soprano pipistrelle had the highest BPPH with 0.23. There were a total of 975 bat passes at Visit 3.

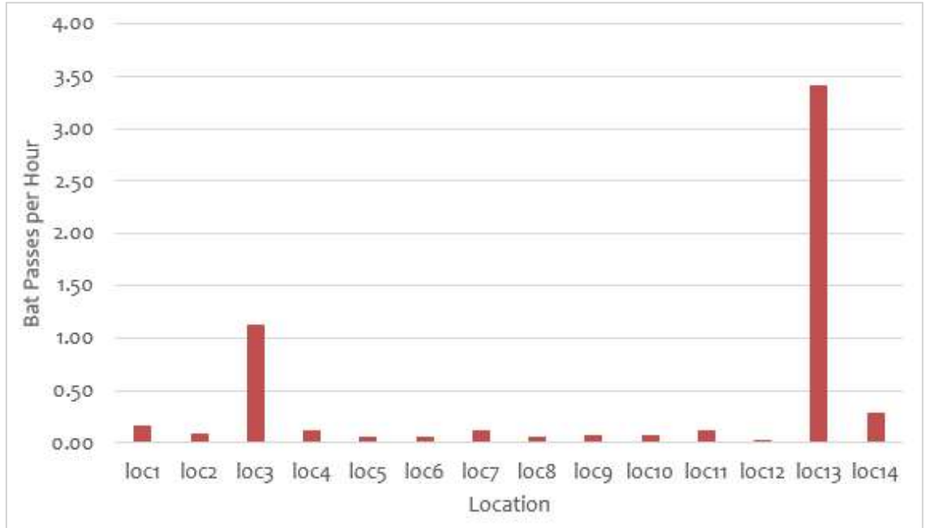

Chart 6-3: Visit 3 Bat Passes Per Hour at each Location

6.3.2 Step 2, 3 and 4: Collision Risk, Population Relative Abundance and Potential Vulnerability

Table 6-3 details the collision risk, population relative abundance and potential vulnerability of the bat species recorded at the Site.

Table 6-3: Collision Risk, Population Relative Abundance and Potential Vulnerability

Bat Species	Collision Risk	Population Relative Abundance	Potential Vulnerability
Soprano pipistrelle	High	Common	Medium
Common pipistrelle	High	Common	Medium
Noctule	High	Rarest	High
Daubenton's	Low	Rarer	Low
Natterer's	Low	Rarer	Low
Myotis spp.	Low	Rarer – Rarest	Low – Medium
Brown long-eared	Low	Rarer	Low

6.3.3 Step 5: Categorising Site Risk Level

The site risk level is determined by project size and habitat risk (see

Table 4-4). The Proposed Development consists of 22 turbines that are over 50 m in height, and so falls within the 'Medium' project size, as shown in **Table 4-4 and Table C-1 in Annex C.**

In terms of habitat risk for bats, there are a small number of buildings and trees with moderate bat roosting potential within 200 m plus the rotor radius of turbines. Foraging habitat quality and connectivity within this buffer area is low with a largely treeless environment and small open upland burns and a fairly homogenous area of open grazed moorland habitat present, resulting in a habitat risk classification of **'Low'** as shown in **table 4-4** and **Table C-1**, **Annex C**.

According to **Table 4-4**, the **'Medium'** project size combined with a **'Low'** habitat risk level results in an overall site risk assessment of **'Low/Lowest' (2).**

6.3.4 Step 6: Risk Assessment – High Collision Risk Species Only

The overall risk assessment is undertaken for high collision risk species which were identified at the Site. Low-risk species have a low risk of collision with a turbine blade, so the impact of the Proposed Development on the local bat population would likely be negligible.

The mean total BPPH for all high-risk species (all *Pipistrelle* spp. and *Nyctalus* spp.) ranges from 0.009 to 0.554 across all locations and visits. Generally, the mean bat passes per hour is considered Low.

Figures 6.7, **6.8** and **6.9** (EIAR Volume 3a) illustrate the results of the mean seasonal bat activity for high collision risk bat species recorded at the Site at each survey location, illustrating how bat activity varies within the Site across the year and by species. This data is also presented in **Table E-1, Annex E** which includes the mean bat passes per hour, mean bat passes per night and maximum bat activity (bat passes per night).

The maximum bat passes per night ranges from 1 to 640. The number of bat passes, based on the calls recorded by the detector, does not directly relate to the number of individual bats at a location (Reason, 2016)[6].

ANNEX A. BATS LEGAL STATUS

The information contained in this Annex is a summarised version of the legislation and should be read in conjunction with the appropriate legislation.

All bat species receive protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)[16].

For any wild bat species, it is an offence to deliberately or recklessly:

- capture, injure or kill a bat;
- harass a bat or group of bats;
- disturb a bat in a roost (any structure or place it uses for shelter or protection);
- disturb a bat while it is rearing or otherwise caring for its young;
- obstruct access to a bat roost or otherwise deny an animal use of a roost;
- disturb a bat in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species;
- disturb a bat in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; and
- disturb a bat while it is migrating or hibernating.

It's also an offence to:

- damage or destroy a breeding site or resting place of such an animal (whether or not deliberately or recklessly); and
- keep, transport, sell or exchange, or offer for sale or exchange any wild bat (or any part or derivative of one) obtained after 10 June 1994[17].

[16] Sections 39(1) – (3).
[17] Available online: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/protected-species-z-guide/protected-species-bats [Accessed February 2024].

Table A-1 Legal and Conservation Status of all UK Bats[18]

Species	Legislation / Convention													
	Bern Convention Appendix II	Bonn Convention Appendix II	WCA	Habitats Directive Annex IV	Habitats Directive Annex II	Habs Regs 1994 (as amended) *Scotland*	Conservation of Habs & Species Regs 2010	Conservation Regs (N Ireland) 1995	CROW Act 2000	NERC Act 2006	Wild Mammals Protection Act	UK BAP Priority species	IUCN Red List*	EUROBATS Agreement
Greater horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Lesser horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Daubenton's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Natterer's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Whiskered bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brandt's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Bechstein's bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Alcathoe bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		DD	✓
Noctule	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Leisler's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Serotine	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Common pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Soprano pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Nathusius' pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brown long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Grey long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Barbastelle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Greater mouse-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓

*IUCN categories: LC is Least Concern, NT is Near Threatened, DD is Data deficient; see www.iucnredlist.org for more details.

[18] Source: Bat Conservation Trust. Available online: http://www.bats.org.uk/pages/bats_and_the_law.html [Accessed February 2024].

ANNEX B. SURVEY TIMINGS & ANABAT LOCATIONS

Table B-1 Description of Anabat Locations and Summary of Temporal Survey Effort

Location	Easting	Northing	Bearing	Habitat	Total Number of Complete Recording Nights		
					Visit 1 24/04/2023 – 08/05/2023	Visit 2 25/07/2023 – 08/08/2023	Visit 3 12/09/2023 – 26/09/2023
1	289303	628438	105	Within 25 m of Mill Burn.	14	14	14
2	289590	628100	20	Within 50 m of Mill Burn.	14	14	14
3	289922	627867	340	Within 15 m of Mill Burn.	14	14	14
4	288547	627801	279	Within open moorland.	14	14*	14
5	288877	627569	283	Within open moorland.	14	14	14
6	289305	627332	304	Within open moorland.	14	14*	14
7	290214	627013	20	Within 50 m of East Thirstone Burn.	14	14	14
8	288047	627294	140	Within open moorland.	14	14*	14
9	288936	626640	200	Within open moorland.	14	14*	14*
10	289705	626253	315	Within open moorland.	14	14	14
11	290139	626206	70	Within open moorland.	14	14	14
12	290921	626131	320	Within open moorland.	14	14	14
13	291300	625790	55	Along plantation edge.	14	14*	14*
14	288471	626027	265	Along young conifer plantation edge.	14	14	14
Total					**747**		

*Indicates detector had fallen during the deployment.

ANNEX C. INITIAL SITE RISK ASSESSMENT

Table C-1 Initial Site Risk Assessment[19].

Site Risk Level (1-5)[20]	Project Size			
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5
Key: Green (1-2) – low/lowest site risk; Amber (3) – medium site risk; Red (4-5) – high/highest site risk				

Habitat Risk	Description
Low	Small number of potential roost features, of low quality. Low-quality foraging habitats that could be used by small numbers of foraging bats. Isolated site not connected to the wider landscape by prominent linear features.
Moderate	Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. At/near edge of range and or an important flyway. Close to key roost and /or swarming.

Project Size	Description
Small	Small scale development (<10 turbines). No other wind energy developments within 10 km. Comprising turbines <50 m in height.
Medium	Larger developments (between 10 and 40). May have some other wind development within 5 km. Comprising turbines 50 – 100 m in height.
Large	Largest developments (>40 turbines) with other wind energy developments within 5 km. Comprising turbines >100 m in height.

[19] Sourced from: NatureScot, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT). (2021). *Bats and Onshore Wind Turbines: Survey Assessment and Mitigation*.
[20] Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

ANNEX D. PRELIMINARY BAT ROOST ASSESSMENT

Table D-1 Preliminary Bat Roost Assessment Target Notes

PRF_ID	Feature	Notes	PRF Cat
PS020	Tree	Mature beech tree with knot hole around 5 m up on trunk. Looks to be facing down, but hard to see how far deep it extends.	Mo
PS021	Tree	Group of five mature broadleaved trees (field maple and ash) outside site boundary. One is dead, with potential for roosts.	Mo
PS022	Structure	Small shed by house with no door.	Mo
PS023	Structure	Large farmhouse. Potential entry points under eaves/flashings. Slate roof looks well intact.	Mo
PS024	Tree	Small group of spruce trees by road.	Neg
PS032	Tree	Plantation of youngish Scots pine. Some small cracks and knotholes. None seem significant.	Low
PS033	Tree	Plantation of youngish Scots pine. Some small cracks and knotholes. None seem significant.	Low
PS034	Tree	Single storm-damaged birch within sheltered woodland glade, with cracked trunk and bark hanging off around 4 m from ground.	Mo
PS035	Structure	Several large barns at Netherton Farm with open entrances.	High
PS036	Tree	Field maple with large break halfway up branch.	Mo
PS037	Tree	Field maple with large downwards-facing knothole on trunk.	Low
PS038	Structure	Large dead tree with multiple cracks and breaks. Missing bark on at least half of trunk. Gaps present under remaining bark. Large crack in trunk around 15m up, but can't see how deep it goes.	Mo
PS039	Tree	Young Scots pines with some small knotholes. Mature willows with no obvious PRFs.	Low
PS040	Tree	Mostly mature maple in garden of farmhouse. Some trees dead but still standing.	Mo
PS049	Tree	Small plantation of Scots pine and spruce trees outside site boundary.	Low

PRF_ID	Feature	Notes	PRF Category	PRF Category Post Further Inspection	Grid Reference
PS050	Tree	Single beech tree with small knot hole around 4 m from ground that appears to continue into the trunk.	Low	n/a	NS 93289 24364
PS051	Tree	Dead beech tree with woodpecker holes around 12 m from ground.	Moderate	n/a	NS 93315 24086
PS055	Tree	Some mature Scots pine at edge of field with no obvious PRFs.	Negligible	n/a	NS 92652 23417
PS056	Structure	Abandoned farmhouse with multiple entrances including broken roof tiles.	High	n/a	NS 92934 23886
PS057	Structure	Large open-faced metal livestock barns. Surrounded by broadleaved trees (trees immature and without PRFs).	Moderate	n/a	NS 92903 24036
PS058	Tree	Dead standing Scots pine with large hole near the top.	Moderate	n/a	NS 92713 24337
PS059	Tree	Mix of Scots pine and semi-mature broadleaved trees. No obvious PRFs.	Negligible	n/a	NS 92777 24299
PS060	Tree	Small mature spruce plantation.	Negligible	n/a	NS 92693 24294
PS061	Structure	Tall, dead Scots pine. Large crack in trunk three quarters of way up. Lots of missing bark.	Low	n/a	NS 92622 24307
PS062	Structure	Large open barn with multiple possible exits and entrances.	Moderate	Negligible	NS 92710 25137
PS063	Tree	Conifer and broadleaved mixed woodland, with few PRFs apart from small knot holes and cracks.	Low	n/a	NS 92733 24800
PS067	Structure	Duneaton Bridge - in good condition with mortar mostly intact and all stone blocks.	Low	n/a	NS 91544 24605
PS069	Tree	Scots pine woodland on embankment below the B7078 - little to no cavities and no rotten trees visible. Low to negligible potential.	Low	n/a	NS 91571 24874
PS070	Tree	Mature woodland strip of sycamore and beech. Most trees all in good condition. Very little rotting limbs/cavities. Follows field boundary and along east side of road.	Low	n/a	NS 93318 23972

ANNEX E. SEASONAL LOCATION SPECIFIC DATA

Table E- 1 Seasonal Location Specific Data for all Species

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc1	MYODAU	Summer	1	0.059	0.008
loc1	MYODAU	Summer	1	0.059	0.008
loc1	MYODAU	Summer	1	0.059	0.008
loc10	MYODAU	Summer	2	0.059	0.008
loc10	MYODAU	Summer	2	0.118	0.016
loc10	MYODAU	Autumn	1	0.063	0.006
loc10	MYODAU	Autumn	1	0.063	0.006
loc11	MYODAU	Summer	1	0.059	0.008
loc11	MYODAU	Summer	1	0.059	0.008
loc11	MYODAU	Summer	1	0.059	0.008
loc11	MYODAU	Autumn	1	0.063	0.006
loc11	MYODAU	Autumn	1	0.063	0.006
loc11	MYODAU	Autumn	1	0.063	0.006
loc13	MYODAU	Spring	1	0.050	0.007
loc13	MYODAU	Spring	1	0.050	0.007
loc13	MYODAU	Spring	1	0.050	0.007
loc13	MYODAU	Spring	1	0.050	0.007
loc13	MYODAU	Summer	2	0.125	0.016
loc13	MYODAU	Summer	2	0.063	0.008
loc13	MYODAU	Summer	2	0.125	0.016

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc13	MYODAU	Autumn	3	0.188	0.018
loc13	MYODAU	Autumn	3	0.063	0.006
loc13	MYODAU	Autumn	3	0.188	0.018
loc13	MYODAU	Autumn	3	0.063	0.006
loc14	MYODAU	Summer	2	0.059	0.008
loc14	MYODAU	Summer	2	0.118	0.016
loc14	MYODAU	Summer	2	0.059	0.008
loc14	MYODAU	Summer	2	0.059	0.008
loc14	MYODAU	Autumn	1	0.063	0.006
loc14	MYODAU	Autumn	1	0.063	0.006
loc14	MYODAU	Autumn	1	0.063	0.006
loc14	MYODAU	Autumn	1	0.063	0.006
loc14	MYODAU	Autumn	1	0.063	0.006
loc2	MYODAU	Autumn	1	0.059	0.006
loc2	MYODAU	Autumn	1	0.059	0.006
loc3	MYODAU	Spring	1	0.063	0.007
loc3	MYODAU	Autumn	1	0.059	0.006
loc3	MYODAU	Autumn	1	0.059	0.006
loc3	MYODAU	Autumn	1	0.059	0.006
loc4	MYODAU	Autumn	2	0.118	0.011
loc4	MYODAU	Autumn	2	0.059	0.006
loc4	MYODAU	Autumn	2	0.059	0.006
loc5	MYODAU	Summer	1	0.059	0.008

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc6	MYODAU	Spring	1	0.056	3.333
loc6	MYODAU	Summer	1	0.059	0.008
loc7	MYODAU	Spring	1	0.056	0.007
loc7	MYODAU	Spring	1	0.056	0.007
loc7	MYODAU	Spring	1	0.056	0.007
loc7	MYODAU	Spring	1	0.056	0.007
loc7	MYODAU	Summer	3	0.063	0.008
loc7	MYODAU	Summer	3	0.063	0.008
loc7	MYODAU	Summer	3	0.188	0.024
loc7	MYODAU	Summer	3	0.063	0.008
loc7	MYODAU	Summer	3	0.188	0.024
loc7	MYODAU	Summer	3	0.188	0.024
loc7	MYODAU	Summer	3	0.188	0.024
loc7	MYODAU	Summer	3	0.125	0.016
loc7	MYODAU	Summer	3	0.063	0.008
loc7	MYODAU	Autumn	3	0.176	0.017
loc7	MYODAU	Autumn	3	0.118	0.011
loc7	MYODAU	Autumn	3	0.176	0.017
loc7	MYODAU	Autumn	3	0.059	0.006
loc8	MYODAU	Summer	1	0.063	0.008
loc8	MYODAU	Autumn	1	0.063	0.006
loc8	MYODAU	Autumn	1	0.063	0.006

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc9	MYODAU	Spring	1	0.056	0.007
loc9	MYODAU	Autumn	2	0.063	0.006
loc9	MYODAU	Autumn	2	0.125	0.011
loc9	MYODAU	Autumn	2	0.063	0.006
loc9	MYODAU	Autumn	2	0.063	0.006
loc1	MYONAT	Summer	1	0.059	0.008
loc1	MYONAT	Summer	1	0.059	0.008
loc11	MYONAT	Autumn	1	0.063	0.006
loc14	MYONAT	Autumn	1	0.063	0.006
loc2	MYONAT	Summer	1	0.059	0.008
loc6	MYONAT	Autumn	1	0.059	0.006
loc1	NYCLEI	Summer	9	0.529	0.071
loc1	NYCLEI	Summer	9	0.235	0.032
loc1	NYCLEI	Summer	9	0.118	0.016
loc10	NYCLEI	Summer	1	0.059	0.008
loc10	NYCLEI	Summer	1	0.059	0.008
loc11	NYCLEI	Summer	1	0.059	0.008
loc11	NYCLEI	Autumn	1	0.063	0.006
loc13	NYCLEI	Summer	7	0.063	0.008
loc13	NYCLEI	Summer	7	0.188	0.024
loc13	NYCLEI	Summer	7	0.063	0.008
loc13	NYCLEI	Summer	7	0.438	0.055

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc13	NYCLEI	Summer	7	0.188	0.024
loc13	NYCLEI	Summer	7	0.063	0.008
loc13	NYCLEI	Summer	7	0.250	0.032
loc13	NYCLEI	Summer	7	0.188	0.024
loc13	NYCLEI	Summer	7	0.125	0.016
loc13	NYCLEI	Summer	7	0.188	0.024
loc13	NYCLEI	Summer	7	0.125	0.016
loc13	NYCLEI	Autumn	10	0.125	0.012
loc13	NYCLEI	Autumn	10	0.375	0.037
loc13	NYCLEI	Autumn	10	0.125	0.012
loc13	NYCLEI	Autumn	10	0.375	0.037
loc13	NYCLEI	Autumn	10	0.625	0.061
loc13	NYCLEI	Autumn	10	0.375	0.037
loc13	NYCLEI	Autumn	10	0.625	0.061
loc14	NYCLEI	Summer	1	0.059	0.008
loc14	NYCLEI	Summer	1	0.059	0.008
loc2	NYCLEI	Summer	1	0.059	0.008
loc2	NYCLEI	Summer	1	0.059	0.008
loc2	NYCLEI	Summer	1	0.059	0.008
loc2	NYCLEI	Summer	1	0.059	0.008
loc2	NYCLEI	Autumn	2	0.118	0.011
loc3	NYCLEI	Summer	6	0.353	0.047
loc3	NYCLEI	Summer	6	0.176	0.024
loc4	NYCLEI	Summer	2	0.118	0.016

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc4	NYCLEI	Summer	2	0.059	0.008
loc5	NYCLEI	Summer	1	0.059	0.008
loc5	NYCLEI	Summer	1	0.059	0.008
loc5	NYCLEI	Autumn	1	0.059	0.006
loc6	NYCLEI	Summer	1	0.059	0.008
loc6	NYCLEI	Summer	1	0.059	0.008
loc6	NYCLEI	Summer	1	0.059	0.008
loc7	NYCLEI	Summer	1	0.063	0.008
loc7	NYCLEI	Summer	1	0.063	0.008
loc8	NYCLEI	Summer	2	0.125	0.016
loc9	NYCLEI	Summer	1	0.063	0.008
loc9	NYCLEI	Autumn	1	0.063	0.006
loc9	NYCLEI	Autumn	1	0.063	0.006
loc1	NYCNOC	Summer	1	0.059	0.008
loc11	NYCNOC	Autumn	4	0.250	0.023
loc13	NYCNOC	Spring	2	0.100	0.015
loc13	NYCNOC	Spring	2	0.100	0.015
loc13	NYCNOC	Spring	2	0.100	0.015
loc13	NYCNOC	Summer	4	0.188	0.024
loc13	NYCNOC	Summer	4	0.063	0.008
loc13	NYCNOC	Summer	4	0.250	0.032
loc13	NYCNOC	Summer	4	0.250	0.032
loc13	NYCNOC	Summer	4	0.125	0.016

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc13	NYCNOC	Summer	4	0.063	0.008
loc13	NYCNOC	Summer	4	0.063	0.008
loc13	NYCNOC	Summer	4	0.063	0.008
loc13	NYCNOC	Autumn	10	0.625	0.061
loc13	NYCNOC	Autumn	10	0.250	0.025
loc13	NYCNOC	Autumn	10	0.063	0.006
loc13	NYCNOC	Autumn	10	0.250	0.025
loc13	NYCNOC	Autumn	10	0.063	0.006
loc3	NYCNOC	Autumn	1	0.059	0.006
loc4	NYCNOC	Autumn	1	0.059	0.006
loc7	NYCNOC	Autumn	1	0.059	0.006
loc1	PIPPIP	Summer	15	0.118	0.016
loc7	NYCNOC	Autumn	1	0.059	0.006
loc1	PIPPIP	Summer	15	0.118	0.016
loc1	PIPPIP	Summer	15	0.294	0.040
loc1	PIPPIP	Summer	15	0.882	0.119
loc1	PIPPIP	Summer	15	0.059	0.008
loc1	PIPPIP	Summer	15	0.059	0.008
loc1	PIPPIP	Autumn	1	0.059	0.006
loc10	PIPPIP	Summer	2	0.059	0.008
loc10	PIPPIP	Summer	2	0.118	0.016
loc10	PIPPIP	Summer	2	0.118	0.016
loc10	PIPPIP	Autumn	1	0.063	0.006
loc10	PIPPIP	Autumn	1	0.063	0.006

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc10	PIPPIP	Autumn	1	0.063	0.006
loc11	PIPPIP	Summer	3	0.118	0.016
loc11	PIPPIP	Summer	3	0.118	0.016
loc11	PIPPIP	Summer	3	0.176	0.024
loc11	PIPPIP	Summer	3	0.118	0.016
loc11	PIPPIP	Summer	3	0.176	0.024
loc11	PIPPIP	Summer	3	0.059	0.008
loc11	PIPPIP	Summer	3	0.059	0.008
loc11	PIPPIP	Autumn	3	0.063	0.006
loc11	PIPPIP	Autumn	3	0.188	0.017
loc11	PIPPIP	Autumn	3	0.063	0.006
loc11	PIPPIP	Autumn	3	0.063	0.006
loc11	PIPPIP	Autumn	3	0.063	0.006
loc12	PIPPIP	Spring	3	0.188	0.022
loc12	PIPPIP	Summer	3	0.176	0.024
loc12	PIPPIP	Autumn	3	0.188	0.017
loc13	PIPPIP	Spring	640	0.150	0.022
loc13	PIPPIP	Spring	640	32.000	4.700
loc13	PIPPIP	Spring	640	0.300	0.044
loc13	PIPPIP	Spring	640	0.550	0.081
loc13	PIPPIP	Spring	640	1.100	0.162
loc13	PIPPIP	Spring	640	2.250	0.330
loc13	PIPPIP	Spring	640	2.150	0.316

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc13	PIPPIP	Spring	640	3.950	0.580
loc13	PIPPIP	Spring	640	2.250	0.330
loc13	PIPPIP	Spring	640	2.850	0.419
loc13	PIPPIP	Spring	640	0.150	0.022
loc13	PIPPIP	Summer	452	14.875	1.884
loc13	PIPPIP	Summer	452	4.375	0.554
loc13	PIPPIP	Summer	452	6.500	0.823
loc13	PIPPIP	Summer	452	0.500	0.063
loc13	PIPPIP	Summer	452	1.875	0.237
loc13	PIPPIP	Summer	452	9.188	1.164
loc13	PIPPIP	Summer	452	0.375	0.047
loc13	PIPPIP	Summer	452	16.625	2.106
loc13	PIPPIP	Summer	452	2.813	0.356
loc13	PIPPIP	Summer	452	28.250	3.578
loc13	PIPPIP	Summer	452	0.625	0.079
loc13	PIPPIP	Summer	452	0.563	0.071
loc13	PIPPIP	Summer	452	2.000	0.253
loc13	PIPPIP	Summer	452	8.813	1.116
loc13	PIPPIP	Autumn	39	0.125	0.012
loc13	PIPPIP	Autumn	39	1.438	0.141
loc13	PIPPIP	Autumn	39	0.250	0.025
loc13	PIPPIP	Autumn	39	0.688	0.068

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc13	PIPPIP	Autumn	39	1.063	0.104
loc13	PIPPIP	Autumn	39	2.438	0.239
loc13	PIPPIP	Autumn	39	0.938	0.092
loc14	PIPPIP	Spring	4	0.056	0.007
loc14	PIPPIP	Spring	4	0.111	0.015
loc14	PIPPIP	Spring	4	0.056	0.007
loc14	PIPPIP	Spring	4	0.222	0.029
loc14	PIPPIP	Spring	4	0.056	0.007
loc14	PIPPIP	Summer	7	0.412	0.055
loc14	PIPPIP	Summer	7	0.059	0.008
loc14	PIPPIP	Summer	7	0.118	0.016
loc14	PIPPIP	Summer	7	0.176	0.024
loc14	PIPPIP	Summer	7	0.059	0.008
loc14	PIPPIP	Summer	7	0.235	0.032
loc14	PIPPIP	Summer	7	0.059	0.008
loc14	PIPPIP	Summer	7	0.294	0.040
loc14	PIPPIP	Summer	7	0.176	0.024
loc14	PIPPIP	Summer	7	0.059	0.008
loc14	PIPPIP	Autumn	11	0.063	0.006
loc14	PIPPIP	Autumn	11	0.313	0.028
loc14	PIPPIP	Autumn	11	0.188	0.017
loc14	PIPPIP	Autumn	11	0.063	0.006

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc14	PIPPIP	Autumn	11	0.063	0.006
loc14	PIPPIP	Autumn	11	0.313	0.028
loc14	PIPPIP	Autumn	11	0.688	0.063
loc2	PIPPIP	Spring	1	0.071	0.007
loc2	PIPPIP	Summer	4	0.059	0.008
loc2	PIPPIP	Summer	4	0.235	0.032
loc2	PIPPIP	Summer	4	0.118	0.016
loc2	PIPPIP	Summer	4	0.059	0.008
loc2	PIPPIP	Summer	4	0.059	0.008
loc2	PIPPIP	Autumn	3	0.059	0.006
loc2	PIPPIP	Autumn	3	0.176	0.017
loc3	PIPPIP	Spring	54	0.063	0.007
loc3	PIPPIP	Spring	54	0.063	0.007
loc3	PIPPIP	Spring	54	3.375	0.397
loc3	PIPPIP	Summer	117	1.588	0.214
loc3	PIPPIP	Summer	117	0.353	0.047
loc3	PIPPIP	Summer	117	0.118	0.016
loc3	PIPPIP	Summer	117	0.176	0.024
loc3	PIPPIP	Summer	117	0.118	0.016
loc3	PIPPIP	Summer	117	0.588	0.079
loc3	PIPPIP	Summer	117	6.588	0.886
loc3	PIPPIP	Summer	117	2.118	0.285

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc3	PIPPIP	Summer	117	6.882	0.926
loc3	PIPPIP	Autumn	57	3.353	0.325
loc3	PIPPIP	Autumn	57	0.176	0.017
loc3	PIPPIP	Autumn	57	0.059	0.006
loc3	PIPPIP	Autumn	57	0.471	0.046
loc3	PIPPIP	Autumn	57	2.235	0.217
loc3	PIPPIP	Autumn	57	0.118	0.011
loc3	PIPPIP	Autumn	57	0.176	0.017
loc4	PIPPIP	Spring	1	0.059	3.529
loc4	PIPPIP	Summer	2	0.059	0.008
loc4	PIPPIP	Summer	2	0.059	0.008
loc4	PIPPIP	Summer	2	0.118	0.016
loc4	PIPPIP	Summer	2	0.059	0.008
loc4	PIPPIP	Autumn	3	0.176	0.017
loc4	PIPPIP	Autumn	3	0.118	0.011
loc4	PIPPIP	Autumn	3	0.118	0.011
loc5	PIPPIP	Summer	1	0.059	0.008
loc5	PIPPIP	Summer	1	0.059	0.008
loc5	PIPPIP	Autumn	4	0.059	0.006
loc5	PIPPIP	Autumn	4	0.235	0.023
loc6	PIPPIP	Summer	1	0.059	0.008
loc6	PIPPIP	Summer	1	0.059	0.008

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc6	PIPPIP	Summer	1	0.059	0.008
loc6	PIPPIP	Summer	1	0.059	0.008
loc6	PIPPIP	Autumn	1	0.059	0.006
loc6	PIPPIP	Autumn	1	0.059	0.006
loc7	PIPPIP	Spring	1	0.056	0.007
loc7	PIPPIP	Summer	5	0.313	0.040
loc7	PIPPIP	Summer	5	0.125	0.016
loc7	PIPPIP	Summer	5	0.125	0.016
loc7	PIPPIP	Summer	5	0.063	0.008
loc7	PIPPIP	Summer	5	0.063	0.008
loc7	PIPPIP	Autumn	3	0.059	0.006
loc7	PIPPIP	Autumn	3	0.176	0.017
loc7	PIPPIP	Autumn	3	0.118	0.011
loc8	PIPPIP	Spring	1	0.059	0.007
loc8	PIPPIP	Summer	1	0.063	0.008
loc8	PIPPIP	Summer	1	0.063	0.008
loc8	PIPPIP	Summer	1	0.063	0.008
loc8	PIPPIP	Autumn	3	0.063	0.006
loc8	PIPPIP	Autumn	3	0.063	0.006
loc8	PIPPIP	Autumn	3	0.063	0.006
loc8	PIPPIP	Autumn	3	0.188	0.017
loc9	PIPPIP	Spring	1	0.056	0.007

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc9	PIPPIP	Summer	2	0.125	0.016
loc9	PIPPIP	Summer	2	0.063	0.008
loc9	PIPPIP	Summer	2	0.063	0.008
loc9	PIPPIP	Summer	2	0.063	0.008
loc9	PIPPIP	Autumn	2	0.063	0.006
loc9	PIPPIP	Autumn	2	0.125	0.011
loc9	PIPPIP	Autumn	2	0.063	0.006
loc1	PIPPYG	Spring	1	0.059	0.007
loc1	PIPPYG	Summer	7	0.118	0.016
loc1	PIPPYG	Summer	7	0.412	0.055
loc1	PIPPYG	Summer	7	0.353	0.047
loc1	PIPPYG	Summer	7	0.059	0.008
loc1	PIPPYG	Summer	7	0.059	0.008
loc1	PIPPYG	Autumn	13	0.176	0.017
loc1	PIPPYG	Autumn	13	0.706	0.068
loc1	PIPPYG	Autumn	13	0.765	0.074
loc10	PIPPYG	Summer	1	0.059	0.008
loc10	PIPPYG	Summer	1	0.059	0.008
loc10	PIPPYG	Summer	1	0.059	0.008
loc10	PIPPYG	Autumn	3	0.063	0.006
loc10	PIPPYG	Autumn	3	0.063	0.006
loc10	PIPPYG	Autumn	3	0.188	0.017
loc10	PIPPYG	Autumn	3	0.125	0.011

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc10	PIPPYG	Autumn	3	0.125	0.011
loc11	PIPPYG	Spring	1	0.059	0.007
loc11	PIPPYG	Summer	1	0.059	0.008
loc11	PIPPYG	Summer	1	0.059	0.008
loc11	PIPPYG	Summer	1	0.059	0.008
loc11	PIPPYG	Summer	1	0.059	0.008
loc11	PIPPYG	Summer	1	0.059	0.008
loc11	PIPPYG	Autumn	2	0.063	0.006
loc11	PIPPYG	Autumn	2	0.063	0.006
loc11	PIPPYG	Autumn	2	0.063	0.006
loc11	PIPPYG	Autumn	2	0.063	0.006
loc11	PIPPYG	Autumn	2	0.125	0.011
loc11	PIPPYG	Autumn	2	0.063	0.006
loc11	PIPPYG	Autumn	2	0.125	0.011
loc12	PIPPYG	Spring	1	0.063	0.007
loc12	PIPPYG	Summer	1	0.059	0.008
loc12	PIPPYG	Autumn	1	0.063	0.006
loc13	PIPPYG	Spring	79	0.100	0.015
loc13	PIPPYG	Spring	79	0.050	0.007
loc13	PIPPYG	Spring	79	0.050	0.007
loc13	PIPPYG	Spring	79	0.050	0.007
loc13	PIPPYG	Spring	79	3.950	0.580
loc13	PIPPYG	Spring	79	0.100	0.015
loc13	PIPPYG	Spring	79	0.050	0.007

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc13	PIPPYG	Summer	69	0.563	0.071
loc13	PIPPYG	Summer	69	0.875	0.111
loc13	PIPPYG	Summer	69	0.063	0.008
loc13	PIPPYG	Summer	69	2.000	0.253
loc13	PIPPYG	Summer	69	4.313	0.546
loc13	PIPPYG	Summer	69	2.438	0.309
loc13	PIPPYG	Summer	69	0.063	0.008
loc13	PIPPYG	Summer	69	2.188	0.277
loc13	PIPPYG	Summer	69	0.313	0.040
loc13	PIPPYG	Summer	69	0.250	0.032
loc13	PIPPYG	Summer	69	0.188	0.024
loc13	PIPPYG	Summer	69	0.563	0.071
loc13	PIPPYG	Autumn	214	1.313	0.129
loc13	PIPPYG	Autumn	214	3.750	0.368
loc13	PIPPYG	Autumn	214	0.313	0.031
loc13	PIPPYG	Autumn	214	5.438	0.534
loc13	PIPPYG	Autumn	214	0.063	0.006
loc13	PIPPYG	Autumn	214	13.375	1.313
loc14	PIPPYG	Spring	1	0.056	0.007
loc14	PIPPYG	Summer	3	0.059	0.008
loc14	PIPPYG	Summer	3	0.059	0.008
loc14	PIPPYG	Summer	3	0.059	0.008

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc14	PIPPYG	Summer	3	0.176	0.024
loc14	PIPPYG	Summer	3	0.059	0.008
loc14	PIPPYG	Summer	3	0.059	0.008
loc14	PIPPYG	Autumn	9	0.125	0.011
loc14	PIPPYG	Autumn	9	0.063	0.006
loc14	PIPPYG	Autumn	9	0.250	0.023
loc14	PIPPYG	Autumn	9	0.563	0.051
loc14	PIPPYG	Autumn	9	0.063	0.006
loc14	PIPPYG	Autumn	9	0.063	0.006
loc2	PIPPYG	Spring	2	0.143	0.015
loc2	PIPPYG	Summer	1	0.059	0.008
loc2	PIPPYG	Summer	1	0.059	0.008
loc2	PIPPYG	Summer	1	0.059	0.008
loc2	PIPPYG	Summer	1	0.059	0.008
loc2	PIPPYG	Autumn	3	0.059	0.006
loc2	PIPPYG	Autumn	3	0.059	0.006
loc2	PIPPYG	Autumn	3	0.176	0.017
loc2	PIPPYG	Autumn	3	0.176	0.017
loc2	PIPPYG	Autumn	3	0.059	0.006
loc3	PIPPYG	Spring	1	0.063	0.007
loc3	PIPPYG	Summer	6	0.059	0.008
loc3	PIPPYG	Summer	6	0.353	0.047
loc3	PIPPYG	Summer	6	0.059	0.008

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc3	PIPPYG	Summer	6	0.118	0.016
loc3	PIPPYG	Summer	6	0.294	0.040
loc3	PIPPYG	Summer	6	0.176	0.024
loc3	PIPPYG	Autumn	37	0.412	0.040
loc3	PIPPYG	Autumn	37	0.294	0.028
loc3	PIPPYG	Autumn	37	0.059	0.006
loc3	PIPPYG	Autumn	37	1.824	0.177
loc3	PIPPYG	Autumn	37	2.176	0.211
loc4	PIPPYG	Summer	4	0.235	0.032
loc4	PIPPYG	Summer	4	0.118	0.016
loc4	PIPPYG	Summer	4	0.059	0.008
loc4	PIPPYG	Autumn	5	0.294	0.028
loc4	PIPPYG	Autumn	5	0.059	0.006
loc4	PIPPYG	Autumn	5	0.118	0.011
loc5	PIPPYG	Spring	1	0.059	0.007
loc5	PIPPYG	Summer	1	0.059	0.008
loc5	PIPPYG	Autumn	1	0.059	0.006
loc5	PIPPYG	Autumn	1	0.059	0.006
loc5	PIPPYG	Autumn	1	0.059	0.006
loc5	PIPPYG	Autumn	1	0.059	0.006
loc6	PIPPYG	Spring	1	0.056	3.333
loc6	PIPPYG	Summer	2	0.059	0.008

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc6	PIPPYG	Summer	2	0.118	0.016
loc6	PIPPYG	Summer	2	0.059	0.008
loc6	PIPPYG	Summer	2	0.059	0.008
loc6	PIPPYG	Summer	2	0.118	0.016
loc6	PIPPYG	Autumn	3	0.059	0.006
loc6	PIPPYG	Autumn	3	0.176	0.017
loc6	PIPPYG	Autumn	3	0.059	0.006
loc6	PIPPYG	Autumn	3	0.059	0.006
loc6	PIPPYG	Autumn	3	0.059	0.006
loc7	PIPPYG	Spring	1	0.056	0.007
loc7	PIPPYG	Spring	1	0.056	0.007
loc7	PIPPYG	Summer	4	0.063	0.008
loc7	PIPPYG	Summer	4	0.063	0.008
loc7	PIPPYG	Summer	4	0.250	0.032
loc7	PIPPYG	Summer	4	0.125	0.016
loc7	PIPPYG	Summer	4	0.063	0.008
loc7	PIPPYG	Autumn	4	0.235	0.023
loc7	PIPPYG	Autumn	4	0.118	0.011
loc8	PIPPYG	Summer	1	0.063	0.008
loc8	PIPPYG	Summer	1	0.063	0.008
loc8	PIPPYG	Summer	1	0.063	0.008
loc8	PIPPYG	Summer	1	0.063	0.008
loc8	PIPPYG	Autumn	1	0.063	0.006

Location ID	Species	Visit	Maximum bat activity (bat passes per night)	Average bat activity (mean bat passes per night)	Average bat activity (mean bat passes per hour)
loc8	PIPPYG	Autumn	1	0.063	0.006
loc9	PIPPYG	Spring	1	0.056	0.007
loc9	PIPPYG	Summer	1	0.063	0.008
loc9	PIPPYG	Summer	1	0.063	0.008
loc9	PIPPYG	Summer	1	0.063	0.008
loc9	PIPPYG	Autumn	2	0.125	0.011
loc9	PIPPYG	Autumn	2	0.063	0.006
loc13	PLEAUR	Summer	1	0.063	0.008
loc13	PLEAUR	Summer	1	0.063	0.008
loc13	PLEAUR	Autumn	3	0.188	0.018
loc4	PLEAUR	Autumn	1	0.059	0.006
loc8	PLEAUR	Autumn	1	0.063	0.006

Technical Appendix 6.4: Fisheries Report

MacArthur Green is helping combat the climate crisis by operating a biodiversity positive, carbon conscious business. Read more at www.macarthurgreen.com

CO_2e Assessed Organisation

Woodland Carbon CO_2de®

M74 West Renewable Energy Park

Fisheries Report

Technical Appendix 6.4

Date: 25 June 2024

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M74 WEST WIND FARM FISHERY SURVEY

David McColl, Dougie McKinlay, Toby Miller and William E. Yeomans

Two male three-spined sticklebacks from the Mill Burn

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www.clyderiverfoundation.org

Report reference: **2023/07**

Date: **15 June 2023**

Project supported by MacArthur Green

1. INTRODUCTION

MacArthur Green contracted the Clyde River Foundation (CRF) to undertake a baseline survey of the fish communities of burns in the vicinity of the proposed M74 West Renewable Energy Park, hereafter referred to as the 'Proposed Development'.

2. METHODS

The fish communities at ten sites were sampled by electric fishing on 13/06/2023 and 14/06/2023 (**Figure 1; Appendix 1, Plates 1-10**).

Following the guidance provided by Scottish Government scientists, (https://www.gov.scot/publications/monitoring-watercourses-in-relation-to-onshore-wind-farm-developments-generic-monitoring-programme/) electric fishing was carried out using an E-Fish 500E backpack (fishing setting 200V smoothed DC). When captured, fish were anaesthetised in a dilute solution of 2-phenoxyethanol, identified and their fork length measured to the nearest mm on a lengthing board. Fish were allowed to recover in natal water before being returned to the river.

Fish were caught using short-handled fry nets. Sites were fished with a single pass by wading upstream between stop nets. Single pass fishing generates a "minimum estimate" of the fish population size. Three pass fishing, which generates a more accurate statistical population estimate requires a larger number of fish to be present than was the case at any of the sites (a rule-of-thumb is a minimum sample size of around 30 of each year class (Riley & Fausch, 1992).

The small number of trout caught in the first run of our planned three-run sampling at every site, therefore, allowed us to terminate the survey and report the semi-quantitative, minimum estimate data.

Trout densities are expressed as fish/100m^2 of wetted riverbed and are reported here as 0+ (young-of-the-year) and 1++ (older fish) and the numbers of trout caught are also noted. Other fish species are reported as numbers caught. Site details and survey data are stored in the Scottish Fisheries Co-ordination Centre database (see https://fms.scot/sfcc/). Details of the fishery sampling sites, and a summary of the fish communities recorded are given in **Table 1**.

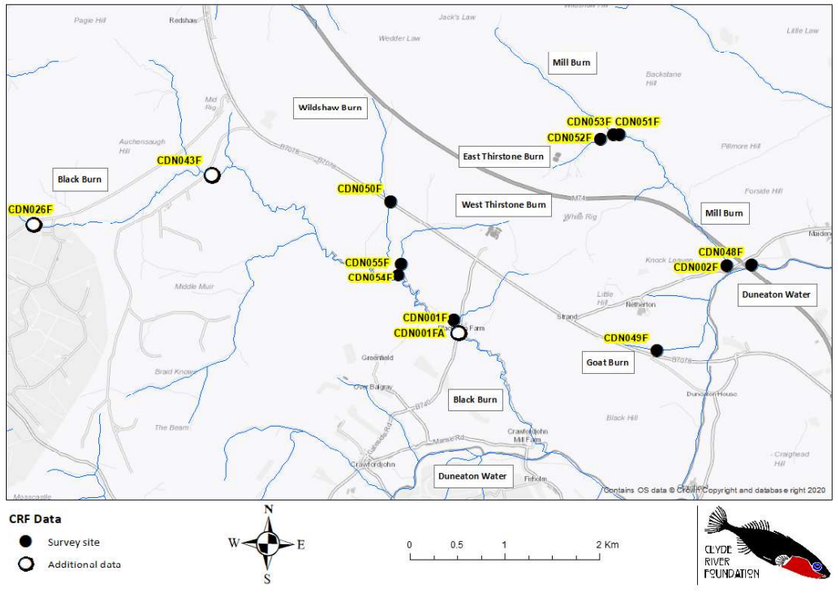

Figure 1: Fish Sampling Locations (and sites with historic data mentioned in the Discussion)

3. RESULTS

Fish were caught at eight of the ten sampling sites (**Table 1**).

No fish were captured at the sites on the Wildshaw (CDN050F) or Goat Burns (CDN 049F) (**Table 1**).

A total of five species of fish were caught among the other eight sites (**Table 1**).

Only 21 trout were caught in total, and no young-of-the-year (0+) fish were encountered. No trout were caught on the Black Burn at Site CDN055F. Numbers of older (1++) trout caught among the other seven sites ranged between one and six fish (**Table 1**).

Three-spined sticklebacks were caught at five sites, minnows at three, brook lampreys at two and stone loach at one (**Table 1**).

Additional archived data are available from four sites on the Black Burn (CDN001F, CDN001FA, CDN026F and CDN043F) and these are also presented in **Figures 1-8**. In summary, no fish were caught in the extreme headwater at Site CDN026F when surveyed in 2011 and 2021. Further downstream, brown trout, brook lamprey and three-spined stickleback were caught at Site CDN043F in 2017. At the bottom of the Black Burn, six species were caught at Site CDN001F in 2004: trout, minnow, stone loach, three-spined stickleback brook lamprey and grayling. In 2010, trout minnow, stone loach and grayling were caught at the adjacent CDN001FA and this site was also sampled during the current survey.

Invasive American signal crayfish were caught at three of the sampling sites, on the Duneaton Water (CDN048F) and at the lower end of the Mill Burn (CDN002F) and the Black Burn (CDN001F).

Table 1: Sampling Sites and Summary of the Recorded Fish Communities

Site Code (Figure 1)	Number of Fishing Runs	Watercourse	Easting	Northing	Sampling Date	Fish Species/Stage Caught					
						0+ Trout/ 100m^2	1++ Trout/ 100m^2 (number caught)	Minnow (number caught)	Stone Loach (number caught)	Three-spined Stickleback (number caught)	Brook Lamprey (number caught)
CDN050F	1	Wildshaw Burn	288217	626620	13/06/2023	No fish caught					
CDN054F	1	West Thirstone Burn	288330	625958	14/06/2023	0	2 (1 fish caught)			3	
CDN055F	1	Black Burn	288296	625839	14/06/2023	0	0	7		5	1
CDN001FA	1	Black Burn	288884	625375	14/06/2023	0	2 (3 fish caught)	>10		6	
CDN049F	1	Goat Burn	291032	625044	13/06/2023	No fish caught					
CDN053F	1	Mill Burn	290637	627322	13/06/2023	0	1 (1 fish caught)			7	
CDN052F	1	East Thirstone Burn	290437	627277	13/06/2023	0	8 (6 fish caught)			6	
CDN051F	1	Mill Burn	290568	627329	13/06/2023	0	3 (1 fish caught)				
CDN002F	1	Mill Burn	291770	625940	13/06/2023	0	4 (6 fish caught)				
CDN048F	1	Duneaton Water	292033	625954	13/06/2023	0	1 (3 fish caught)	>1000	2	10	1

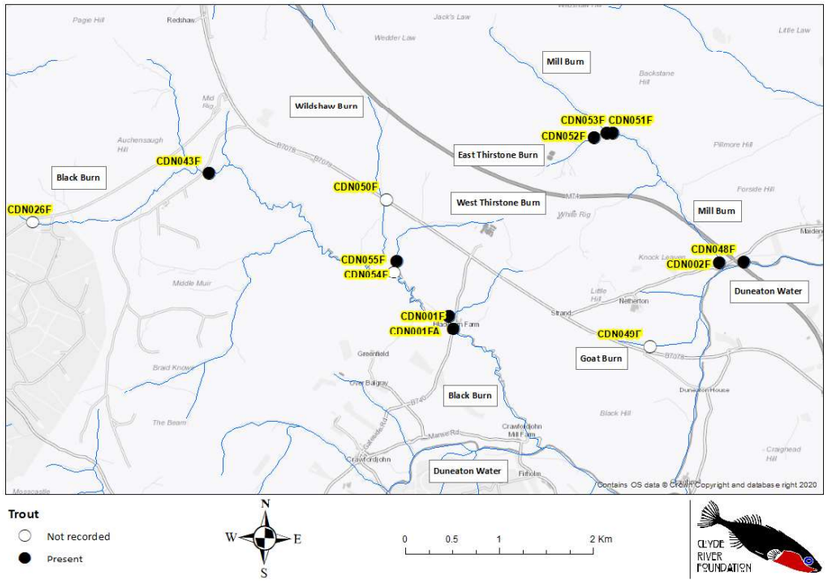

Figure 2: Distribution of Brown Trout

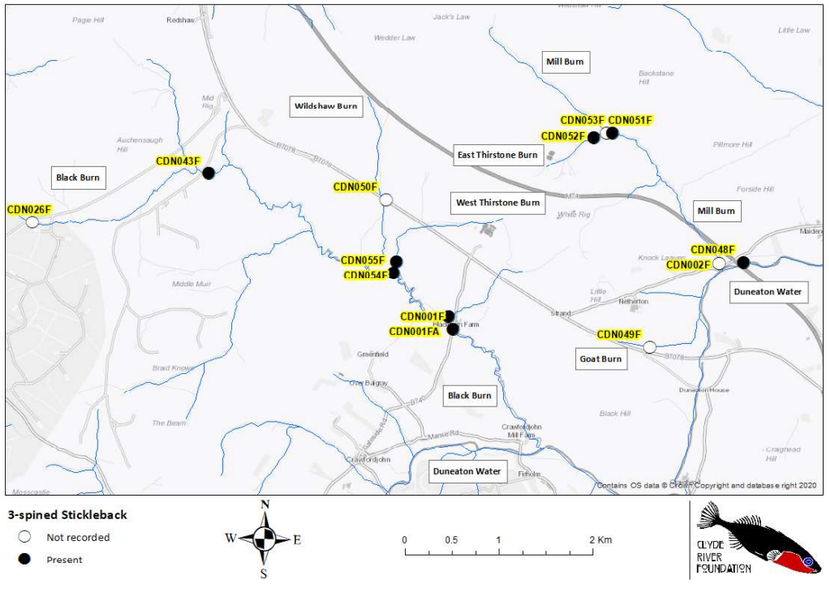

Figure 3: Distribution of Three-Spined Stickleback

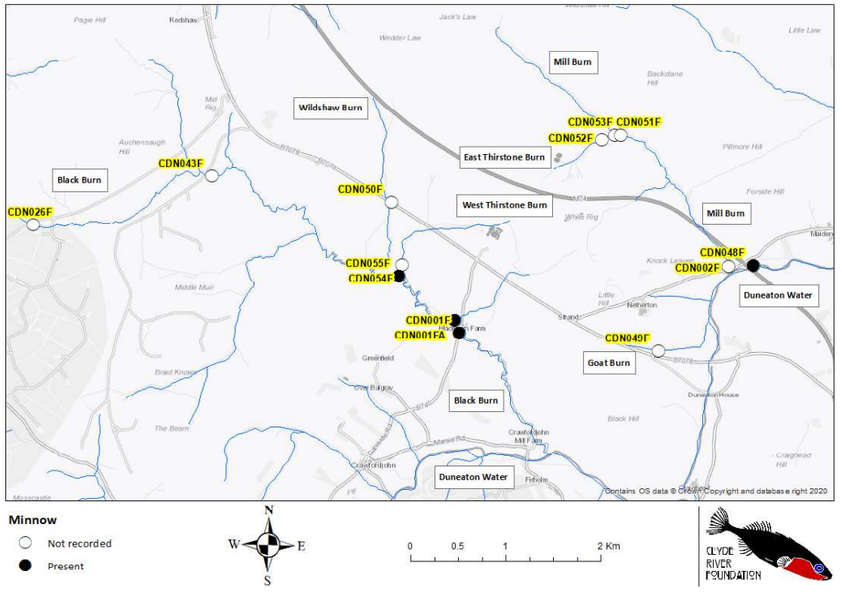

Figure 4: Distribution of Minnow

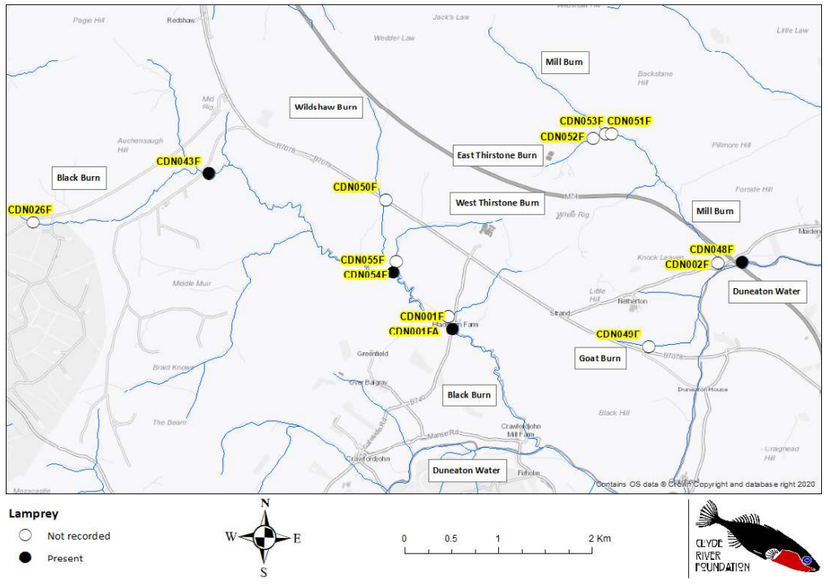

Figure 5: Distribution of Brook Lamprey

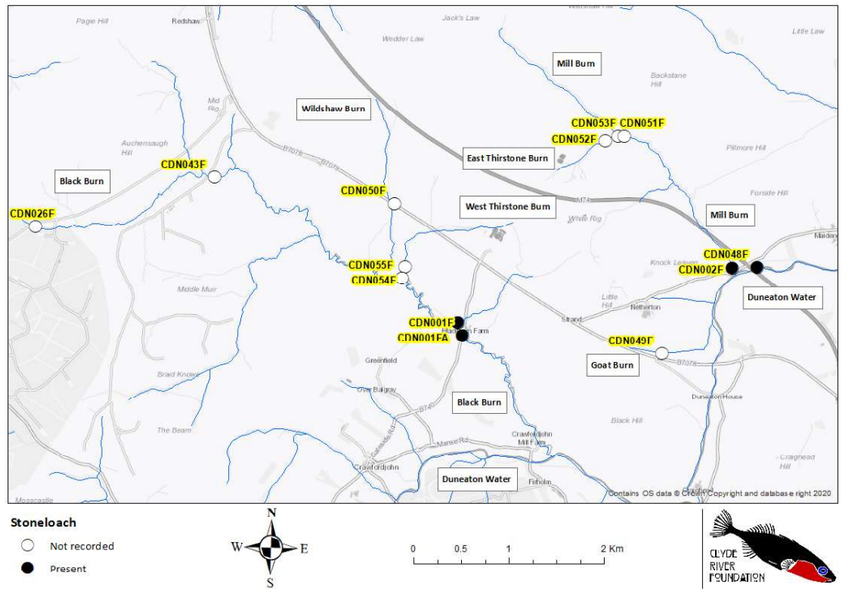

Figure 6: Distribution of Stone Loach

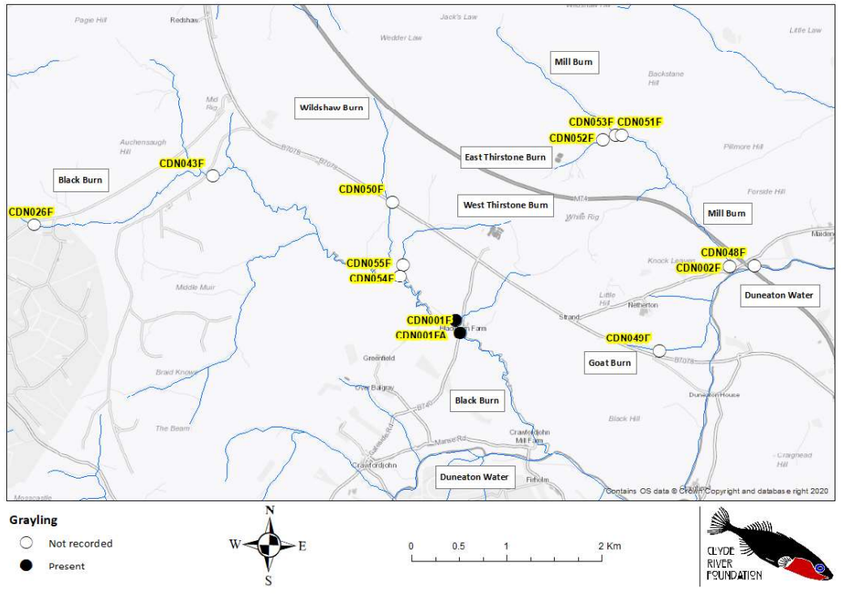

Figure 7: Distribution of Grayling (see Discussion section)

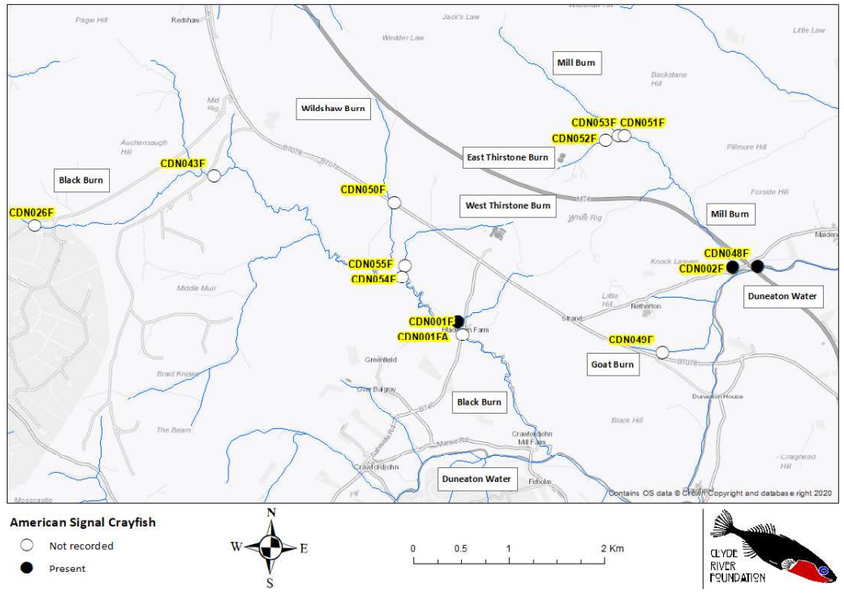

Figure 8: Distribution of American Signal Crayfish

4. DISCUSSION

Extreme headwaters like the Wildshaw and Goat Burns are often fishless. The combination of very low summer flows (**Plates 1 & 5**) and poor spawning substrate prevents permanent fish communities from forming. Our similar archived data from the upper Black Burn (Site CDN026F) is consistent with these two sites in the same locality.

The five species of fish captured among the other seven sites form typical communities for Clyde catchment headwaters without free access to the sea – migratory fish (salmon and eels) were absent. Stone loach, minnow and three-spined stickleback are small at adult size and were probably under-represented in the catch; all three species occur sporadically in upland burns in the Clyde catchment. The site on the Duneaton Water (CDN048F) was essentially a large, slow-flowing river (**Plate 10**), which was perfect minnow habitat and this accounted for the very large number of fry present.

The brook lamprey records are notable; this species also occurs sporadically across the Clyde catchment where the substrate is suitable for spawning, and depositional habitats allow the juveniles to persist. The Black Burn in particular, which is largely ditch-like and slow-flowing, seems to be suitable and we have archived data of lampreys upstream of the current survey sites, at Site CDN043F (**Figure 5**).

Trout is the most widespread and common fish species in the Clyde catchment and the species requires cold, clean water to persist. It could, therefore, be considered an indicator of the 'health' of our rivers.

Among the sites fished, six contained trout but no evidence of young-of-the-year (0+) fish. Trout populations in small, upland burns are often dominated by 0+ fish but these are affected by many environmental and biological variables and numbers can be volatile. It is unusual to find only older (1++) fish across a survey which encompasses such a wide range of stream sizes.

The standardised densities of 1++ trout recorded among the sites were very low, ranging from 1-8 fish/100m^2 of wetted area. We also reported the number of fish caught (Table 1) at each site to illustrate the small populations present. The presence of 1++ trout, even in small numbers, confirms that water quality across the survey area is sufficient to support trout but missing year classes and low population densities suggest water quantity or habitat quality issues, or a combination of both.

The introduced grayling has been caught in the past at both Site CDN001F and the adjacent CDN001FA (surveyed here but no grayling caught) and these records are included for completeness (**Figure 7**). Grayling is widely considered to require better quality water than trout but occur infrequently in electrofishing samples in the Clyde catchment.

It is acknowledged that some of the archived data is not of recent origin and some is from upstream of the proposed development area but they are included to give the most complete picture of the fish communities of the Black Burn possible.

There is a large and increasing population of the invasive, non-native American signal crayfish in the upper Clyde and its tributaries. The records presented here are the first known from the Duneaton Water sub-catchment and increase the known range by approximately 7 km. The presence of these animals has biosecurity implications for future surveying and in-stream working protocols.

5. ACKNOWLEDGEMENTS

We thank UCAPA Ltd for permission to use the electrofishing equipment.

6. REFERENCES

Riley, S. & Fausch, K.D. (1992). Underestimation of trout population size by maximum-likelihood removal estimates in small streams. North American Journal of Fisheries Management **12,** 768-776.

APPENDIX 1: PLATES

Plate 1: Site CDN050F, Wildshaw Burn

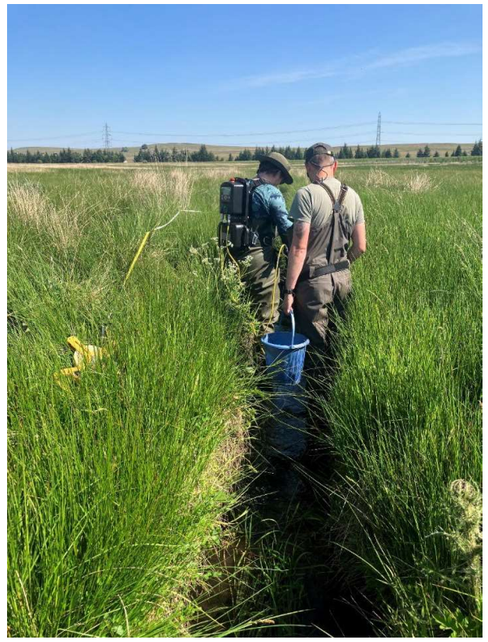

Plate 2: Site CDN054F, West Thirstone Burn

Plate 3: Site CDN055F, Black Burn

Plate 4: Site CDN001FA, Black Burn

Plate 5: Site CDN049F, Goat Burn

Plate 6: Site CDN053F, Mill Burn

Plate 7: Site CDN052F, East Thirstone Burn

Plate 8: Site CDN051F, Mill Burn

Plate 9: Site CDN002F, Mill Burn

Plate 10: Site CDN048F, Duneaton Water.

Technical Appendix 6.5: Species Protection Plan

M74 West Renewable Energy Park

Species Protection Plan

Technical Appendix 6.5

Document Quality Record

Version	Status	Person Responsible	Date
0.1	Draft	Drew Oliver	16/05/2024
0.2	Reviewed	Nadia White	28/05/2024
0.3	Updated	Drew Oliver	18/06/2024
1	Internal Approval	Drew Oliver	28/06/2024

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CONTENTS

LIST OF TABLES

1 INTRODUCTION

MacArthur Green has prepared this outline Species Protection Plan (SPP) on behalf of M74 West Limited (the Applicant) to ensure all reasonable protection measures are undertaken with regard to protected species AT the proposed M74 West Renewable Energy Park, hereafter referred to as the 'Proposed Development'.

The SPP is to be implemented during the construction and decommissioning phases of the Proposed Development, although it can also be used for guidance should the need arise for maintenance during the operational period.

The SPP will ensure the adequate preservation of protected species interests during construction and decommissioning activities associated with the Proposed Development to safeguard the resident species and ensure compliance with the relevant nature conservation legislation (see **ANNEX A**).

The SPP will be a live document subject to review and updating to assist staff in the protection of species during construction and decommissioning, under the guidance of the Ecological Clerk of Works (ECoW).

2 BACKGROUND INFORMATION

Baseline habitats and protected species surveys, including associated desk studies, have been undertaken to inform the Environmental Impact Assessment Report (EIAR) for the Proposed Development. Full details and results are reported within **Technical Appendices 6.1 – 6.4** (EIAR Volume 4). The SPP is designed to reflect the results of the surveys and the distinct ecology and distributions of protected species within the Site.

These baseline surveys have recorded the likely presence of the following protected or notable species within, or in the vicinity of, the Site:

- Badger (Meles meles);
- Reptiles, including common lizard (Zootoca vivipara);
- Otter (Lutra lutra);
- Brown trout (Salmo trutta);
- Daubenton's bat (Myotis daubentonii);
- Natterer's bat (Myotis nattereri);
- Leisler's bat (Nyctalus leisleri);
- Noctule (Nyctalus noctula);
- Common pipistrelle (Pipistrellus pipistrellus);
- Soprano pipistrelle (Pipistrellus pygmaeus); and
- Brown long-eared bat (Plecotus auritus).

With respect to bats, a number of features with suitability for roosting bats were recorded during surveys; the use status of the identified features has not been determined (see **Technical Appendix 6.3** (EIAR Volume 4) for full details).

Although no evidence of pine marten (*Martes martes*) or red squirrel (*Sciurus vulgaris*) were recorded during surveys, limited suitable habitat was present within the Site. Furthermore, no evidence of reptile was identified during surveys, however seven potential hibernacula features were recorded within the Site (see **Technical Appendix 6.2** (EIAR Volume 4)).

No other protected species, or protected plant species, were recorded within the Site during baseline surveys. Habitat within the Site was considered unsuitable for great crested newt (GCN) (*Triturus cristatus*), beaver (*Castor fiber*) and wildcat (*Felis silvestris*).

3 AIMS & OBJECTIVES OF THE SPECIES PROTECTION PLAN

The aim of the SPP is to ensure all reasonable precautions are taken by the Applicant and its contractors to safeguard protected species from disturbance, injury and death and to protect any structure or place, which any such protected species uses for growth, breeding, resting, shelter or protection during the construction and decommissioning of the Proposed Development.

The aim of the SPP will be fulfilled by the Applicant adopting the following objectives throughout the construction and decommissioning of the Proposed Development:

a) Objective A – Implement a monitoring and protection plan for protected species;

b) Objective B – Follow an approved procedure if an active feature is found; and

c) Objective C – Ensure adequate education and awareness of site personnel.

Objective A addresses the monitoring procedure to be followed to ensure that the aim of this SPP is achieved. Objective B covers the detailed procedure in the event of a protected species feature being discovered. Objective C addresses the educational needs of appropriate personnel on the Site to further reduce the risk of an offence being committed. The procedures to be adopted that will fulfil these objectives are detailed in **Section 6**.

4 RESPONSIBILITIES

The overall responsibility for ensuring that the planning conditions and the conditions of any licence granted are adhered to, in particular those conditions relating to protected species, will lie with the Applicant. The personnel responsible for the day-to-day implementation of the SPP are detailed in **Table 4-1**.

4.1 Role of the Ecological Clerks of Works (ECoW)

The ECoW will have the specific remit of monitoring compliance with the SPP during the construction and decommissioning phases and reporting any breaches to the Applicant's Construction Project Management Team. The ECoW's role shall involve direct monitoring of all activities on the Site to the extent the ECoW considers this to be required, and/or training of nominated personnel to carry these out in a manner likely to minimise the potential for impact on the protected species. The ECoW will also agree changes to construction operations to prevent breaches of the SPP.

Table 4-1: SPP Responsibilities

Task	Responsibility
Implementation of the SPP	The Applicant's Construction Project Management Team
Monitoring and review of the SPP	ECoW
Regular site monitoring for protected species and associated protected features, including, but not limited to; bats, reptiles, badger, red squirrel, otter, pine marten, water vole and plants listed on Annex II of the Habitats Directive (Council Directive 92/43/EEC)	ECoW or a suitably qualified ecological surveyor
On-going watching brief for the above	All site personnel

5 THE POTENTIAL IMPACTS OF DEVELOPMENT

Impacts on protected species can result from the physical effects of construction such as soil stripping, road laying, turbine foundation construction and noise disturbance. These operations can negatively affect protected species in a number of ways including:

- Abandonment of a holt/burrow/roost/den/sett/pond etc. due to disturbance;
- Abandonment of dependant young due to disturbance;
- Damage to or destruction of a protected feature or species;
- Damage to navigation/commuting routes (i.e. ditches, burns, fence lines etc.);
- Fragmentation of territories;
- Damage to foraging areas (e.g. areas containing amphibians or fish in the case of otter);
- Contamination of water;
- Disturbance to a protected species that results in behaviour that negatively impacts their life stage; and
- Accidental injury or death to species by machinery, tools or vehicles.

6 PROCEDURES FOR PROTECTING PROTECTED SPECIES

This section details the procedures to be followed to ensure all reasonable precautions have been adopted to protect species from disturbance, injury and death and to protect any structure or place that any such species uses for growth, breeding, resting, shelter or protection.

The level of disturbance free zones for each species is shown in **Table 6--1.** If other protected species are identified during pre-construction surveys or during construction, suitable buffer zones will be advised by the ECoW and agreed in consultation with NatureScot.

Table 6-1: Level of Protection and Recommended Disturbance Free Zones

Species Feature	Level of Protection	Disturbance Free Zone
Otter (holts, etc.)	European	30/200 metres[1]
Bat (roost)	European	30/200+ metres[2]
Badger (sett)	National	30/100 metres[3]
Water vole (burrow)	National	5-10 metres[4]
Red squirrel (drey)	National	5/50 metres[5]
Pine marten (den)	National	30/100 metres[6]
Reptiles (hibernacula)	National	n/a[7]

6.1 Objective A – Monitoring and Protection Plan

6.1.1 Monitoring Plan

It will be the duty of the ECoW to check the status of the protected species and any associated protected features immediately prior to construction activity progressing across the Site and to continue spot checks during construction for any new protected species features in the vicinity of the construction works. Where construction work is staggered across the Site, any watercourses within the vicinity of the works due to be carried out should be monitored and checked immediately prior to the commencement of works. This should occur during each phase of construction.

If it is not possible to determine the status of features during ECoW checks, further monitoring by use of camera traps may be required.

Guidelines detailing the monitoring of protected species and associated protected features by the ECoW or suitably qualified ecological surveyor are described below.

[1] The disturbance zone will be 30 metres unless a breeding/natal holt is identified, in such an instance the disturbance zone will be increased to 200 metres.
[2] The disturbance zone will be 30 metres; however, turbines must be positioned 200 metres from potential roost habitats (Natural England, 2012).
[3] Disturbance is defined by Scottish Natural Heritage as any new procedure that approaches within a minimum of 30 metres of a sett margin. For piling or blasting activities, this buffer zone is extended to 100 metres.
[4] Dependant on burrow location and bank profile.
[5] The disturbance zone will be 5 m or one tree's distance (whichever is less) unless a breeding drey is identified, in such instances the disturbance zone will be increased to 50 m during the red squirrel breeding season (February to September inclusive) (SNH, 2020).
[6] 100 m applied if breeding.
[7] Due to the more limited nature of their protection and their ability to avoid machinery etc. during their active phase, no specified disturbance zone for reptiles is given; however, if a hibernaculum is discovered, an appropriate disturbance exclusion zone will be demarcated.

Potential Features

a) European Protected Species – fauna (otters and bats) and Nationally Protected Species (badger, red squirrel, pine marten, water vole and reptiles):

Further checks of the potential features will be completed during construction and all potential protection features will be clearly demarcated.

i. If the status of the potential protected feature remains unoccupied, construction may occur in the area, but not damaging the potential feature under close supervision by the ECoW[8]; or
ii. If the status of the feature changes to occupied then the undernoted procedure for occupied sites will be followed. The ECoW will be responsible for this survey work as required.

Occupied Features of Importance

a) European Protected Species – fauna (otters and bats)

Where an occupied feature exists within the Site or disturbance free zone, and the infrastructure cannot be microsited away:

i. A licence to disturb will be applied for to NatureScot; or
ii. A licence to damage or destroy will be applied for to NatureScot if there are no reasonable alternatives.

(b) National Protected Species (badger, water vole, red squirrel, pine marten, and reptiles)

i. Where an active badger sett exists within the Site or disturbance zone, and the infrastructure cannot be microsited away, it may be necessary to undertake a relocation exercise. This is a licensed activity which will require prior authorisation from NatureScot. Guidance for this process has been produced by NatureScot, who should be consulted throughout.
ii. Where a water vole burrow, red squirrel drey or pine marten den or mountain hare form exists within the Site or disturbance zone, and the infrastructure cannot be microsited away, the Applicant will discuss any licensing requirements and appropriate mitigation with NatureScot.
iii. Where reptiles are found to be occupying any infrastructure during their hibernacula period and the infrastructure cannot be microsited away, the Applicant will discuss appropriate mitigation with NatureScot. Reptiles are capable of actively avoiding disturbances during their active phase.

[8] If the infrastructure cannot be microsited away from the potential feature, the monitoring and checks by the ECoW will be used to assess the likelihood of current use, with appropriate species-specific monitoring undertaken as required. For badger, if it is proven the potential feature is not in use, or has not been in recent use, then it would not be considered a protected feature, and could be sensitively destroyed under supervision of the ECoW.

6.1.2 Protection Plan

In addition to the mitigation measures detailed above, further general steps should be implemented to increase the protection levels and reduce general disturbance from the Proposed Development:

- Covering/securing all excavations and piping. If this is not possible then a means of escape must be provided for any animal that could fall in e.g. a ramp with a gradient of 45° or shallower.
- Any temporarily exposed open pipe system should be capped in such a way as to prevent mammals gaining access, as may happen when contractors are offsite. If such pipes are left for an extended time, periodic checks will be carried out to ensure that the pipe is inaccessible to animals.
- All excavations will be checked at the start of works and prior to the commencement of any works activities to ensure otters and badgers are not present or have become trapped overnight. A responsible individual will be tasked with carrying out these checks. Documentary evidence will be completed for each check.
- Nighttime working will be minimised to reduce disturbance to nocturnal and crepuscular fauna. Where this is not possible, security lighting used in the construction compound and those areas where lighting is absolutely necessary to ensure safe working conditions will be angled downwards to reduce light spillage into adjacent areas. Lighting outwith the construction compound will be switched off when no works are being undertaken. Other required lighting will be directed to where it is needed and away from features (including setts, treelines, watercourses/riparian habitats, mammal paths, etc.) to minimise light disturbance.
- All works undertaken in proximity to watercourses will be undertaken in line with pollution prevention measures outlined in a detailed Construction Environment Management Plan (CEMP).
- Works in the vicinity of Duneaton Water (within 50 m) should commence one hour after sunrise and will cease no later than one hour before sunset.
- Instream works at watercourse crossings in relevant sensitive watercourses (i.e. where there are spawning fish/spawning gravels/redds in the vicinity of the instream works area) will not be conducted during the salmonid spawning/incubation period from October to May, inclusive, without prior survey and approval from SEPA[9].
- An appropriate speed limit (of c.a. 15 to 20 mph) for all vehicles on the site, and vehicle movements will be kept to pre-determined routes wherever possible.
- Watercourse crossings will be designed to allow the passage of small mammals on the site, where appropriate.
- Vegetation within 50 m of all watercourses should be left undisturbed except in areas of construction of watercourse crossings and access roads leading to crossings as well as construction associated activities (such as drainage and mitigation).

[9] The likelihood of spawning fish/redds in any watercourse will be determined by the ECoW or suitably qualified ecologist in advance of construction works.

- Chemicals should not be stored within 100 m of a sett, holt, couch, den or within 10 m of hibernacula, or other protected feature, or along mammal paths. All paints, chemicals and sealants used during the construction process will be removed from the working area at the end of each working day. Open tins or other containers will not be left at the works areas but will be stored in a suitable container at the construction compound.
- Any areas for location of wind turbines and infrastructure will be subject to inspection by an experienced ECoW immediately prior to any works. The ECoW will monitor the Proposed Development so that *in-situ* materials associated with works will not incidentally create reptile refuges, e.g. piles of cut vegetation. Materials will be removed from the Site if advised by the ECoW.

6.2 Objective B – Procedure if Active Feature is Found

6.2.1 Procedure if Previously Unrecorded Active Feature or Protected Species Found in Advance of Construction or Decommissioning Activity

If an active feature or protected species is found by the ECoW's monitoring in advance of construction activity progressing across the Site, the following text outlines the procedure to be followed.

- If Obstruction, Damage or Destruction (ODD) to a protected species is likely, a location specific ODD risk assessment will be completed. This will consider all potential mitigation measures to avoid ODD. This may include micrositing of infrastructure away from the location and outwith the disturbance zone and the demarcation of the protected site.
- If Disturbance is likely, a location specific Disturbance Risk Assessment will be completed. This should firstly consider revision to the disturbance zone as a result of the site-specific topography and habitat quality (e.g. if a ridge lies between activity and a holt then the disturbance zone may be reduced). Also, other measures which could reduce disturbance to an acceptable level should be considered (including micrositing and the demarcation of the protected site).
- The Disturbance or ODD risk assessments will be submitted to NatureScot for consideration.
- If it is not possible to microsite and, in consideration of the risk assessment, NatureScot determines that ODD and/or significant levels of Disturbance is likely to occur, the procedures described in Objective A will be adopted for unoccupied and occupied features. If there is uncertainty over whether the feature is occupied a precautionary approach will be adopted and occupancy will be assumed.

6.2.2 Procedure if Previously Unrecorded Protected Feature or Species Found During Construction or Decommissioning

In the event of any site personnel discovering an unrecorded protected feature or protected species, the following procedure must be followed:

- Work should stop immediately within the specified disturbance zone;
- The ECoW should be contacted;
- The location should be checked by the ECoW to determine the nature of the new find; and

- If the protected species or feature is confirmed then the procedure detailed in Objective A above should be followed.

6.3 Objective C – Education and Awareness

The Applicant will provide the necessary education and awareness as part of a site induction to all site personnel with regard to the protection of protected species that are or could be present on the Site, in particular the actions that should be taken if protected species are seen on the Site. All site personnel (including contractors and sub-contractors) will be informed of the objectives of the SPP to ensure they are aware of any species present on the Site.

This information will include as a minimum:

- The requirements and use of the SPP;
- Identification of protected species and features;
- Key risk activities and sensitive areas; and
- Site personnel responsible for dealing with protected species.

The Applicant will undertake that any person found on the Site by them to be inadequately trained, or to be disregarding the terms of the SPP is immediately expelled from the Site until such time that it is appropriate for them to be allowed to return. In general, such persons will need to undertake retraining in the use and application of the SPP to ensure the impact on protected species is minimised. Species-specific Toolbox Talk handouts will be provided by the ECoW as required.

7 REFERENCES AND RELEVANT LEGISLATION AND GUIDANCE

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

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

Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds. Fiona Mathews and Paul Chanin. The Mammal Society, London.

European Commission. (1979). Directive 79/409/EEC: Conservation of Wild Birds. HMSO, London.

European Commission. (1992). Directive 92/43/EEC: Conservation of Natural Habitats and of Wild Flora and Fauna. HMSO, London.

Forestry Commission. (2006). Forest operations and red squirrels in Scotland's forests – the law and good practice. FCS Guidance Note 33.

Forestry Commission. (2009). Forest operations and great crested newts in Scotland. FCS Guidance Note 35b.

Forestry Commission (2009). Forest operations and wildcats in Scotland. FSC Guidance Note 35d.

Gent, T. & Gibson, S. (1998). Herpetofauna Workers' Manual. JNCC, Peterborough.

HMSO. (1994). Biodiversity: The UK Action Plan. HMSO, London.

HMSO. (1981). Wildlife & Countryside Act 1981. HMSO, London .

HMSO. (1994). The Conservation (Natural Habitats, &c.) Regulations 1994. HMSO, London.

HMSO. (1992). Protection of Badgers Act 1992. HMSO, London.

Mitchell-Jones, A. J. & McLeish, A. P. (2004). Bat Workers Manual – 3rd Edition. JNCC, Peterborough.

NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust. (2021). Bats and onshore wind turbines – survey, assessment and mitigation.

NatureScot (2023). Standing Advice for Planning Consultations. Available online: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-standing-advice-and-guidance-documents.

Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield.

Scottish Badgers (2018). Surveying for Badgers: Good Practice Guidelines. Version 1.

ANNEX A. LEGAL PROTECTION

A full list of protected species and the associated legislation can be found on the NatureScot website[10]. The following provides a summary of protected species' legal protection, however, the specific legislation should be consulted for the true terminology.

Bats and Otter

All bat species, and otter receive protection in Scotland under the Conservation (Natural Habitats, &c.) Regulations (1994) (as amended) (the Habitats Regulations), being classified as European protected species of animals[11].

For European protected species, NatureScot guidance[12] sets out that it is an offence to deliberately or recklessly:

- capture, injure or kill an animal;
- harass an animal or group of animals;
- disturb an animal while it is occupying a structure or place used for shelter or protection;
- disturb an animal while it is rearing or otherwise caring for its young;
- obstruct access to a breeding site or resting place, or otherwise deny an animal use of a breeding site or resting place;
- disturb an animal in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species;
- disturb an animal in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;
- disturb an animal while it is migrating or hibernating;
- take or destroy an animal's eggs (GCN); or
- damage or destroy a breeding site or resting place of such an animal (these sites and places are protected even when the animal is not present)[13].

Regulation 44(2)(e) of the Habitats Regulations allows a licence to be granted for activities ordinarily prohibited, where that purpose is:

> "Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment."

Mountain Hare, Pine Marten and Red Squirrel

Mountain hare, pine marten and **red squirrel** and are protected in Scotland under the Wildlife and Countryside Act 1981[14] (the 1981 Act).

[10] NatureScot (2022). Table of all of Scotland's Protected Species. Online. Available: https://www.nature.scot/doc/table-all-scotlands-protected-species [Accessed September 2023].
[11] Schedule 2.
[12] NatureScot (2023). European protected species. Online. Available: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations/european-protected [Accessed September 2023].
[13] Note that this is a summary of offences. Refer to Regulations 39 and 40 of the Habitats Regulations for legislative context.
[14] Schedule 5.

Under Sections 9(1) and 9(2) of the 1981 Act, it is an offence to intentionally or recklessly kill, injure or take such an animal, or be in possession or control of such an animal (whether live or dead).[15]

Under Section 9(4)(a) and (b), it is an offence to intentionally or recklessly:

- damage or destroy, or obstruct access to, any structure or place which any wild animal included in Schedule 5[16] uses for shelter or protection; or
- disturb any such animal while it is occupying a structure or place which it uses for that purpose.

Further, Section 9(5) sets out that it is an offence to:

- sell, offer or expose for sale, or possess or transport for the purpose of sale, any live or dead wild animal included in Schedule 5, or any part of, or anything derived from, such an animal; or
- publish or cause to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things.

Water Vole

Water vole is protected in Scotland under Sections 9(4) and 10 of the 1981 Act[17].

Under Section 9(4)(a) and (b) of the 1981 Act, it is an offence to intentionally or recklessly:

- damage or destroy, or obstruct access to, any structure or place which any wild animal included in Schedule 5[18] uses for shelter or protection; or
- disturb any such animal while it is occupying a structure or place which it uses for that purpose.

Section 10(3)(c) provides for exceptions under Section 9, such that a person shall not be guilty of an offence where that person shows:

- that each of the conditions specified in subsection (3A) was satisfied in relation to the carrying out of the unlawful act; or
- that the unlawful act was carried out in relation to an animal bred and, at the time the act was carried out, lawfully held in captivity.

Subsection (3A) states those conditions referred to in Section 10(3)(c) are:

a) That the unlawful act was the incidental result of a lawful operation or other activity;
b) That the person who carried out the lawful operation or other activity:
   i. took reasonable precautions for the purpose of avoiding carrying out the unlawful act; or
   ii. did not foresee, and could not reasonably have foreseen, that the unlawful act would be an incidental result of the carrying out of the lawful operation or other activity; and
c) That the person who carried out the unlawful act took, immediately upon the consequence of that act becoming apparent to the person, such steps as were reasonably practicable in the circumstances to minimise the damage or disturbance to

[15] See exceptions under Section 9(3).
[16] Animals which are protected under Section 9 of the 1981 Act.
[17] as amended by the Nature Conservation (Scotland) Act 2004.
[18] Animals which are protected under Section 9 of the 1981 Act.

the wild animal, or the damage or obstruction to the structure or place, in relation to which the unlawful act was carried out.

Badger

Badger are protected in Scotland under the Protection of Badgers Act 1992 (the Badgers Act)[19].

Under Section 1(1) of the Badgers Act, "a person is guilty of an offence if, except as permitted by or under this Act, he wilfully kills, injures or takes, or attempts to kill, injure or take, a badger."

Where it can reasonably be concluded that a person had been attempting to kill, injure or take a badger, then it will be presumed that that person had been attempting to do so, unless it can be proven otherwise[20].

Under Section 1(3), unless authorised under the Badgers Act, a person is guilty of an offence where "he has in his possession or under his control any dead badger or any part of, or anything derived from, a dead badger."

Under Section 3(1), unless authorised under the Badgers Act, it is an offence to interfere with a badger set*. The following actions are described as interference:

- damaging a badger sett or any part of it;
- destroying a badger sett;
- obstructing access to, or any entrance of, a badger sett;
- causing a dog to enter a badger sett; or
- disturbing a badger when it is occupying a badger sett,

intending to do any of those things or being reckless as to whether his actions would have any of those consequences.

It is also an offence if a person knowingly causes or permits any of the above actions to be carried out[21].

*Note: A badger sett is defined under the Badgers Act as any structure or place which displays signs of current use by a badger[22].

Reptiles

The three native species of **reptile** to Scotland, **adder**, **slow worm** and **viviparous lizard**, are protected under Section 9(1) (insofar as the action relates to killing or injuring the animal), and Section 9(5) of the 1981 Act.

Under Section 9(5), it is an offence to:

- sell, offer or expose for sale, or possess or transport for the purpose of sale, any live or dead wild animal included in Schedule 5, or any part of, or anything derived from, such an animal; and
- publish or cause to be published any advertisement likely to be understood as conveying that he buys or sells, or intends to buy or sell, any of those things.

[19] as amended by the Nature Conservation (Scotland) Act 2004 (as amended).
[20] Section 1(2) of the Badgers Act.
[21] Section 3(2).
[22] Section 14.

Section 10(3)(c) provides for exceptions under Section 9, such that a person shall not be guilty of an offence where that person shows:

- that each of the conditions specified in subsection (3A) was satisfied in relation to the carrying out of the unlawful act; or
- that the unlawful act was carried out in relation to an animal bred and, at the time the act was carried out, lawfully held in captivity.

Subsection (3A) states those conditions referred to in Section 10(3)(c) are:

a) That the unlawful act was the incidental result of a lawful operation or other activity;

b) That the person who carried out the lawful operation or other activity:

   i. took reasonable precautions for the purpose of avoiding carrying out the unlawful act; or;

   ii. did not foresee, and could not reasonably have foreseen, that the unlawful act would be an incidental result of the carrying out of the lawful operation or other activity; and

c) That the person who carried out the unlawful act took, immediately upon the consequence of that act becoming apparent to the person, such steps as were reasonably practicable in the circumstances to minimise the damage or disturbance to the wild animal, or the damage or obstruction to the structure or place, in relation to which the unlawful act was carried out.

Other Protected Species

Freshwater pearl mussel is protected by the 1981 Act and by the Nature Conservation Act 2004 (the 2004 Act). They are also listed as endangered on the IUCN/WCMC Red Data List. Offences relevant to development works include to intentionally or recklessly:

- kill, injure, take or disturb a freshwater pearl mussel; or
- damage, destroy or obstruct access to a riverbed supporting freshwater pearl mussels.

Some freshwater pearl mussel populations are qualifying features of Special Areas of Conservation (SACs), and therefore receive further legal protection under The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations).

Technical Appendix 6.6: Outline Biodiversity Enhancement Management Plan

M74 West Renewable Energy Park

Outline Biodiversity Enhancement Management Plan

Technical Appendix 6.6

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1 INTRODUCTION

The following document presents an Outline Biodiversity Enhancement Management Plan (OBEMP), which has been prepared to accompany the proposed M74 West Renewable Energy Park (hereafter referred to as the 'Proposed Development') Environmental Impact Assessment Report (EIAR).

It sets out habitat and species conservation management measures that are proposed as part of the Proposed Development and which will contribute to the enhancement of biodiversity in accordance with the principals of National Planning Framework 4 (NPF4) Policy 3: Biodiversity, through restoring degraded habitats and creating and strengthening nature networks.

Following receipt of planning consent for the Proposed Development, the aims, objectives and prescriptions of management measures outlined herein will be finalised in consultation with NatureScot, relevant landowners and the advisory of an appointed Biodiversity Advisory Committee (BAC), and submitted for approval by South Lanarkshire Council (SLC), by way of a suitably worded planning condition.

The finalisation of management measures and the areas over which those measures will take place, would be undertaken prior to the commissioning of the Proposed Development and will be informed through further site-investigations and input from technical specialists as required.

Once finalised, management measures, together with requirements for monitoring and reporting, will be set out and implemented as the Biodiversity Enhancement Management Plan (BEMP) for the Proposed Development, which will remain in place as agreed for the Proposed Developments operational lifetime (anticipated to be 40 years), unless otherwise agreed with SLC, NatureScot and the advisory of the BAC.

The BEMP will be subject to an agreed review process, to ensure that local biodiversity is enhanced over the lifetime of the Proposed Development to a demonstrably better state than without intervention.

The implementation and funding of the agreed BEMP will be the responsibility of the Applicant, or any subsequent operator of the Proposed Development.

This OBEMP is set out in the following sections and should be read with reference to **Figure 6.11 Proposed Outline Biodiversity Enhancement Management Plan Areas** (EIAR Volume 3a).

- Baseline Characteristics;
- Target Habitats and Species;
- Biodiversity Enhancement Area;
- Aims, Objectives and Management Prescriptions;
- Finalisation;
- Monitoring;
- Reporting and BEMP Review; Management and Monitoring Timetable; and
- Management and Monitoring Timescales (**Annex A**).

2 BASELINE CHARACTERISTICS

The following section provides a summary of baseline ecological and ornithological conditions established at the Site and which have informed the identification of aims and objectives of this OBEMP and the assessment of effects presented in **Chapter 6: Ecology** and **Chapter 7: Ornithology** of the EIAR (EIAR Volume 2).

Full details of baseline studies, which has included desk study, field surveys are presented in **Technical Appendices 6.1 – 6.4** inclusive and **Technical Appendix 7.1** (EIAR, Volume 4) and consultation with relevant stakeholders are presented in **Technical Appendix 2.1** (EIAR, Volume 4).

2.1 Ecology (Non-Avian)

The Proposed Development is located immediately north and northwest of Abington, South Lanarkshire. The Red Moss Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) are located in-part in the west of the Site and extend west out of the Site.

The Site is mainly comprised of open upland habitats, with the most common and widespread habitats being unimproved acid grassland, marshy grassland, wet modified bog and improved grassland. Interwoven throughout theses are patches and pockets of other habitat types such as woodlands (including broadleaved semi-natural woodland, broadleaved plantation woodland and coniferous (non-native plantation woodland[1]), heaths, blanket bog, flush, tall ruderal and neutral and semi-improved acid grasslands, blanket bog and acid/neutral flashes. The Site contains an active quarry and is also intersected by the M74 motorway and B7078 and B740 local roads.

As per **Chapter 6** of the EIAR (EIAR Volume 2), important ecological features (IEFs) scoped-in to the ecological impact assessment comprise blanket bog/wet modified bog. The Proposed Development could potentially impact up to 0.86 hectares (ha) of blanket bog (direct permanent loss 0.34 ha, direct temporary loss 0.52 ha), and 7.07 ha of wet modified bog (direct permanent loss 2.45 ha, direct temporary loss 4.62 ha). Due to the minor predicted habitat losses and the specific location of these, no significant effects are predicted.

There are numerous minor watercourses on and around the Site which drain into the Duneaton Water and River Clyde. Low numbers of brown trout (*Salmo trutta*) were caught in West Thirstone Burn, Black Burn, Mill Burn, East Thirstone Burn, and Duneaton Water caught during the surveys.

Evidence of badger *Meles meles* (including setts) and otter *Lutra lutra* (including a couch) as per **Technical Appendix Confidential Annex 6.2C** (EIAR Volume 4), and **Figures 6.5 and 6.5.2** (EIAR Volume 3a) were recorded within the Site. No signs of pine marten (*Martes martes*), red squirrel (*Sciurus vulgaris*) or water vole (*Arvicola amphibous*) were recorded and beaver (*Castor fiber*), wildcat (*Felix sylvestris*) and great crested newt (*Triturus cristatus*) were scoped out of the assessment based on the Site being outwith the species natural range, or there being a lack of suitable habitat within the Site.

The automated bat surveys recorded a total of seven bat species within the Site; soprano pipistrelle (Pipistrellus pygmaeus), common pipistrelle (*P. pipistrellus*), Noctule (*Nyctalus noctula*), Leisler's

[1] The non-native coniferous woodland plantation as planted in 2017 under a woodland grant scheme; Figure 6.11.

bat (*N. leisleri*), Daubenton's (*Myotis daubentonii*), Natterer's (M. nattereri) and brown long-eared bat (*Plecotus auritus*).

Although identified as an IEF in Chapter 6 of the EIAR (EIAR Volume 2), with implementation of the standard mitigation throughout the operation of the Proposed Development, the risk to bats is considered not to be significant.

2.2 Ornithology

The Site does not form part of any statutory designated site for nature conservation with qualifying ornithological interests, or lie within potential connectivity distance of any Special Protection Area (SPA).

Baseline studies have established the Site and adjacent habitats are used by foraging, breeding and roosting raptors and owls including barn owl, hen harrier, peregrine, red kite and short-eared owl.

An assemblage of breeding ground nesting waders has also been recorded at the Site and which includes curlew, lapwing, snipe, redshank and oystercatcher. The Site is located within the monitoring and advisory area for the Clyde Valley Wader Initiative (CVWI) and Agri-environment Climate Scheme (AECS) options for breeding waders are currently under agreement within parts of the Site (**Figure 6.11**, EIAR Volume 3a).

Black grouse were not recorded within the Site during baseline surveys, but are known to have been previously recorded and are present within the wider surrounding areas.

The Site and immediate surrounding area are not identified as being important for migratory waterfowl.

3 TARGET HABITATS AND SPECIES

Habitats and species for which biodiversity enhancement measures are proposed to be delivered by the aims and objectives of the BEMP have been identified through baseline ecological and ornithological surveys and assessments of the Site and surrounding area together with the aims of the fourth South Lanarkshire Biodiversity Strategy[2] 2024-2030 (SLBS).

The SLBS 2024-2030 sets out a partnership approach to guide the conservation and enhancement of biodiversity in South Lanarkshire to 2023. It sets out 10 strategic outcomes and actions of local biodiversity conservation, which cover six ecosystems of the greatest importance within South Lanarkshire. The SLBS also sets out the actions proposed by the South Lanarkshire Biodiversity Partnership (SLBP)[3] to achieve its strategic outcomes and which will contribute to national and global priorities.

The proposed aims of the BEMP and the key strategic outcomes and actions of the SLBS they will support are summarised in **Table 3.1** (overleaf).

The aims of the BEMP will be delivered in addition to the Proposed Developments community benefit fund and which will also serve to support the actions of the SLBS 'Strategic Outcome 3: People have opportunities to connect with nature', where funding is used to support:

- Nature-based education, skills and volunteering; and
- Learning Outdoors Projects linking schools with their local greenspace for outdoor learning.

[2] https://www.southlanarkshire.gov.uk/downloads/file/16574/biodiversity_strategy_2024_-_2030
[3] Formed in 1997, with members including the Butterfly Conservation Scotland (BC), Clyde River Foundation (CRF), Froglife (FL), Forestry and Land Scotland (FLS), Glasgow and Clyde Valley Green Network (GVC), NatureScot (NS), Royal Society for the Protection of Birds (RSPB), Scottish Environment Protection Agency (SEPA), South Lanarkshire Council (SLC), Scottish Wildlife Trust (SWT) and the Tweed Forum (TF).

Table 3-1 Aims of the OBEMP and strategic outcomes and key actions of the SLBS.

SLBS Strategic Outcome	Key Actions	Key Relevant Aims of the BEMP
Strategic Outcome 2: Designated and locally important sites are conserved	Nationally designated sites are monitored. Actions are taken to maintain and /or improve the condition of nationally designated sites.	Aim 1: Peatland Restoration / Enhancement
Strategic Outcome 4: Freshwater habitats are improved and preserved	Improve the ecological status of water bodies.	Aim 3: Riparian and Riverine Enhancement
Strategic Outcome 5: The biodiversity value of low-lying farmland is improved	As part of the Clyde Valley Wader Initiative, continue to work with the farming community to conserve important wading bird populations, by managing the agricultural grasslands and wetlands on which they depend. Promote good farming measures through funding streams that contribute to biodiversity conservation. Monitor the evolution of the new agri-env payments through the Natural Environment Bill for opportunities to work with private landowners.	Aim 1: Peatland Restoration / Enhancement Aim 2: Native Woodland Enhancement Aim 6: Species-Rich Meadow/Grassland Creation Aim 7: Species Rich Hedgerow Creation Aim 8: Enhance and Conserve Breeding Wader Productivity
Strategic Outcome 6: Peatlands are protected and improved	Monitor the restoration of peatland habitats that is stipulated in windfarm habitat management plans (HMP). Clyde Peatlands - Peatland officer to work with landowners to identify areas of lowland peat to be restored.	Aim 1: Peatland Restoration / Enhancement Aim 2: Native Woodland Creation
Strategic Outcome 7: Uplands are managed in a sustainable way	Ensure Habitat Management Plans (HMP) from renewable energy developments are used to secure landscape scale habitat restoration. In partnership with others, seek funding mechanisms to develop conservation initiatives aimed at the conservation of upland birds including black grouse, waders and raptors in southern Scotland including	Aim 1: Peatland Restoration / Enhancement Aim 2: Native Woodland Creation Aim 3: Riparian and Riverine Enhancement Aim 8: Enhance and Conserve Breeding Wader Productivity

SLBS Strategic Outcome	Key Actions	Key Relevant Aims of the BEMP
	Lowther Hills, as part of landscape scale project delivery. Monitor opportunities presented by the new agri-environmental payments through the Natural Environment Bill.	
Strategic Outcome 8: The urban environment of South Lanarkshire benefits biodiversity	Identify and create nature networks to create corridors for species movement, link to neighbouring authorities to improve ecological connectivity across Scotland. Investigate and control the impacts of increasing deer populations to the urban environment, particularly woodlands.	Aim3: Riparian and Riverine Enhancement Aim 4: Woodland Planting Aim 5: Grassland / Scrub Planting Aim 7: Species Rich Hedgerow Creation
Strategic Outcome 10: Woodlands are restored and managed	There is no loss of ancient semi-natural woodland. Increasing woodland cover and native woodland expansion contributing to our Nature Networks and the Clyde Climate Forest. Produce and implement a Tree Policy which will manage and enhance woodland and trees and support measures such as canopy assessment and replacement planting. Target new woodland creation schemes to manage the impact of sitka spruce regeneration on wetlands, peatlands and open space habitats.	Aim 2: Native Woodland Creation Aim 3: Riparian and Riverine Enhancement Aim 4: Woodland Planting

4 BIODIVERSITY ENHANCEMENT AREA (BEA)

4.1 Overview

This OBEMP proposes a Biodiversity Enhancement Area (BEA) covering approximately 407.72 ha, which comprises seven overarching Habitat Management Areas (A-H inclusive); see **Figure 6.11** (EIAR Volume 3a), each focussing on a particular habitat or feature type, within which management and monitoring works would be implemented.

Habitat and biodiversity management and monitoring works would be undertaken within these respective Habitat Management Areas. Details of each Habitat Management Area are provided in Sections 4.2-4.9 inclusive.

The overall aim of the OBEMP is to restore, enhance, create and conserve habitats of ecological value in these Habitat Management Areas, which in turn will benefit existing flora and fauna as well as increase biodiversity in general.

The precise objectives and management prescriptions for the finalised Habitat Management Areas (and relevant sub-units there-in) will depend on the current state of the habitat and the factors acting upon it. In order to inform the objectives and detail appropriate management prescriptions, further specific surveys may be required to be undertaken in developing the final BEMP. These surveys may include, but are not limited to relevant peatland condition assessments in line with Peatland Action guidance[4]; monitoring of habitats in accordance with JNCC Common Standards Monitoring of Upland Habitats[5] or habitat condition assessments utilising the latest Biodiversity Metric[6] condition assessment pro-forma and methodology; hydrology walkover to identify opportunities for drain blocking and restoration of the peatland water table; a Herbivore Impact Assessment (HIA) and pre-commencement ornithological surveys.

4.2 Habitat Management Area A – Peatland Restoration/Enhancement

Habitat Management Area A covers a total area of approximately 143.10 ha, split over four potential sub-units (A1 – A4 as shown in **Figure 6.11**, EIAR Volume 3a). The Habitat Management Area is comprised of predominantly blanket bog and wet modified bog habitats.

Within Habitat Management Area A and its component sub-units A1, A2, A3 and A4, the aim will be to enhance the existing and degraded peatland habitats and create favourable conditions for the re-establishment of peatland vegetation. Sub-units have been selected as suitable candidate areas for peatland restoration and enhancement due to the presence of peat hagging.

Enhancement is proposed to be fulfilled through:

- peat hagg reprofiling;

[4] NatureScot (2021). Peatland Action: Peat Depth and Peatland Condition Survey. https://www.nature.scot/doc/peatland-action-peat-depth-and-peat-condition-survey-guidance-and-recording-form-guidance
[5] https://jncc.gov.uk/our-work/common-standards-monitoring
[6] https://publications.naturalengland.org.uk/publication/6049804846366720

- livestock management (sub-unit A2 only); and
- removal of non-native self-seeding trees.

Although it appears that some drains are present in part of sub-units A1, A2, A3 and A4, the implementation of peat damming is not proposed in the OBEMP (**Sections 4.2.1 and 4.2.2**).

It is considered that peat damming of drainage ditches in the management area (Sub-Unit A1) could reduce water flow to the Red Moss SAC and which could have an adverse effect of the integrity of SAC, affecting the recovery of the designations blanket bog qualifying interests to a favourable conservation status (currently unfavourable recovering).

Peat damming in other parts of the Habitat Management Area (sub-unit A2, A3 and A4) would also impede the continuation of livestock grazing and welfare.

4.2.1 Sub-Unit A1

Habitat Management Area sub-unit A1 is located immediately east of the Red Moss SAC and SSSI and includes part of the Class 1 Peatland[7] within the Site.

The land in sub-unit A1 slopes down toward the Red Moss SAC / SSSI. The drains are steep and based on discussions with the landowner, introduction of a livestock management regime is not suitable due to the risk to livestock welfare from steep sided banks and gullies.

The removal of adjacent coniferous plantation woodland (**Section 4.3**) and reduction of local water retention there-in, may therefore result in previously retained water being available to the SAC (rather than previously being removed by establishing plantation habitat).

Through the removal of the coniferous plantation (**Section 4.3**), together with the removal of any self-seeded coniferous specimens within the sub-unit and through leaving drains open (i.e. no peat damming) this will contribute to the improvement in the condition of the SAC / SSSI.

4.2.2 Sub-Unit A2 and Sub-Unit 3

Sub-units A2 and A3 are located to the north of the M74 motorway.

4.2.3 Sub-Unit A4

Sub-unit A4 is located between the M74 (to the north) and the B7078 (to the south).

4.3 Habitat Management Area B – Native Woodland Creation

Habitat Management Area B comprises three areas of coniferous plantation woodland (Sitka spruce and mixed conifer) within the Site, planted under Forestry Grant Scheme (FGS) 16FGS10015 in 2017.

The three areas cover a total area of 32.2 hectares, which are currently stocked with Sitka spruce and mixed conifer. A further 3.9 ha of native broadleaved woodland planting under the FGS will be retained and enhanced with additional broadleaf planting.

The aim within Habitat Management Area B will be to remove the monoculture Sitka spruce and mixed conifer plantation at construction together with associated fencing and drainage as

[7] https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/

practicable, and restock with native broadleaf planting. Replanting in situ with 24.09 ha of native broadleaved trees is proposed.

In consultation with Scottish Forestry[8] and the Applicant, it is understood that as the FGS woodland would be felled prior to the end of the FGS contractual obligation, the funding awarded for the coniferous plantation option would be repaid in full by the Applicant.

Broadleaf planting proposed to replace the coniferous FGS planting would likely largely reflect the canopy composition of W10/W11 NVC woodland types, however depending on the character and respective soil conditions within each sub-unit other target NVC types may also be considered. Broadleaf species selected would be deemed suitable for the environment (elevation, hydrology and substrate) and would consider future climactic changes

Planting will be carefully considered so as to ensure that planting does not continue to retain water and which could adversely impact the conservation objectives of Red Moss SAC/SSSI which lies down gradient of the proposed planting (see **Section 4.2**).

The small-seeding broadleaf panting proposed would serve to benefit local black grouse populations through the provision of foraging resources and shelter, and the removal of the coniferous plantation reduce habitat suitability for predators of ground-nesting birds, including breeding waders.

4.4 Habitat Management Area C – Riparian and Riverine Enhancement

Habitat Management Area C is divided into two sub-units (C1 and C2) which will collectively cover a linear corridor of approximately 10.44 hectares along the Duneaton Water.

No large areas of block woodland are proposed as part of this proposal, but instead discontinuous riparian planting along the Duneaton Water (sub-unit C1) and Black Burn (sub-unit C2) will be implemented.

Riparian planting offers several benefits;

- Reduction of flooding risk downstream;
- Increasing biodiversity;
- Providing a robust riparian corridor improving connectivity of biodiversity;
- Improves the riparian corridor for otter (signs recorded during the survey);
- Provides a foraging resource for bats and birds;
- Providing support to eroding banks along both watercourses; established root systems will offer the riverbanks more support to tolerate increased water levels / flows (increasingly common in winter) and will help to reduce erosion; and
- Providing shading of Duneaton Water and Black Burn which will reduce water temperatures (a known phenomenon which is impacting salmonid spawning success) and also increase the suitability of the watercourses for salmonid species; fisheries surveys found that salmonid presence within the watercourses is limited, which is likely to be in part due to bare river banks.

Dependent on soil conditions and hydrology, the mixture of native broadleaf trees will include oak, aspen, rowan, birch, hazel, alder, willows, wych elm, holly, wild cherry and hawthorn. This composition will again serve to benefit black grouse populations, improving habitat connectivity locally for the species.

It should be noted that Habitat Management Area C has considered the locations of habitat management areas for Aim 8: Enhance and Conserve Breeding Wader Productivity, to reduce the potential for conflicting management prescriptions.

4.5 Habitat Management Area D – Woodland Planting

Habitat Management Area D comprises an area of native broad-leaved woodland planting around the substation (**Figure 6.11**, EIAR Volume 3a) and which will provide partial screening of the substation building and habitat heterogeneity for onsite biodiversity. The planting would cover an area of approximately 4.37 ha and would be coupled with grassland and scrub planting, within Habitat Management Area E.

Dependent on soil conditions a mixture of native broadleaf trees will include oak, aspen, rowan, birch, hazel, alder, willows, wych elm, holly, wild cherry and hawthorn.

4.6 Habitat Management Area E – Grassland / Scrub Planting

Habitat Management Area E comprises an area of grassland and scrub planting and which will provide partial screening of the substation and additional habitat heterogeneity for onsite biodiversity. Habitat Management Area E covers a total of 3.57 ha in extent. The habitats present here are currently large areas of improved grassland and bare ground (active quarry). These habitats are generally of negligible conservation value. Based on the proposed restoration, the habitat would become a mix of rough grazing and grassland.

The aim within Habitat Management Area E would be to create scrub and grassland to complement the proposed broadleaf planting to screen the substation (Habitat Management Area D). As well as an aesthetic benefit, the habitats will bring benefits such as greatly increasing local floral diversity and supporting populations of insects, birds, bats, and many other species which rely on these important, but scarce and declining, habitats.

4.7 Habitat Management Area F – Meadow Grassland Enhancement

Habitat Management Area F is focussed on the solar array and covers approximately 108.96 ha which are currently fields used of improved grassland, marshy grassland, unimproved acid grassland and unimproved neutral grassland. They are subject to grazing and as such, offer a reduced plant diversity.

The aim within Habitat Management Area F is to manage extensive grazing (where it occurs) and encourage for the formation of a species-rich lowland neutral meadow/grassland habitat within the solar array compounds. This would primarily be achieved through ground preparation, seeding with an appropriate seed mix (if required) followed by appropriate ongoing grassland management.

[8] Call between Neil Mackay of McKay Foresty and Tom Hobbs, operation manager with Scottish Forestry on 26 June 2024.

M74 West Renewable Energy Park:
Outline Biodiversity Enhancement Management Plan

The creation of a species-rich meadow/grassland habitat has multiple biodiversity benefits such as greatly increasing local floral diversity and supporting populations of insects, birds, bats, and many other species which rely on these important, but scarce and declining, habitats. The creation of such a habitat also aligns with a restoration of species rich grassland aim within the SLBS[2].

4.8 Habitat Management Area G – Species Rich Hedgerow

Habitat Management Area G is linear compartment and covers approximately 865 m and covers anarea of 0.18 ha. The aim for Habitat Management Area G is to create native and species-rich hedgerows, these will be planted along existing post and wire fences. This will provide multiple biodiversity benefits such as greatly increasing local floral diversity and supporting populations of insects, birds, bats, and many other species which rely on these important, but scarce and declining, habitats. The hedgerows will provide further species diversity and create habitat corridors for a range of species and in general further enhance habitat connectivity and local biodiversity.

Furthermore, there is potential to connect the hedgerow with the planting around the Abington motorway services, further enhancing opportunities and habitat connectivity for biodiversity as discussed above.

4.9 Habitat Management Area H: Breeding Wader Management

Habitat Management Area H, with sub-units H1 and H2 comprises those areas of the Site that are currently entered into the 2024 AECS round under: Wader Grazed Grassland and Wader (and Wildlife) Mown Grassland. Collectively they currently cover an area of 90.17 ha within the Site.

It is therefore proposed that following the commencement of construction works for the Proposed Development, these areas would not be entered into subsequent AECS rounds. Instead, the future and long-term management of these areas would be undertaken for the benefit of breeding waders under revised prescriptions contained within the BEMP, over the remaining construction period and Proposed Developments operational lifetime (anticipated to be 40 years).

It is proposed that core management under the BEMP would comprise:

- A revised grazing and/or mowing regimes;
- Annual installation of seasonal predator fencing; and
- Creation and maintenance of wader scrapes where feasible.

Prescriptions would be informed in consultation with landowners and advisory from the CVWI, subject to trials where necessary.

5 AIMS AND OBJECTIVES

It is proposed that the BEMP will have the following eight aims, supported by clear objectives, management prescriptions and a management and review process, to enable significant biodiversity enhancements to be delivered over the lifetime of the Proposed Development:

- Aim 1: Peatland Restoration / Enhancement (Habitat Management Area A)
- Aim 2: Native Woodland Creation (Habitat Management Area B)
- Aim 3: Riparian and Riverine Enhancement (Habitat Management Area C)
- Aim 4: Woodland Planting (Habitat Management Area D)
- Aim 5: Grassland / Scrub Planting (Habitat Management Area E)
- Aim 6: Species-Rich Meadow/Grassland Creation (Habitat Management Area F)
- Aim 7: Species Rich Hedgerow Creation (Habitat Management Area G)
- Aim 8: Enhance and Conserve Breeding Wader Productivity (Habitat Management Areas H)

This section sets out the objectives and outline of management prescriptions that are proposed to achieve these aims.

Annex A provides an indicative timetable for the implementation of the proposed management prescriptions under Aims 1-7.

5.1 Aim 1: Peatland Habitat Enhancement

Peatlands act as one of Scotland's largest carbon stores, so are crucial in mitigating the effects of climate change, they also play an important role in maintaining out drinking water quality and store water, which reduces flood risks. Healthy peatlands also provide important habitats for wildlife including plants, birds, invertebrates and reptiles.

Peatland habitats within the Site comprise blanket bog and wet modified bog. The blanket bog within the survey area is a degraded resource in relatively poor condition that has been impacted over time in several ways. Historical and ongoing impacts on blanket bog (and wet modified bog) at the Site include livestock grazing and agricultural improvement, extensive moor grip drainage, conifer plantation (direct planting on peatland and also indirect effects, such as drainage and ground disturbance), the presence of an active quarry and associated track and drainage network (e.g., direct removal of peat, and drainage and disturbance effects), and the presence of the M74 motorway and B7078 road (historically severing and fragmenting larger bog units). Some of the relatively larger patches of bog also exhibit some erosion features, such as haggs. The overall result is a highly fragmented, impacted, modified, and degraded peatland that would be classified, using NatureScot Peatland Action Condition Criteria , as predominantly 'Drained: Artificial' with any remaining areas falling within the 'Modified' or, less so, 'Drained: Hagg/Gully' categories.

Peatland restoration is a nature-based solution, which will have multiple synergistic benefits including the expansion and preserving of carbon sinks and reduction of net carbon emissions, providing enhanced habitats for species such as breeding birds (ground-nesting waders, raptors and owls), invertebrates and micro-organisms present within the BEA.

Habitat Management Area(s): A

Objective 1.1	Re-profile haggs reducing the area of exposed peat.
Objective 1.2	Increase the abundance and structural diversity of dwarf shrubs such as *Calluna vulgaris*, *Erica tetralix* and *Vaccinium* spp. in line with local reference blanket bog.
Objective 1.3	Achieve improved condition blanket bog.
Prescription 1.1	Manage livestock numbers, via livestock fencing within Search Area A in agreement with the landowners, to achieve Objectives 1.1, 1.2 and 1.3.
Prescription 1.2	Undertake peat hagg restoration and peat surface re-profiling with a low-pressure excavator and in line with relevant guidance[9], [10].
Prescription 1.3	Removal of self-seeded coniferous trees within sub-unit A1 (as appropriate).
Prescription 1.4	The following activities would be prohibited within the Habitat Management Area: • clearing out of existing ditches; • supplementary feeding of livestock; • application of any insecticides, fungicides or molluscicides; • application of lime or any other substance to alter the soil acidity; • cutting or topping of vegetation except to control injurious weed species or to improve the biodiversity of the habitat; • burning of vegetation or other materials; • use of roll or chain-harrow; • planting trees; • carrying out any earth moving activities; • use of off-road vehicle activities with the exception of use of low scale agricultural vehicle movements (e.g., quad bike); • construction of tracks, roads, yards, hardstandings or any new structures (not associated with the Proposed Development); and • storage of materials or machinery.

5.2 Aim 2: Native Woodland Creation

The conversion of existing coniferous woodland within the site to native broadleaf woodland will increase the botanical biodiversity within the Site, bring species-related benefits and contribute to the improvement of the Red Moss SAC/SSSI.

Removal of the FGS coniferous plantation to allow the creation of native broadleaf woodland would also serve to reduce predation risks for ground-nesting birds, including breeding waders.

[9] According to methodology detailed in: Peatland Action (2022) Technical Compendium. Available at: https://www.nature.scot/doc/peatland-action-technical-compendium

[10] Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman, R. & Brooks, S. (2019). Conserving Bogs: The Management Handbook. (2nd Edition). (https://www.iucn-uk-peatlandprogramme.org/resources/restoration-practice/conservation-handbook)

Furthermore, native woodland is of benefit to invertebrates, birds (including black grouse), bats, and mammals, and will increase the biodiversity within the Site.

Habitat Management Area(s): B

Objective 2.1	Create areas of native broadleaved woodland and increase diversity within and around the site, seeking to achieve Moderate condition broadleaved woodland in 15 years after planting.
Objective 2.2	Increase and enhance faunal diversity within and around the site by providing more habitat structure and new breeding, reduce predation risks for ground-nesting birds, provide new shelter and foraging habitats for bats and other small mammals, and invertebrates.
Prescription 2.1	Undertake the felling of the areas of conifer planation within Management Area B and partially replant with a diverse mix of native broadleaved species to extend the existing broadleaf woodland habitat. Associated fencing and drainage installed as part of the WGS planting would also be removed as practicable. Given the location, soils and prevailing baseline habitats of the proposed planting areas, and to reflect the character and structure of the existing broadleaved woodlands locally, it is anticipated that the species mixes here would primarily contain oak (*Quercus* spp.), birch (*Betula* spp.) and rowan (*Sorbus aucuparia*). However, it is proposed to increase diversity by also including smaller proportions of species such as aspen (*Populus tremula*), goat willow (*Salix caprea*), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), bird and/or wild cherry (*Prunus* spp.), crab apple (*Malus sylvestris*), small-leaved lime (*Tilia cordata*), wych elm (*Ulmus glabra*) and holly (*Ilex aquifolium*). Where there are damper soils the species mix may also include alder (*Alnus glutinosa*) and grey willow (*Salix cinerea*). Proportions of species and their planting locations would be determined by a forester, in agreement with a suitably qualified ecologist, during preparation of the final BEMP. Tree planting would be carried out between the months of November and March when trees are dormant and more likely to establish successfully. Days when the ground is frozen or when snow or excessive surface water is present are to be avoided.
Prescription 2.2	New fencing of some planting areas may be required to protect new trees from deer and livestock browsing during the establishment phase. This will be avoided in so far as is possible, with any new fencing would follow guidelines in Trout & Kortland (2012)[11] to minimise collision risks for black grouse. Trees will be planted in 1 m - 1.2 m tree tubes to further protect from browsing damage in areas that remain unfenced, or where deer or livestock may breach fenced areas. Tree tubes (and fencing where applicable) will be removed after approximately 10 years or after adequate establishment of the trees.
Prescription 2.3	Manage deer densities, if required, to allow woodland establishment. Subsequently use the results of vegetation and tree monitoring to determine whether ongoing deer management and culling requires to be reviewed to allow successful establishment of the trees planted.
Prescription 2.4	Prohibited activities noted in Prescription 1.3 above apply (with the exception of planting native broad-leaved trees).

[11] Trout, R. and Kortland, K. (2012). Fence marking to reduce grouse collisions. Forestry Commission Technical Note.

5.3 Aim 3: Riparian and Riverine Enhancement

The creation of native broadleaf woodland along riparian corridors will increase the botanical biodiversity within the Site and create and strengthen nature networks providing habitat connectivity for invertebrates, birds (including black grouse), bats, and mammals, and increasing the overall biodiversity interest within the Site.

In addition to the creation of native woodland within the Site, riparian corridors will aid with cooling running freshwater within the headwaters of the Clyde catchment, with provide support to eroding banks and will provide connectivity and cover for mammals such as otter which use the Duneaton Water.

Habitat Management Area(s): C

Objective 3.1	Create linear strips of native broadleaved tree planting and increase diversity within and around the site, seeking to achieve Moderate condition broadleaved woodland in 15 years after planting. This will focus riparian planting along the Duneaton Water and Black Burn (within the red line boundary).
Objective 3.2	Increase and enhance faunal diversity within and around the site by providing more habitat structure and new breeding, shelter and foraging habitats for a range of birds, bats and other small mammals, and invertebrates.
Prescription 3.1	Given the location, soils and prevailing baseline habitats of the proposed planting areas, and to reflect the character and structure of the existing broadleaved woodlands locally, it is anticipated that the species mixes here are those discussed within Prescription 2.1 would be used. Proportions of species and their planting locations would be determined by a forester, in agreement with a suitably qualified ecologist, during preparation of the final BEMP. Tree planting would be carried out between the months of November and March when trees are dormant and more likely to establish successfully. Days when the ground is frozen or when snow or excessive surface water is present are to be avoided.
Prescription 3.2	Fencing of some planting areas may be required to protect new trees from deer and livestock browsing during the establishment phase and deter the establishment of predators of ground-nesting birds. Any new fencing would follow guidelines in Trout & Kortland (2012[11]) to minimise collision risk for black grouse. Trees will be planted in 1 m - 1.2 m tree tubes to further protect from browsing damage in areas that remain unfenced, or where deer or livestock may breach fenced areas. Tree tubes (and fencing where applicable) will be removed after approximately 10 years or after adequate establishment of the trees.
Prescription 3.3	Prohibited activities noted in Prescription 1.3 above apply (with the exception of planting trees).

5.4 Aim 4: Woodland Planting

The creation of additional native broadleaf woodland will increase the botanical biodiversity within the Site.

Habitat Management Area(s): D

Objective 4.1	Create areas of native broadleaved woodland and increase diversity within and around the site and provide partial screening of the substation, seeking to achieve Moderate condition broadleaved woodland in 15 years after planting.
Objective 4.2	Increase and enhance faunal diversity within and around the site by providing more habitat structure and new breeding, shelter and foraging habitats for a range of birds, bats and other small mammals, and invertebrates.
Prescription 4.1	Given the location, soils and prevailing baseline habitats of the proposed planting areas, and to reflect the character and structure of the existing broadleaved woodlands locally, it is anticipated that the species mixes here are those discussed within Prescription 2.1 would be used. Proportions of species and their planting locations would be determined by a forester, in agreement with a suitably qualified ecologist, during preparation of the final BEMP. Tree planting would be carried out between the months of November and March when trees are dormant and more likely to establish successfully. Days when the ground is frozen or when snow or excessive surface water is present are to be avoided.
Prescription 4.2	Fencing of some planting areas may be required to protect new trees from deer and livestock browsing during the establishment phase. Any new fencing would follow guidelines in Trout & Kortland (2012)[11] to minimise collision risk for black grouse. Trees will be planted in 1 m - 1.2 m tree tubes to further protect from browsing damage in areas that remain unfenced, or where deer or livestock may breach fenced areas. Tree tubes (and fencing where applicable) will be removed after approximately 10 years or after adequate establishment of the trees.
Prescription 4.3	Manage deer densities, if required, to allow woodland establishment. Subsequently use the results of vegetation and tree monitoring to determine whether ongoing deer management and culling requires to be reviewed to allow successful establishment of the trees planted.
Prescription 4.4	Prohibited activities noted in Prescription 1.3 above apply (with the exception of planting trees).

5.5 Grassland / Scrub Planting

Habitat Management Area(s): E

Objective 5.1	Create scrub and grassland to complement the proposed broadleaf planting to screen the substation. As well as an aesthetic benefit, the habitats will bring

	benefits such as greatly increasing local floral diversity. Aim is to achieve a condition category of Good in 15 years.
Objective 5.2	Increase faunal diversity locally by providing more flower-rich habitat that benefits populations of insects, birds, bats, and many other species.
Prescription 5.1	This will initially involve ground preparation, creating a stale seedbed, and sowing with appropriate native wildflower seed at the correct time of year. The wildflower seed mix will be confirmed within the final BEMP.
Prescription 5.2	Annual grassland management to maintain the habitat in line with best practice and guidance[12]. This will be via cutting. Alternatively, the grassland will be managed via cutting in late summer, no earlier than 31st July. Grass cuttings would be baled and removed. Around 5%-10% of the field may remain uncut each year, a different area each time, to vary the sward height and allow seed to set seed. Grazing after cutting (aftermath grazing) will also create variety, if applicable.
Prescription 5.3	No supplementary chemical fertilisers, organic manures or slurry to be applied to the field for the lifetime of the BEMP.
Prescription 5.4	Weed species such as docks, ragwort and creeping thistle will be controlled where they impact negatively on the overall area of species-rich grassland. Weeds can be chemically spot treated.
Prescription 5.5	Prohibited activities noted in Prescription 1.3 above apply.

5.6 Aim 6: Meadow Grassland Enhancement

As well as creating a new habitat within the Site and increasing the botanical biodiversity within the Site, the creation of the habitat will support, invertebrates, birds, bats, and small mammals such as hedgehog.

Habitat Management Area(s): F

Objective 6.1	Create a species-rich lowland neutral meadow/grassland habitat and increase floral diversity through the creation of 108.96 ha of wildflower meadow within the solar arrays, seeking to achieve a condition category of Good in 15 years.
Objective 6.2	Increase faunal diversity locally by providing more flower-rich habitat that benefits populations of insects, birds, bats, and many other species.
Prescription 6.1	Convert the field of improved grassland and rough pasture in Management Area E into a species-rich meadow/grassland habitat. This will initially involve ground preparation, creating a stale seedbed, and sowing with appropriate native wildflower seed at the correct time of year. The wildflower seed mix will be confirmed within the final BEMP.
Prescription 6.2	Annual grassland management to maintain the habitat in line with best practice and guidance[13]. This will be via grazing or cutting.

[12] For example see https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/species-rich-grassland-management/guidance-for-species-rich-grassland-management/, http://www.magnificentmeadows.org.uk/ and https://www.nature.scot/doc/species-rich-grasslands-guidance-leaflet#:~:text=Species%20rich%20grasslands%20have%20a,amphibians%20and%20many%20other%20animals.

[13] For example see https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/species-rich-grassland-management/guidance-for-species-rich-grassland-management/, http://www.magnificentmeadows.org.uk/ and

	Grazing is usually the preferred management since grazing animals create variety by eating, dunging and trampling unevenly across the field. Cattle are preferred as they are less selective grazers than sheep. If applicable, grazing proposals, including timing and stocking rates will be detailed in the final BEMP. Alternatively, the grassland will be managed via cutting in late summer, no earlier than 31st July. Grass cuttings would be baled and removed. Around 5%-10% of the field may remain uncut each year, a different area each time, to vary the sward height and allow seed to set seed. Grazing after cutting (aftermath grazing) will also create variety, if applicable.
Prescription 6.3	No supplementary chemical fertilisers, organic manures or slurry to be applied to the field for the lifetime of the BEMP.
Prescription 6.4	Weed species such as docks, ragwort and creeping thistle will be controlled where they impact negatively on the overall area of species-rich grassland. Weeds can be chemically spot treated.
Prescription 6.5	Prohibited activities noted in Prescription 1.3 above apply.

5.7 Aim 7: Species Rich Hedgerow Creation

As well as creating a new habitat within the Site and increasing the botanical biodiversity within the Site, the creation of the habitat will support, invertebrates, birds, bats, and small mammals such as hedgehog.

Habitat Management Area(s): G

Objective 5.1	Create approximately 865 m of new species-rich hedgerow[14] and link with existing hedgerows/scrub to create and enhance habitat corridor connectivity.
Prescription 5.1	Plant approximately 2000 m of new native species-rich hedgerows. The hedgerows are likely to consist of 60-80% hawthorn with crab apple (*Malus sylvestris*), hazel, blackthorn and holly generally making up the remainder of the species-mix. Some trees may also be included within the hedge (such as oak, birch, rowan and cherry). Planting should be in double-staggered rows at a density of six plants per metre. When planting, the minor component species would be planted first, to get a suitable distribution, and then areas in-filled with the hawthorn. Plant the same species in groups of at least one metre, to avoid single plants being outcompeted by other species.
Prescription 5.2	Protect young and developing hedge plants from browsing by animals via livestock fencing and guards/tree tubes. The fence would be situated a minimum of 1 m away from the centre line of the hedge to allow space for the hedge's expansion and to leave room for trimming, coppicing or laying the hedge in the future.
Prescription 5.3	Control competing vegetation in the first two years of establishment. Using strimming, a mulch, or if necessary, an appropriate herbicide.

https://www.nature.scot/doc/species-rich-grasslands-guidance-leaflet#:~:text=Species%20rich%20grasslands%20have%20a,amphibians%20and%20many%20other%20animals.

[14] In line with Scottish Government (2017). Supporting guidance for Planting or Replanting of Hedges. Available at: https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/planting-or-replanting-of-hedges/guidance-for-planting-or-replanting-of-hedges/ [Accessed June 2023]

Prescription 5.4 The hedgerow would be managed in line with best practice and relevant guidance[15], including the following key aspects:

- Light, regular, trimming of the hedgerow will be undertaken in its early and establishment years to encourage dense, bushy growth.
- After establishment, the hedge may be cut just once every two or three years. Alternatively, cut just one side or the top each year, and not trimming the same length of hedge annually. Each time let the hedge grow out and up a little and do not cut back to the same height each trimming cycle.
- Hedge trimming must only be undertaken between 1 December and the last day in February.
- Leave occasional berry or fruit bearing trees to grow to maturity. These would be identified in the establishment years and not trimmed in order to allow them to mature and in the longer term create a hedge with scattered trees.

5.8 Aim 8: Enhance and Conserve Breeding Wader Productivity

Baseline studies have established that the Site supports an assemblage of breeding ground nesting waders including curlew, lapwing, snipe, redshank and oystercatcher. Farmland waders have undergone steep population declines in recent years; curlew and lapwing are both featured on the Birds of Conservation Concern (BoCC) Red-list, with oystercatcher, redshank and snipe featured on the BoCC Amber-list.

The Site is also located within the monitoring and advisory area of the CVWI; a partnership formed of farmers, RSPB Scotland and Scottish Agricultural College (SAC) Consulting. The initiative focuses on the monitoring wader breeding attempts and developing and testing of new management practices aimed at conserving breeding wader populations, to help inform management requirements in future rounds of the AECS.

The following AECS options, illustrated as Habitat Management Area H (sub-units H1 and H2) in **Figure 6.11** (EIAR Volume 3a), are currently in place for the 2024 AECS round within the Blackburn Farm component of the Site:

- Wader Grazed Grassland (WGG, Habitat Management Area sub-unit H1)[16]; and
- Wader and wildlife mown grassland (WMG, Habitat Management Area sub-unit H2)[17].

These areas will therefore be managed until 2028, as per the relevant AECS management requirements in order to receive compensatory payments.

It is unknown if after the end of the 2024 AECS round, Blackburn Farm or any other farm holding within the Site would enter subsequent AECS fundings rounds. It is also unknown if management

[15] e.g., https://hedgelink.org.uk/

[16] AECS Wader Grazed Grassland management requirements (published November 2023): https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/wader-grazed-grassland/

[17] AECS Wader and Wildlife Mown management requirements (published November 2023): https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/wader-and-wildlife-mown-grassland/

requirements for WGG and WMM in future rounds of the AECS will change substantially and if compensatory funding will remain attractive to farm holdings.

In review of CVWI monitoring data for the local area, obtained in consultation with RSPB Scotland, despite the adoption of AECS options, there is understood to a high incidence of failed breeding attempts (failed nest hatching success) annually for species including curlew, lapwing and oystercatcher. This is thought to be as a result of predation pressures and agricultural disturbance (CVWI, 2023[18]).

As such in addition to benefits to breeding waders that will arise from the proposed objectives of Aims 1 and 2, there is further opportunity to conserve, enhance, expand (where appropriate) specific existing management measures for breeding waders within (and adjacent to) the Site, including in areas away from operational infrastructure and support the actions of the CVWI (and the SLBP) over the lifetime of the Proposed Development.

Prescriptions will focus on the creation, enhancement and maintenance of safe places for breeding waders to nest and feed and the sharing of information to inform future management requirements of AECS options.

Habitat Management Area(s): H

Objective 8.1	Manage grassland habitats for the benefit of nesting and foraging breeding waders.
Objective 8.2	Reduce predator pressures on breeding waders.
Objective 8.3	Support research and innovation in changes in agricultural management that can improve breeding wader hatching success to help inform national AECS schemes.

Prescription 8.1 As a minimum, or else as advised by the CVWI and subject to trials as necessary, for sub-unit H1 managed under a grazing regime:

- Exclude livestock from 1 April to 12 May inclusive, followed by a period of grazing; or
- Exclude livestock from 15 April to 26 May inclusive, followed by a period of grazing; or
- Restrict livestock by stocking with up to **≤1 LU/hectare** from 15 March to 15 June inclusive.

and:

- No harrowing, rolling or topping grass from 15 March until 30 June inclusive.
- No application of lime, fertiliser, slurry or farmyard manure from 15 March to 15 May inclusive.
- The sward must be grazed down to remove annual growth to avoid a build-up of matted dead plant material. The sward may contain occasional tussocks of taller vegetation.
- No spraying, except for the spot-treatment of injurious weeds (requires prior written notification) or treatment of invasive species (requires prior written approval).
- No establishment of new drainage.

[18] CVWI (2023) Clyde Valley Waders – Development new approaches to wader conservation on farmland [Online]. Available at: https://community.rspb.org.uk/ourwork/farming/b/farming-blog/posts/clyde-valley-waders---developing-new-approaches-to-wader-conservation-on-farmland.

It is proposed that the restrictions of livestock will be managed through the use of temporary fencing or if appropriate virtual fencing, with funding for livestock neckbands and training provided by the BEMP. It is understood that costs are around £400 per collar.

As a minimum, or else as advised by the CVWI and subject to trials as necessary, for sub-unit H2 managed under a mowing regime:

- No rolling, harrowing or grazing the area from 1 April until 30 June inclusive
- No application of lime, fertiliser, slurry or farmyard manure from 15 March to 15 May inclusive.
- Areas must be mown, but not before 30 June.
- Hay or silage must be cut in a wildlife-friendly manner. This would be undertaken through potential funding for specialist equipment.
- A strip of grass at least two metres wide around the field boundary must be left uncut.
- This uncut strip must be grazed down before the next exclusion period.
- No spraying, except for the spot-treatment of injurious weeds (requires prior written notification) or treatment of invasive species (requires prior written approval).

Prescription 8.2	Creation of wader scrapes where agreed with landowners within sub-units H1 and H2. Each scrape must be a minimum size of 20 square metres and hold water from at least 1 March to 31 May[19], or as otherwise informed through the advisory of the CVWI. Scrapes should be created and managed in such a way, that they will hold value for other biodiversity interests including reptiles, amphibians and invertebrates.
Prescription 8.3	Provide an annual salary contribution to the funding of a locally-based seasonal gamekeeper to undertake or otherwise advise on predator control within the BEA and monitoring area of the CVWI.
Prescription 8.4	Undertake the annual installation and/or maintenance of predator fencing around the perimeters of sub-units H1 and H2.
Prescription 8.5	Provide an annual salary contribution to the funding of a seasonal ornithological field surveyor to undertake regular breeding wader monitoring within the BEA and to assist in the wider monitoring and advisory work of the CVWI.
Prescription 8.6	Facilitate the public dissemination of non-sensitive monitoring reports via an online project portal.

[19] Based on current AECS management requirements for the Creation of Wader Scrapes: https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/creation-of-wader-scrapes/

6 FINALISATION OF THE BEMP AND REPORTING

This OBEMP is based on several identified Habitat Management Areas (A-G inclusive as shown on **Figure 6.11,** EIAR Volume 3a). These Habitat Management Areas were identified through discussions with the Applicant, landowners, and relevant technical specialists in order to create and enhance habitats of biodiversity value.

The Habitat Management Areas will likely be refined following further specialist surveys and feedback from relevant consultees. Some Habitat Management Areas may therefore not be taken forward within the final BEMP, and other Habitat Management Areas and/or prescriptions may also be considered and agreed; however, the Applicant remains committed to delivering significant biodiversity enhancement as part of the Proposed Development.

The OBEMP will be refined and developed into a final BEMP post-consent. The final BEMP will confirm the overarching BEA encompassing all biodiversity enhancement proposals, and Habitat Management Areas, where the aims, objectives and management prescriptions of the BEMP will apply.

The final BEMP will be finalised in consultation with NatureScot, relevant landowners and the advisory of an appointed Biodiversity Advisory Committee (BAC), and submitted for approval by South Lanarkshire Council (SLC), by way of a suitably worded planning condition.

As above, a BAC will be invited to form and advise on the finalisation and also the implementation of the agreed BEMP. The BAC should include representatives from SLC, NatureScot, relevant landowners, the Applicant, and other relevant stakeholders including the Clyde Rivers Trust and CVWI.

An annual report (for each of the first five years) will be submitted by M74 West Limited and be approved by the BAC detailing the tasks (management and monitoring) completed over the last year and those planned for the year ahead.

Management prescriptions in the BEMP may be amended considering monitoring results to ensure progress towards the stated aims and objectives of the plan.

7 MONITORING

Monitoring will establish whether the proposed management prescriptions are achieving the various aims and objectives and in turn will inform adaptive management to ensure the aims and objectives are achieved through the life of the BEMP.

The Sections below outline the likely monitoring required for the Aims detailed above, however the detailed monitoring proposals will be provided in the final BEMP to be submitted post-consent and prior to the commissioning of the Proposed Development when the BEA, Habitat Management Areas and associated prescriptions have been finalised.

An indicative monitoring timetable for Aims 1-7 is provided in **Annex A**.

7.1 Aim 1: Restore/enhance peatland habitat and improve bog habitat condition (Habitat Management Area A)

The following monitoring would be undertaken to evaluate the success of this aim:

- Habitat/vegetation monitoring would evaluate the success of restoration and enhancement of peatland. This would be achieved by recording changes to the structure and composition of the vegetation and species abundance, evenness and diversity. Recording of impacts from deer/livestock would also be included in the monitoring programme, using the HIA methodology described in MacDonald *et al*. (1998)[20] guidance.
- A representative sample of permanent quadrats would be established within Search Area A's finalised Management Unit to gather sufficient data to inform future management and assess the trajectory of plant species and habitats. The respective monitoring surveys would be carried out at the most appropriate times of year (e.g., flora surveys versus browsing impact surveys). Repeat surveys would be carried out in the same month in each monitoring year (Years 1, 3, 5, 10, 15) to gather comparable data. Photographs would also be taken of each sample quadrat, as well as overview photographs of the Management Unit.
- In addition, should finalised Habitat Management Area A be fenced off and livestock excluded, a number of quadrat monitoring locations would also be set up outwith the enclosed Habitat Management Area and in nearby and similar habitat in order to allow a temporal comparison of the habitats inside and outside the enclosure over the lifetime of the BEMP.
- A blanket bog condition assessment utilising i) the latest Biodiversity Metric[6] condition assessment pro-forma and methodology, and/or ii) a CSM[5] blanket bog site condition survey, at representative locations within finalised Habitat Management Area A.
- Any peat hagg or surface reprofiling works, and any installed peat dams, would be monitored to ensure works are successful over the first three years after works are completed. Remedial measures would be undertaken if restoration works have failed.

[20] MacDonald, A., Stevens, P., Armstrong, H., Immirzi, P and Reynolds, P. (1998). A Guide to Upland Habitats - Surveying Land Management Impacts - Volume 2, Field Guide. Scottish Natural Heritage, Edinburgh.

- The presence of encroaching self-seeded conifer trees and new broadleaved seedlings would be monitored.

7.2 Aims 2, 3, 4 and 7: Promote native broadleaved woodland cover and hedgerows (Habitat Management Areas B, C, D and G)

Monitoring would be undertaken in Habitat Management Areas B, C, D and G to ensure the establishment of the broadleaved woodland and hedgerows planted.

A professional forester would monitor the planted areas in Years 1-5 following planting to ensure successful establishment, specifically looking for evidence of damage (e.g., browsing) or disease. Failed specimens should be replaced in the consecutive winter (i.e., between November and March). The forester would also advise on whether any further management or maintenance is required to ensure the establishment of the trees or hedgerows. Any additional measures would be discussed and agreed within the Biodiversity Montoring Group (BMG).

These areas would be monitored again by a professional forester in operational Year 10 to ensure that there are no issues with disease or invasive species and to determine if any thinning at this stage would benefit woodland establishment. Monitoring would be undertaken again in operational Year 20 when some thinning operations may be required in woodland in order to encourage growth of better trees and create more open woodland, further new enhancement/enrichment planting may also be considered at this stage. This would aid regeneration of seedlings and begin the process of establishing a mixed age structure.

Each finalised Habitat Management Areas respective target habitat type and target condition category would also be assessed and monitored using the latest Biodiversity Metric[6] condition assessment pro-forma and methodology with the following habitat specific intervals:

- Habitats Management Areas, B, C and D – Broadleaved Woodland: Year 10 (after planting) and every 5 years thereafter; and
- Habitat Management Area G – Hedgerows: Years 3, 5, 7, 10 and every 5 years thereafter.

7.3 Aim 5: Species-rich meadow/grassland creation (Habitat Management Area E)

Monitoring in finalised Habitat Management Area E would likely include:

- Vegetation monitoring through the establishment of a representative sample of permanent quadrats to record changes to the composition of the vegetation and species abundance, evenness and diversity.

  The respective monitoring surveys would be carried out at the most appropriate times of year (and prior to any cutting). Repeat surveys would be carried out in the same month in each monitoring year (Years 1, 3, 5, 7, 10, 15) to gather comparable data. Photographs would also be taken of each sample quadrat, as well as overview photographs of the Management Unit;
- A relevant grassland condition assessment utilising i) the latest Biodiversity Metric[6] condition assessment pro-forma and methodology, and/or ii) a CSM[5] grassland site condition survey;

- A pollinator survey (specifically bees, moths and butterflies) in each monitoring year (Years 1, 3, 5, 7, 10, 15) to track species presence and abundance over time. Surveys would be conducted in the summer on warm sunny days, prior to any cutting (if applicable); and
- Sward height monitoring over a number of transects within the Management Unit (the sward should mostly be between 5 cm – 20 cm for a neutral meadow[21]).

7.4 Aim 6: Meadow Grassland Enhancement (Habitat Management Area F)

Monitoring in finalised Habitat Management Area F would likely include:

- Bracken monitoring, such as mapping extent and change over time.
- Grassland monitoring through the establishment of a representative sample of permanent quadrats to record changes to the composition of the vegetation and species abundance, evenness and diversity.

  The respective monitoring surveys would be carried out at the most appropriate times of year. Repeat surveys would be carried out in the same month in each monitoring year (Years 1, 3, 5, 10, 15) to gather comparable data. Photographs would also be taken of each sample quadrat, as well as overview photographs of the Habitat Management Area.
- A relevant grassland condition assessment utilising i) the latest Biodiversity Metric[6] condition assessment pro-forma and methodology, and/or ii) a CSM[5] grassland site condition survey, at representative locations within Habitat Management Area F.
- Target Notes of any substantial areas of injurious weeds such as docks, ragwort and creeping thistle.

7.5 Aim 8: Breeding Wader (Habitat Management Area H)

Monitoring in finalised Habitat Management Area H (sub-units H1 and H2) would likely include:

- Breeding wader surveys undertaken in accordance with species-specific methodologies agreed in consultation with the CVWI.
- Monitoring surveys would be annually, at least initially e.g. for at least the first five years, and then at a frequency agreed with the BAC for the remaining implementation of the BEMP.
- Compliance monitoring of habitat management prescriptions would also be undertaken in accordance with protocols agreed in consultation with CVWI. Monitoring would be carried out annually, at least initially, and then at a frequency agreed with the BAC over the duration of the BEMP implementation.

8 REPORTING & BEMP REVIEW

A report would be submitted by the wind farm owner to the BAC in Years 1, 2, 3, 4 and 5 of operation, the frequency of reporting after Year 5 would be agreed by the BAC.

[21] https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/species-rich-grassland-management/guidance-for-species-rich-grassland-management/

This report will detail:

- Management undertaken in the past year(s);
- Monitoring undertaken, results and discussion of results; and
- Management and monitoring proposed for the following year(s).

The BAC may meet periodically to discuss the reports and management of the BEA, if this is considered necessary by the members of the BAC.

Where monitoring indicates any management objectives are not met, further management prescriptions or interventions would be agreed by the BAC.

In addition, it is proposed the BEMP would be reviewed by the BAC every five years from its commencement, or earlier if the BAC consider it necessary. The purpose of the review will be to assess the effectiveness of the proposed management prescriptions at achieving the aims and objectives of the BEMP. If necessary, such measures may be amended by the BAC (in agreement with SLC and under the advice of the BAC) at any time.

ANNEX A. MANAGEMENT AND MONITORING TIMETABLE

Table A-8-1 Indicative Management and Monitoring Timetable

Year	0*	1**	2	3	4	5	6	7	8	9	10	11	12	13	14	15…
Work Item	**Year of Implementation**															
Management Prescriptions																
Peat hagg reprofiling (Habitat Management Area A)	✓	✓														
Livestock exclusion fencing to allow management (Habitat Management Areas B, C and D)	✓															
Livestock/deer exclusion fencing (Management Unit B)	As required following staggered felling and replanting															
Ground preparation and sowing (Habitat Management Areas B, C, D E and G)	✓															
Excluded activities as per Prescription 1.5 (Habitat Management Areas A – F)	Throughout lifetime of BEMP															
Native hedgerow planting/creation (Habitat Management Area G)	✓	✓														
Grassland management vis grazing or mowing/baling (Habitat Management Area F)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Control competing vegetation in the first two years of hedgerow establishment (Habitat Management Area G)	✓	✓														
Removal of tree tubes (Habitat Management Areas B, C and D)											✓[22]					
Hedgerow management (Management Unit G)			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Monitoring																
Inspection of peat hagg reprofiling (Habitat Management Area A)		✓	✓	✓												
Vegetation monitoring and condition assessments (Habitat Management Areas A, E and F)		✓		✓		✓					✓					✓

[22] Fast growing species may require the removal of trees guards before Year 10, to prevent damage. This would be informed by forestry monitoring surveys.

Year	0*	1**	2	3	4	5	6	7	8	9	10	11	12	13	14	15…
Woodland & hedgerow establishment/growth monitoring – (Habitat Management Areas B, C, D and G[23])		✓	✓	✓	✓	✓	As required									
Broadleaved woodland condition assessment (Habitat Management Area B)											✓					✓
Hedgerow condition assessment (Habitat Management Area G)				✓		✓		✓			✓					✓
Reporting / Reviews																
BEMP Report		✓		✓		✓	Reporting schedule after Year 5 to be agreed by the BMG									
BMG 5-year review of BEMP						✓					✓					✓

* Construction Phase

**First year after final commissioning of the Proposed Development.

[23] Following initial planting, any failed specimens recorded during forestry monitoring surveys would be replaced during a "beating up" second planting period to be determined.

Technical Appendix 6.7: Ecology Methodology

M74 West Renewable Energy Park

Ecological Impact Assessment Methodology

Technical Appendix 6.7

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CONTENTS

LIST OF TABLES

1 INTRODUCTION

MacArthur Green has prepared this Method of Assessment for the Ecology Chapter of the Environmental Impact Assessment Report (EIAR) on behalf of M74 West Limited (the Applicant) in regard to the proposed M74 West Renewable Energy Park, hereafter referred to as the 'Proposed Development'.

2 METHOD OF ASSESSMENT

The assessment methodology, including criteria for assessing sensitivity of receptors, magnitude of change and cumulative effects, is outlined below .

The significance of the potential effects of the Proposed Development has been assessed by professional consideration of the sensitivity of the ecological features and the spatial and temporal magnitude of the potential effects.

The assessment method follows the process set out in The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017[1] , Chartered Institute of Ecology and Environmental Management (CIEEM) (2022)[2] and guidance on the implementation of the EU Birds and Habitats Directive (SERAD, 2001)[3] .

The assessment for wider countryside interests (i.e., unrelated to any Natura 2000 sites) involves the following process:

- identification of the potential ecological effects of the Proposed Development on ecological features, including both positive and negative;
- considering the likelihood of occurrence of potential effects;
- defining the nature conservation value and conservation status of the ecological features present to determine sensitivity;
- establishing the magnitude of change associated with the potential effect (both spatial and temporal);
- based on the above information, making a professional judgement as to whether or not the resultant effect is significant in terms of the EIA Regulations;
- if a potential effect is determined to be significant, measures to avoid, reduce, mitigate or compensate for the effect are suggested where required;
- considering opportunities for enhancement where appropriate; and
- confirming residual effects after mitigation, compensation or enhancement are considered.

2.1.1 Sensitivity of Ecological Features

The sensitivity of the baseline conditions, including the importance of ecological features on or near to the Site, or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and/or professional judgement.

[1] Scottish Government (2017d). The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/101/contents
[2] CIEEM (2022). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
[3] SERAD (2001). European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements.

Determination of the level of sensitivity of an Important Ecological Feature (IEF) is based on a combination of the feature's nature conservation value and conservation status. Nature conservation value is defined on the basis of the geographic context shown in **Table 2-1**, which follows the CIEEM (2018) guidance.

Attributing a value to an ecological feature is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of an importance level. For example, the Moorfoot Hills SAC is designated under the Habitats Directive and is therefore implicitly of European (international) importance. In the case of species, assigning value is less straightforward as contextual information about distribution and abundance is fundamental, including trends based on historical records. This means that even though a species may be protected through legislation at a national or international level, the relative value of the population on site may be quite different (e.g., the site population may consist of a single transitory animal, which within the context of a thriving local/regional/national population of a species, is therefore of local or regional value as opposed to national or international).

Determination of the level of importance of ecosystems, habitats and species is based on professional judgement and a combination of factors, such as level of protection, rarity, conservation status, population trends, and quality/extent of the feature in the study area. Published evaluation criteria (e.g., the SBL and JNCC (2022)) are used where relevant. Where appropriate, information regarding the particular ecological feature's conservation status is also considered to fully define its importance. This enables an appreciation of current population or habitat trends to be incorporated into the assessment.

In line with the CIEEM (2018) guidance, it is not necessary to carry out detailed assessment on features that are sufficiently widespread, unthreatened, and resilient to effects of the Proposed Development . However, those IEF affected by the Proposed Development are taken forward for assessment.

Table 2-1: Approach to Valuing Ecological Features

Value of Feature in Geographical Context	Description
International/European	An internationally designated site (e.g., SAC), or undesignated areas that meet the criteria for international designations, or qualifying species whose presence contributes to the maintenance of such a site.
	Species present in internationally important numbers (>1 % of biogeographic populations).
National (UK)	A nationally designated site (e.g., SSSI, or a National Nature Reserve ('NNR')), or sites meeting the criteria for national designation or qualifying species whose presence contributes to the maintenance of such a site.
	Species present in nationally important numbers (>1 % of UK population).
Regional (Natural Heritage Zone or Local Authority Area)	Regionally significant and viable areas of key habitat identified in a regional Biodiversity Action Plan ('BAP').
	Species present in regionally important numbers (>1 % of Natural Heritage Zone ('NHZ') population).
	Areas of key habitat falling below criteria for selection as a SSSI (e.g., areas of semi-natural ancient woodland larger than 0.25 hectares (ha)).

Value of Feature in Geographical Context	Description
Local	A site within the local area designated for nature conservation (e.g., Local Nature Reserves).
	Areas of semi-natural ancient woodland smaller than 0.25 ha.
	Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g., species-rich flushes or hedgerows
Negligible	Usually widespread and common habitats and species that do not meet the above criteria. Features falling below local value are not normally considered in detail in the assessment process.

2.1.2 Magnitude of Effect

The magnitude of potential effects refers to changes in the extent and integrity of an ecological feature. The following definition of ecological 'integrity' is found within Scottish Executive circular 6/1995 (updated by Scottish Executive (2000)): "The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified" . Although this definition is used specifically regarding European level designated sites (e.g., an SAC), it is applied to wider countryside habitats and species for the purposes of this assessment.

The magnitude of potential effects will be identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development, how the ecological features are likely to respond to the Proposed Development, the duration and reversibility of an effect and the application of professional judgement, best practice guidance and legislation. This change can occur during construction or operation of the Proposed Development, and effects can be beneficial, neutral or adverse.

Effects are determined in terms of magnitude in space and time. There are five levels of spatial effects and five levels of temporal effects, described in **Table 2-2** and **Table 2-3**.

Table 2-2: Definition of Spatial Effect Magnitude upon the IEFs

Magnitude of Effects	Definition
Very High	Would cause the loss of the majority of a feature (>80 %) or would damage a feature sufficiently to immediately affect its integrity.
High	Would have a major effect on the feature or its integrity, for example more than 20 % habitat loss or damage.
Medium	Would have a moderate effect on the feature or its integrity, for example between 10 and 20 % habitat loss or damage.
Low	Would have a minor effect upon the feature or its integrity, for example, less than 10 % habitat loss or damage.
Negligible	Minimal change on a very small scale; effects not dissimilar to those expected within a 'do nothing' scenario.

Table 2-3: Definition of Temporal Effect Magnitude upon the IEFs

Magnitude of Effects	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken here as >30 years), except where there is likely to be substantial improvement after this period in which case the category Long Term may be more appropriate.
Long Term	Between 15 years up to (and including) 30 years.
Medium Term	Between 5 years up to (but not including) 15 years.
Short Term	Up to (but not including) 5 years.
Negligible	No effect.

2.1.3 Significance of Effect

The significance of potential effects is determined through a standard method of assessment based on professional judgement and available evidence, considering the sensitivity (nature conservation value and conservation status) of the IEF, and the nature and magnitude of effect, in a reasoned way.

A 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for IEFs or for biodiversity generally . Broadly, significant effects include those which result from impacts on the structure and function of defined sites, habitats or ecosystems, and the conservation status of habitats and species (including extent, abundance and distribution) .

Table 2-4 sets out the significance criteria used to assess the potential effects of the Proposed Development.

Table 2-4: Significance Criteria

Magnitude of Effects	Definition
Major	Significant effect, as the effect is likely to result in a long term significant adverse effect on the structure and function of defined sites, habitats or ecosystems or on the conservation status of habitat and species.
Moderate	Significant effect, as the effect is likely to result in a medium term or partially significant adverse effect on the structure and function of defined sites, habitats or ecosystems or on the conservation status of habitats and species.
Minor	Not a Significant effect, the effect is likely to adversely affect the feature at a low level by virtue of its limited duration and/or extent, but there will probably be no effect on the structure and function of defined sites, habitats or ecosystems or on the conservation status of habitats and species.
Negligible	No material effect. The effect is assessed to be Not Significant.

Using these definitions and the four categories above, it must then be decided whether there would be any effects which would be sufficient to adversely affect the IEF to the extent that its conservation status deteriorates from that which would be expected should baseline conditions remain (i.e., the 'do nothing' scenario).

Major and moderate effects are considered to be significant within the context of the EIA Regulations.

Where significant adverse effects are identified, mitigation and/or compensation is required to reduce or offset effects where possible , including avoidance or reduction through implementation

of and compliance with best practice guidance and protected species legislation. Effects that are not significant would be expected to be avoided or reduced through compliance with best practice guidance and protected species legislation.

Residual effects are characterised as either adverse, neutral or beneficial and either significant or not significant, taking mitigation proposals into account.

2.1.4 Cumulative Assessment

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated to a particular location . As such, NatureScot guidance (2021[4]) sets out that cumulative effects require the assessment of the effects of the Proposed Development together with other developments, projects or activities . In the interests of focusing on the potential for significant effects, this assessment considers the potential for cumulative effects with other onshore wind farm EIA developments within 5 kilometres (km) of the Proposed Development. The context in which these effects are considered is heavily dependent on the ecology of the features assessed. For example, for water voles it may be appropriate to consider effects specific to individual catchments, should the distance between neighbouring catchments be sufficient to assume no movement of animals between them, whereas for blanket bog, the region or NHZ may be the relevant spatial scale. Therefore, where it is considered necessary, an assessment of cumulative effects will be made for each feature, appropriate to its ecology.

[4] NatureScot (2021). Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments (update to 2012 guidance). [Online] Available at: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments.