Cairnmore Hill Wind Farm
Biodiversity Enhancement Management Plan

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1   INTRODUCTION

MacArthur Green was commissioned by RES Ltd (the Applicant) to prepare a Biodiversity Enhancement Management Plan (BEMP) with supporting Biodiversity Net Gain (BNG) metric for the proposed Cairnmore Hill Wind Farm (hereafter referred to as the 'Proposed Development').

This BEMP details the proposed habitat and conservation management measures to enhance biodiversity within the site (i.e., the area encompassed by the Proposed Development's application boundary).

This BEMP is set out in the following sections:

- The Site & Baseline Conditions;

- Biodiversity Net Gain (BNG);

- Biodiversity Enhancement Area;

- Aims, Objectives and Management Prescriptions;

- BNG Assessment;

- Monitoring;

- Reporting & BEMP Review; and

- Management and Monitoring Timetable.

The management recommendations within this BEMP are based on the findings of Chapter 7: Ecology and Chapter 8: Ornithology of the Cairnmore Hill Wind Farm Environmental Impact Assessment (EIA) Report and a further site walkover survey in May 2023 to specifically look at realistic and viable options for biodiversity enhancement onsite. The key habitats addressed are wet dwarf shrub heath, the key ornithological species for consideration are waders.

The measures detailed within this BEMP aim to achieve significant biodiversity enhancement at the site, in line with objectives outlined in National Planning Framework 4 (NPF4) Policy 3[1]. A BNG metric is utilised to demonstrate the measures proposed for the creation and enhancement of habitats would result in a 16% increase in the biodiversity value of the site post construction.

A Biodiversity Management Group (BMG) will oversee and monitor the implementation of the agreed BEMP. The BMG should include representatives from The Highland Council (THC), NatureScot and the wind farm owner.

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

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[1] Scottish Government (2023). National Planning Framework 4. Available at:
https://www.gov.scot/publications/national-planning-framework-4/ [Accessed June 2023].

2 THE SITE & BASELINE CONDITIONS

2.1 Site Description

The Proposed Development (the site) is for up to five turbines and associated infrastructure (as fully described in Chapter 2: Proposed Development of the EIA Report). The site covers an area of approximately 3.59 km² located approximately 4.5 km northwest of Thurso on the north coast of Caithness in the Scottish Highlands.

The site is low lying and gently undulating, with its highest points lying just over 140 m above sea level in the northeast of the site by Ravens Hill and 138 m above sea level at Hill of Forss within the centre of the site; Cairnmore Hillock reaches 134 m to the west of the site. The southern central area of the site is a level plateau of heathland on shallow peat/organo-mineral soils. From the central area and towards the outer edges of the site the ground generally gently slopes away, and the peat/organo-mineral soil habitats give way to mineral soils. Several widespread minor watercourses drain the site.

2.2 Baseline Conditions

2.2.1 Ecology

The site does not overlap with any ecologically designated sites.

As per Figure 1, the site habitats can be split into a few broad zones: the north of the site around Taldale and Forss Holdings are mainly comprised of improved and semi-improved grasslands, whereas the central and more elevated parts of the site around Hill of Forss and Cairnmore Hillock are dominated by wet dwarf shrub heath; these grassland and heath areas are intensively grazed by sheep. The southeast portion of the site from around Blackheath to Glenburnie is predominately arable cropland interspersed with some strips and patches of neutral grassland. Scattered throughout the site there are also small patches of several other habitat types, such as marshy grassland, swamps and gorse (*Ulex europaeus*) scrub. There is no woodland within the site.

The wet heath within the site is dominated by National Vegetation Classification (NVC) type M15 *Trichophorum germanicum – Erica tetralix* wet heath. The M15 present has a species assemblage which contains varying amounts of characteristic species such as heather (*Calluna vulgaris*), cross-leaved heath (*Erica tetralix*), deergrass (*Trichophorum germanicum*), bog asphodel (*Narthecium ossifragum*), heath rush (*Juncus squarrosus*) and sedges (*Carex* spp.); in the basal layer mosses tend to be pleurocarpous mosses with frequent to abundant lichens (*Cladonia* spp.), and there is only sparse Sphagna (usually *Sphagnum capillifolium*). However, the M15 present is considered to be heavily degraded and of poor quality due to overgrazing, trampling, drainage and burning; there are often patches of bare earth/peat and prostrate and very short, clipped vegetation. There are intricately linked areas of a similar and related non-NVC vegetation type characterised by small sedges, which was termed a small sedge mire; code used in the EIA Report was 'SSM'.

Baseline surveys over several years for the EIA Report did not record any evidence of otter, badger, water vole, red squirrel, pine marten or reptiles on the site. Fish habitat surveys also indicated that none of the watercourses within the site were suitable for containing fish. Automated bat activity

survey recorded low number of bats using the site, with four species and one bat genus classification recorded: common pipistrelle, soprano pipistrelle, Daubenton's and Natterer's bat.

2.2.2 Ornithology

The site does not overlap with any ornithological designated sites.

Baseline surveys of the site over several years recorded range of upland, and some coastal species, as detailed within Chapter 8: Ornithology of the EIA Report. Much of the bird activity at the site and locally was from subsequently scoped in species, i.e., geese and swans, and waders, specifically curlew, lapwing and golden plover.

2.3 Existing Land Use & Management

The site is split across a number of landowners. As noted above, the southeast portion of the site from around Blackheath to Glenburnie is predominately arable cropland and planted with cereal crops.

The remainder of the site is grazed by sheep to varying levels. The heathland parts of the site covered by the Biodiversity Enhancement Area (BEA; see Section 4) are generally grazed from December to March by approximately 300 sheep.

No routine deer management is undertaken within the site.

2.4 Assessment of Potential Effects

2.4.1 Ecology

The only ecology receptor scoped in and assessed within the Proposed Developments EIA Report was wet heath. The direct and potential indirect loss of wet heath was considered minor and not significant within the context of the site and the wider area.

Overall habitat loss for the Proposed Development, for all habitat types combined, was predicted to be 4.73 ha, comprised of 3.57 ha for permanent infrastructure and 1.16 ha for temporary infrastructure (to be reinstated at the end of construction).

2.4.2 Ornithology

Of the ornithological receptors scoped into the ornithological impact assessment the unmitigated effects were considered to be as follows:

- Geese & Swans – minor adverse and not significant;

- Curlew & Lapwing – minor adverse and not significant; and

- Golden Plover – negligible-minor adverse and not significant.

3 BIODIVERSITY NET GAIN

Biodiversity Net Gain (BNG) is a process which follows the principal of biodiversity enhancement and leaves nature in a better state than before development work started.

In the current absence of a Scottish Government or NatureScot developed or adopted BNG Metric tool, Scottish & Southern Energy Renewables (SSER) has developed a BNG toolkit[2] based upon the Natural England Biodiversity Metric 3.1[3] which aims to quantify biodiversity based upon the value of habitats for nature. It is a method for demonstrating whether development projects have been able to maintain or increase the biodiversity value of a development site after construction works. This SSER BNG toolkit has been utilised here to undertake a BNG assessment for the site and the measures proposed within this BEMP.

The scope of the BNG assessment is to quantify the overall potential biodiversity impacts for the Proposed Development; this includes a biodiversity baseline assessment, analysis of habitat losses due to temporary works and permanent structures (e.g., tracks and hardstandings) during construction works, and analysis of biodiversity gains following reinstatement of habitats in areas of temporary construction work and additional habitat enhancement and creation.

The area used within the BNG assessment includes the full site boundary and is based upon the NVC and habitat surveys undertaken for the EIA Report. This data was further supplemented by a site walkover in May 2023 which updated the habitat mapping in some areas and filled any gaps in site coverage (presented in Figure 1). The site walkover was also undertaken to gather further information on the current condition and quality of the site baseline habitats, and to explore realistic and viable options for biodiversity enhancement onsite.

4 BIODIVERSITY ENHANCEMENT AREA

The Biodiversity Enhancement Area (BEA) will comprise of four Management Units (Units A – D), each focussing on a particular habitat type, with Unit B being split further into three sub-units (i.e., B1 – B3: see Figure 2). The overall BEA covers a total area of 76.45 ha and 2,385 m of linear features. Habitat and biodiversity management and monitoring works would be undertaken within these respective Management Units. Details of each management unit are provided below.

The overall goal of the BEMP is to restore, enhance and create habitats of ecological value within the site via these Management Units, which in turn will benefit existing flora and fauna as well as increase biodiversity in general. The detailed Aims, Objectives and Management Prescriptions are detailed in Section 5.

4.1 Management Units

4.1.1 Management Unit A – Wet Dwarf Shrub Heath Restoration

Management Unit A covers 66.33 ha and is predominantly comprised of wet heath habitats with some interspersed smaller areas of small sedge mire (combined total approximately 56.68 ha). The wet heath here is heavily degraded, primarily through decades of intensive grazing and trampling.

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[2] https://www.sserenewables.com/sustainability/biodiversity-net-gain/
[3] Natural England (2022) The Biodiversity Metric 3.1.
https://nepubprod.appspot.com/publication/5850908674228224

This has resulted in a wet heath that is at the driest end of the wet heath spectrum with a species-poor sward that for the most part is only a few centimetres tall, prostrate and clipped short by grazing pressure. There are frequently patches of bare peat/organo-mineral soil and evidence of poaching by livestock. There are few active drains in this area, but where historical drainage lines are present these have now largely infilled and add some species diversity to an otherwise largely homogenous landscape due to the regular presence of a slightly more flushed vegetation in these drainage lines, which often includes species such as black bog rush (*Schoenus nigricans*) and small sedges (*Carex* spp.).

Comparing against the Common Standards Monitoring (CSM)[4] criteria for wet heath, the wet heath present on site would be considered to be in unfavourable condition, as it fails to meet several criteria with regards to vegetation composition/cover, vegetation structure and levels of browsing, erosion and disturbance. Additionally, when compared to the condition assessment criteria within the respective Biodiversity Metrics[2,5] then the wet heath present fails on many criteria and would be classified in the 'Poor' category.

With suitable management, the aim is to enhance the wet heath present to a condition category of Good within 30 years; these condition criteria and time to target conditions are derived from the respective BNG metrics and experience.

Restoring the wet heath to Good condition will increase the vegetations structural and species diversity, reduce the negative impacts of browsing, reduce erosion and disturbance and carbon losses from the peaty-soils and enhance the habitats for various fauna. Restoration of the heath will enhance the breeding, wintering, and foraging habitats for various species, from invertebrates to the local bird populations (including waders).

The key method in the restoration of the wet heath will be grazing and livestock management.

4.1.2   Management Unit B – Native Broadleaved Woodland Creation

Management Unit B is 5.57 ha and is made up of three smaller sub-units (B1 – B3), as per Figure 2.

The existing habitat types within Management Unit B are a mix of generally lower conservation value and common neutral and acid semi-improved grassland habitats, primarily NVC types MG10 and U4b (i.e., the semi-improved form of U4).

The aim within Management Unit B is to create areas of semi-natural appearing broadleaved woodland. This will involve the planting of a range of broadleaved species in non-uniform patterns and densities within the respective sub-units. The woodland and planting will aim to reflect the canopy composition of W7/W10/W11 NVC woodland types depending on the respective soil conditions within each sub-unit. There is no peatland nor sensitive groundwater dependent terrestrial ecosystems (GWDTEs)[6] within Management Unit B, and as such it is all available for planting.

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[4] https://jncc.gov.uk/our-work/common-standards-monitoring
[5] https://publications.naturalengland.org.uk/publication/6049804846366720
[6] https://forestry.gov.scot/publications/117-briefing-note-18-publication-of-gwdte-practice-guide

With suitable management, the aim is to create a broadleaved woodland with a condition category of Moderate in 15 years (condition criteria and time to target conditions are derived from the respective BNG metrics and experience).

There is currently no woodland within the site, and it is sparse locally, therefore the creation of broadleaved woodland is a clear biodiversity enhancement and gain for the site. The creation of woodland has multiple beneficial biodiversity effects, the planting of trees in a treeless environment will itself increase floral species diversity as well as creating structure and new breeding, shelter and foraging habitats for a range of species. There are also many secondary benefits of woodland creation, such as natural flood management, shade, carbon sequestration and helping to mitigate the effects of climate change.

4.1.3   Management Unit C – Native Mixed Scrub Enhancement/Creation

Management Unit C is 4.55 ha and currently comprised of predominantly acid grassland (NVC types U4 and U5) with a few scattered bushes of gorse. The area is intensively grazed by sheep so there is a short grass sward with reduced species diversity. The only scrub species present within the site is gorse, and grazing supresses the opportunity for further scrub establishment.

The aim within Management Unit C is primarily to create a mosaic of scattered mixed scrub within the grassland, and secondly to reduce pressures on the remaining grassland in order to enable a taller and more varied grassland sward which allows wildflowers to develop and set seed. Therefore, management in Unit C will involve the planting of a range of scrub species in scattered and non-uniform patterns and densities, a low number of broadleaved trees would also be included within the planting mix to further enhance the long-term structure and diversity. There is no peatland nor sensitive GWDTEs within Management Unit C, and as such it is all available for planting.

With suitable management, the aim is to create an area of mixed scrub with grassland glades/opening with a condition category of Good in 10 years (condition criteria and time to target conditions are derived from the respective BNG metrics and experience).

Gorse is the only scrub species present within the site and therefore the enhancement of the scrub and grassland mosaic and the creation of more diverse and species-rich scrub will provide biodiversity enhancement at the site and create new shelter and foraging habitats for a range of species.

4.1.4   Management Unit D – Native Hedgerow Creation

Management Unit D is linear and covers approximately 2,385 m. In the north of the site and in parts of the west of the site there is a network of post and wire stock fences that create the field boundaries for many of the more improved grassland areas.

The aim for Management Unit D is to create native and species-rich hedgerows, these will be planted along existing post and wire fences and also along the edges of the proposed new track from the junction with the A836 and through the improved grassland fields south of Taldale, see Figure 2.

With suitable management, the aim is to create hedgerows with a condition category of Good within 12 years (condition criteria and time to target conditions are derived from the respective BNG metrics).

The hedgerows will provide further species diversity and create habitat corridors for a range of species and in general further enhance habitat connectivity and the site's biodiversity.

5 AIMS, OBJECTIVES AND MANAGEMENT PRESCRIPTIONS

The Aims define the general BEMP goals, and the related Objectives further define the Aims into quantifiable targets. The Prescriptions detail the indicative management works to be implemented to achieve these Aims and Objectives. Annex A provides an indicative timetable for the implementation of the various Prescriptions.

5.1 Aim 1: Restore and enhance wet dwarf shrub heath (Management Unit A)

Objective 1.1   Achieve Good condition wet heath within 30 years.

Objective 1.2   Increase the abundance and distribution of dwarf shrubs (other than *Calluna vulgaris*) such as *Erica* spp., *Empetrum nigrum* and *Vaccinium* spp. and Sphagna such as *Sphagnum capillifolium* in line with local reference wet heath.

Objective 1.3   Create a more varied sward of *Calluna vulgaris*, in both height and age classes.

Objective 1.4   Reduce bare peat/soil to <1% of the area

Objective 1.5   Improve habitat suitability for upland waders.

Prescription 1.1   All livestock to be removed and no grazing permissible until after Year 5 of the operational phase.
After Year 5 the following initial grazing regime is proposed:
- No grazing between 1 October and the last day of February.
- From 1 March to 30 September graze at no more than 0.075LU/ha (i.e., no more than 33 ewes for Management Unit A).

The grazing regime may be adjusted in the future, following monitoring and in agreement with the BMG, if this is required to meet the respective aims and objectives.

Prescription 1.2   Dam actively flowing drains[7] (even if vegetated) in order that the water level is raised to create wetter areas and enhance conditions for a range of wet heath species, including Sphagna. This should be carried out under the supervision of a suitably qualified ECoW.

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[7] According to methodology detailed in: Peatland Action (2022) Technical Compendium. Available at: https://www.nature.scot/doc/peatland-action-technical-compendium [Accessed May 2023].

Prescription 1.3   The following activities would be prohibited within the Management Unit:

- supplementary feeding of livestock;

- clearing out of existing ditches;

- application of any insecticides, fungicides or molluscicides;

- application of lime or any other substance to alter the soil acidity;

- cutting, topping or spraying 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 or low impact vehicles (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: Promote native broadleaved woodland cover and increased site biodiversity (Management Unit B)

Objective 2.1   Create areas of native broadleaved woodland and increase diversity within the site, seeking to achieve Moderate condition broadleaved woodland in 15 years.

Objective 2.2   Increase faunal diversity within the site by providing more habitat structure and new breeding, shelter and foraging habitats, for instance for woodland passerines, bats and other small mammals and invertebrates.

Prescription 2.1   Undertake native broadleaved woodland planting within Management Unit B and respective sub-units. Planting will be non-uniform patterns and of variable densities on advice from a professional forester and utilise low impact ground preparation techniques such as screefing or inverted mounding[8].

Given the locations of Management Unit B sub-units, and the prevailing existing habitats and generally drier acid to neutral soils it is anticipated that the species mixes here would primarily contain 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*),

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[8] Scottish Forestry. (2021). Cultivation for upland productive woodland creation sites: applicants' guidance. https://forestry.gov.scot/publications/1032-cultivation-for-upland-productive-woodland-creation-sites-applicant-s-guidance

sessile oak (*Quercus petraea*), goat willow (*Salix caprea*), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), bird and/or wild cherry (*Prunus* spp.), and holly (*Ilex aquifolium*). Sub-units B1 and B2 contain smaller areas with some damper neutral soils (indicated by the presence of NVC type MG10) and the species mix here would be supplemented with alder (*Alnus glutinosa*) and grey willow (*Salix cinerea*).

Exact proportions of species and their planting locations would be determined by a forester, in agreement with a suitably qualified ecologist, during the pre-construction period and refined 'on the ground' during construction.

Tree planting will be initiated during construction and be completed by the end of the construction period. 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   Stock fencing of sub-units B1 – B3 may be required to protect new trees from livestock browsing during the establishment phase.

All trees will be planted in 1 - 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 will be removed after approximately 10 years or after adequate establishment of the trees.

Prescription 2.3   To increase the success of tree establishment a 1 m ring of vegetation will be cut around each tree in spring for the first three years after planting. Application of herbicide will be avoided.

5.3   Aim 3: Promote species-rich native scrub cover and increased site biodiversity (Management Unit C)

Objective 3.1   Create areas of native mixed scrub and increase floral diversity within the site, seeking to achieve Good condition mixed scrub in 10 years.

Objective 3.2   Increase faunal diversity within the site by providing more habitat structure and new breeding, shelter and foraging habitats.

Prescription 3.1   Undertake scrub planting within Management Unit C. Planting will be non-uniform patterns and of variable densities on advice from a professional forester and utilise low impact ground preparation techniques such as screefing or inverted mounding. Planting will also be scattered in order to retain areas of grassland and to allow the formation of grassland glades/openings and a mixed scrub – grassland mosaic.

The area already contains gorse. The scrub planting will supplement this with primarily hawthorn, but the planting species mix would also include blackthorn (*Prunus spinosa*), common juniper (*Juniperus communis*), hazel and holly.

In addition, a low number of scattered broadleaved tree species would be included (birch and rowan) to further enhance the long-term structure and diversity.

Exact proportions of species and their planting locations would be determined by a forester, in agreement with a suitably qualified ecologist, during the pre-construction period and refined 'on the ground' during construction.

Scrub planting will be initiated during construction and be completed by the end of the construction period. Planting would be carried out between the months of November and March when plants 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   Management Unit C is situated within and surrounded by Management Unit A. It is not proposed to fence off Management Unit C as the livestock/grazing management proposed in Prescription 1.1 should allow the establishment of scrub. However, scrub and trees will be planted in tree tubes to protect from possible browsing damage. Tree tubes will be removed after approximately 5 years or after adequate establishment of the scrub.

Prescription 3.3   Prescription 1.3 also applies here (with the exception of tree planting).

5.4   Aim 4: Create, and increase the extent of, native hedgerows (Management Unit D)

Objective 4.1   Create approximately 2,385 m of new species-rich hedgerow[9] to create and enhance habitat corridor connectivity, seeking to achieve a condition category of Good in 12 years.

Prescription 4.1   Plant approximately 2,385 m of new native species-rich hedgerows in the areas outlined in Figure 3.

The hedgerows are likely to consist of 60-80% hawthorn with crab apple (*Malus sylvestris*), hazel, blackthorn and holly making up the remainder of the species-mix. Some trees may also be included within the hedge.

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 4.2   Protect young and developing hedge plants from browsing by animals via livestock fencing and guards/tree tubes. The fence would be situated a

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[9] 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]

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 4.3   Control competing vegetation in the first two years of establishment. Using strimming, a mulch, or if necessary, an appropriate herbicide.

Prescription 4.4   The hedgerow would be managed in line with best practice and relevant guidance[10], 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

6   BNG ASSESSMENT

6.1   Overview

The biodiversity of the site was quantified using the SSER biodiversity toolkit[2] and includes:

- quantitative assessment to determine the biodiversity baseline of the site prior to development based on the habitats data collected for the Proposed Development;
- assessing the loss of habitat during construction; and
- analysis of the biodiversity value following works, with retention and creation/restoration of habitats onsite.

Habitat quality (distinctiveness, condition, strategic significance and connectivity) was determined for each Phase 1 habitat type by reviewing the habitats survey data, May 2023 walkover data and surveyor experience, and referring to the following guidance:

- SSER BNG Toolkit User Guide[2];
- Natural England Biodiversity Metric 3.1[3] and 4.0[11] – User Guide, Technical Supplements, and Habitat Condition Assessment; and

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[10] e.g., https://hedgelink.org.uk/
[11] https://publications.naturalengland.org.uk/publication/6049804846366720

- JNCC Common Standards Monitoring (CSM)[4] criteria (used to aid some habitat condition assessments).

The boundary for the baseline biodiversity assessment equates to the site boundary (Figure 1).

6.2 Limitations to the BNG Assessment

6.2.1 Baseline Biodiversity

Due to the feasibility of quantifying the quality of all habitat parcels (distinctiveness, condition, strategic significance, and connectivity) covering a large area, overall values were assigned for each Phase 1 habitat type. Where habitats exhibited variable quality, a precautionary approach was taken.

The watercourses onsite are small unmappable features, often no more than managed drainage channels present on 1:10,000 Ordnance Survey (OS) mapping. However, no watercourses would be directly impacted through loss (i.e., they will be culverted) and as such are not included in the BNG assessment.

6.2.2 Post-Development Biodiversity

The post-development biodiversity unit calculations are based on the difficulty to create habitats (Delivery risk) and the time (in years) to reach their target condition (Temporal risk) which are based on published guidance and previous project experience. As with the baseline calculations, overall values are assigned for each Phase 1 habitat type rather than for each habitat parcel.

6.3 BNG Assessment Results

6.3.1 Biodiversity Baseline

The biodiversity baseline for the site covers 358.6 ha and is based upon the habitat quality scores (distinctiveness, condition, strategic significance and connectivity), the area of the habitats and the resulting number of biodiversity units each type of habitat contributes. Habitats types of less than 0.01 ha are under the minimum mappable unit (MMU) and were not included in line with SSER metric guidance[2], as they are not large enough to be considered a viable habitat and be effectively managed to increase overall biodiversity. Figure 1 displays the Phase 1 habitats across the site which comprises the biodiversity baseline.

The site comprises 358.6 ha with the main habitat types being wet heath (40%), arable (20%) and improved grassland (12%). Using the SSER BNG toolkit, the biodiversity value of the site baseline was calculated to be 1940.3 Biodiversity Units (BU). Results of the biodiversity baseline breakdown and the area of the habitats, assessment scores, and number of biodiversity units each type of habitat contributes are shown in Annex B, Table B-1.

6.3.2 Biodiversity Change during Construction

During the construction of the Proposed Development, habitats will be lost, either temporarily or permanently, to provide construction compounds, access roads, and the turbine/hardstandings infrastructure footprints. The majority of habitat, and biodiversity, under infrastructure footprint areas is therefore lost during works.

The BU that will be removed to accommodate the Proposed Development are summarised in Table 1 below, with detailed breakdown provided in Annex B, Table B-2. The results highlight a 4.73 ha

loss of habitat and an overall -1.5% loss of biodiversity (i.e., 29.5 BU). The majority of BU lost are from wet heath (i.e., 20.8 BU). During construction of the Proposed Development, 353.83 ha of habitat would be retained and directly unaffected by the Proposed Development, comprising a total of 1910.8 BU.

6.3.3 Following Works

At the end of construction any temporary working areas will be restored following best practice methods and guidance. The SSER BNG Metric user guide[2] states that in situations where habitats will be temporarily impacted by any works and will be fully restored to its baseline condition (or improved) within two years, it can be considered as retained habitat within the toolkit. However, some of the habitat types impacted at the site will likely take more than two years to recover to their previous condition and therefore this cannot be considered a 'temporary' loss and must be recorded in the BNG calculation tool as having been permanently lost. It is assumed that in general and where feasible, reinstated habitats in the temporary works areas will be 'like for like, or better', compared to the baseline habitat and in line with guidance principles. The restoration of temporary working areas will recreate 5.1 BU.

Biodiversity enhancement and an increase in the site BU would be further delivered onsite through the restoration and creation of habitat types following the construction of the Proposed Development, as proposed for the habitat types and BEA as outlined in Section 4 above and Figure 3.

The proposals within this BEMP will result in the enhancement of 56.68 ha of wet heath, the creation of 5.57 ha of broadleaved woodland, 4.55 ha of species-rich scrub and 2,385 m of new species-rich hedgerows, all of which will enhance flora and fauna biodiversity at the site on top of the retained baseline habitats.

The value of these habitats in terms of BU net gain, and the increased BU produced due to the enhancement and creation of habitats is summarised in Table 1, with detailed breakdown provided in Annex B, Table B-3.

6.3.4 Summary of Overall Biodiversity Change

Table 1 summarises the change in BU from the baseline, during works (lost and retained habitats), and after works actions involving the reinstatement, enhancement and creation of habitats following completion of construction and as set out within this BEMP. Overall, following construction, BEMP implementation and subsequent habitat management, the Proposed Development would result in a net gain for biodiversity of 313.3 BU (i.e., 16 %) over and above the baseline value.

Table 1 Biodiversity Unit Change at each Stage of Development

Stage	Total area (ha)	Biodiversity Units	Biodiversity Units per hectare (BU/ha)	Biodiversity Units Gained/Lost from Baseline
Baseline	358.56	1940.3	5.41	N/A
During works	353.83	1910.8	5.40	- 29.5 (1.5% loss)
After works restoration and implementation of the BEMP	354.99	2256.6	6.36	316.3 (16% gain)

7 MONITORING

Monitoring will establish whether or not 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.

7.1 Aim 1: Restore and enhance wet dwarf shrub heath habitat (Management Unit A)

7.1.1 Vegetation Monitoring

Vegetation monitoring within Management Unit A should evaluate the restoration and enhancement of wet heath habitat by recording changes to the condition via structure of the vegetation and species abundance and diversity. The following monitoring methods will be employed.

- A wet heath habitat condition assessment utilising i) the latest Biodiversity Metric[5] condition assessment pro-forma and methodology, and/or ii) a CSM[4] wet heath site condition survey, at six locations within Management Unit A.

To support the overarching condition assessments the following detailed monitoring would also be undertaken within Management Unit A.

A representative sample of 15 fixed vegetation quadrats would be established to gather data to help inform condition assessments, assess the trajectory of plant species and the habitat, and inform future management. Quadrats will be 2 m x 2 m and the survey will be carried out during the main flowering season; subsequent repeat surveys would be carried out in the same month in each monitoring year to gather comparable data. In the field, the following methods will be employed:

- The sampling point will be located using a GPS;

- At the sample point a short wooden stake approximately 30/40cm long and painted at the tip will be placed in the ground, this is the permanent marker post to allow the quadrat to be precisely located in the future and allow monitoring of the same quadrat area;

- Once the marker post has been placed in the ground, the surveyor will face due north and position the quadrat so the marker post is positioned in the south-western corner of the quadrat;

- A general description of the vegetation and any other relevant data (e.g., on slope, aspect, peat erosion etc.) will be made;

- At each quadrat a botanical species list will be compiled, and an estimate will be made of each species' quantitative contribution to the vegetation. This will be estimated by eye as % cover of the species;

- Presence or absence of herbivores (e.g., sheep, cattle, deer) and impacts (dung, trampling, browsing); and

- A fixed-point photograph will be taken of each sample quadrat.

If any of the following species are recorded within the quadrat the undernoted data will also be collected in the quadrat, following MacDonald *et al.* (1998)[12] guidance:

- Height of *Calluna vulgaris* (tallest in quadrat);

- *Calluna* annual growth increment; measured from the start of the previous season's growth to the end of the previous season's growth. One sample taken per quadrat;

- *Calluna* off-take; measured as the number of long shoots grazed out of five. One sample taken per quadrat;

- *Calluna* condition. Classified as either: (1) heavily grazed: showing >1 of the following forms - drumstick, topiary or carpet, or (2) low to medium grazing: open, bushy form;

- Height of *Vaccinium myrtillus* (tallest in quadrat);

- Height of *Erica tetralix* (tallest in quadrat); and

- Height of grass sward (highest stem in quadrat).

Vegetation monitoring would be undertaken during construction to collect a baseline data set for future comparison. Monitoring would then be undertaken in operational Year 1 following implementation of the respective Prescriptions in Section 5 above. Surveys would then be repeated in Years 3, 5, 7, 10 and 15 of the operational phase of the wind farm. The frequency of monitoring thereafter will be agreed with the BMG.

Additionally, every five years (or sooner if apparent), following monitoring, a review will also be undertaken with respect to the livestock numbers and intensity and timing of sheep grazing of Management Unit A to determine whether the grazing regime should remain as it is or if there should be adaptions in order to meet the aims and objectives (for example an increase in grazing to help reduce the any build-up of rank or dying vegetation, or a change in the timing or length of the livestock accessible period). Any future grazing amendments would be agreed between the BMG and the respective landowner.

7.1.2 Breeding Bird Monitoring

The enhancement and restoration of wet heath habitats would have beneficial effects for the local upland breeding bird assemblage.

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[12] MacDonald, A., Stevens, P., Armstrong, H., Immirzi, P. & Reynolds, P. (1998). A Guide to Upland Habitats: Surveying Land Management Impacts. The field guide (Volume 2). Scottish Natural Heritage, Edinburgh.

The main objective of this breeding bird monitoring will be to assess changes in ground nesting upland breeding bird activity, in particular wader activity, in response to wet heath restoration/enhancement. Breeding bird surveys (BBS) will follow standard methods and guidance for upland breeding waders (Brown & Shepherd, 1993[13]), commonly adapted to include passerines (Bibby *et al.*, 2000[14]). BBS surveys will, as recommended, include four survey visits between April and July (Calladine *et al.*, 2009[15]; SNH, 2017[16]). Each visit will be at least 7 days apart and will cover Management Unit A plus a 500 m buffer (where land access is permissible). Any raptor activity will also be recorded.

BBS surveys as detailed above will be carried out in operational years 1, 3, 5, 7, 10 and 15. The frequency of monitoring thereafter will be agreed with the BMG.

7.2 Aims 2, 3 and 4: Promote native broadleaved woodland/scrub/hedgerow cover and increased site biodiversity (Management Units B, C and D)

Monitoring will be undertaken in Management Units B, C and D to ensure the establishment of the trees, scrub and hedgerow planted.

A professional forester will 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 will also advise on whether any further management or maintenance is required to ensure the establishment of the trees, scrub or hedgerows. Any additional measures will be discussed and agreed within the BMG.

These areas will 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/scrub establishment. Monitoring will 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 planting may also be considered. This will aid regeneration of seedlings and begin the process of establishing a mixed age structure.

Each Management Unit's respective target habitat type and condition category will also be assessed and monitored using the latest Biodiversity Metric[5] condition assessment pro-forma and methodology with the following habitat specific intervals:

- Management Unit B – Broadleaved Woodland: Year 10 and every 5 years thereafter;

- Management Unit C – Mixed Scrub: Years 3, 5, 7, 10 and every 5 years thereafter; and

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[13] Brown, A.F. & Shepherd, K.B. (1993). A Method for Censusing Upland Breeding Waders. *Bird Study*, 40, 189-195.

[14] Bibby, C.J. Burgess, N.D., Hill, D.A. & Mustoe, S.H. (2000). *Bird Census Techniques*. 2nd Edition. Academic Press,
London.

[15] Calladine, J., Garner, G., Wernham, C. & Thiel, A. (2009). The influence of survey frequency on population estimates of moorland breeding birds. *Bird Study*, 56, 381-388.

[16] SNH. (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*. SNH, Battleby.

- Management Unit D – Hedgerows: Years 3, 5, 7, 10 and every 5 years thereafter.

8   REPORTING & BEMP REVIEW

A report will be submitted by the wind farm owner to the BMG in Years 1, 3 and 5 of operation, the frequency of reporting after Year 5 will be agreed by the BMG. 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 BMG may meet periodically to discuss the reports and management of the site, if this is considered necessary by the members of the BMG.

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

The requirement for the measures, monitoring and reporting following year 15 of the operational phase will be dependent on the results of the monitoring which will be discussed and agreed within the BMG in year 15, or as agreed in writing with the BMG.

In addition, the BEMP will be reviewed by the BMG every five years from its commencement, or earlier if the BMG 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 BMG at any time.

Table A-1 below provides an indicate management and monitoring timetable for construction and the first 15 years of operation of the site, as discussed in the various sections above.

Table A-1 Management and Monitoring Timetable

Year[17]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Work Item	Year of Implementation															
Management Prescriptions																
Livestock/grazing management of Management Unit A	Throughout lifetime of BEMP															
Damming of active drains – Management Unit A	✓	✓														
Excluded activities as per Prescription 1.3 – Management Unit A	Throughout lifetime of BEMP															
Native tree planting – Management Unit B	✓															
Native mixed scrub planting – Management Unit C	✓															
Native hedgerow planting/creation – Management Unit D	✓															
Stock fencing to facilitate trees/hedgerow establishment - Management Units B (if required) and D	✓															
Vegetation cutting around newly planted trees/scrub – Management Units B and C	✓	✓	✓													
Control competing vegetation in the first two years of hedgerow establishment – Management Unit D	✓	✓														
Removal of tree tubes – Management Unit B											✓[18]					
Removal of tree tubes – Management Units C & D						✓										

[17] Year '0' equates to the Proposed Development's construction period. Year 1 equates to the first year of operation following final commissioning, followed by Year 2, 3 etc.

[18] 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[17]	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hedgerow management as per Prescription 4.4	Throughout lifetime of BEMP															
Monitoring																
Vegetation Monitoring and Condition Assessments – Management Unit A	✓	✓		✓		✓		✓			✓					✓
Breeding Bird Survey Monitoring – Management Unit A (plus 500 m buffer)		✓		✓		✓		✓			✓					✓
Woodland/scrub/hedgerow establishment/growth monitoring[19] – Management Units B, C and D.		✓	✓	✓	✓	✓										
Broadleaved Woodland Condition Assessment – Management Unit B											✓					✓
Mixed Scrub Condition Assessment – Management Unit C				✓		✓		✓			✓					✓
Hedgerow Condition Assessment – Management Unit D				✓		✓		✓			✓					✓
Reporting / Reviews																
BEMP report		✓		✓		✓	Reporting schedule after Year 5 to be agreed by the BMG									
Livestock/grazing prescription review – Management Unit A						✓					✓					✓
BMG 5-year review of BEMP						✓					✓					✓

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

ANNEX B.   BNG ASSESSMENT CALCULATIONS

Table B-1 Biodiversity Baseline

Phase 1 Habitat Type	Distinctiveness Band	Condition Rating	Connectivity Rating	Strategic Significance Rating	Area of Habitat (ha)	Biodiversity Units (BU)
A2.1: Scrub: dense/continuous	Medium	Poor	Low	Low	6.27	25.08
B1.1: Acid grassland: Unimproved (Medium)	Medium	Moderate	Low	Low	24.76	198.08
B1.2: Acid grassland: Semi-improved	Low	Poor	Low	Low	23.01	46.66
B2.1: Neutral grassland: Unimproved	Medium	Moderate	Low	Low	12.42	99.36
B2.2: Neutral grassland: semi-improved	Medium	Moderate	Low	Low	9.55	74.64
B4: Improved grassland	Low	Poor	Moderate	Low	44.17	97.17
B5: Marsh/marshy grassland (Low)	Medium	Moderate	Low	Low	15.75	126.00
C3.1: Other Tall Herb and Fern: Ruderal	Low	Poor	Low	Low	0.22	0.44
D1.1: Dry dwarf shrub heath: Acid	High	Poor	Low	Medium	0.77	5.08
D2: Wet dwarf shrub heath	High	Poor	High	Medium	142.39	1080.74
E1.7: Bog: Wet modified bog	Very High	Moderate	Low	Medium	0.88	15.49
E2.1: Flush and spring: acid/neutral flush	Very High	Moderate	Low	Medium	0.30	5.28
E2.2: Flush and spring: basic flush	Very High	Moderate	Low	Medium	0.06	1.06
F1: Swamp	Very High	Moderate	Low	Medium	1.22	21.47
J1.1: Cultivated/disturbed land: Arable (Low)	Low	Poor	Low	Low	71.19	142.38
J1.2: Cultivated/disturbed land: Amenity grassland	Low	Poor	Low	Low	0.19	0.38

Phase 1 Habitat Type	Distinctiveness Band	Condition Rating	Connectivity Rating	Strategic Significance Rating	Area of Habitat (ha)	Biodiversity Units (BU)
J3.6: Built-up areas: Buildings	N/A	N/A - No biodiversity value	Moderate	Low	0.58	0.00
J4: Bare ground	N/A	N/A - No biodiversity value	Moderate	Low	4.72	0.00
G1.3: Standing water: Oligotrophic (Medium)	Medium	Moderate	Low	Low	0.12	0.96
TOTALS					358.57	1940.3

Table B-2 Habitat area & BU retained & removed for construction of the Proposed Development

| Phase 1 Habitat Type	Area of Habitat Retained (ha)	Area of Habitat Removed (ha)	Biodiversity Units Retained (BU)	Biodiversity Units Removed (BU)
A2.1: Scrub: dense/continuous	6.27	0.00	25.08	0.00
B1.1: Acid grassland: Unimproved (Medium)	24.37	0.39	194.96	3.12
B1.2: Acid grassland: Semi-improved	22.77	0.24	46.18	0.48
B2.1: Neutral grassland: Unimproved	12.41	0.01	99.28	0.08
B2.2: Neutral grassland: semi-improved	9.48	0.07	74.08	0.56
B4: Improved grassland	43.84	0.33	96.45	0.73
B5: Marsh/marshy grassland (Low)	15.51	0.24	124.08	1.92
C3.1: Other Tall Herb and Fern: Ruderal	0.22	0.00	0.44	0.00
D1.1: Dry dwarf shrub heath: Acid	0.73	0.04	4.82	0.26

Phase 1 Habitat Type	Area of Habitat Retained (ha)	Area of Habitat Removed (ha)	Biodiversity Units Retained (BU)	Biodiversity Units Removed (BU)
D2: Wet dwarf shrub heath	139.65	2.74	1059.94	20.80
E1.7: Bog: Wet modified bog	0.88	0.00	15.49	0.00
E2.1: Flush and spring: acid/neutral flush	0.30	0.00	5.28	0.00
E2.2: Flush and spring: basic flush	0.04	0.02	0.70	0.35
F1: Swamp	1.22	0.00	21.47	0.00
J1.1: Cultivated/disturbed land: Arable (Low)	70.58	0.61	141.16	1.22
J1.2: Cultivated/disturbed land: Amenity grassland	0.19	0.00	0.38	0.00
J3.6: Built-up areas: Buildings	0.58	0.00	0.00	0.00
J4: Bare ground	4.68	0.04	0.00	0.00
G1.3: Standing water: Oligotrophic (Medium)	0.12	0.00	0.96	0.00
TOTALS	**353.83**	**4.73**	**1910.8**	**29.5**

Table B-3 Habitat area and Net BU of habitats enhanced/created through implementation of the BEMP[20]

Phase 1 Habitat Type	After Works Action	Distinctiveness	Target Condition	Area/Length of Habitat	Difficulty to Enhance/Create	Time to Target Condition (Years)	Net BU Created
D2: Wet dwarf shrub heath	Enhancement	High	Good	56.68 ha	Low	30	295.12
A1.1.1: Broadleaved Semi-Natural Woodland	Creation	Medium	Moderate	5.57 ha	Low	15	15.08

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[20] N.B. The restoration of temporary working areas also generates 5.1 BU.

Phase 1 Habitat Type	After Works Action	Distinctiveness	Target Condition	Area/Length of Habitat	Difficulty to Enhance/Create	Time to Target Condition (Years)	Net BU Created
A2.2: Scrub: scattered	Creation	Medium	Good	4.55 ha	Low	10	6.92
J2.1.1: Species-rich Intact Hedge / J2.3.1: Species-rich Hedge with Trees	Creation	Medium	Good	2,385 m	Low	12	23.65
TOTALS							**340.8**[20]
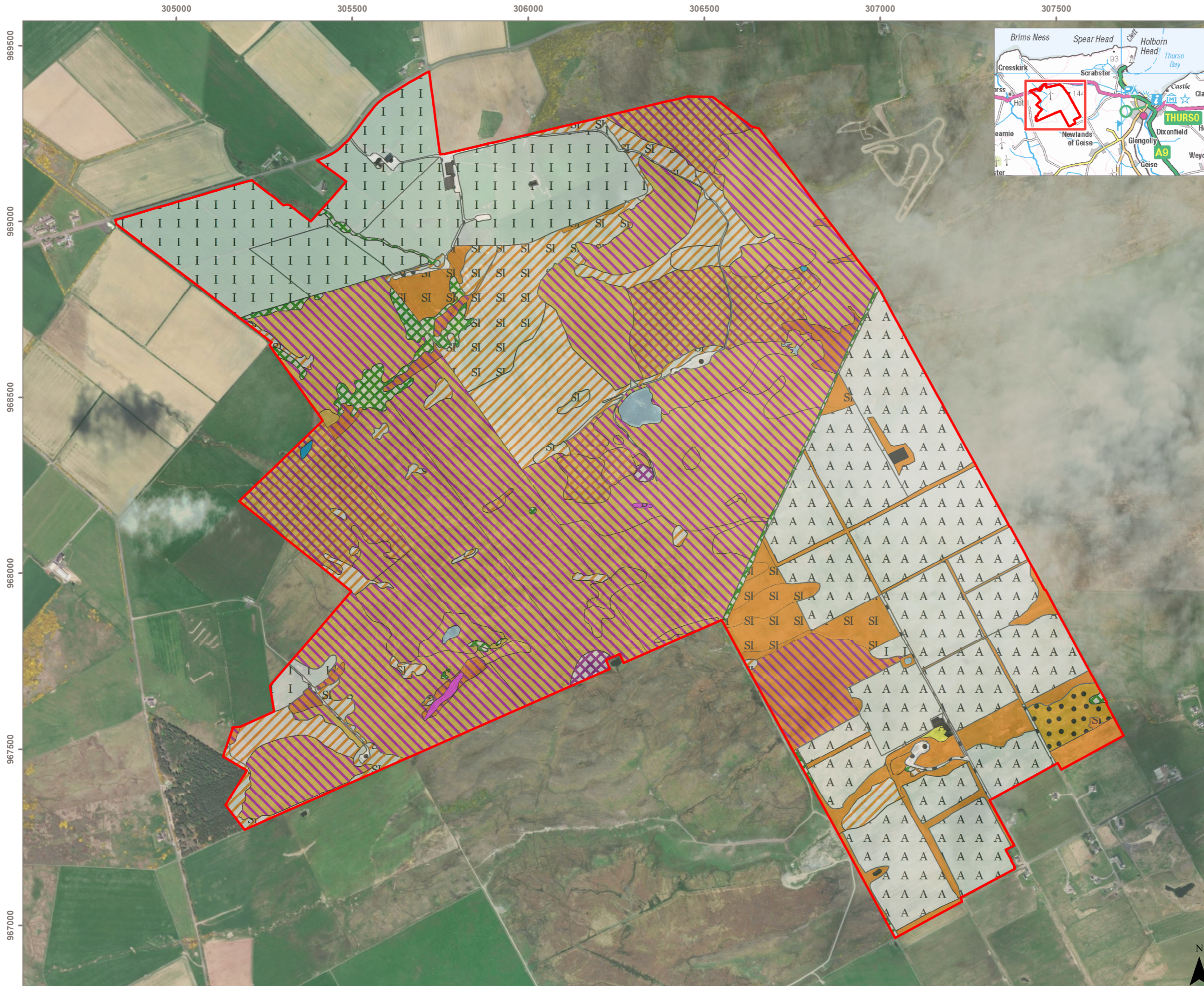
Legend:

Site Boundary

Phase 1 Habitat Description (Code)

- Dense/Continuous Scrub (A2.1)
- Unimproved Acid Grassland (B1.1)
- Semi-Improved Acid Grassland (B1.2)
- Semi-Improved Acid Grassland/Marsh/Marshy Grassland Mosaic (B1.2/B5)
- Unimproved Neutral Grassland (B2.1)
- Unimproved Neutral Grassland/Bare Ground Mosaic (B2.1/J4)
- Semi-Improved Neutral Grassland (B2.2)
- Improved Grassland (B4)
- Marsh/Marshy Grassland (B5)
- Poor Semi-Improved Grassland (B6)
- Tall Ruderal (C3.1)
- Acid Dry Dwarf Shrub Heath (D1.1)
- Wet Dwarf Shrub Heath (D2)
- Wet Heath/Acid Grassland Mosaic (D6)
- Wet Modified Bog (E1.7)
- Acid Neutral Flush (E2.1)
- Basic Flush (E2.2)
- Swamp (F1)
- Standing Water (G1)
- Arable (J1.1)
- Amenity Grassland (J1.2)
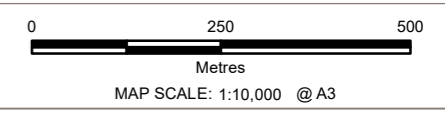- Building (J3.6)
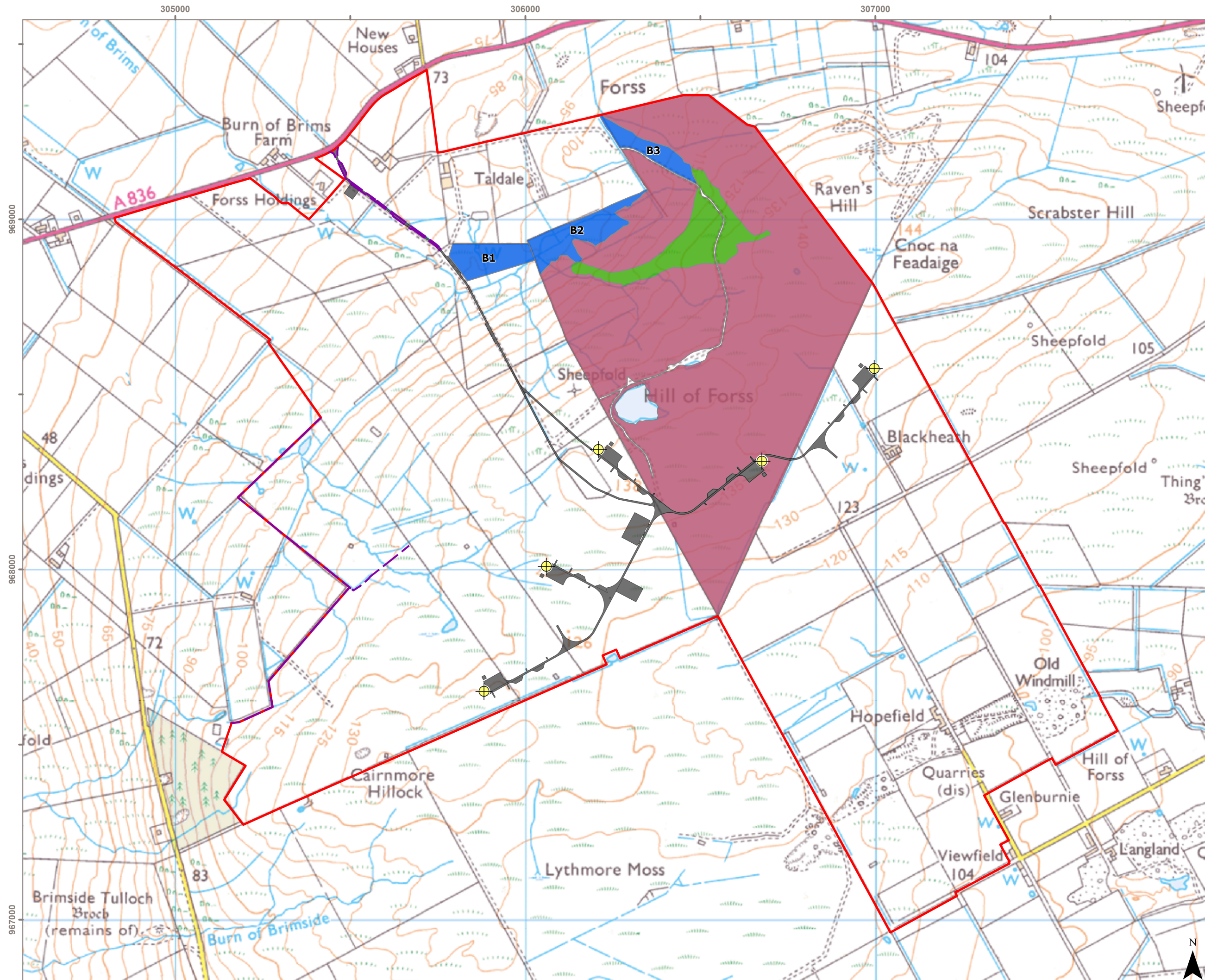- Bare Ground (J4)

Source: MacArthur Green

Cairnmore Hill Wind Farm

Figure 1

Phase 1 Habitats

0   250   500
Metres
MAP SCALE: 1:10,000   @ A3

Datum: OSGB 1936, Projection: British National Grid

Date: 04/07/2023

Map Author: LM   Checked: LNF   Approved: BH   Status: Rev0

Document Path: S:\Projects\RES\Cairnmore Hill_CAH03_DataE_R_BEMP_Fig1_P1_Habitats_CAH.mxd

Figure 2

Biodiversity Enhancement Area and Management Units

Cairnmore Hill Wind Farm

Legend:
- ⊕ Turbines
- Site Boundary
- Infrastructure

Biodiversity Enhancement Area and Management Units
- Management Unit A
- Management Unit B
- Management Unit C
- Management Unit D

Source: MacArthur Green

Datum: OSGB 1936, Projection: British National Grid

Date: 18/10/2023

MAP SCALE: 1:10,000 @ A3

0   200   400
Metres

Map Author: TD   Checked: LNF   Approved: BH   Status: Rev0

Document Path: \\macg-dc01\Company\Projects\RES\Cairnmore Hill_CAH\03_Data\04_APRX\E_R_BEMP_Fig2_BEMP_Units_CAH.aprx