APPENDIX 6-4

BIODIVERSITY MANAGEMENT AND ENHANCEMENT PLAN (BMEP)

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1. INTRODUCTION

1.1 Background

This Biodiversity Management and Enhancement Plan (BMEP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the proposed Crumhach Wind Farm, Co. Sligo. The Proposed Project consists of the decommissioning of 23 no. existing turbines on Dunneill and Kingsmountain Wind Farm and the construction, operation and decommissioning of 17 Proposed Turbines and all ancillary works. The BMEP demonstrates the offsetting obligations for (1) measures outlined in the EIAR for any potential impacts on biodiversity and (2) compliance with the offsetting requirements for total habitat loss following the Biodiversity Net Gain (BNG) policy under the current Sligo County Development Plan by enhancing higher value habitat to offset the loss of lower value habitat.

As detailed in Section 1.1.1 in Chapter 1 of this EIAR, the following references are used: 'Proposed Project', 'the Site, 'Proposed Wind Farm', 'Proposed Turbines', 'Proposed Grid Connection Route', 'Existing Wind Farm' and 'Existing Grid Connection'. Please see Section 1.1.1 of this EIAR for further details. A detailed description of the Proposed Project is provided in Chapter 4 of this EIAR. The term 'management' is used for all actions applying to the proposed areas, 'restoration' is used where impacts from the construction of the Proposed Project are to be reverted into a favourable condition, 'safeguarding' is used where actions are being taken to maintain the current conservation status of an area and prevent degradation, and the term 'enhancement' is used where areas without impact from the Proposed Project are intended to be changed to a more favourable conservation status

Where the term 'Plan' is used in this document, this refers to the Biodiversity Management and Enhancement Plan.

1.1.1 Objectives of the Biodiversity Management and Enhancement Plan

- **Objective A:** To enhance habitat condition of 36ha of degraded peatland habitats to favourable conservation status for upland blanket bog with affinities to Annex 1 habitat Blanket bog [7130]. For this to be an objective a baseline condition assessment in line with guidance[1] was undertaken showing areas of poor conservation status, the measures, remedial actions and measurements of success proposed which will allow us to demonstrate favourable conservation status of the habitat in future, thereby creating a biodiversity net gain (BNG) by enhancing unfavourable habitats.
- **Objective B:** To safeguard existing peatland habitats within the 36ha management area which links up existing peatland habitats of the Ox Mountains Bogs SAC, thereby improving habitat connectivity.
- **Objective C:** To implement a grazing management regime which will enhance 36ha of overgrazed peatland habitats and safeguard existing peatland habitat with good conservation status, thereby protecting existing habitat and offsetting the loss of 0.5ha of marginal blanket bog habitat for the Proposed Project.
- **Objective D:** To restore the proposed 5.45ha of peat and spoil management areas over cutover bog and restore the peatland condition to an active peat forming system, thereby mitigating the loss of 3.6ha of cutover bog habitat for the Proposed Project.
- **Objective E:** To provide a management and monitoring plan to ensure the success of the proposed biodiversity enhancement and offsetting measures.

[1] [1] *https://www.npws.ie/sites/default/files/publications/pdf/IWM79.pdf*

1.1.2 Statement of Authority

This Plan has been prepared by Julie Kohlstruck (B.Sc. and M.Sc. Landscape Ecology). Julie has over 5 years' experience in ecological consultancy and has worked on several upland Wind Farm developments where she has undertaken condition assessments, created enhancement and management plans and undertaken compliance monitoring and reporting. This report has been reviewed by Rachel Walsh (B.Sc., MCIEEM). Rachel is a Senior Ecologist with 6 years' experience in professional ecological consultancy and is a full member of CIEEM with a First-Class Honours BSc in Environmental Science. Rachel's key strengths are in terrestrial flora and fauna ecology, including Irish Vegetation Classification surveys, Annex I habitat surveys, habitat mapping and mammal surveys. Rachel has extensive experience in writing and review of Appropriate Assessment reporting, Ecological Impact Assessment and EIA inputs, and has worked widely on renewable energy infrastructure projects.

1.2 Habitat Loss as a Result of the Proposed Project

The following paragraphs detail the habitats identified as Key Ecological Receptors (KERs) in Chapter 6 of the EIAR which will be lost for the Proposed Project.

0.5ha of marginal upland blanket bog (PB2) and 3.6ha of Cutover bog (PB4) will be lost to accommodate the Proposed Project. The areas of PB2 are discrete small patches associated with infrastructure, particularly around Proposed Turbines T1-T5 and T15 and T16, as well as a peat and spoil management area north of T12. These areas are marginal peatland habitats bordering existing infrastructure and show signs of degradation due to ongoing edge drainage effects. The areas of PB4 are mainly located by Proposed Turbines T1-T5 and T12, the areas are actively cut and vegetation communities vary between cells and range from bare peat over recolonising peat with few species to dry and leggy ling heather (*Calluna vulgaris*). Peat depth in the cutover cells also varies significantly with depth between 30cm and 150cm.

In addition to the KERs identified in Chapter 6, there will be an additional loss of 3.4ha of semi-natural habitat consisting of 0.8ha of Dry-humid Acid Grassland [GS3] and 2.6ha Dry-humid Acid Grassland [GS3]/ Wet grassland [GS4].

1.3 Proposed Management Areas

An area of approximately 36ha is proposed for habitat enhancement under Objectives A-C (shown in Figure 2-1

Figure 2-1 Habitat Management and Enhancement Areas). It is located in the centre of the Proposed Wind Farm; however, it is not bordering any associated proposed infrastructure. The management area shares a boundary with the Ox Mountains Bogs SAC in the southeast of approximately 220m and a winding boundary in the west of approximately 1500m. The Site slopes steeply down towards the Dunneill_010 river along its eastern boundary. The slope towards the Dunneill_101 river supports areas of dense bracken and peat depths on the slope are between 0cm and 50cm.

The management area supports upland blanket bog (PB2) in varying degrees of degradation and is currently grazed by sheep. The entire management area is cut by several drains of varying sizes. Particularly in the northwest and west these drains are shallow (40-60 cm) and abundant. The north eastern section of the management area supports some intact blanket bog communities with notable pool topographies including habitats with affinity to the Annex 1 Habitat Peat depressions of the *Rhynchosporion* [7150]. These areas have intact hydrology with no or little noticeable compacting of the underlying peat. Peat depth within the area was consistently over 1m with over 5m peat depth measured in the centre of the management area. The entire management area, but in particular the

areas to the south, shows sign of overgrazing with areas of up to 60% bare peat. Numerous sheep tracks were recorded to show signs of erosion, with some erosion channels being up to 30cm deep (Plate 2-1).

The area of cutover bog in the vicinity of Proposed Turbines T2-T4 and T1-T3 is proposed to be used for peat and spoil storage and management. The area consists of a network of cutover cells with varying degrees of peat depth (30 cm-150cm) and vegetation cover with areas of bare peat, recolonising peat with hare's tail cotton-grass (*Eriophorum vaginatum*) and areas of long leggy ling heather (*Calluna vulgaris*). Under Objective D following the storage of excavated materials, this area will, where possible, restored to active peatland habitat, this will cover an area of approximately 5.45ha.

The total area available for potential management following Objectives A-D covers 41.45ha.

1.4 Implementation of the Plan

The developer will be responsible for the implementation of the measures, the monitoring and the submission of the associated monitoring reports, the developer will furthermore be responsible to appoint an experienced contractor to implement the prescribed measures and a qualified ecologist to oversee the enhancement measures and undertake the outlined monitoring and assessments. The prescribed enhancement measures and possible remedial measures following monitoring assessments will be carried out in agreement with National Parks and Wildlife Service (NPWS).

2. Proposed Biodiversity Measures

2.1 Peatland Restoration/Management

2.1.1 Objective A: Peatland Enhancement and Restoration

In order to reinstate an intact hydrology regime throughout the management areas, alterations to the structure of the peatland will be reversed or mitigated wherever peat stability, peat condition and vegetation communities indicate a potential for successful restoration. This areas with drain networks. Where drainage and erosion have caused significant areas of bare peat (Plate 2-2) steps will be taken to reinstate the vegetation in this area. The areas identified as suitable for peatland enhancement are shown in Figure 2-1.
A grazing Regime as detailed in Objective C will be implemented to maintain the enhancement measures detailed under this Objective.

A1 Drain Blocking

- The methodology laid out in Nature Scots "Peatland Action- Technical Compendium" will be followed for the installation of drain blocks[2]
- Some minor drains will be blocked as required, infilling to approx. 30 cm of ground level to allow for some drainage in extreme weather events
- Drain blocking will only be undertaken in areas of no to slight sloping ground
- Peat dams will be used where possible
- The maximum spacing between dams will be dependent on ground conditions and follow best practise guidance
- A low ground pressure excavator will be used to undertake the works
- Drain blocking techniques will be reviewed depending on drain and ground conditions and follow best practice guidance
- Peat donation sites, where required, will be located upstream and upslope from the peat dam
- Peat donation pits, where required, will be stretched inwards from the sites to recreate a coherent surface.

A2 Erosion control

- The methodology laid out in Nature Scots "Peatland Action- Technical Compendium" will be followed for the flow management[3]
- Shallow erosion gullies (<50cm) caused by heavy trampling linked to herbivores will be mitigated through flow management with the installation of surface bunds
- Locations for bunds will be marked out prior to installation
- Turves/peat will be preferred as bunds material if good material can be found on site in borrow pits, otherwise alternative materials compliant with the guidance will be considered
- A low ground pressure excavator will be used to undertake the works
- Peat donation sites will be located upstream and upslope from the peat dam
- Peat donation pits will be stretched inwards from the sites to recreate a coherent surface.

[2] *https://www.nature.scot/doc/peatland-action-technical-compendium-restoration-4-artificial-drains*
[3] *https://www.nature.scot/doc/peatland-action-technical-compendium-restoration-6-flow-management*

A3 Stabilisation and Revegetation

- Larger areas of bare peat in the southern section of the management area will be revegetated using mulching and textile application[4] after flow management has been instated
- Mulch will be harvested from a good, local donor site, with heather and good mix of cotton grass and mosses. The donor site must be cut low (to get mosses), but care will be taken not to expose the peat surface. Prior to selecting the donor site it will be ensured that the site contains mosses and plant species that can establish at the restoration sites – e.g the appropriate species of Sphagnum.
- A thick layer of mulch will be applied following best practice guidelines
- Mulching will be carried out by hand, if required based on ground conditions.
- Herbivore pressure on revegetation sites will be closely monitored and measures such as stock control will be adjusted where necessary.

2.1.2 Objective B: Peatland Safeguard

In order to reinstate the favourable conservation status of upland blanket bog and protect areas of good quality within the 36ha management area, this area will be safeguarded for the lifetime of the Proposed Project to ensure that they are not reclaimed or developed or converted to another land-use. The areas are shown on Figure 2-1. The specific management measures for these areas include the following:

B1 Structural safeguarding

- No peat cutting will be permitted;
- No burning will be permitted;
- No drainage or excavation works will be permitted;
- No forestry planting on the bog and heath areas within the enhancement area will be permitted;

B2 Vegetation composition safeguarding

- Self-seeded conifers invading open areas of bog and heath will be removed.
- Bog habitats will be surveyed following the monitoring plan (Objective E1 and E2) to ensure that new seedlings are removed;
- The developer will be responsible for the removal of any self-seeding conifers identified during vegetation monitoring.
- The application of chemical or organic fertiliser will be prohibited;
- Any *Rhododendron* or other invasive species must be removed as per the Invasive Species Management Plan included in Appendix 6-5. Ongoing monitoring will be undertaken during the monitoring visits. Acceptable control methods are cutting/pulling.

2.1.3 Objective C: Grazing management

A specific grazing regime will be implemented in these areas to ensure that scrub is managed appropriately, and that over-grazing and associated erosion does not occur. This Objective is crucial to maintain the enhancement measures laid out in Objective A. The areas are shown in Figure 2-1. The specific management measures for these areas include the following:

[4] *https://www.nature.scot/doc/peatland-action-technical-compendium-restoration-7-stabilisation-and-revegetation*

C1 Fencing

- Stock proof fencing will be installed along the northern boundary of the management area;

C2 Grazing regime

- In general, maintain stocking levels of no greater than 0.02[5] livestock units (LU) per forage hectare where restoration is taking place;
- In the case of intact blanket bog and cutover areas without restoration measures maintain stocking levels of up to 0.05 LU/ha;

Plate 2-1 Erosion caused by herbivore trampling. High waterflow is starting to cause gullying.

[5] *https://www.fas.scot/downloads/tn686-conservation-grazing-semi-natural-habitats/*

Plate 2-2 Area in the south of the management area where intensive grazing and erosion have resulted in extensive areas of bare peat.

2.1.4 Objective D: Restoration of Peat and Spoil Management Area (Proposed Wind Farm)

The proposed peat and spoil management areas around Proposed Turbines T1-T4 are located in an area of cutover bog within a wider landscape of intact blanket bog. Excavated peat as a result of the development will be stored in designated areas within the cutover areas. Peat stability assessments will determine suitable sites for peat storage to avoid movement of peat and impacts on any nearby watercourses.

D1 Reprofiling and infill

- Excavated peat and other material will be segregated and stored into its layers (mineral substrate, catotelm (underground peat) and acrotelm (topmost peat layer) including surface vegetation), the surface vegetation in the "cutaway cells" will be removed, peat will be deposited in the correct layer and surface vegetation swill be reinstated carefully.
- As per the current plan, there will be no peat storage in the vicinity of proposed turbine T5 to avoid impacts on the freshwater pearl mussel catchment
- The excavation, reinstatement and restoration of the peat management areas will be supervised by an ECoW.

D2 Reinstating hydrological conditions

- Drain blocking or resurfacing might be required in some cells to reinstate an appropriate hydrological regime, where this is not sufficient the redirecting of drainage from the surrounding peat extraction areas can be considered.
- Peat stability assessments will be undertaken for any major drain blocking exercises.

D3 Reinstating vegetation

- Vegetated turfs used to stabilise the surface layer will include a range of species suitable for revegetation such as *Sphagnum* mosses and cotton grasses (*Eriophorum* spp.). Turfs consisting mainly of lichens (*Cladonia* spp.) and ling heather (*Calluna vulgaris*) should be avoided.
- Where not enough suitable vegetated surface turfs are available, other measures to encourage revegetation will be undertaken such as mulching, textile mat application or Sphagnum cultivation, with the suitable methodology to be determined on a case-by-case basis.

Map Legend

- EIAR Site Boundary
- Permanent Project Footprint
- Proposed Turbines Locations

Habitat Management and Enhancement Areas

- Objective A: Erosion Control
- Objective A: Drain Blocking
- Objective C: Grazing Management
- Objective D: Peat and Spoil Management Area Restoration
- Objective B: Fencing

Drawing Title
Habitat Management and Enhancement Areas

Project Title
Crumhach Wind Farm Development

Drawn By	Checked By
JK	RW
Project No.	Drawing No.
230841	Figure 2-1
Scale	Date
1:15,000	13/05/2026

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2.1.5 Objective E: Monitoring

The measures outlined in this Plan will be the subject of ongoing monitoring to assess the effectiveness of the measures proposed and employed and will contribute to advances in habitat management methods, which can be applied to future similar projects. The monitoring can also aid adaption and implementation of improved methods and measures as they emerge. The timelines, monitoring and reporting requirements, Measures of success, and responsibilities are outlines in Table 2-1.

Monitoring measures will include:

E1 Detailed Vegetation analysis

- Vegetation sampling: A number of fixed relevé sites (i.e. permanent relevés) will be set up in the peatland enhancement areas. Data will be recorded prior to the commencement of habitat enhancement activities. The character of each relevé will be recorded (e.g. species proportions present using Domin scale, vegetation structure) and photographs will be taken of each relevé from a fixed point. These relevés will then be re-examined in years 1, 3, 5, 10, 15, 20, 25 and 30 following commencement of the Plan to establish the extent of habitat improvement resulting from management practices. Habitat condition assessment as detailed in Wildlife Manual No. 79 (Perrin *et al.* 2014) will be undertaken to further assess the relevé sites.
- Vegetation Analysis is going to be undertaken for both the restoration area and the peat and spoil management area

E2 Interim vegetation assessments

- Yearly high-level assessments of the sites will be undertaken in the peatland habitats following the ACRES scorecards[6] for peatland habitats in years where no relevé assessments are being undertaken for the first 10 years after the implementation of the measures. The scorecard assessments will be submitted with the monitoring report for the subsequent monitoring year.
- Should the score cards show deteriorating conditions, this will be addressed directly and with remedial actions and changes to the management

E3 Hydrological monitoring

- Water levels within areas where drains are blocked will be recorded quarterly for two years and again during years 3 and 5. Phreatic standpipes will be installed (prior to restoration) to allow monitoring of water levels within the restoration area and outside the restoration area. In this way, any positive impacts on the local hydrology can be verified and quantified.

E4 Monitoring Reporting

- An initial monitoring report will be undertaken for the construction year detailing baseline conditions and measures undertaken
- A monitoring report detailing the actions undertaken, the vegetation analysis and the condition assessments and providing a compilation of the interim scorecards will be prepared in years 1, 3, 5, 10, 15, 20, 25 and 30 and submitted to the relevant authority.
- Analysis of the data collected will be the basis for a review of the measures and techniques employed. Should any adjustments to the plan be deemed necessary or advisable, these will be undertaken in consultation with the NPWS prior to any alterations to the plan.

[6] *https://assets.gov.ie/static/documents/acres-scorecards-general-co-operation-approach.pdf*

Table 2-1 Monitoring and reporting table.

Measure	Timing	Monitoring and Reporting	Measurement of success/ Remedial Action	Responsibility
A1 Drain Blocking	Pre- construction/ During construction	Within construction year monitoring report	Measures undertaken and reported on.	Contractor / ECoW
A2 Erosion control	Pre- construction/ During construction	Within construction year monitoring report	Measures undertaken and reported on. Remedial action to install further erosion control.	Contractor / ECoW
A3 Stabilisation and Revegetation	Pre- construction/ During construction	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Measures undertaken and reported on. Remedial action to repeat mulching and review grazing.	Contractor / ECoW
B1 Structural safeguarding	Throughout construction and operation.	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	No further structural changes recorded.	SSE/ Landowner
B2 Vegetation composition safeguarding	Throughout construction and operation.	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	No adverse changes in vegetation composition recorded.	SSE/ Landowner
C1 Fencing	Throughout construction and operation.	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Fences in place and stockproof	SSE/ Landowner
C2 Grazing regime	Throughout construction and operation.	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Stocking rates achieved.	SSE/ Landowner

D1 Reprofiling and infill	Pre- construction/ During construction	Within construction year monitoring report	Measures undertaken and reported on.	Contractor / ECoW
D2 Reinstating hydrological conditions	Pre- construction/ During construction	Within construction year monitoring report	Measures undertaken and reported on.	Contractor / ECoW / Hydrologist
D3 Reinstating vegetation	Pre- construction/ During construction	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Measures undertaken and reported on.	Contractor / ECoW
E1 Detailed Vegetation analysis	Post- construction/ Throughout operation	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Relevés and condition assessments undertaken and reported on.	ECoW/ Contracted Ecologist
E2 Interim vegetation assessments	Post- construction/ Throughout operation in year 2,4,6,7,8 and 9	Within years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Score cards assessment undertaken	ECoW/ Contracted Ecologist
E3 Hydrological monitoring	Post- construction	Within construction year and years 1 and 3 monitoring reports	Sampling undertaken and reported on.	ECoW
E4 Monitoring Reporting	Post- construction/ Throughout operation	Within construction year and years 1, 3, 5, 10, 15, 20, 25 and 30 monitoring reports	Reports submitted	ECoW/ Contracted Ecologist

3. Conclusions

The measures described in this BMEP will serve to offset the loss of 0.5ha of marginal blanket bog habitat, 3.6ha of cutover bog and 3.4ha of semi-natural habitats associated with the Proposed Project. This Plan provides for sufficient habitat restoration to ensure no net permanent loss of these habitats occurs and the enhancement area of approximately 41.45ha will result in a gain of high-quality peatland habitat as shown in Table 4-1 and provide connectivity between fragments of the Ox Mountains Bogs SAC.

Table 3-1 Concluding Table

Semi-natural Habitat	Habitat Area within the Proposed Wind Farm [ha]	Area to be lost to Proposed Project footprint [ha]	Habitat Gain through Enhancement and Restoration Measures [ha]	Biodiversity Net Gain
Upland Blanket Bog (PB2)	236	**0.5**	36	35.5
Cutover Bog (PB4)	92	**3.6**	5.45	1.85
Wet Heath (HH3)	9.6	**0**	0	0
Dry-humid Acid Grassland (GS3)	37.2	0.8	0	-0.8
Dry-humid Acid Grassland (GS3)/ Wet grassland (GS4)	45	2.6	0	-2.6
Total	419.8	7.5	41.45	33.95

The success of these measures will be evaluated through a detailed monitoring and reporting programme. Following the implementation of the measures outlined in this report to offset the loss, there will be no residual net loss of these habitats as a result of the Proposed Project. There will be enhanced peatland habitat connectivity as a result of the Proposed Project.

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