



# Carrigeen Renewable Energy Development

## Biodiversity Enhancement & Management Plan (BEMP)

Doherty Environmental Consultants Ltd.

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Carrigeen Renewable Energy Development

Biodiversity Enhancement & Management Plan

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## 1 Introduction

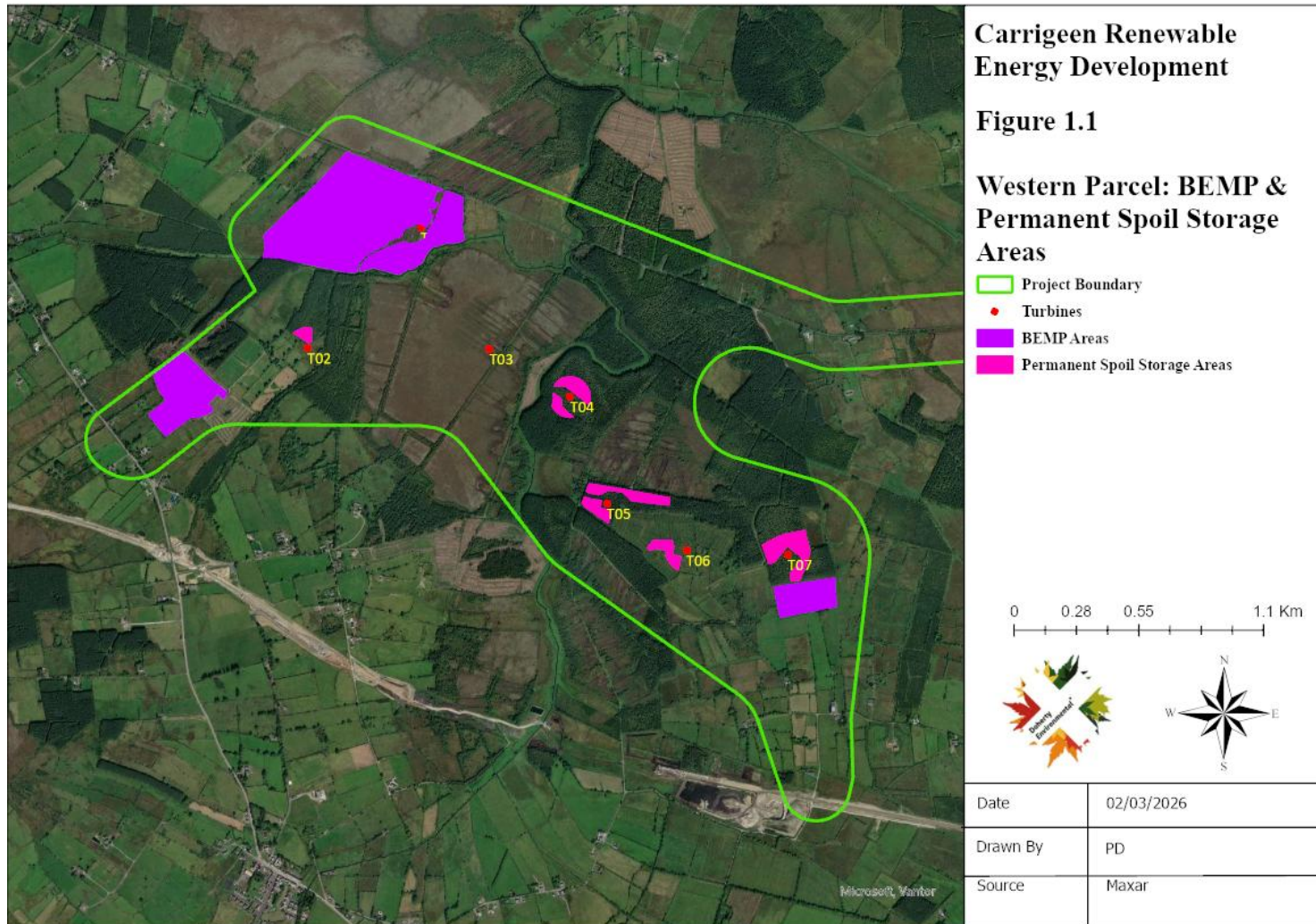
Doherty Environmental Consultants (DEC) Ltd. have been commissioned by Carraigin Power Ltd. (the Applicant) to prepare a Biodiversity Enhancement & Management Plan (BEMP) for the Carrigeen Renewable Energy Development (hereafter the 'Project').

This BEMP has been prepared for three parcels of lands associated with the Project. These parcels comprise the BEMP Areas 1 to 5 and the Permanent Spoil Storage areas surrounding the proposed turbines T2; T4; T5; T6; T7; T10; and T11. The location of the BEMP Areas and the Permanent Spoil Storage areas are shown on **Figure 1.1** and **Figure 1.2**.

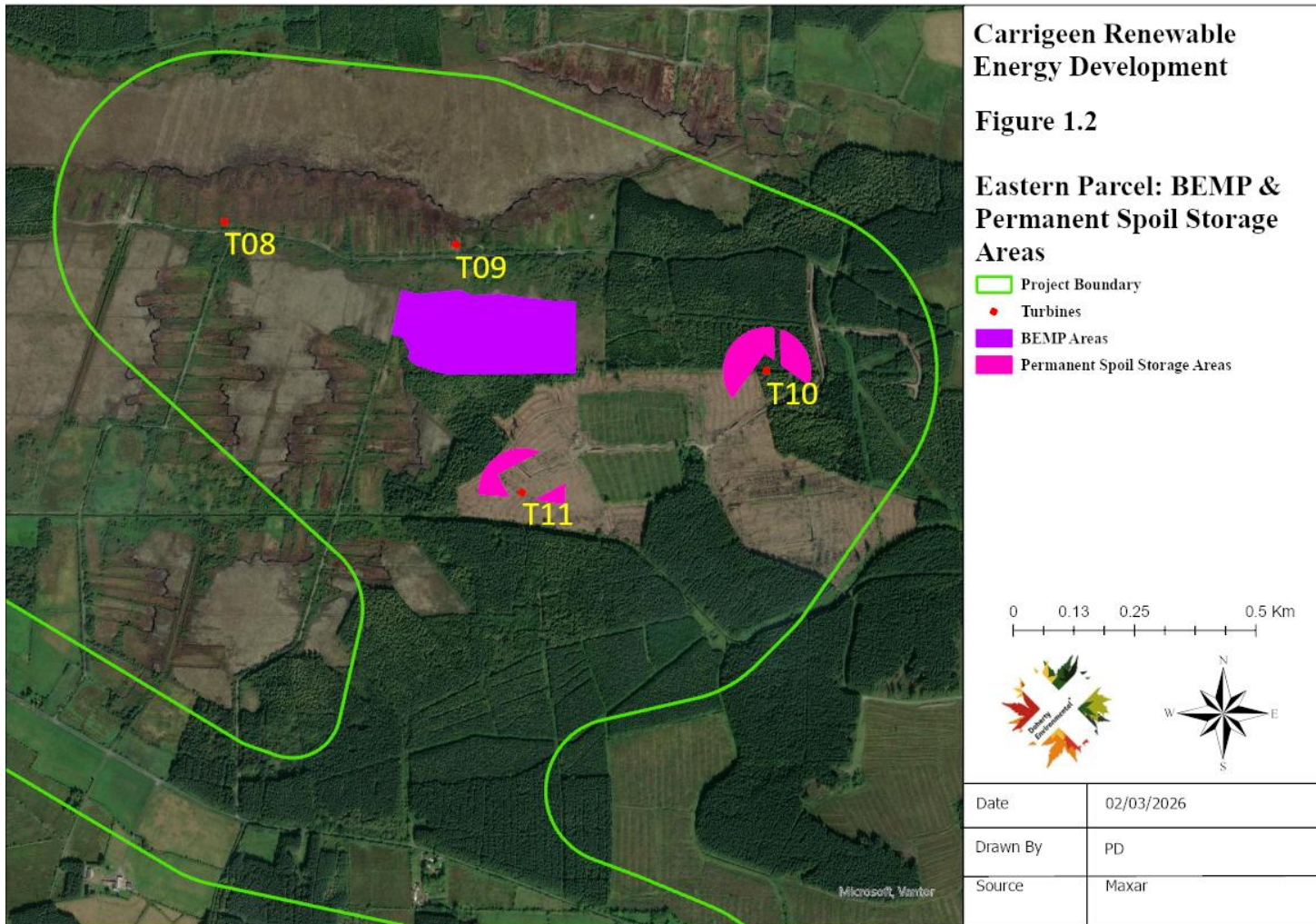
The BEMP Areas amounts to c. 44 hectares, while the Permanent Spoil Storage areas amount to c. 17 hectares. Both parcels that are subject to the measures outlined in this BEMP measure c. 61 hectares. These lands make up the **BEMP Land Holding**.

The BEMP Land Holding will be managed throughout the lifetime of the Project with a view to improving biodiversity throughout the site, managing Annex 1 peatland habitats and implementing measures to compensate for the loss of habitat arising from the Project. It is noted that none of the lands currently included in the c.61 ha of this BEMP land holding are managed under any nature conservation schemes, and thus there are no restrictions to land management practises, which is evident from the current condition of the habitats and land cover occurring at the BEMP and Permanent Spoil Storage areas. The implementation of this BEMP as part of the overall Project provides an opportunity to manage and conserve the peatland habitats occurring within the BEMP Land Holding for the lifetime of the Project.

The wind farm operator will, throughout the lifetime of the Project, ensure the implementation of the actions specified within the BEMP. Pursuant to the terms and conditions of the lease agreements on site, the landowners must comply with all necessary actions and precautions required by the Project operator for the implementation of this BEMP.



**Figure 1.1: Western Parcel: BEMP and Permanent Spoil Storage Areas**



**Figure 1.2: Eastern Parcel: BEMP & Permanent Spoil Storage Areas**

## 2 Purpose of the BEMP

The purpose of this BEMP is to provide detailed descriptions of the locations, methods and activities of habitat restoration and enhancement that will:

- (a) reinstate peatland habitats around infrastructure elements of the proposed Project; and
- (b) enhance areas of degraded raised bog outside of the Project footprint but on land within the control of the Applicant.
- (c) provide compensatory woodland habitat that will be lost to the footprint of the Project in the form of new hedgerows, broad-leaved woodland and native wet woodland.

In order for this BEMP to be meaningful, the aims and objectives of habitat restoration and management for each part of the site are described. This is necessary to:

- (a) make sure that expectation levels for the quality of legacy habitat are realistic; and
- (b) ensure that post habitat restoration monitoring is adequately prescribed.

## 3 Scope of BEMP

The BEMP sets out the following:

1. details of SuDS measures to be provided;
2. detailed methodology and prescriptions of habitat management measures, including timescales and with defined criteria for the success of the measures;
3. details of regular monitoring of habitat management measures using fixed quadrat locations;
4. appropriate maps, clearly identifying habitat management areas;
5. details of the production of regular monitoring reports to be submitted to the Planning Authority at years 1, 3, 5, 7, 10, 15, 20, 25, 30, & 35 which will include details of contingency measures should monitoring reveal unfavourable results.

## **4 Description of BEMP & Permanent Spoil Storage Areas**

### **4.1 Overview of Location & Existing Land Cover**

#### **4.1.1 Proposed Wind Farm Site**

The Wind Farm Site is located approximately 4.2km south-east of Frenchpark and 13km south of Boyle in Co. Roscommon, situated 2.5km north of the N5 national carriageway and easterly adjacent to the N61 national carriageway.

The EIAR Boundary covers an area of c.1,040 ha. The principal land use in the general area consists of agricultural pasture grazing land, peat harvesting and commercial forestry.

The Wind Farm Site is of generally level topography with lands comprised predominantly of cut-over raised peat bog and isolated areas of coniferous forestry.

#### **4.1.2 BEMP Area**

##### **4.1.2.1 Area 1**

BEMP Area is dominated by degraded raised bog with patches of birch and willow dominated woodland established on cutover and drained raised bog. The bog areas have been subject to historical intensive turbarry with cut peat cells and areas of denuded peat at the surface occurring throughout the area.

BEMP Area 1 is bounded to the north by the local road L1217 and to the south by the Carricknabraher River.

##### **4.1.2.2 Area 2**

BEMP Area 2 is located to the east of the proposed Wind Turbine T1 and associated proposed Site Access Road infrastructure. This area is comprised of linear birch and willow dominated woodland established on cutover raised bog. To the east of the woodland remnant drained raised bog habitat occurs. The area is bounded to the north by the local Road L1217 and to the south by the Carricknabraher River. A treeline separates much of BEMP Area 1 from an area of drained and degraded raised bog habitat to the east.

#### 4.1.2.3 Area 3

BEMP Area 3 comprises an area of recently felled conifer plantation. A review of historical aerial imagery shows that this area was planted with conifer plantation in 1987 and 1992 and was recently felled during 2024.

#### 4.1.2.4 Area 4

BEMP Area 4 consists of species-rich wet grassland, supporting abundant *Succisa pratensis*, *Filipendula ulmaria*, *Lychnis flox-cuculi*, *Hydrocotyle vulgaris*, *Angelica sylvestris*, *Cirsium dissectum*, *Dactylorhiza fuchsii*, *Iris pseudocorus*, *Carex nigra*, *Carex panicea*, *Carex echinata*, *Agrostis stolonifera*, *Anthoxanthum odoratum* and with occasional *Molinia caerulea*. The grassland is not subject to intensive management.

#### 4.1.2.5 Area 5

BEMP Area 5 is an area of uncut raised bog that has been subject to drainage, particularly to the east of the area where parallel drainage grips are in place. It is bounded by will scrub woodland to the north and conifer plantation to the south.

### **4.1.3 Permanent Spoil Storage areas**

#### 4.1.3.1 T2 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of conifer plantation.

#### 4.1.3.2 T4 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of conifer plantation.

#### 4.1.3.3 T5 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of conifer plantation.

#### 4.1.3.4 T6 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of immature conifer plantation.

#### 4.1.3.5 T7 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of conifer plantation.

#### 4.1.3.6 T10 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of conifer plantation and recently felled conifer plantation.

#### 4.1.3.7 T11 Permanent Spoil Storage area

This Permanent Spoil Storage area consists entirely of conifer plantation and recently felled conifer plantation.

#### 4.1.3.8 Borrow Pit Permanent Spoil Storage areas

These Permanent Spoil Storage areas consist entirely of conifer plantation and recently felled conifer plantation.

## 4.2 Existing & Past Management of BEMP & Permanent Spoil Storage areas

### 4.2.1 Land Use

The dominant land use at the Wind Farm Site is for conifer plantation with turbary on cutover raised bog also been carried out. Pasture farming in the form of cattle and sheep grazing occurs in grassland habitats within the Wind Farm Site. Grazing by agricultural livestock does not occur within the raised bog habitats occurring within the Project and is not a land use pressure for these habitats within the Wind Farm Site.

## 4.3 Overview of Habitat Condition

The area of cutover and degraded raised bog habitat occurring within BEMP Areas 1 and 2 have been subject to significant historic drainage, turbary and/or reclamation for use as grassland habitat. These areas are considered to be degraded to the point that they are not capable of natural regeneration.

The area of conifer plantation, immature conifer plantation and recently felled conifer plantation in BEMP Areas 3 is representative of artificial habitats occurring on mineral soils and peat substrate.

The area of wet grassland occurring at BEMP Area 4 is representative of species-rich semi-natural grassland habitat in good condition.

The area of raised bog habitat occurring at BEMP Area 5 is representative of a remnant area of degraded raised bog that is subject to ongoing drainage. The drainage at this location will continue to undermine the condition of this area of remnant raised bog habitat.

The conifer habitats occurring at each of the Permanent Spoil Storage areas are representative of artificial habitat of poor condition.

#### 4.4 BEMP Target Habitats

The BEMP target habitats comprise:

- Raised bog habitats;
- Broad-leaved woodland;
- Species-rich Wet Grassland;
- Heath;
- Hedgerows; and
- Watercourses.

The extent of each of these habitats occurring within the BEMP Land Holding are outlined in **Table 4.1** below. In addition to raised bog, woodland and hedgerow habitats, freshwater habitats in the form of watercourses are also included as a BEMP target habitat.

Measures in the Plan will be specified for the target habitats and those specific to different types of raised bog (i.e. uncut but degraded raised bog, cutover and degraded raised bog etc.) will be clearly specified. A description of the measures to be applied to these target habitats is provided under **Table 4.1** below.

Project design and construction phase management measures to protect eroding upland rivers are also specified in **Table 6.2** of this BEMP.

**Table 4.1: Extent of Target Habitats (polygons) occurring within the BEMP Lands**

| Habitat Type                                   | Location                      | Area (Ha)<br>/Length (m)        | Overview of Habitat<br>Enhancement   |
|--|-------------------------------|---------------------------------|--|
| Uncut, degraded raised bog                     | BEMP Area 1                   | 10.32                           | <ul style="list-style-type: none"> <li>Ditch blocking of drainage ditches</li> <li>Conifer seedling removal</li> </ul>   |
|  | BEMP Area 2                   | 1.09                            |  |
|  | BEMP Area 5                   | 5.6                             |  |
| Cutover degraded raised bog                    | BEMP Area 1                   | 9.82                            | <ul style="list-style-type: none"> <li>Ditch blocking of drainage ditches</li> <li>Peat Infill of Cut Cells</li> <li>Re-seed with <i>Eriophorum</i> seed</li> <li><i>Sphagnum</i> inoculation</li> <li>Overseeding with <i>Calluna</i> brash or seed to thicken up the proportion of <i>Calluna</i> in the sward.</li> </ul> |
| New Broad-leaved Woodland Creation             | BEMP Area 2                   | 1.34                            | <ul style="list-style-type: none"> <li>Native Broad-leaved Woodland establishment</li> </ul>   |
|  | BEMP Area 3                   | 3.12                            |  |
| Existing Broadleaved Woodland to be Maintained | BEMP Area 1                   | 3.28                            | <ul style="list-style-type: none"> <li>Maintain woodland extent</li> </ul>   |
|  | BEMP Area 2                   | 1.95                            |  |
| Hedgerow Creation                              | BEMP Area 3                   | 993                             | <ul style="list-style-type: none"> <li>Native Hedgerow Creation</li> </ul>   |
| Species-rich Grassland                         | BEMP Area 4                   | 3.33                            | <ul style="list-style-type: none"> <li>Maintain species-rich grassland extent</li> </ul>   |
| Watercourses                                   | Wind farm                     | 1                               | <ul style="list-style-type: none"> <li>Riparian buffers</li> <li>Water quality protection</li> </ul>   |
| Dry heath                                      | Permanent Spoil Storage areas | 17                              | <ul style="list-style-type: none"> <li>Establishment of dry heath <i>Calluna vulgaris</i> dominated vegetation on Permanent Spoil Storage areas</li> </ul>   |
| <b>Total Area</b>                              |                               | <b>56.85 Ha</b><br><b>993 m</b> |  |

## **5 Habitat Restoration & Enhancement**

### **5.1 Good Working Practices During Construction and Habitat Restoration**

During construction and habitat restoration works a number of good working practices are required to make sure that areas which are to be protected are not damaged during habitat restoration of other parts of the BEMP lands and to ensure that the measures in this BEMP are correctly implemented. The following sections describe standard good working measures which will be implemented as part of the Project's habitat restoration works.

#### ***5.1.1 Ecological Clerk of Works***

An Ecological Clerk of Works (ECoW) will be appointed to supervise the works and to ensure that more valuable areas are protected and avoided during the construction phase to ensure that habitat restoration and enhancement activities are implemented as planned, and to advise on any environmental or ecological aspect of the works. The ECoW will inspect habitat and ditches/water courses during the habitat restoration works and will be in charge of water quality monitoring throughout. The ECoW will be the first point of contact with the NPWS if required. A full description of the role and responsibilities of the ECoW is provided below under Section 7.

#### ***5.1.2 Access and egress***

The Project site entrances and Site Access Roads will be used for access and egress during the construction and operational phase. These Site Access Roads will be used to provide access to areas of habitat restoration. All works associated with habitat restoration and enhancement requiring plant machinery such as peat deposition and cell infill in BEMP Area 1 will be completed during the construction phase. The proposed Site Access Roads and existing access tracks will be used to facilitate the deposition of fill materials to cells during the construction phase.

The route of the Site Access Roads will provide a designated controlled route for vehicles and plant and a permissible construction corridor will be designated within which vehicles and plant can operate during the construction works. This corridor will be marked with temporary fencing. The purpose of the controlled construction corridor is to prevent unnecessary vehicle and plant trafficking across parts of the site that support valuable (priority and non-priority Annex 1) habitats that are to be protected.

### **5.1.3 Laydown and temporary storage of materials**

Laydown and temporary storage of materials will take place only within designated areas (which are generally on constructed hard stands, access tracks, etc.). There will be no laydown of any type of materials without first consulting with the ECoW.

Both access and egress routes and laydown of materials will take place only within the construction corridor around the infrastructure footprint and at the temporary construction compound. A plan of temporary storage areas is provided for in **Figure 1.2** of the EIAR for the Project.

### **5.1.4 Peat Storage**

The majority of the Wind Farm Site is underlain by peat substrate which will be excavated during the construction phase. The peat substrate occurs in areas of degraded raised bog and conifer plantation.

The following approach will be implemented for the storage of peat excavated from areas of degraded raised bog habitat:

- The upper 0.3m to 0.5m will be stored in separate designated areas and will not be mixed with underlying peat or mineral soil.
- The peat material excavated at depths below 0.3m to 0.5m will be transferred to cutover raised bog cell infill areas as shown on **Figure 5.3** below.
- Where surplus peat material remains following the completion of cutover raised bog cell infill peat substrate will be stored in the Permanent Spoil Storage areas. The peat stored in these areas will be stored separately to mineral soil.
- The maximum height at which peat substrate will be stored within the Permanent Spoil Storage areas will be 1m to avoid compaction and desiccation.
- Peat stored in the Permanent Spoil Storage areas will be kept moist until turving/overseeding with *Calluna* is completed (see **Section 5.3**).

## 5.2 Habitat Restoration; Enhancement & Compensation

For the purposes of this BEMP, the terms ‘habitat restoration’ and ‘habitat enhancement’ will be used in a specific manner, as follows:

1. **Habitat restoration** is used for restoring areas of vegetation that have been impacted by wind farm construction activities, such as the restoration of vegetation along Site Access Road verges, around Turbine Hardstands, Temporary Construction Compounds, and at Permanent Spoil Storage areas.
2. **Habitat enhancement** is a benefit of the Project and this term is used for activities that are designed to improve the quality of existing degraded habitats on land that is within the control of the Applicant. Habitat enhancement targets the raised bog that have been degraded or damaged by past land management activities such as drainage and peat cutting.
3. **Habitat Compensation** is used for the provision of new habitat that will compensate for the loss of existing habitat to the footprint of the Project. The habitats that will be subject to habitat compensation comprise hedgerows and broad-leaved woodland. This BEMP has been designed to provide for an overall net increase in the extent of hedgerow and woodland habitat within the Project site and the local areas that will provide for a significant net increase in the extent of hedgerow and native broad-leaved woodland habitat over the long-term time frame.

## 5.3 Habitat Restoration: Temporary Construction Infrastructure Footprint & Peat & Spoil Storage Areas

In all areas where vegetation is stripped ahead of the construction of Site Access Roads, Turbine Foundations, Turbine Hardstands, Temporary Construction Compounds and Internal Cabling for the Project, as well as at the surface of the Permanent Spoil Storage areas, there is the need to restore vegetation cover after the construction activities have been completed. The prime aim of the restoration of vegetation within the wind farm footprint is to re-vegetate peaty surface soils to stabilise them, prevent erosion and to reinstate peatland or heathland vegetation.

### 5.3.1 *Methods of peatland vegetation restoration*

Peatland vegetation cover around the construction footprint will be restored by over-seeding of the peaty surface soil or where available re-turfing with intact vegetated peat turves, saved at the time of turf stripping. It is noted that, given the position of the majority of the Project infrastructure footprint within areas of conifer plantation and degraded cutover raised bog it is

expected that the stock of intact turves with peat/heath sward saved during the construction phase will be low and not sufficient for revegetating the majority of the temporary construction infrastructure footprint. As such over-seeding of the peaty surface soils within the temporary construction infrastructure footprint will be undertaken using locally collected heather brush or heather seed wherever saved turves with peat/heath vegetation are not available.

Careful stripping and replacement of turf is usually the best option for restoring around infrastructure because it permits restoration of a near full range of plant community species and possibly elements of the invertebrate fauna. It may also produce more rapid results as it largely involves vegetative regrowth of established plants. Where saved turves are used the quality of vegetation restoration depends very much on the quality of turf storage and the care taken during the replacement of turves.

Four main activities will be carried out to ensure that the restoration is effective and that vegetation is restored as quickly as possible. These are:

- Careful stripping of suitable vegetation turves as per the above wherever available;
- Storage of intact turves close to their point of origin for as short a period of time as possible;
- Careful reinstatement of turves, with additional heather seeding where suitable; and
- Monitoring of reinstated vegetation.

Each activity is described in more detail below. Monitoring is described in Section 6.

### ***5.3.2 Careful Stripping of Vegetation Turf***

Ahead of the construction of Turbine Foundations, Turbine Hardstands, and cut sections of Site Access Roads, the vegetation will be stripped in intact turves, ideally in large sections using plant with a modified metal tray, to function as a slane, attached to the arm of a tracked excavator. The turves shall be large in area (such a slane as shown on **Plate 5.1** will allow for excavation of turves at c 1m x 1m) and as deep as the surface soil organic horizon (peat), but not less than 30cm to ensure that the turves stay moist and intact during handling and storage. This will also assist their successful reinstatement. To ensure careful work, it is proposed that an experienced driver is used for this task and that all drivers are trained to meet this requirement.

**Plate 5.1: View of modified excavator ‘slane’ attachment for removal of peat turves**



For the excavation of cable trenches, the method for turf stripping and peat excavation will ensure that sections of cable trench (e.g. 500m sections) are excavated, laid and restored as quickly as possible and that the cable trench is not left open across the site and restored in one activity. This will allow the most rapid reinstatement of peatland (and other) vegetation and will prevent drying out of both the stored turves and areas of vegetation adjacent to the trench.

**5.3.3 Storage of intact turves**

Stripped turves shall be stored as close to their point of origin and for as short a period of time as possible. In the case of Turbine Foundations this is likely to be of the order of weeks, but for cable trenches it will be in the order of days.

Locations chosen for the storage of vegetated peat turves shall be located away from any areas of valuable peatland vegetation (uncut raised bog, adjacent to watercourses, on semi-natural grassland habitat), particularly areas that are in good condition, within the Wind Farm Site, as agreed by the ECoW. Turf storage areas will be designated in advance and contained so that no soil erosion can runoff the storage area. The method of storage will be such that:

(a) turf stripped from areas of degraded raised bog and under conifer plantation is stored vegetation side up to a maximum of two turf heights, and

(b) turves stripped from areas where the vegetation has been degraded by overgrazing which are likely to be less intact and more easily broken up, are more carefully stripped, transported and stored, vegetation side up, to no greater than two turf layers high. Turf storage areas shall be managed so that the turves can be deposited and lifted with minimal impact on underlying vegetation.

To ensure good conservation and to retain moisture status of turves during storage, particularly in dry weather when desiccation can occur rapidly, they may require periodic watering, or they will be covered (plastic sheeting) as determined by the ECoW, particularly if storage includes any longer spells of hot, sunny and windy weather.

#### **5.3.4 *Habitat restoration using stored turves***

The aim will be to restore habitat around all construction areas to their original vegetation type using stored turves initially stripped from these areas.

Where the Site Access Road is constructed as a ‘cut’ track, it will be ensured that the Site Access Road verges and the cable trench will be constructed in such a way as to minimize the disturbance of stripped vegetation and excavated peat. This approach will involve vegetation restoration on the road verge and over the cable trench as a single process after all the construction work has been completed.

Habitat restoration around batters of Turbine Foundations, Turbine Hardstands, Temporary Construction Compounds, Borrow Pits and sections of cut Site Access Road will be achieved by

- (a) ensuring sufficiently shallow batter gradients to prevent peat or soil erosion;
- (b) careful levelling and firming of subsoil to the correct density to minimise the risk of uneven settlement; and
- (c) by careful replacement of turves, butted close together and well tamped into place, so that they will not easily erode. Any unavoidable gaps shall be filled with loose peat and well tamped.

The quality of restored areas will be checked by the ECoW immediately after completion to confirm that turf reinstatement has been carried out correctly. Subsequent checks and monitoring of restored areas are described in **Section 6**.

Should there be a requirement to dress batters with stored peat and/or mineral soil in addition to peat turves; the stored peat and/or mineral soil will be replaced first in a layer, with peat typically of approximately 0.3-0.5m depth, well tamped into place and levelled in order to reduce the potential for peat erosion. Peat turves will then be carefully placed on top, closely butted, and further tamped into place. The peat and turf replacement process will be carried out as one activity and in no case will any replaced loose peat be left as an exposed layer without turf cover, unless under the guidance of the on-site ECoW. In such cases, revegetation of bare peat will be according to the methods to reseed using heather brash or seed, outlined in **Section 5.3.5**.

Habitat restoration of cable trenches will be completed as soon as sections of trench, 500m long, are completed and back-filled. To ensure successful restoration of vegetation along cable trenches, and to ensure that trenches do not become routes of preferential flow for drainage waters, trenches will be designed with cross dams and back-filling and re-turfing will take place immediately after cables have been laid. Appropriate scale plant will be used for these activities to minimize as much as possible the trafficking of adjacent peat.

Should areas of replaced turf require overseeding to thicken up vegetation regeneration, the method will follow that described in **Section 5.3.5** below.

### **5.3.5 Heather Seeding**

*Calluna vulgaris* seed will be collected from suitable *Calluna*-dominated vegetation community supporting stands of mature heather in the surrounding region. The donor sites for the collection of heather seed will be identified by the Project ECoW during the pre-construction stage and the Applicant will be required to secure permission to collect seed from the donor site.

Under the guidance of the ECoW, areas with mature *Calluna vulgaris* at the donor site will be selected for mowing. The ECoW will undertake an inspection of the area to select the best and most easily accessible areas as donor locations for collection of heather seed for re-seeding at the BEMP Areas and Permanent Spoil Storage areas. These donor areas will display signs of mature and 'leggy' heather stands in need of regeneration and display good seed production.

Heather seed is very small and can be produced in great abundance. Heather seed does not ripen until about October, depending on weather conditions. Germination requires light, warmth and moisture, so seed collected in the autumn is best sown in the spring. Most germination usually occurs in mid to late summer. If conditions are unsuitable, seed will remain dormant and can persist in the seedbank for decades although viability varies greatly according to site conditions.

In order to use locally/regionally-sourced heather seed for both revegetating areas of bare peat and enhancing re-turved areas, a programme of heather seed collection, using brush harvesters, will be conducted on suitable areas of heather dominated vegetation. Brush harvesters can be deployed as rear and side-mounted brush harvesters, tractor-trailed, ATV-trailed and pedestrian brush harvesters. For the purpose of heather seed collection, the most sensitive mechanisms for collection that will be used for seed collection will be a combination of either quad-bike ATV-trailed harvesters and pedestrian harvesters. This will avoid the use of heavy machinery at donor sites and the compaction of underlying peat/soil substrate at donor locations.

A number of component tasks will be carried out and managed by the ECoW. These tasks will include as a minimum:

- Identification and inspection of suitable donor areas for *Calluna* seed collection. Donor areas suitable for seed collection will be accessible and will display signs of mature and ‘leggy’ showing good flowering characteristics. This inspection and selection will be carried out by the ECoW;
- Plan suitable storage facilities for both heather brush and heather seed (if required) so that harvested materials can be suitably conserved until it is deployed in habitat restoration works; and
- If there are any bare patches in restored areas within the Wind Farm Site, implement heather seed spreading on a location-by location basis, as indicated below and as directed by the ECoW.

The ECoW will plan and supervise a targeted heather seed collection programme in line with the requirements of the Wildlife Act and the breeding bird season. As such all heather seed collection will be carried out during the period 1<sup>st</sup> September to end of February to protect ground-nesting birds. This time frame falls within the optimum period of the year for *Calluna*

seed collection, which is from October through to December. As such all seed collection will be completed during the months of October to December inclusive.

Suitable dry storage facilities for both heather brush and heather seed will also be planned so that harvested materials can be suitably conserved and protected from wet conditions until they are deployed in habitat restoration works.

#### *5.3.5.1 Seed Application & Management*

Heather reseedling shall take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination. A sowing rate of 15 – 17kg per hectare, with repeated applications over several years, will be required as part of the habitat restoration.

Regrowth of competitor vegetation must be reduced during the establishment phase by one or a combination of the following management actions:

- Topping
- Controlled grazing; and/or
- Weed wiping

The areas within the Wind Farm Site that will be treated with heather seed will be areas of bare peat occurring within the degraded peatland and heath habitats occurring within the Wind Farm Site as shown on **Figure 5.3**. These areas have been subjected to overgrazing by sheep. Seeding of these areas with heather seed, along with the combined treatment of stock reduction will contribute towards the re-establishment of heath vegetation in these areas of the Wind Farm Site.

#### *5.3.6 Fencing and Grazing Management*

No managed grazing occurs at the Project site and within the BEMP areas. The principal grazing animal at in the vicinity of the temporary construction infrastructure footprint and the Permanent Spoil Storage areas are deer. The deer population is not considered to have the potential to suppress vegetation establishment and as such no fencing is proposed to be installed. Continued monitoring of the BEMP Areas will be undertaken and where the Project Ecologist identifies a need for fencing then fencing will be installed as recommended by the Project Ecologist.

## 5.4 Habitat Enhancement: BEMP Areas 1, 2 & 5

### 5.4.1 Introduction

The habitat enhancement measures set out in this BEMP will target the cutover raised bog and uncut drained and degraded raised bog within the Wind Farm Site.

A number of land management practices have damaged and caused the degradation of raised bog habitat at the Wind Farm Site. In addition to preventing the occurrence of these damaging management practices in the future, there are a number of habitat enhancement and improvement activities that will be implemented as part of the BEMP.

The Applicant will work with the current landowners to manage areas of raised bog within the BEMP Areas so as to return them to good conservation status for at least the lifetime of the Project, which is predicted to be at least 35 years.

The techniques for habitat enhancement and improvement that will be implemented will comprise:

- **Ditch blocking.** Opportunities for blocking drainage features resulting in water loss from peatland habitats have been identified within the Wind Farm Site and the peat storage and restoration (habitat enhancement) area. The blocking of ditches will reinstate higher water table levels which would have been present before artificial drainage and peat cutting.
- **Reinstatement of raised bog vegetation community.** Areas of degraded raised bog, badly damaged through drainage, mechanical peat cutting and compaction caused by heavy vehicle trafficking, are targeted for reinstatement.
- **Reprofiling of cutover degraded raised bog.** Reprofiling of areas of cutover degraded raised bog in BEMP Area 1 where the surface vegetation, upper surface layer of the acrotelm and lower catotelm have been removed will be implemented to promote reinstate original raised bog levels and promote the active raised bog conditions.
- **Fencing.** Fencing will be provided both during the construction and decommissioning phase and the operation phase of the Project to promote peatland restoration and ongoing management.
- **Agreements with landowners** to prevent any ongoing damaging land management practices.

### **5.4.2 Ditch blocking and infilling**

Opportunities for blocking drainage features resulting in water loss from peatland habitats have been identified within the BEMP Areas at BEMP Area 1; BEMP Area 2 and BEMP Area 5. Areas where water loss from raised bog habitat is occurring either through artificial drainage ditches, erosion gullies or peat cuttings have been identified during a review of orthophotography, satellite imagery and site walkover surveys undertaken between 2023 and 2026. Blocking these features will have the potential to prevent water loss from raised bog habitat and reinstate a high water table and promote rewetting of raised bog occurring within these BEMP areas.

The drainage and seepage features shown in **Figure 5.1 & 5.2** are artificial and/or a result of erosion brought about from excessive grazing and are causing water loss from raised bog habitats. The drainage features to be blocked include artificial drainage ditches, informal drainage channels that have become established along the base of cut peat face banks and drainage pathways through peat cutting on sloping ground. The indicative location of drainage blocking and the type of drainage features to be blocked for BEMP Areas 1 & 2 and BEMP Area 5 are shown on **Figure 5.1 & 5.2**.

Note that the drainage features within cutover raised bog in BEMP Area 1 labelled standing water in cut cells occur at the base of cut cells and will be subject to infilling as per **Section 5.4.4** below.

It is predicted that, with the blocking of these drainage features the water table in the surrounding area will rise and promote optimal conditions for the maintenance and enhancement of peatland habitats.

#### **5.4.2.1 Methodology of Ditch Blocking**

Ditch blocking has been shown in numerous studies to be a highly effective method of raising water tables as a pre-cursor to active bog restoration. See, for example, Armstrong *et al.* (2009a) who reviewed the results of 32 ditch blocking programmes in England and Scotland and also provide a drain-blocking best practice guide which advises on methodology (Armstrong *et al.*, 2009b). Typical methods for ditch blocking involve the use of plastic or wooden piling, often accompanied by infilling/backfilling the blocked ditch with peat or heather bales. In some places, for example areas where drainage ditches intercept mineral substrate below, stone dams have been used.

A number of techniques can be used for ditch blocking. These include the use of decomposed peat and the creation of “wave dams” or the use of plastic sheet piling; coir rolls or netting. Peat turves are often the most widely used method for damming drainage ditches, since turves are available on site and the method is cheap. The wave damming approach using decomposed peat either side of drains has proved an effective method for drain blocking on wind farms in Scotland.

Plastic piling has been the most widely recommended method for ditch blocking, particularly where there is sufficient peat below the ditch in which to secure the piling. The method for inserting dams to block ditches at the Wind Farm Site is provided in NatureScot’s (2019) document entitled “Guidance for land managers installing plastic piling dams”<sup>1</sup> and will consist of very simple, manually-installed plastic piles in addition to backfilling ditches with peat turf. This is the most simple and effective method. Personnel installing plastic piling dams at the Wind Farm Site will refer directly to the Nature Scot (2019) document. Useful information is provided in that document on: selection of where to put each dam, method of pile insertion, checking that the dams are properly installed, post installation monitoring and repairing dams if they are found to be damaged or not working properly.

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<sup>1</sup> <https://www.nature.scot/doc/peatland-action-guidance-land-managers-installing-peat-and-plastic-dams>

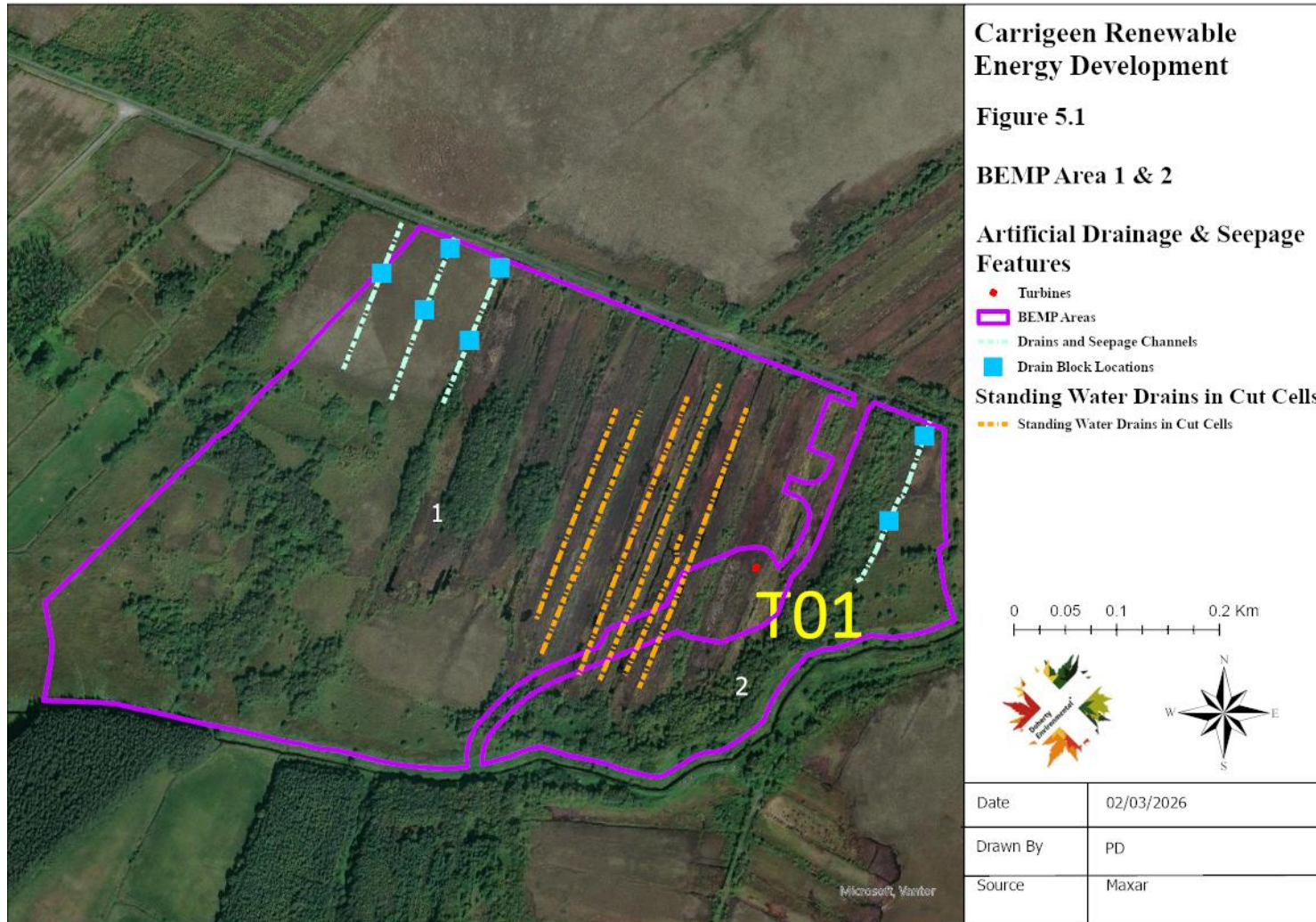


Figure 5.1: BEMP Area 1 & 2

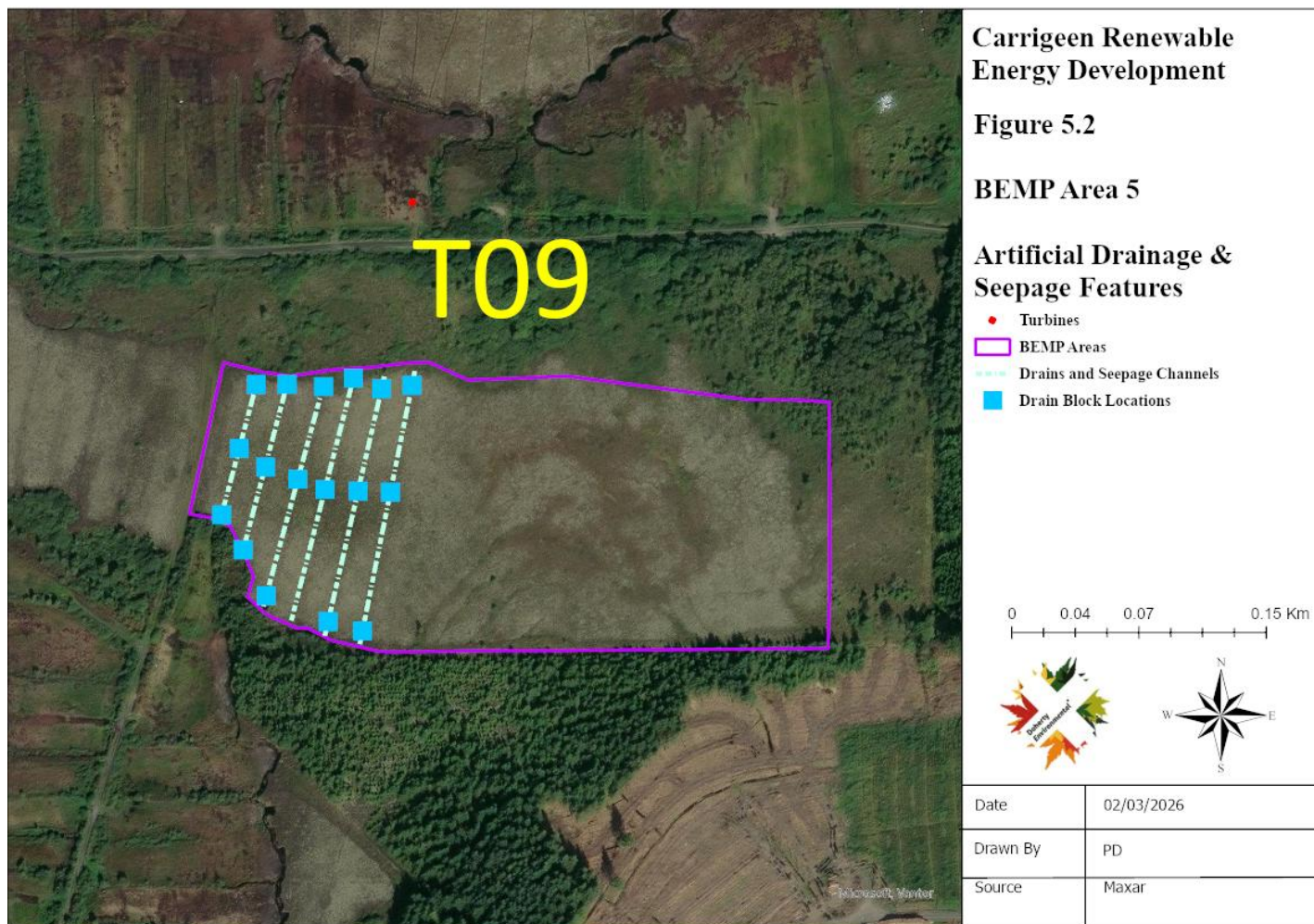


Figure 5.2: BEMP Area 5

The spacing between dams will be determined by the slope of the land, the width of the ditch and the rate of water flow. No generic criteria can be provided for damming in terms of spacing aside from the general rule that the spacing between dams should exhibit a ‘top to toe’ effect whereby the raised water table stretches from one dam up to the next one upslope. Dam location will be finalised by the ECoW in consultation with a peat/hydrology expert during the construction phase.

There will be a number of key requirements imposed on the construction contractor during ditch blocking and dam construction, including:

- planning access and egress routes to minimise as much as possible the compaction of peat around drainage ditches;
- use of plant (if required, since much of this work can be done by hand) with low pressure bearing tyres or suitably wide tracks to reduce compaction around the construction areas;
- careful backfilling with originally excavated peat from ditches, so as to cause as little disturbance to the ditch banks as possible and to leave original underlying bankside vegetation intact; and
- peat must be carefully and sufficiently tamped and keyed into the bottom and sides of the drain and dam to avoid undercutting or leakage. This is particularly true where piles intercept both peat and underlying mineral substrates.

Monitoring of the success of drain blocking will be undertaken by:

- a. vegetation analysis using quadrats immediately adjacent to blocking locations;
- b. the monitoring of dipwells/piezometers adjacent to blocking locations; and
- c. also through a detailed photographic log of the blocking location during ongoing operation phase monitoring.

### **5.4.3 Management agreements with landowners**

A number of land management practices are damaging to raised bog and peatland. Under the terms of their lease with the respective landowners, the Applicant will prevent ongoing damaging land management practices during the lifetime of the Project within the BMEP areas. In this respect, there will be:

- no peat cutting;
- no new drainage and no maintenance of existing drains, with the exclusion of drains designed to protect the Project's infrastructure;
- no flailing or mowing (with the exception of any flailing or mowing designed specifically for habitat enhancement as part of the Project); and
- no burning.

#### **5.4.4 BEMP Area 1- Cutover Raised Bog**

Areas of cutover bog within BEMP Area 1 that now present themselves as cut cells below the original ground level of surrounding raised bog will be infilled with surplus peat spoil material from the proposed Wind Farm Site. The cutover cells to be infilled are shown on **Figure 5.3** below and amount to c. 3.74 Ha in area. The average depth across these cells is estimated to be c. 1.5m. The cut cells will provide capacity for c. 50,482m<sup>3</sup> of peat spoil to be stored, taking into account a peat bulking factor of 10%. Works associated with the deposition of surplus peat and infilling of existing cut cells will involve the machinery similar to that used for peat excavation for the proposed Wind Farm Site. A 40-60 tonne 360 degree long reach hydraulic excavator and tractors and trailers will be used to place the spoil in areas of cut away cells to create broadly level surface. Berms will be created around the boundary of the cut cell infill area as the cells are infilled so that a continuous berm is provided upon completion around the boundary of the infill area (see **Figure 5.3** for illustration of final berm upon completion).

Two approaches will be taken to restoring active peat-forming vegetation on the surface of the deposited peat substrate within the cut cells. The approach to be used will be dictated by the existing condition of the cut cell, which are presentative of either a) cut cells that support typical peatland vegetation including abundant Sphagnum cover; and b) cut cells that are dominated by bare peat and do not support rehabilitating raised bog habitat.

##### **5.4.4.1 Cells Supporting Peatland Vegetation**

Where the cut cell that is to receive surplus peat materials currently supports a vegetation community that is typical of peatland vegetation, the vegetation will be removed from the cell as turves in advance of the deposition of surplus peat material. The removal of the vegetation as turves will follow the approach detailed in **Section 5.3** above. The turves will be stored on degraded raised bog adjacent to the cut cell. The storage of the turves will follow the approach set out in **Section 5.3** above. Once surplus peat has been deposited, the turves supporting the peatland vegetation community will be re-laid on top of the deposited surplus peat material.

The turves will be applied as the finish layer to the infilled cut cell as per the approach set out in **Section 5.3.4** above.

The following sequence of works will be implemented for cut cells supporting existing peatland vegetation:

- a) The boundary of the cell will be re-inspected prior to infilling to confirm the continued absence of drainage linkage to the existing main Local Road side drain to the north or to the Carricknabraher River to the south. No such linkages were identified as occurring during the detailed baseline ecological and hydrological field surveys completed for the proposed Project.
- b) In the event that new connections link the cut cells to the drain to the north or the Carricknabraher River to the south they will be entirely blocked so that all cells are isolated/disconnected from both these surface water features.
- c) Infilling of cells will progress from east to west, commencing at Cell No. 1 and finishing at Cell No. 9.
- d) The existing peat forming vegetation in the cut cell will be removed as turves.
- e) The surplus peat will be deposited to existing ground level.
- f) The surplus peat will be profiled so that it forms a dished or slightly concave profile with the centre of the cell lying slightly lower than the edges
- g) Berms will be formed along the southern and northern boundary of the cell area moving in a westerly direction as each cell is infilled. Intermediary berms will also be created so that water levels are maintained at the surface. The intermediary berms are shown on **Figure 5.3**. These will be formed as the cells are infilled and works progress in a westerly direction
- h) The surface turves will be re-laid on the surface of the infilled cell within the berm.

#### 5.4.4.2 *Cells Dominated by Bare Peat/Not Supporting Peatland Vegetation*

Where the cut cell that is to receive surplus peat materials is currently dominated by bare peat or does not support a vegetation community that is typical of peatland habitat, the surplus peat will be deposited on to the existing surface.

Once all material is applied the surface of the cell will be profiled so that it forms a slightly concave profile with the centre lying slightly lower than the edges at the surrounding berm. This profile will be provided so that the cell will hold a shallow film of water within the cell.

The cell surface will be inoculated with *Sphagnum* and *Eriophorum* seed collected from donor locations within the peat storage and restoration (habitat enhancement) area.

The following sequence of works will be implemented for cut cells supporting existing rehabilitating raised bog vegetation:

- a) Existing drains resulting in water loss from the cell, generally at a cell outfall location will be blocked.
- b) The surplus peat will be deposited to existing ground level.
- c) The cell will be profiled to a shallow concave shape.
- d) A berm will be provided around the cell.
- e) The cell surface will be inoculated with *Sphagnum*.

#### 5.4.4.2.1 *Sphagnum* Inoculation

The main objective of this enhanced rehabilitation intervention is to accelerate the rate of natural colonisation of *Sphagnum* moss at suitable sites by introducing donor material. The presence of *Sphagnum*-rich vegetation on peatlands brings significant benefits as this is considered a potential carbon sink.

*Sphagnum* inoculation will be used to establish peat forming vegetation within the water-logged areas of bare peat surface within the cell infill area. This method involves preparing the raised bog surface by removing the oxidised layer of bare peat. *Sphagnum* will be sourced from the Wind Farm Site under the direction of the ECoW. *Sphagnum* is spread across the prepared surface at a ratio of 1:10 (i.e. *Sphagnum* collected from 1Ha of a donor site will inoculate 10Ha). Where there is a shortfall in the amount of *Sphagnum* required additional quantities will be procured from other established cutover bog sites in the surrounding region. Small amounts (handfuls) will be distributed into the newly created infill cells on deep peat cutover bog. This material can be planted into the soft peat or scattered into shallow water.

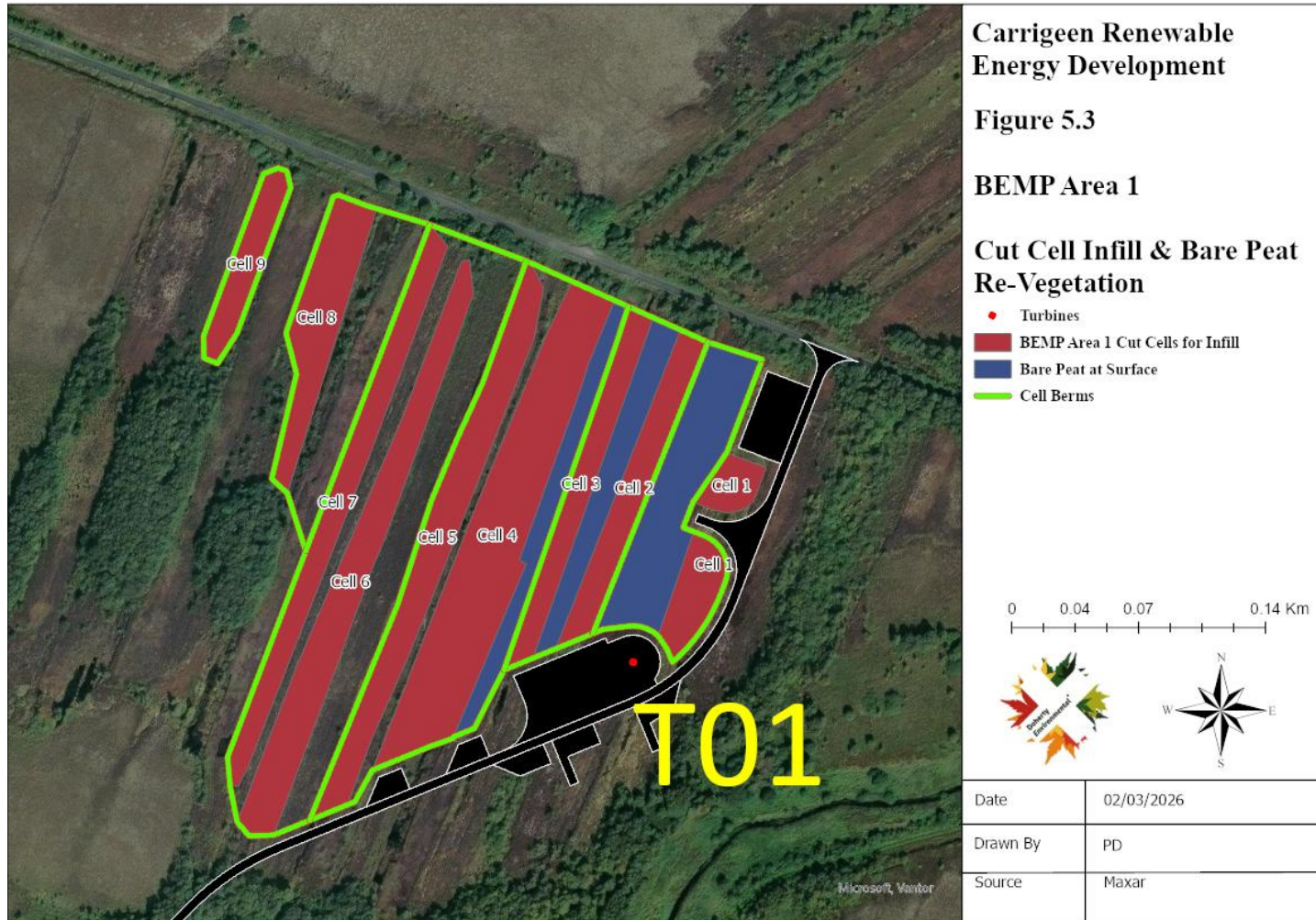


Figure 5.3: BEMP Area 1

The approach to Sphagnum inoculation will follow the best practice guidance as per Mackin et al. (2017)<sup>2</sup>.

There are significant benefits for climate action from establishing Sphagnum-rich peatland vegetation communities. These have been found to quickly develop as carbon sinks (> 10 year). This enhanced measure will be used to accelerate and optimise the development of Sphagnum-rich vegetation within the cell infills.

#### **5.4.5 Uncut Bare Peat Surface between Cut Cells**

Three strips of bare peat surface occur between cut cells towards the east of BEMP Area 1. As with the cut cell infill surface, the surface of these existing strips of bare peat will be profiled so that that it forms a dished or slightly concave profile with the centre lying slightly low than the edges at the surrounding berm. This profile will be provided so that the cell will hold a shallow film of water within the cell.

The cell surface will be inoculated with Sphagnum as per the approach set out in **Section 5.4.4.2.1** above.

The following sequence of works will be implemented for degraded areas of raised bog where surplus peat will be deposited:

- a) The bare peat surface will be profiled to a dished/slightly concave surface
- b) A berm will be provided around the edge of the cell.
- c) The bare peat surface will be inoculated with donor Sphagnum.

#### **5.4.6 Treatment of Cell Berms**

All berms enclosing cells that are to receive surplus peat material from the proposed Wind Farm Site will be treated as a heath habitat. As the berms will sit proud of the surrounding peat substrate they will be subject to drier conditions. The aim will be to establish heather-clad

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<sup>2</sup> Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

berms enclosing the areas of raised bog within cells. The berms will be seeded with *Calluna vulgaris* seed.

During the construction phase the ECoW will identify suitable donor areas for heather seed collection. The seed will be collected and applied in line with the approach set out under **Section 5.3.5** above.

#### **5.4.7 Existing Broad-leaved Woodland Maintenance: BEMP Area 1 & 2**

Existing broad-leaved woodland in the form of wet willow and birch woodland occurs within BEMP Areas 1 and 2. The extent of the existing woodland, as per the wind farm habitat map, are shown on **Figure 5.4** below.

The aim of the habitat enhancement for the existing woodland habitat occurring at BEMP 1 and 2 will be to maintain the extent of this woodland within this area such that the area is stable or increasing, with the current area being c. 5.25 Ha in area.

##### *5.4.7.1 Woodland Structure*

The woodland structure shall be managed with the objectives of maintaining and/or enhancing a diverse structure with a canopy containing mature trees, shrub layer with semi-nature trees and shrubs and well-developed field layer and good cover in the bryophyte layer so that total canopy cover is at least 30%, with median canopy height at least 7m. The shrub layer will be maintained so that it consists entirely of native species and the cover of native species in the shrub layer should range from 20% to 70%. The native herb/dwarf shrub layer should cover at least 20% with a height of at least 20cm, whilst the bryophytes should cover at least 4%.

##### *5.4.7.2 Negative Indicator Species*

Negative indicator species will be removed from the woodland as part of the ongoing management and enhancement. Negative indicator species comprise all non-native invasive plant species. *Acer pseudoplatanus* and all conifer plantation species are included as negative indicator species. The presence of negative indicator species will be identified at seedling stage and will be removed by hand pulling.

##### *5.4.7.3 Dead Wood*

Dead wood cover will be maintained within the woodland with a target of at least 19 stems/Ha of dead wood at least 20cm in diameter.

#### 5.4.7.4 Grazing

Grazing levels within the woodland by herbivores (mainly deer, along with rabbit) will be monitored by the appointed Forester and Project ECoW to ensure no overgrazing occurs. Indicators of overgrazing include topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, severe recent bark stripping, and trampling. Where evidence of overgrazing is identified, management measures such as temporary fencing, stem protection etc. will be implemented.

#### 5.4.7.5 Forester

A Forester, along with the Project ECoW will be engaged to manage the existing woodland with the aim of achieving the above objectives. The Forester and the ECoW will be engaged for the construction phase and the operation phase so that BEMP Actions as set out in **Table 6.2** below are discharged as required.

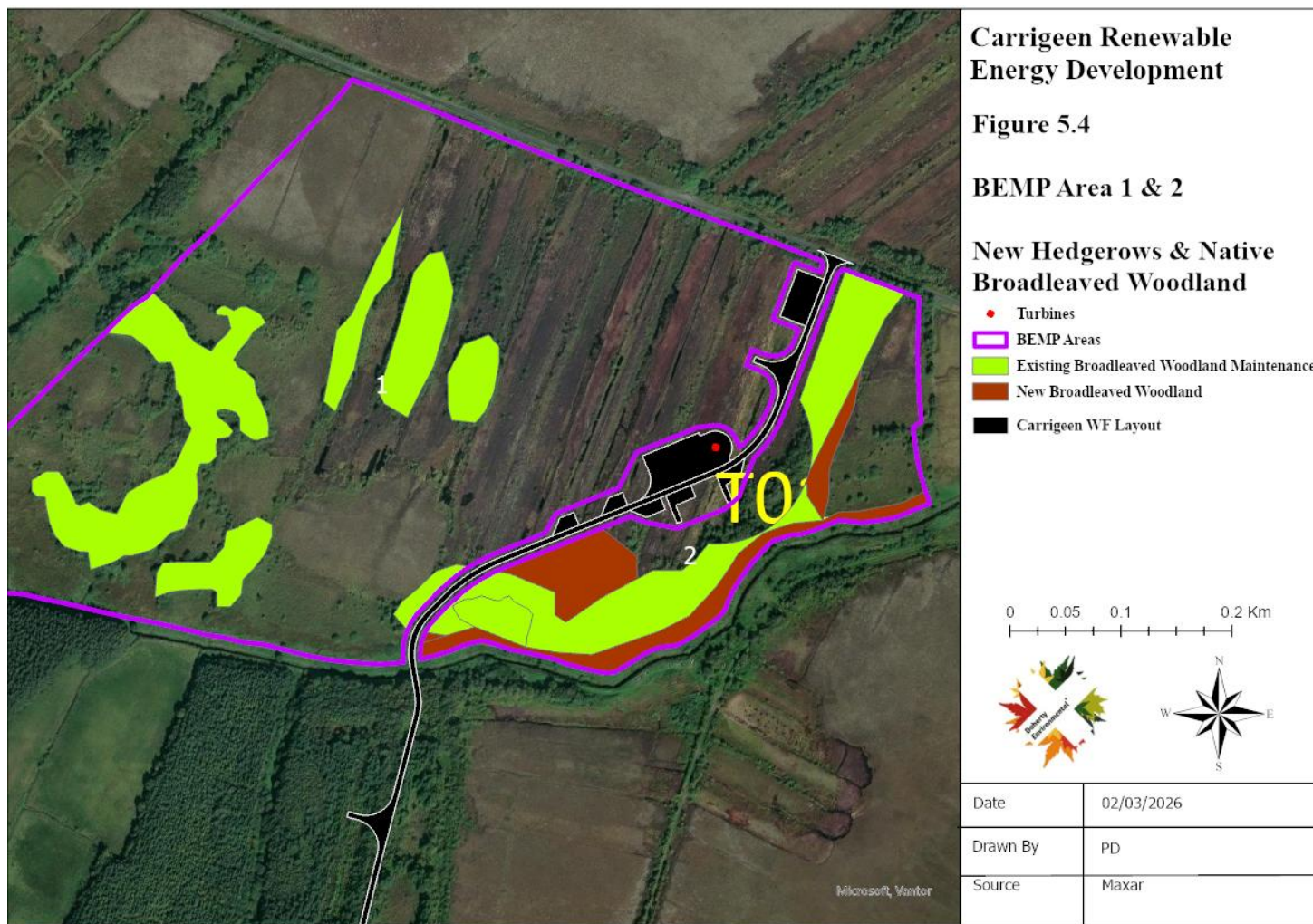


Figure 5.4: BEMP Area 1 & 2

#### **5.4.8 New Broad-leaved Woodland: BEMP Area 1 & 2**

Plots of new native broad-leaved woodland will be provided within BEMP Areas 1 and 2 to the south and east of the proposed Wind Turbine T01. The linear woodland corridor as indicated on **Figure 5.4** will be established as a riparian woodland fringe to existing woodland, whilst the plot between the proposed Site Access Road and the existing broad-leaved woodland will be established as a birch dominated native woodland.

The objectives for the new woodland establishment in BEMP Area 1 and 2 are:

- Biodiversity Enhancement: Create a diverse and resilient woodland ecosystem that supports a wide range of flora and fauna, including wetland and riparian species.
- Habitat Creation: Provide new habitats for birds, bats, non-volant mammals, insects, and amphibians. The woodland will be created outside of the bat buffer surrounding the proposed Wind Turbine T1 with the aim of providing a foraging resource for bats outside of this buffer and attracting bat foraging activity away from the Wind Turbine and the buffer area. Roosting opportunities will be provided for bats within the new native broadleaved woodland.
- Water Quality Improvement: The riparian woodland will contribute to improved water quality in the Carricknabraher River by filtering runoff and stabilizing riverbanks.
- Carbon Sequestration: Contribute to climate change mitigation through carbon uptake and storage.
- Landscape Enhancement: Improve the aesthetic value of the local landscape.
- Erosion Control: The riparian woodland will help stabilize riverbanks and reduce erosion.

##### *5.4.8.1 Species Composition*

The birch woodland plot between the proposed Site Access Road and the existing woodland will comprise a canopy of *Betula pubescens* with *Alnus glutinosa* and an understorey of *Ilex aquifolium* and *Crataegus monogyna*.

The percentage composition of each species to achieve the objectives of the woodland are as follows:

*Betula pubescens* will account for 60% of the species mix;

*Alnus glutinosa* will account for 10% of the species mix;

*Ilex aquifolium* will account for 15% of the species mix; and

*Crataegus monogyna* will account for 15% of the species mix.

The species composition for the riparian woodland will comprise a canopy of *Alnus glutinosa* with *Salix fragilis*, *Salix alba* and *Salix viminalis* to be provided, particularly along the river side edge of the woodland. *Quercus robur* will be provided at lower density on the landward side of the riparian woodland. Shrub species will comprise *Prunus spinosa* and *Euonymus europaeus*.

The percentage composition of each species to achieve the objectives of the woodland are as follows:

*Alnus glutinosa* will account for 60% of the species mix;

*Quercus robur* will account for 5% of the species mix;

*Salix species* will account for 25% of the species mix; and

*Prunus spinosa* and *Euonymus europaeus* will account for 10% of the species mix.

#### 5.4.8.2 *Planting Density*

In order to achieve an open woodland habitat upon maturity that is not overly dense and provides ideal foraging habitat for bat species a reduced planting density of 1,500 to 2,000 trees per hectare will be implemented.

Spacing between whips will be at 2m. Whips will be planted in irregular formation and internal glades within the large plot of woodland to the west of the BEMP Area will be included for in the design.

The riparian woodland river side edge will be comprise of the above listed *Salix* species.

#### 5.4.8.3 *Negative Indicator Species*

Negative indicator species will be removed from the woodland as part of the ongoing management and enhancement. Negative indicator species comprise all non-native invasive plant species. *Acer pseudoplatanus* and all conifer plantation species are included as negative indicator species. The presence of negative indicator species will be identified at seedling stage and will be removed by hand pulling.

#### 5.4.8.4 *Dead Wood*

Dead wood cover will be maintained within the woodland with a target of at least 19 stems/Ha of dead wood at least 20cm in diameter.

#### 5.4.8.5 *Grazing*

Grazing levels within the woodland by herbivores (mainly deer, along with rabbit) will be monitored by the appointed Forester and Project ECoW to ensure no overgrazing occurs. Indicators of overgrazing include topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, severe recent bark stripping, and trampling. Where evidence of overgrazing is identified, management measures such as temporary fencing, stem protection etc. will be implemented.

#### 5.4.8.6 *Forester*

A Forester, along with the Project ECoW will be engaged to manage the existing woodland with the aim of achieving the above objectives.

#### 5.4.8.7 *Planting & Ongoing Management*

A Forester will be engaged to oversee the planting and maintenance of the new native woodland. The Forester will overview appropriate ground preparation with the aim of minimising soil disturbance. Woodland planting will be completed during the months of November to February. All trees shall be planted as whips (1+1<sup>3</sup> transplants at a height of 40-60cm for woodland creation).

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<sup>3</sup> "1+1" signifies the age and nursery history of the plant, referring to a seedling that spent **1 year in a seedbed** followed by **1 year transplanted** in a nursery bed.

All whips used shall be 1+1 or heavier, this means a one-year seedling (1+0) has been taken and lined out for a further year (becoming 1+1) at a wider spacing than the seedbed, The root formation on the 1+1 shall be bushy and fibrous.

All whips planted on site will be provided with stem protection from herbivores such as Tubex Easywrap.

#### 5.4.8.8 *Tree Source*

All tree seedlings to be used will be of local/Irish provenance. All seedlings will be sourced from nurseries / brokers registered under the EU Plant Health Directive, and must be accompanied by a valid EU Plant Passport to certify the absence of the relevant pests and diseases.

### 5.4.9 ***Ongoing Management & Monitoring for Existing & New Woodland***

#### ***Year 1-5: Establishment Phase***

Fencing: Install fencing to eliminate grazing by herbivores.

Weed Control: removal of all weeds and undesirable, negative indicator species.

Beat-up/Replacement Planting: Inspect regularly for failures and replace dead or unhealthy trees during the dormant season.

Protection Maintenance: Regularly check and repair tree protection.

Pest and Disease Monitoring: Regularly inspect for signs of pests (e.g., voles, deer damage) or diseases. Take appropriate action if detected.

#### **Year 5-20: Developing Woodland Phase**

Thinning (selective): As the canopy begins to close, selective thinning may be required to promote the growth of the best-formed trees, improve light penetration, and increase structural diversity.

Invasive Species Control: Continue to monitor and control any undesirable negative indicator species that may appear.

Tree Protection Removal: Once trees are robust enough to withstand browsing pressure, tree protection can be gradually removed.

### **Long-Term Management (Year 20+): Mature Woodland Phase**

Minimal Intervention: As the woodland matures, management will become more focused on minimal intervention to allow natural processes to dominate.

Deadwood Management: Retain standing and fallen deadwood as per **Section 5.4.7.3/5.4.8.4**.

Monitoring and Review: Ongoing monitoring of biodiversity indicators (birds, bats, plants), tree health, and water quality. Monitoring as per the BEMP Action Plan set out in **Section 6** below.

## **5.5 Habitat Enhancement: BEMP Area 4**

BEMP Area 4 comprises species-rich wet grassland established on deep peaty soils with impeded drainage and a seasonally high water table. The sward supports a diverse assemblage of mesotrophic to mildly acidic wet grassland species, with abundant *Succisa pratensis* (Devil's-bit Scabious), indicating favourable conditions for invertebrates, and particularly marsh fritillary butterfly and associated pollinator assemblages.

The grassland displays characteristics consistent with semi-natural wet meadow communities, with recent relaxed management reducing evidence of agricultural-related land use pressures. Peaty substrates are vulnerable to structural degradation, nutrient enrichment, and hydrological alteration; therefore, management must prioritise soil integrity, water retention, and botanical diversity.

The habitat enhancement objective for BEMP Area 4 is to maintain and enhance the ecological integrity of the wet grassland while preventing peat degradation.

Specific objectives are to:

- Maintain a high and stable water table appropriate to wet meadow conditions.
- Retain and increase floristic diversity, particularly:
  - *Succisa pratensis*
  - Associated wet grassland forbs
- Prevent nutrient enrichment and competitive dominance by coarse grasses.

- Avoid peat oxidation, soil compaction, and erosion.
- Enhance structural heterogeneity to benefit invertebrates.
- Provide long-term resilience under changing climatic conditions.

Management prescriptions to be implemented for the species-rich wet grassland at BEMP Area 4 are set out under the following sub-sections

### **5.5.1 Hydrology**

The following measures will be implemented to manage hydrology at BEMP Area 4:

- Maintain existing drainage regime; no new drainage works permitted.
- Block artificial drains and seepage channels as per **Figure 5.5**.

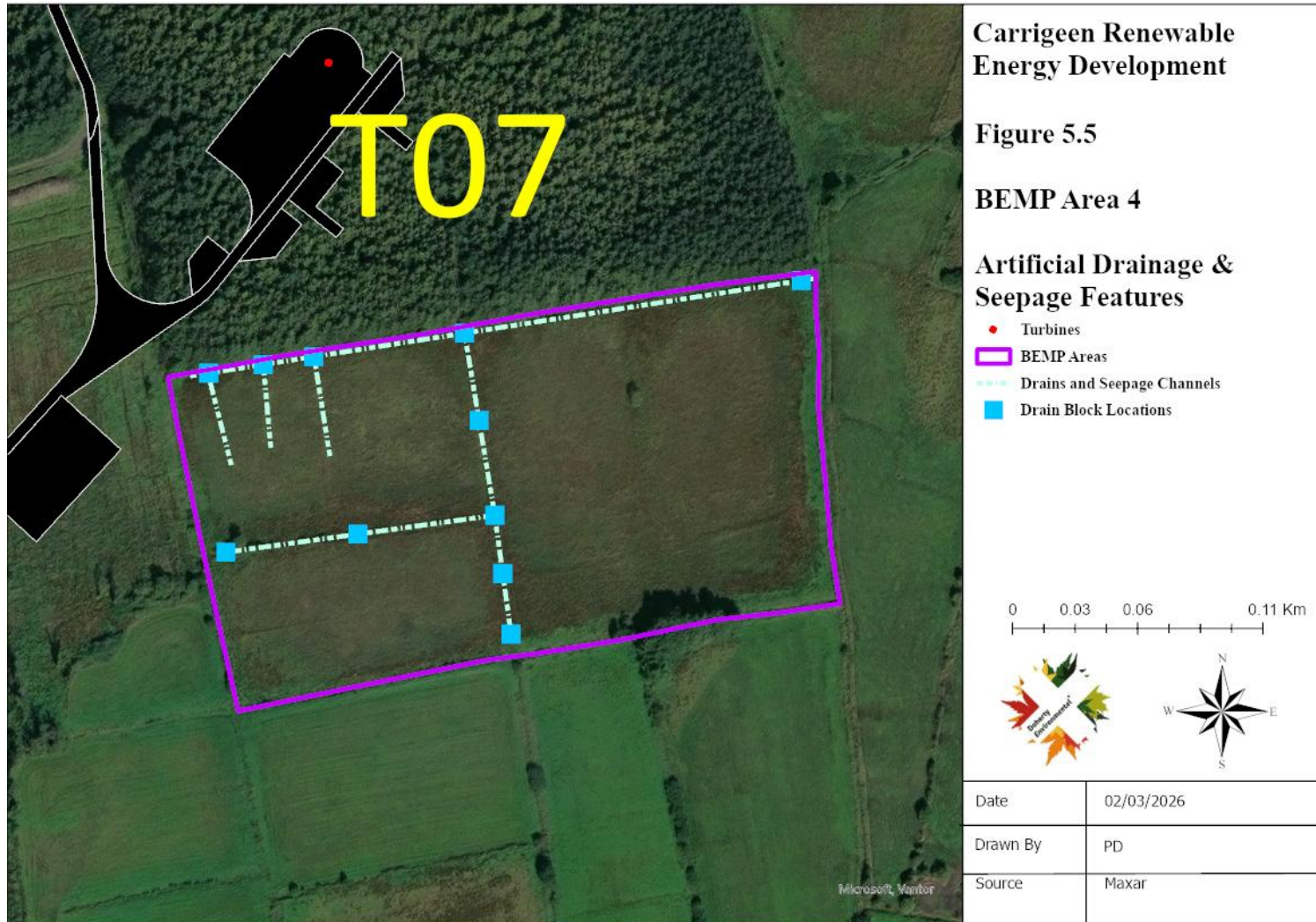


Figure 5.5: BEMP Area 4

- Prevent deepening or maintenance of historic drainage features.
- Avoid vehicle access during waterlogged periods to prevent peat rutting.
- Monitor seasonal water levels using dipwells/piezometers adjacent to blocking locations

### **5.5.2 Grazing**

Appropriate grazing is essential to prevent dominance of coarse grasses while maintaining structural diversity. The following grazing regime will be implemented for BEMP AREA 4:

- Light grazing by cattle or pony. No grazing by sheep will be permitted as they remove large *Succisa pratensis* plants
- The following livestock types have been proven to be suitable: hardy breeds of suckler cow, Holstein Friesian dairy replacements or stores, hardier beef stores (such as Welsh Black or Belted Galloway) and ponies (such as Connemara).
- Stocking rate: Low density (e.g. 0.2–0.3 LU/ha depending on productivity).
- With the low stocking density and associated light grazing pressure in place, grazing can occur between the months of May to October.
- Avoid poaching during wet conditions. Cattle to be moved off BEMP Area 4 in the event of periods of persistent heavy rainfall during the August to October grazing season.

### **5.5.3 Nutrient Management**

The following measures will be implemented to maintain low soil phosphorous levels compatible with species-rich grassland:

- No artificial fertiliser.
- No slurry or organic amendments.

### **5.5.4 Undesirable Species Control**

Undesirable species such as conifer seedlings, scrub (e.g. gorse scrub) and dense stands of *Juncus effusus* will be managed as follows:

- Conifer seedlings will be hand pulled. Any gorse, willow or birch seedlings will be hand pulled or cut at the stump.

- Treat invasive species (e.g. *Juncus effusus* if dominant) through targeted cutting with all cuttings lifted from the area.
- In the event that dense stands of *Juncus effusus* persist herbicide use only as spot treatment and under ecological supervision by project ECoW will be undertaken.

### **5.5.5 Peaty Soil Management**

The following measures will be implemented to manage and maintain the integrity of peaty soil substrate:

- No ploughing, reseeding, or soil disturbance.
- Avoid heavy machinery use.
- No mole drainage.
- Maintain continuous vegetative cover.
- Monitor for signs of peat shrinkage or cracking during drought.

### **5.5.6 Management of *Succisa pratensis***

The abundance of *Succisa pratensis* indicates suitable hydrological and nutrient conditions. To maintain and enhance populations:

- Ensure late flowering and seed set prior to cutting or grazing.
- Maintain moderate sward height (avoid tightly grazed turf).
- Retain uncut refugia annually (5–10% of area) to support invertebrate life cycles.
- Avoid overgrazing in spring when rosettes are developing.

## **5.6 Habitat Compensation: BEMP Area 3**

### **5.6.1 Hedgerow Creation**

New continuous hedgerows will be provided for as per **Figure 5.6**.

All new hedgerows will support a variety of native broadleaved tree species. A minimum of five species will be supported by these hedgerows. These species will include a mix of the following: pedunculate oak, hazel, wych elm, crab apple, hawthorn, blackthorn, elder, spindle and wild cherry.

Hedgerows will be maintained so that a diversity of hedgerow structure is provided. Tall and short ( $\leq 3\text{m}$ ) sections will be provided. Thick and dense cover at the base of the hedgerow will be maintained and gaps along hedgerows will be minimised. Gaps to facilitate agricultural farm access will be provided at selected locations along hedgerows as required.

The outer edges of the hedgerows will be maintained so that they undulate, or have a wavy plan profile.

Hedgerows will be maintained on an ongoing basis as follows:

- Hedgerow trimming will be undertaken on three-year rotations.
- Hedgerow trimming will be alternated between sections of hedgerows so that at least one-third of the hedgerow length remains uncut.
- Hedgerow trimming will be undertaken between the months of January and February

A landscaper will be appointed during the construction phase to plant the new hedgerows. The ECoW will monitor the planting during the construction phase and confirm all planting as required is implemented.

### **5.6.2 Woodland Creation**

The footprint of the new native broad-leaved woodland habitat to be established at BEMP Area 3 is set out in **Figure 5.6**. The objective is the establishment of a native woodland dominated by Pedunculate Oak (*Quercus robur*), with a structurally diverse but not overly dense understorey designed to maximise biodiversity value and specifically enhance bat foraging suitability.

The woodland will be designed to:

- Establish a structurally diverse native woodland
- Achieve a closed oak canopy at maturity
- Maintain an open, uncluttered understorey
- Provide high-quality foraging habitat for bats
- Enhance ecological connectivity within the surrounding agricultural landscape

#### 5.6.2.1 Species Composition

The woodland will comprise a canopy of *Quercus robur* with a secondary canopy of *Betula pubescens* and an understorey of *Ilex aquifolium*, *Crataegus monogyna*, *Prunus spinosa*, *Euonymus europaeus* and *Malus sylvestris*.

The percentage composition of each species to achieve the objectives of the woodland are as follows:

*Quercus robur* will account for 70% of the species mix;

*Betula pubescens* will account for 15% of the species mix

The understorey pollinator and berry producing species will account for 15% of the species mix.

#### 5.6.2.2 Planting Density

In order to achieve an open woodland habitat upon maturity that is not overly dense and provides ideal foraging habitat for bat species a reduced planting density of 1,000 to 1,250 trees per hectare will be implemented.

Spacing between whips will be at 2.5 – 3.0m. Whips will be planted in irregular formation and internal glades within the large plot of woodland to the west of the BEMP Area will be included for in the design. An open north to south corridor central ride line will be established in the main woodland plot with the edge of the ride line designed as a scalloped edge to enhance shelter for invertebrates and maximise bat foraging abundance.

Woodland edges will comprise a higher density of the pollinator and berry producing shrub species.

#### 5.6.2.3 Planting & Ongoing Management

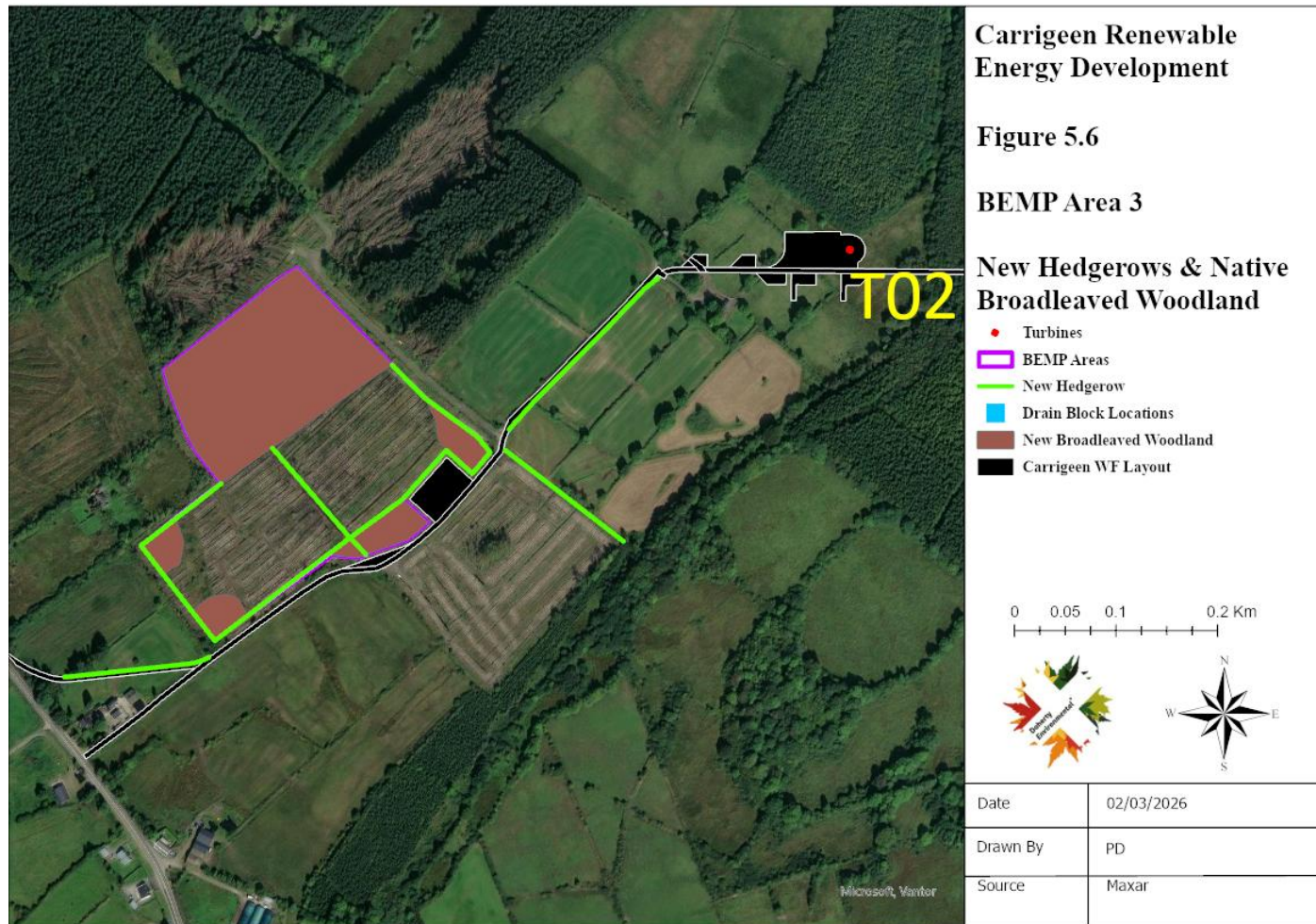
A forester will be engaged to oversee the planting and maintenance of the new native woodland. The forester will overview appropriate ground preparation with the aim of minimising soil disturbance. Woodland planting will be completed during the months of November to February. All trees shall be planted as whips – 1+1 transplants at a height of 40-60cm for woodland creation.

All whips used shall be 1+1 or heavier, this means a one-year seedling (1+0) has been taken and lined out for a further year at a wider spacing than the seedbed, The root formation on the 1+1 shall be bushy and fibrous.

All whips planted on site will be provided with stem protection from herbivores such as Tubex Easywrap.

#### 5.6.2.4 *Tree Source*

All tree seedlings to be used will be of local/Irish provenance. All seedlings will be sourced from nurseries / brokers registered under the EU Plant Health Directive, and must be accompanied by a valid EU Plant Passport to certify the absence of the relevant pests and diseases.



**Figure 5.6: BEMP Area 3**

### **5.6.3 Oak Planting**

Oak whips will be planted at spacing of 2.5m within each plot. A 2.5m spacing is in line with the recommended spacing as set out for the Native Woodland Scheme. By planting the Oak trees in blocks at spacing of 2.5m allowance is provided for a percentage of loss whilst providing a sufficient number that should survive and grow to form a canopy.

### **5.6.4 Shrub Planting**

Shrub planting will be provided between the Oak plots. Shrubs will be planted at a 2.5m spacing. The shrub planting area amounts to approximately 55% of the area to be planted within the Planted Woodland area.

The shrub species to be planted will comprise the following species.

Birch at 40% of the shrub planting mix

Hazel at 40% of the shrub planting mix Holly at 10%

Wild Cherry at 5% of the shrub planting mix

Spindle at 5% of the shrub planting mix

### **5.6.5 Edge Planting**

Edge planting will be provided along the boundary of the new native woodland plots. The width of the edge planting at its widest will be approximately 10m. The species to be planted at the edge planting area will comprise:

Hawthorn at 40% of edge planting mix

Holly at 40% of edge planting mix

Spindle at 10% of edge planting mix

Crab Apple at 10% of edge planting mix.

### **5.6.6 Open Space**

As per Planting Density above open space will be provided as a north to south central ride line within the main woodland plot with the edge of the ride line designed as a scalloped edge to enhance shelter for invertebrates and maximise bat foraging abundance. Ongoing management of the woodland will include measures to keep open space corridors free of stands of bramble thicket, Sycamore and other non-native species.

### **5.6.7 Tree Planting Specifications**

All trees shall be planted as whips – 1+1 transplants at a height of 40-60cm for woodland creation.

All whips used shall be 1+1 or heavier, this means a one-year seedling (1+0) has been taken and lined out for a further year at a wider spacing than the seedbed, The root formation on the 1+1 shall be bushy and fibrous.

### **5.6.8 Tree Source**

All tree seedlings to be used will be of local/Irish provenance. All seedlings will be sourced from nurseries / brokers registered under the EU Plant Health Directive, and must be accompanied by a valid EU Plant Passport to certify the absence of the relevant pests and diseases.

### **5.6.9 Whip Protection**

All whips planted on site will be provided with stem protection from herbivores such as Tubex Easywrap.

### **5.6.10 Enhancement of Bat Roosting Opportunities**

In order to enhance roosting opportunities for bats, artificial bat roosts will be installed within the main area of new native broadleaved woodland habitat to the west of the wind farm access

road. The artificial roosts will comprise the provision of 2 no. pole mounted maternity bat boxes<sup>4</sup>.

#### ***5.6.11 Ongoing Management & Monitoring***

Implement ongoing management and monitoring as per **Section 5.4.9** above and **Section 6** below.

### **5.7 New Wetland Habitat – SuDS Stilling Ponds**

SuDS stilling ponds which form part of the drainage design for the wind farm will be designed to enhance their role as a wetland habitat. This will involve ensuring side walls for attenuation ponds are at a shallow grade and the ponds are at varying depths from shallow shelves to deeper areas. The SuDS ponds are located in areas where they are unlikely to dry out during the summer. A typical sketch of a SuDS pond that aims to maximize its potential to support biodiversity is provided as **Figure 5.7** below.

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<sup>4</sup> See: <https://www.nhbs.com/pole-mounted-maternity-bat-box> for example of pole mounted bat boxes to be installed

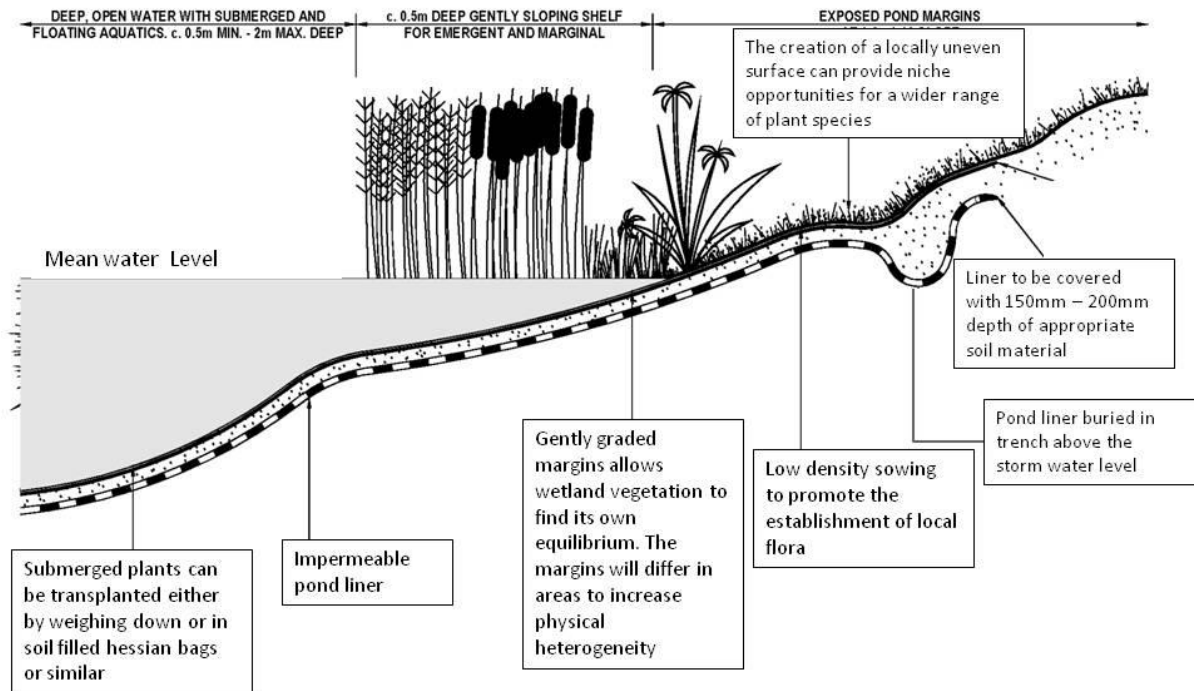


Figure 5.7: Section through margin of SuDS Pond. Adapted from Vol. 4 UK DMRB

In addition, the following measures are recommended:

- Prevent colonisation of attenuation ponds by species such as *Phragmites australis*, which will lead to gradual terrestrialisation. Prevent shading, particularly from the south surrounding attenuation ponds. Prevent poaching of pond edges.
- Provide suitable terrestrial habitat, hibernation sites and basking sites adjacent to SUDS ponds. Pile logs and large boulders adjacent to SuDS ponds.

## 6 Biodiversity Enhancement & Management Action Plan

**Table 6.2** outlines an Action Plan for the promotion and implementation of management actions to manage and enhance peatland habitats within the BEMP Area.

The responsibility for the completion of actions are outlined in **Table 6.2**. The implementation of actions during the construction phase will be completed by the main civil contractor.

### 6.1 Monitoring

To ensure that management actions outlined in Table 6.2 are achieving the required objectives for each target, regular monitoring is required. Table 6.2 below lists the monitoring required for each target, the measurement to be recorded, timing and frequency of monitoring and the personnel who shall carry out each task.

This monitoring programme covers the construction period in addition to years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30 & 35 following the completion of the construction period. Baseline surveys exist for the entire site, and these will be complemented by confirmatory surveys completed through the construction phase.

Habitat monitoring will be undertaken using quadrats, fixed point photography and dipwells/piezometers.

Monitoring during the early years of the operation phase will be particularly important for evaluating the success or otherwise of management actions to achieve favourable conservation status for raised bog, woodland and grassland habitats.

The Favourable Conservation Status of raised bog, woodland and grassland will be based upon the attributes and targets outlined in **Table 6.1**.

**Table 6.1: Attributes, Measurements and Targets for Achieving Favourable Conservation Status**

| Attribute  | Measurement        | Target   |
|--|--------------------|--|
| <b>Raised bog BEMP Area 1 &amp; 5</b>            |                    |  |
| Vegetation Composition                           | Relevé             | Number of positive indicator species present $\geq 8$ . See Appendix 1 for list of positive indicator species  |
|  | Relevé             | Sphagnum cover >40%  |
|  | Relevé             | Bare peat cover <10%   |
|  | Relevé             | Cover of non-native species < 1%   |
|  | Local vicinity     | Cover of non-native species < 1%   |
| Physical Structure                               | Microtopography    | Abundant Sphagnum and other peat forming vegetation present that will facilitate initiation of microtopographical differentiation over the lifetime of the plan        |
|  | Dipwell/Piezometer | Water table is less than 15cm below the surface at monitoring points.  |
|  | Drainage           | No artificial drainage from the raised bog habitat   |
| <b>Broad-leaved woodland BEMP Area 3</b>         |                    |  |
| Positive indicator species                       | Relevé             | At least one target species and >6 positive species (see Appendix 1 for species lists)   |
| Negative species cover                           | Plot wide          | <10%   |
| Canopy Height                                    | Plot Wide          | >10m   |
| Shrub layer cover                                | Plot Wide          | 10 – 50% of Plot   |
| Dwarf Shrub/Field Layer                          | Plot Wide          | >20% of plot   |
| Bryophyte cover                                  | Plot Wide          | >4%  |
| Grazing pressure                                 | Not signs          | All indicators absent. Indicators are topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, and severe recent bark stripping           |
| <b>Broad-leaved woodland BEMP Area 1 &amp; 2</b> |                    |  |
| Positive indicator species                       | Relevé             | At least one target species and >6 positive species (see Appendix 1 for species lists)   |
| Negative species cover                           | Plot wide          | <10%   |
| Canopy Height                                    | Plot Wide          | >7m  |
| Total Canopy Cover                               | Plot Wide          | >30%   |
| Shrub layer cover                                | Plot Wide          | 10 – 50% of Plot   |
| Dwarf Shrub/Field Layer                          | Plot Wide          | >20% of plot   |
| Bryophyte cover                                  | Plot Wide          | >4%  |
| Grazing pressure                                 | Not signs          | All indicators absent. Indicators are topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, trampling and severe recent bark stripping |
| Urtica dioica cover                              | Plot Wide          | <75% cover of plot   |
| <b>Species-rich Wet Grassland BEMP 4</b>         |                    |  |
| Positive indicator species                       | Relevé             | At least 7 positive species (see Appendix 1 for species lists)   |
| Negative species cover                           | Plot wide          | % cover of scrub, bracken and woody species less than 5%; % cover of negative indicator  |

| Attribute  | Measurement | Target   |
|--|-------------|--|
|  |             | species <20%; % cover non-native invasive species less than 1%                                 |
| Vegetation structure: broadleaf herb:grass ratio | Plot Wide   | Broadleaf herb component of vegetation between 40% and 90%                                     |
| Vegetation structure: sward height               | Plot Wide   | At least 30% of sward between 10cm and 80cm tall   |
| Vegetation structure: litter                     | Plot Wide   | Litter cover not more than 25%   |
| Physical structure: bare ground                  | Plot Wide   | Not more than 10% bare ground  |
| Physical structure: grazing or disturbance       | Plot Wide   | Area of the habitat showing signs of serious grazing or disturbance less than 20m <sup>2</sup> |

Management Actions and techniques outlined in Sections 5 above aim to achieve favourable conservation status of peatland and heathland habitats within the BEMP Areas.

Where management actions are not deemed to be successful in achieving the targets for favourable conservation status of target habitats, then the implementation of remedial measures will be required. It is noted that the nature of the remedial action to be applied will be dependent upon which attributes are not meeting the targets of favourable conservation status and the appropriate measures will be identified by the Project ECoW and recommendations for action will be set out in the annual monitoring report.

### 6.1.1 *Monitoring of Bat Buffers*

As part of the BEMP Action Plan monitoring of the bat buffers assigned for each of the Wind Turbines will be completed to confirm the continued absence of bat habitat in the form of structured vegetation (i.e. hedgerows, woodland, scrub) within the bat buffers (refer to **Chapter 7** of the EIAR).

## 6.2 **Reporting of Monitoring**

**Table 6.2** specifies the timing of monitoring for each BEMP Action.

The ECoW will produce a final report documenting the implementation of Habitat Management Plan Actions (as well as environmental and ecological effects – see **Section 7**) of the construction period. The report will be made available to the Owner, Contractor, Planning Authority, NPWS and other external agencies where appropriate (e.g. Inland Fisheries Ireland).

A report detailing the results of all actions requiring implementation during the construction phase will be furnished to the Planning Authority within 12 months of the completion of construction activity, and subsequently in years 2, 3, 5, 7, 10, 15, 25, 30, & 35.

### **6.2.1 Quadrats & Fixed-Point Photography**

Habitat surveys during the monitoring programme will be based on fixed quadrat surveys. Each quadrat will be surveyed using the DOMIN Scale so that individual vegetation communities are identified. Fixed quadrat monitoring locations will be identified by the ECoW during the construction phase.

Quadrats will be located within all areas of the proposed Wind Farm Site and the peat storage and restoration (habitat enhancement) area that are subject to the habitat management measures outlined in **Section 5** above.

Fixed point photographs will be taken of the vegetation at all quadrats and of the surrounding area during each round of monitoring. The grid reference of the initial fixed point photograph location will be recorded during the initial round of monitoring and the direction of view of photographs recording the surrounding area will also be recorded.

### **6.2.2 Water Level Monitoring**

Monitoring of water levels within raised bog, species-rich wet grassland and wet woodland habitat will also be undertaken using dipwells/piezometers. The location of dipwells/piezometers will be selected by the ECoW during the construction phase. A vegetation monitoring quadrat will be positioned at each dipwell/piezometer location.

**Table 6.2: Habitat Management & Monitoring Action**

| <b>BEMP Action Ref. No.</b> | <b>Management Measure</b>  | <b>Target</b>   | <b>Method</b>   | <b>Measurement</b>  | <b>Timing</b>  | <b>Entity Responsible</b>         |
|-----------------------------|--|---|---|---|--|-----------------------------------|
| 1.                          | <b>Protect Water Quality in Rivers</b>   | No decrease in water quality in eroding upland rivers during the construction phase.  | Implementation of all project design and construction phase management measures as specified in the EIAR for the Project.   | ECoW to review and monitor construction phase to ensure implementation of design measures and construction phase management measures.   | Throughout the construction phase  | Construction Contractor           |
| 2.                          | <b>Block Drainage Ditches as specified at BEMP Areas 1, 2, 4 &amp; 5</b>                           | Improve water balance in areas adjacent to Drainage Ditches   | Drainage blocking will follow the techniques outlined in <b>Section 5.4.2</b> above.  | The success of drainage blocking will be monitored using permanent fixed quadrats and dipwells/piezometers to measure water table depth. A photographic log of all quadrats and areas subject to drainage blocking and re-wetting will be maintained. | Install blocking during construction phase.<br><br>Monitor during Years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of the operation phase | Construction Contractor /Operator |
| 3.                          | <b>Sensitive removal of peatland vegetation from areas of the construction footprint as turves</b> | Sensitively remove peatland vegetation as turves under the footprint construction site, maintain turves in good condition so that they can be reinstated in temporary construction areas. | Remove peat as turves excavated to a depth of at least 50 cm, thus allowing for full protection of the roots. This layer will be stored as turves and kept viable by irrigation if necessary because peat is prone to shrinkage and drying. | Construction Contractor's ECoW monitoring of peatland turving and condition during the construction phase.  | Construction phase – vegetation clearance.   | Construction Contractor           |
| 4.                          | <b>Peat Storage</b>  | Maintain peat substrate material to be stored on site in good condition.  | Store peat in accordance with the requirements set out in <b>Section 5.1.4</b> and the accompanying CEMP.   | Weekly visual inspection of peat storage areas to confirm proper storage and continued condition of peat  | Construction phase – vegetation clearance.   | Construction Contractor           |

| BEMP Action Ref. No. | Management Measure  | Target  | Method   | Measurement  | Timing  | Entity Responsible                    |
|----------------------|---|---|--|--|---|---------------------------------------|
| 5.                   | <b>Turves &amp; Harvesting of Peatland Vegetation from Cut Cells at BEMP Area 1</b> | Prior to infill of cut cells, harvest peat vegetation and Sphagnum present in cut cells.  | Harvest using excavator and store locally at BEMP Area 1 for short-term period for use as surface dressing of peat substrate at infilled cells and bare peat strips. Maintain high moisture levels for harvested peat vegetation turves and sphagnum | Weekly visual inspection of harvested peat turves and Sphagnum to confirm proper storage and continued condition of vegetation.  | Construction phase – vegetation clearance.  | The Construction Contractor           |
| 6.                   | <b>Cut Cell infill and Surface Treatment at BEMP Area 1</b>                         | Restore original raised bog surface levels, promote bog re-vegetation with peat forming vegetation.                               | Re-instate turves following the management techniques outlined in <b>Section 5.3.4.</b>  | The success of peatland enhancement will be monitored using permanent fixed quadrats and dipwells/piezometers. A photographic log of all quadrats and areas subject to turve reinstatement will be maintained. | Re-instate turves during the Construction stage.<br><br>Monitor during Years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of the operation phase.          | The Construction Contractor /Operator |
| 7.                   | <b>Restore Raised bog at BEMP Area 1</b>  | Restore raised bog conditions within BEMP Area 1 to meet the targets set out in <b>Table 6.1</b> over the lifetime of the Project | Restore condition in line with the methods set out under <b>Section 5.4.</b>   | The success of peatland enhancement will be monitored using permanent fixed quadrats and dipwells/piezometers. A photographic log of all quadrats and areas subject to turve reinstatement will be maintained. | Complete restoration works during the Construction stage.<br><br>Monitor during Years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of the operation phase. | The Construction Contractor /Operator |
| 8.                   | <b>Provide Berms at cutover raised bog area of BEMP Area 1</b>                      | Construction boundary and intermediary berms within the cutover raised bog treatment area as per <b>Figure 5.3</b>                | Construction berms using surplus peat substrate. Vegetation berms as per <b>Section 5.4.6.</b>   | The success of peatland enhancement will be monitored using permanent fixed quadrats and dipwells/piezometers. A photographic log of all quadrats and areas subject to turve reinstatement will be maintained. | Complete restoration works during the Construction stage.<br><br>Monitor during Years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of the operation phase. | The Construction Contractor           |

| BEMP Action Ref. No. | Management Measure   | Target  | Method   | Measurement   | Timing   | Entity Responsible                    |
|----------------------|--|---|--|---|--|---------------------------------------|
| 9.                   | <b>Establish Heath Vegetation on temporary construction infrastructure footprint &amp; Permanent Spoil Storage areas</b> | Establish dry heath Calluna vulgaris dominated vegetation on areas of the temporary construction infrastructure footprint and Permanent Spoil Storage areas | Establish dry heath vegetation as per the methods set out in <b>Section 5.3.</b>   | Quadrat monitoring<br><br>Photographic log  | Establishment of Calluna vulgaris initial treatment to be completed by the Construction Contractor prior to the completion of the construction phase.<br><br>Monitor condition of Calluna vulgaris dominated dry heath throughout lifetime, and monitor/report 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of operation phase. | The Construction Contractor /Operator |
| 10.                  | <b>Plant &amp; Monitor New Hedgerow Corridors</b>  | Establish new hedgerows as per the details provided in <b>Figure 5.6.</b>   | Plant new hedgerow in accordance with the methods outlined in <b>Section 5.6</b> above and any additional requirements identified by the Forester/landscape contractor and ECoW on the ground prior to planting. | Quadrat monitoring<br><br>Photographic log  | Complete new hedgerow planting during the construction phase.<br><br>Monitor hedgerow condition throughout lifetime, and monitor/report 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of operation phase.  | The Construction Contractor /Operator |
| 11                   | <b>Plant &amp; Monitoring of Existing and New Woodland Plots</b>   | Establish native woodland habitat within the new woodland areas for BEMP 1, 2 and 3.  | Plant new woodland in accordance with the methods outlined in <b>Section 5.4</b> above and any additional requirements identified by the Forester and ECoW on the ground prior to planting.                      | Quadrats will be 4m x 4m in size. Quadrat locations will be selected in areas to be fenced for native woodland creation. Quadrats will monitor the condition of habitats and the establishment of native species.<br><br>Dominance in native woodland tree species will be used as the principal indicator of success for woodland establishment. | Monitor during years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of operation phase.   | The Construction Contractor/Operator  |

| BEMP Action Ref. No. | Management Measure  | Target   | Method   | Measurement  | Timing  | Entity Responsible                    |
|----------------------|---|--|--|--|---|---------------------------------------|
|                      |   |  |  | Whole plot monitoring of woodland plots for relevant attributes listed in <b>Table 6.1</b> .   |   |                                       |
| 12.                  | <b>Monitoring Species-rich Wet grassland at BEMP Area 4</b> | Maintain and enhance condition of species-rich wet grassland with abundant <i>Succisa pratensis</i>                                      | Implementation of methods set out in <b>Section 5.5</b> . On-going monitoring.                           | Quadrats will be 2m x 2m in size. Quadrat locations will be selected in areas to be fenced for native woodland creation. Quadrats will monitor the condition of habitats and the establishment of native species.  | Monitor during years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of operation phase.  | The Construction Contractor/Operator  |
| 13.                  | <b>Control competitive non-indicator species</b>            | Negative-indicator species for raised bog, woodland and grassland target habitats will be kept below targets set out in <b>Table 6.1</b> | Removal of Negative Indicator Species.   | Quadrat and whole plot monitoring and photographic log will be undertaken to measure the extent of negative-indicator species.   | Control on an annual basis and/or as recommended by Project Ecologist in Annual Monitoring Reports.<br><br>Monitor during Years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of the operation phase. | The Construction Contractor /Operator |
| 14.                  | <b>Habitat Enhancement of Stilling Ponds</b>                | Create semi-natural wetland habitat at SuDS Ponds  | Design ponds in accordance with the details provided in <b>Section 5.12</b> and <b>Figure 5.7</b> above. | Quadrat monitoring of pond margins.<br><br>Measurement of successful establishment will be based on occurrence of marginal vegetation communities representative of reed and large sedge swamp; marsh; and/or wet grassland.<br><br>Visual inspection of pond margin for hibernation sites and basking | Monitor during Years 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35 of the operation phase.  | The Construction Contractor /Operator |

| BEMP Action Ref. No. | Management Measure                        | Target  | Method   | Measurement   | Timing   | Entity Responsible |
|----------------------|---|---|--|---|--|--------------------|
|                      |   |   |  | sites.<br>Measurement of success will be based on the presence of suitable hibernation and basking sites at pond margins.   |  |                    |
| 15.                  | <b>Restrict turbary</b>                   | No commercial turbary extraction throughout the lifetime of the BEMP                              | Restrict turbary activity as outlined under <b>Section 5.4.5</b>   | Monitoring of site for any signs of turbary activity. Liaise with landowner to ensure no commercial turbary activity is undertaken throughout the lifetime of the plan. | Throughout the lifetime of the BEMP  | Operator           |
| 16.                  | <b>Bat Buffers</b>                        | No Bat Foraging Habitat in Turbine Bat Buffers  | Restrict bat foraging habitat from establishing within the bat buffers   | Annual visual inspection of bat buffers.  | Throughout the lifetime of the BEMP  | Operator           |
| 17.                  | <b>Prevent certain land use practices</b> | Prevent certain land use practices to ensure favourable conservation status of peatland habitats. | Prevent the following activities within the BEMP Areas throughout the lifetime of the BEMP: <ul style="list-style-type: none"> <li>• The reclamation, fertilisation or drainage of the BEMP area will be restricted.</li> <li>• The application of slurry, lime, herbicides, pesticides, insecticides, fungicides will be restricted.</li> <li>• Scrub will be prevented from establishing on peatland and heathland habitats</li> </ul> | Quadrat monitoring<br><br>Photographic log  | Implement throughout lifetime, and monitor/report 1, 2, 3, 5, 7, 10, 15, 20, 25, 30, & 35. | Operator           |

| BEMP Action Ref. No. | Management Measure  | Target   | Method   | Measurement   | Timing  | Entity Responsible                    |
|----------------------|---|--|--|---|---|---------------------------------------|
|                      |   |  | through ongoing removal.   |   |   |                                       |
| 18.                  | <b>Identification of Areas Requiring Remedial Action during the Operation phase</b> | Implement any remedial actions as required on foot of annual monitoring.   | Examples of remedial action measures include:<br>Collection of Sphagnum/seeds/brash from donor habitats during the autumn of the year when any areas of raised bog or dry heath the are identified as failing and seed/brash identified areas during the next spring season.<br><br>Beating-up of woodland and replant as required.<br><br>Elimination of negative-indicator species from target habitat | The success of remedial action will be monitored using permanent fixed quadrats and dipwells within remedial areas as described above. A photographic log of all quadrats and areas subject to seed/brash remediation will be maintained. | Identification of areas requiring seeding during the ongoing monitoring. Areas requiring seeding/brushing as a remedial measure will be monitored during the summer months following the application of seed/brash. Further monitoring will be undertaken in the subsequent year. | Operator                              |
| 19.                  | <b>Appoint Landscaper, Forester and ECoW</b>  | Professional landscape, forester and Ecologist to be appointed for duration of works as specified in <b>Section 5</b> above. | Procurement of professional services   | N/A   | Pre-Construction Phase; Construction Phase and Operation phase as required  | Applicant /Operator                   |
| 20.                  | <b>Enhance Bat Roosting Opportunities</b>   | Occupancy of artificial bat roost  | Installation of 2 no. pole mounted bat boxes   | Roost occupancy survey to be completed by undertaking dust emergence and/or pre-dawn re-entry surveys   | Roosts to be installed during the construction phase.<br><br>Monitor for presence of roosting bats and integrity of roost boxes during years 1, 2,  | The Construction Contractor /Operator |

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| <b>BEMP<br/>Action<br/>Ref. No.</b> | <b>Management<br/>Measure</b> | <b>Target</b> | <b>Method</b> | <b>Measurement</b> | <b>Timing</b>                        | <b>Entity<br/>Responsible</b> |
|-------------------------------------|-------------------------------|---------------|---------------|--------------------|--------------------------------------|-------------------------------|
|                                     |                               |               |               |                    | 3, 5, 7, 10, 15, 20, 25, 30, &<br>35 |                               |

## **7 Ecological Clerk of Works**

### **7.1 Background**

An appropriately qualified Environmental/Ecological Clerk of Works (ECoW) will be employed for the duration of the Civil Works Contract. This person will be known as the Project ECoW. The ECoW must be a member of the Chartered Institute of Ecology and Environmental Management (CIEEM) or equivalent body. The ecologist performing the ECoW role will attend the site on a weekly basis to ensure that all works are being completed to the appropriate standards.

As the delivery of this BEMP is highly dependent on the roles and responsibilities of the ECoW, some detail is provided here regarding this position.

### **7.2 Term of Appointment**

The ECoW will be on site for minimum 1 day per week during the construction works; provision will be made for an initial briefing to all contractors, and a final visit to report on the ecological aspects of construction. Some office time is also required for weekly reporting.

### **7.3 ECoW Tasks**

#### **Overview**

The provision of an ECoW helps to ensure that ecological protection aspects of the Environmental Statement, BEMP, Construction Environmental Management Plan (CEMP) and Construction Method Statements (CMS) are fully adhered to during construction. It also allows any issues arising to be dealt with in an appropriate manner.

Taking account of the requirements set out in this BEMP, the following are deemed to be required services of the ECoW:

- a) Construction surveys.
- b) Monthly measurement of water levels in dipwells.
- c) Selection of sites for raised bog re-wetting, supervision of dam installation, monitoring of works.
- d) Monitoring SuDS stilling pond construction to ensure appropriate wildlife habitats are incorporated into their design (including briefing of digger drivers).
- e) Maintaining records of checks and issues.

- f) Providing a report detailing the implementation of the BEMP Management Actions during the construction phase.
- g) Survey the site for sensitive and protected species prior to construction (due diligence survey).

### **Pollution Prevention Plan**

- a) Review, agreement and approval of Contractor's pollution prevention plan prior to commencement of work.
- b) Conduct weekly inspection of site pollution prevention measures (silt traps, etc.) and visually assess their effectiveness. This will include inspection of water management measures installed by Contractor such as excavation pumping and diversion channels, as well as containment of silt away from watercourses and advice on micro-siting of mitigation measures.
- c) Maintain a Pollution Prevention Measures Register of the weekly inspections, to include an inventory of all measures on the site, their effectiveness, as well as any advice provided.
- d) Collation of water sampling results (collected and analysed by third parties) for presentation in weekly reports.
- e) Suspension of work where potential risk from pollution is identified and agreed safeguarding measures, as specified in the CEMP or method statements are not in place, or where construction methods and mitigation measures are not specified in construction method statements and/or plans as agreed at commencement of works.
- f) Provide advice and recommendation to the wind farm owner and its contractors regarding the above.

### **Waste Management**

- a) Review, agreement and approval of the Contractor's Site Waste Management Plan
- b) Review of the Contractor's records for all inspections of fuel, oil or chemical storage areas, including the integrity of storage facilities.

### **Drainage Management**

- a) Review, agreement and approval of the Contractor's Site Drainage Management Plan
- b) Inspection of drainage management works.
- c) Liaison with Planning Authority / NPWS inspecting the works.
- d) Agreement of monitoring standards to be applied by Contractor's personnel.
- e) Confirmatory survey in advance of habitats and species for ground to be affected by drainage management.

- f) Review of Contractor's records for plant inspections, evidence of contamination and checks made after extreme weather conditions.
- g) Liaison, field discussion and agreement of drainage management works with Planning Authority, IFI, NPWS when required by consultees and when considered necessary by ECoW.
- h) Agreement of frequency and location of drainage ducts installed beneath floated roads.
- i) Agreement of drainage management associated with temporary peat storage and reinstatement works in advance of such works commencing.

#### **Watercourse Crossings**

- a) Review, agreement and approval of the Contractor's Site Watercourse Crossing Plan.
- b) Confirmatory survey in advance of watercourse condition and protected mammals for all ditch and stream crossings, using established specialist if necessary.
- c) Review the Contractor's records for plant inspections, evidence of contamination and checks made after extreme weather conditions.

#### **Water Quality Monitoring**

- a) Review, agreement and approval of the Contractor's and independent Site Water Quality Monitoring Plans where undertaken.
- b) Inspection of Contractor's records for water environmental monitoring and comparison of those records with independent records.
- c) Presentation of independent water environmental monitoring results at weekly site meetings.

#### **Excavated Materials and Reinstatement**

- a) Review, agreement and approval of the Contractor's Spoil Management and Reinstatement Plan.
- b) Marking working areas and route corridors, in consultation with the Geo-technical/Civil Designer and/or Archaeologist as necessary.
- c) Granting permission to work off hard ground using low ground pressure machines, including specification points for entry and return, and the route to be taken.
- d) Agreeing proposals for side casting and temporary storage areas as development proceeds.
- e) Agreeing timing of restoration and reinstatement of Site Access Road sides.
- f) Monitoring the condition of stored turf.
- g) Agreeing any required hydroseeding specification, including seed mix and fertiliser quantities.

- h) Issuing instruction to cease work if unexpected risks arise, until an agreed alternative solution is identified and risks are avoided or minimised.

#### **7.4 Recording**

The ECoW will keep a record of the following:

- a) notable animal sightings and signs (including birds, in addition to other site ornithological monitoring);
- b) The Pollution Prevention Measures Register (as detailed above);
- c) The habitats and soil (including peat depth) of ground to be developed via survey at least a week in advance of construction work;
- d) record of tasks carried out;
- e) written record of all oral advice given

The ECoW will maintain a GIS database of key recordings made during the construction period. ECoW weekly site visit notes will be made available for all personnel on site to consult and will incorporate the following:

- Monitoring of requirements listed under BEMP
- Monitoring of requirements listed under the CMS
- Pollution Prevention Measures Register

#### **7.5 On-Site Communication**

The success of ECoW appointment is largely dependent on well-defined lines of communication. In theory, robust construction method statements will incorporate many of the areas of ECoW concern into the daily activities of construction personnel. However, the ECoW will always inform the Civil Contractor and their Designer of areas of particular concern, who will then make a decision as to the subsequent action.

The ECoW will be involved in the delivery of biodiversity-related Toolbox Talks as part of the site induction process. Toolbox talks will be given to the work force at regular intervals to highlight the environmental issues that are unique to the Wind Farm Site. The ECoW will inform the staff of the following:

All staff working onsite and personnel visiting the site are briefed on the importance of the protection of key biodiversity receptors occurring onsite.

All staff will be informed of obligations to restrict construction operations to the construction footprint.

Restrictions on plant machinery traversing into sensitive habitats outside of the construction footprint.

The responsibility of all construction staff to ensure that sensitive peatland habitats occurring outside the construction footprint are not tampered with, removed, damaged or breached by any field operators or others visiting the Wind Farm Site.

## **7.6 Incident Response**

If an ecological incident occurs on the Wind Farm Site, the following protocol should be implemented:

- The ECoW shall be contacted immediately;
- Ensure appropriate corrective measures are put in place;
- Implement actions to prevent reoccurrence/further incidents; and
- Identify responsibilities and timescales for implementation.

## **7.7 Liaison with Consultees**

The ECoW will provide a liaison between NPWS and IFI if this is required.

## **7.8 Final Report**

The ECoW will produce a final report documenting the environmental and ecological effects of the construction period. The evidence for effects will be based on findings included in the minutes of weekly meetings, together with other recording information maintained by the ECoW. The report will be made available to the Owner, Contractor, the relevant Planning Authority, NPWS and other external agencies where appropriate (e.g., IFI).

## Appendix 1: Indicator Species

### Indicator Species

Positive indicator species for raised bog habitat in favourable conservation condition are listed in Table 1 below. The species lists are sourced from NPWS, 2019.

**Table 1: Indicator Species**

| <b>Raised Bog BEMP Area 1 &amp; 5</b>   |  |
|---|--|
| <b>Vascular Plants</b>  | <b>Mosses, Liverworts &amp; Lichens</b>  |
| Andromeda polifolia, Drosera anglica, D. intermedia, D. rotundifolia, Eriophorum angustifolium, E. vaginatum, Menyanthes trifoliata, Narthecium ossifragum, Rhynchospora alba, Utricularia minor and Vaccinium oxycoccos  | Aulacomnium palustre, Campylopus atrovirens, Cladonia spp. (C. ciliata and C. portentosa), Leucobryum glaucum, Pleurozia purpurea, Racomitrium lanuginosum, Sphagnum denticulatum, S. capillifolium, S. cuspidatum, S. fuscum, S. beothuk, S. austinii, S. magellanicum, S. papillosum, S. pulchrum and S. subnitens |
| <b>Broad-leaved woodland BEMP Area 1 &amp; 2</b>  |  |
| <b>Vascular Species</b>   | <b>Mosses &amp; Liverworts</b>   |
| Trees as per species composition ( <b>Section 5.4.7</b> )<br><br><b>Herbs, Ferns &amp; Grasses</b><br><br>Agrostis stolonifera; Angelica sylvestris; Carex remota; Filipendula ulmaria; Galium palustre; Iris pseudocorus; Lycopus europaeus; Mentha aquatica; Phalaris arundinacea; Ranunculus repens; Rumex sanguineus; Urtica dioica | Calliergonella cuspidata; Thamnobryum alopecurus   |

| <b>Broad-leaved woodland BEMP Area 3</b>  |   |
|---|---|
| <b>Vascular Species</b>   | <b>Mosses &amp; Liverworts</b>  |
| <p>Trees as per species composition (<b>Section 5.4.7</b>)</p> <p><b>Herbs</b></p> <p>Blechnum spicants; Hyacinthoides non-scripta; Luzula sylvatica; Oxalis acetosella; Polypodium sp.</p> | <p>Dicranium scoparium; Diplophyllum albicans; Hylocomium brevirostre; Mnium hornum; Plagiothecium undulatum; Polytrichum formosum; Pseudotaxiphyllum elegans; Rhytidiadelphus loreus; and Scapania gracilis</p>  |
| <b>Species-rich Wet Grassland BEMP Area 4</b>   |   |
| <b>High Quality Species</b>   | <b>Positive Species</b>   |
| <p>Carex pulilcaris; Carex verticillatum; Cirsium dissectum; Crepis paludosa; Galium uliginosum; Juncus conglomeratus; Lathyrus palustris; Orchid species</p>                               | <p>Achillea ptarmica; Carex echinata; Carex flacca; Carex nigra; Carex panicea; Equistum palustre; Filipendula ulmaria; Galium palustre; Juncus acutiflorus; Lotus pedunculatus; Luzula multiflora; Mentha aquatica; Molinia caerulea; Potentilla anglica; Potentilla erecta; Ranunculus flammula; Succisa pratensis; Viola palustris</p> |