APPENDIX 6-6

BIODIVERSITY MANAGEMENT AND ENHANCEMENT PLAN

Planning and Environmental Consultants

Appendix 6-6: Biodiversity Management and Enhancement Plan

Proposed Clonberne Wind Farm, Co. Galway

DOCUMENT DETAILS

Client:	**Clonberne Wind Farm Ltd.**
Project Title:	**Proposed Clonberne Wind Farm, Co. Galway**
Project Number:	**180740**
Document Title:	**Appendix 6-6: Biodiversity Management and Enhancement Plan**
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Rev	Status	Date	Author(s)	Approved By
03	Final	20.06.2024	KB	PR

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1. INTRODUCTION

1.1 Background

This Biodiversity Management and Enhancement Plan (BMEP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the proposed Clonberne Wind Farm Development.

This BMEP has been prepared in order to set out the proposed biodiversity enhancement measures associated with the Proposed Project. This BMEP also outlines how the Proposed Project has been designed to offset any loss of habitat or loss of faunal supporting habitat.

Approximately 2.14 ha of Woodland, scrub and linear vegetation will be lost to facilitate the construction of the Proposed Project infrastructure and turbine bat buffers (as per NatureScot guidelines). The areas lost are shown on Figure 1-1. The proposed areas for woodland replanting are shown in Figure 1-2 and the areas proposed for hedgerow replanting are shown in Figure 1-3. Whilst, no uncut peat is being lost, 7.73ha of degraded and cut over bog is being lost and 11.6ha is being enhanced. The proposed areas for peatland enhancement are shown in Figure 1-4.

1.2 Statement of Authority

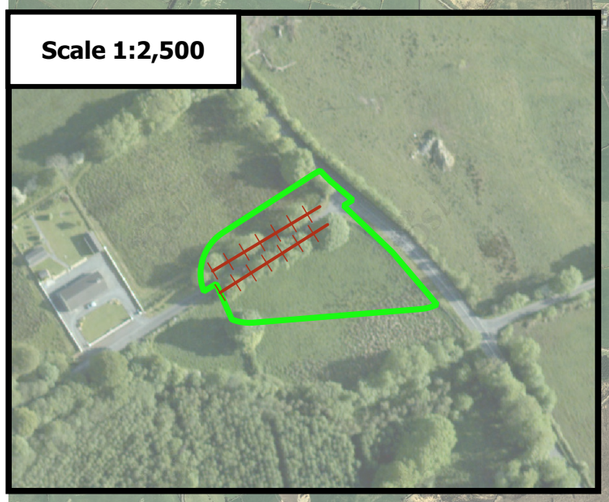
This report has been prepared by Katy Beckett (B.A., M.Sc.) and Kate O'Donnell (B.Sc., ACIEEM). Katy has the relevant qualifications and experience to compile this report and Kate has over 4 years' experience in ecological consulting. Kate has extensive ecological consultancy experience, having worked on Appropriate Assessments and Ecological Impact Assessments for a range of project types, including renewable energy infrastructure, water services infrastructure and transport infrastructure. This report has been reviewed by Pat Roberts (B.Sc., MCIEEM) who has over 19 years' experience in ecological assessment and ecological management.

1.3 Structure of this Report

This report will follow the below layout:

- **Section 1** is the introduction which discusses briefly the core areas of Biodiversity Management and Enhancement associated with the Proposed Project,
- **Section 2** discusses the replanting of 2.89ha of woodland to create a net gain in this habitat within the Site and offset the losses of Wet willow-alder-ash woodland (WN6), Bog woodland (WN7), Immature woodland (WS2) and Scrub (WS1) associated with the Proposed Project,
- **Section 3** discusses the loss of 1155m of hedgerows and treelines and the replanting of 1,875m to create a net gain in linear vegetation within the Site,
- **Section 4** discusses the measures put in place to enhance peatland habitats to offset the losses of Cutover bog (PB4) habitats associated with the Proposed Project,
- **Section 5** discusses the measures put in place to protect and enhance the *Molinia* meadow that will remain on the site following the loss of 2.17ha of this habitat and offset any loss of this habitat associated with the Proposed Project,
- **Section 6** provides a conclusion for all Biodiversity and Enhancement Measures presented within this report.

Turbine Delivery Route Accommodation Areas



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T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed New Roads
- Proposed Upgrades to Existing Roads

Linear Habitats to be lost

- Hedgreows (WL1)
- Treelines (WL2)

Woodland and Scrub Loss

- Wet Grassland/Scrub (GS4/WS1)
- Wet willow-alder-ash woodland (WN6)
- Bog Woodland (WN7)
- Scrub (WS1)
- Immature Woodland (WS2)

Drawing Title: Woodland, Scrub and Linear Vegetation Loss

Project Title: Proposed Clonberne Wind Farm, Co. Galway

Drawn By	Checked By
KB	KOD
Project No.	**Drawing No.**
180740	Figure 1-1
Scale	**Date**
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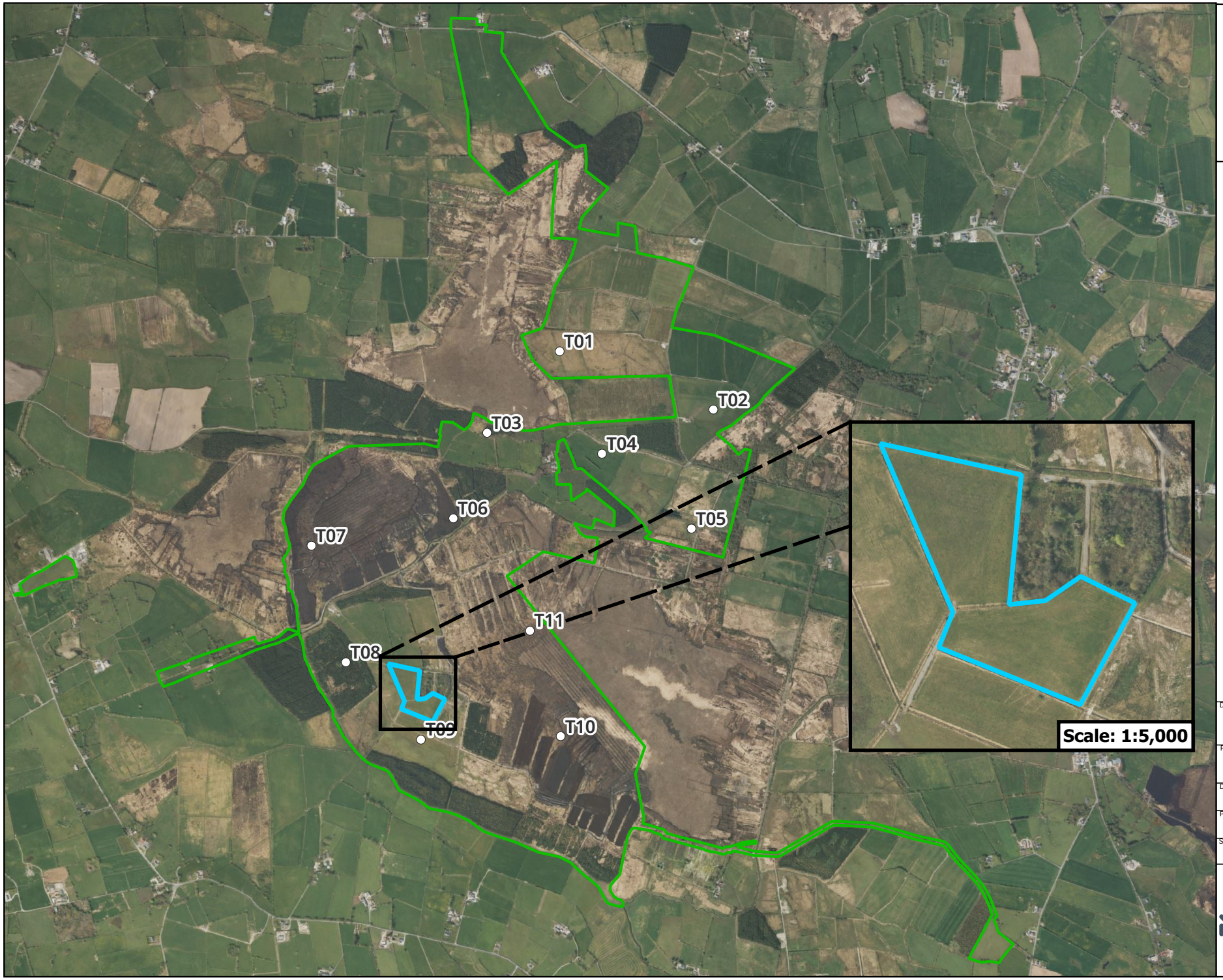

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Woodland Replanting Area

N

Drawing Title
Proposed Woodland Replanting

Project Title
Proposed Clonberne Wind Farm, Co. Galway

Drawn By	Checked By
KB	KOD
Project No.	Drawing No.
180740	Figure 1-2
Scale	Date
1:22,500	21.03.2024

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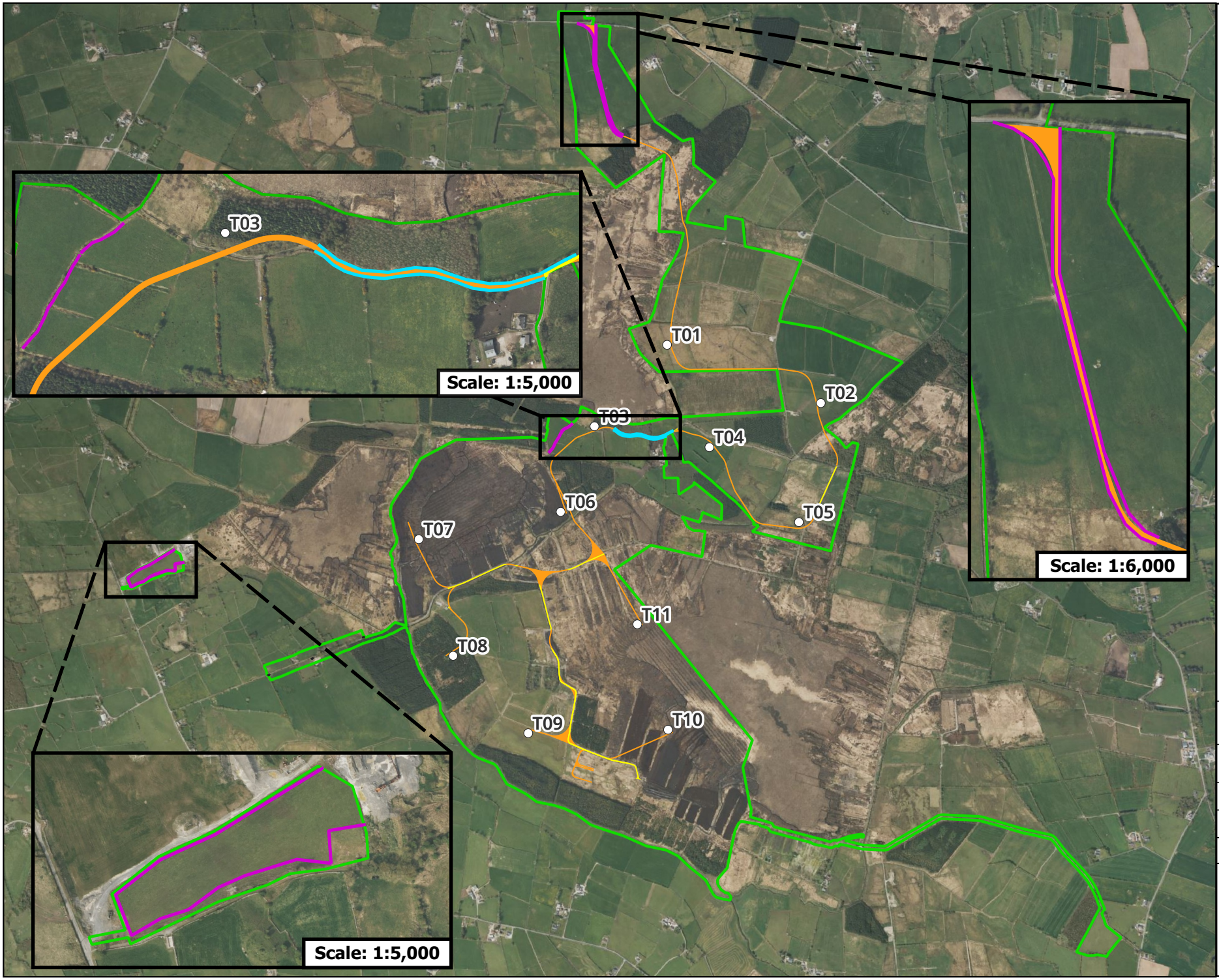

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed New Roads
- Proposed Upgrades to Existing Roads

Proposed Replanting

- Hedgerow
- Treeline

N

Drawing Title: Proposed Linear Replanting Areas

Project Title: Proposed Clonberne Wind Farm, Co. Galway

Drawn By	Checked By
KB	KOD
Project No.	**Drawing No.**
180740	Figure 1-3
Scale	**Date**
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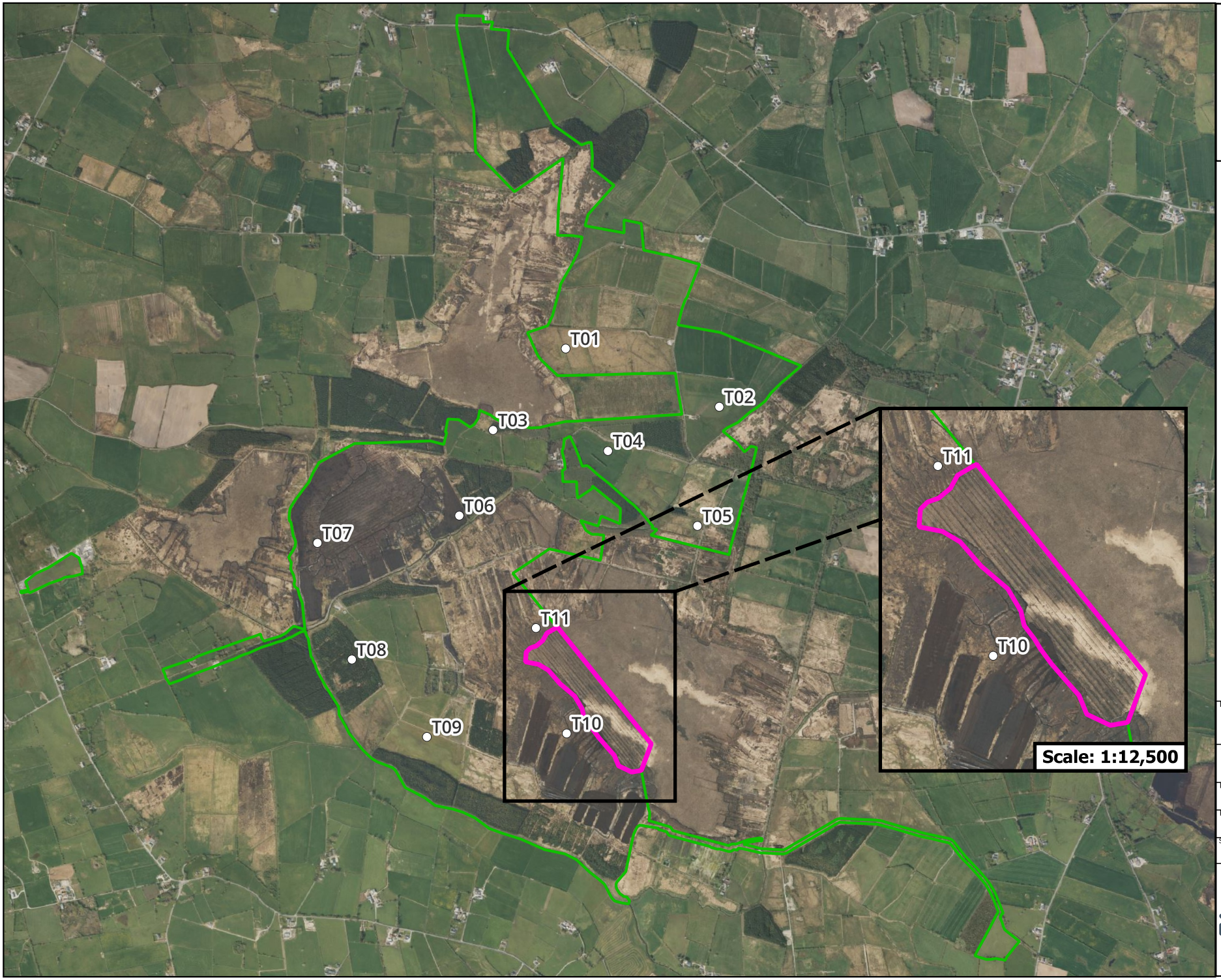

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Peatland Enhancement Area

Drawing Title	Proposed Peatland Enhancement Area
Project Title	Proposed Clonberne Wind Farm, Co. Galway
Drawn By: KB	Checked By: KOD
Project No.: 180740	Drawing No.: Figure 1-4
Scale: 1:22,500	Date: 21.03.2024

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2. WOODLAND REPLANTING

2.1 Woodland Loss

There will be a loss of approximately 2.14ha of woodland and scrub to accommodate the Proposed Project, including turbines and associated bat buffers, wind farm roads and other key infrastructure. Woodland types to be lost to accommodate the development are summarised in Table 2-1

Table 2-1 Summary of woodland losses as a result of the Proposed Project

Habitat	Total area on site (ha)	Area to be lost (ha)	Infrastructure causing loss	Key Species
Wet willow-alder-ash woodland (WN6)	2.00	0.15	• Upgrade and widening of road N of Turbine 9 • New site access road N of Turbine 1	• Alder (*Alnus glutinosa*) • Ash (*Fraxinus excelsior*) • Sycamore (*Acer pseudoplatanus*) • Willow (*Salix* sp.) • Beech (*Fagus sylvatica*) • Hawthorn (*Crataegus monogyna*)
Bog woodland (WN7)	2.05	0.30	• New road S of Turbine 2 • Turbine 5 bat felling buffer	• Birch (*Betula pubescens*) • Willow (*Salix* sp.) • Pine (*Pinus* sp.) • Rhododendron (*Rhododendron ponticum*)
Immature woodland (WS2)	1.58	0.03	• Construction compound	• Ash (*Fraxinus excelsior*)
Scrub (WS1)[1]	8.93	1.67	• Substation • Construction compound • Upgrade and widening of existing roads throughout the Site • Turbine 6 bat felling buffer	• Willow (*Salix* sp.) • Gorse (*Ulex europaeus)* • Bramble (*Rubus fruticosus*)

Woodland losses associated with construction of the Proposed Project infrastructure and turbine bat buffers (as per NatureScot guidelines) are shown on Figure 1-2.

2.2 Proposed Woodland Replanting

The loss of 2.14ha of woodland and scrub will be offset through the planting of native woodland within the Site. It is proposed to plant approximately 2.89 hectares of native woodland to offset that loss as well as achieving an increase in the amount of woodland within the site, as such habitat would constitute a high local biodiversity value. The area chosen for the planting of woodland to replace those lost because it does not currently support woodland and is dominated by improved agricultural grassland of low biodiversity value. This area is immediately adjacent to an existing area of Wet willow-alder-ash woodland (WN6) north of proposed Turbine 9, which is described in Section 2.1 above.

[1] *Area of Scrub (WS1) includes those areas in a mosaic with Wet grassland (GS4/WS1)*

It is proposed to plant approximately 2.89ha of native tree species within the Site in this area north of Turbine 9. Tree species and plant community to be planted will include those which have the potential to develop a habitat in-keeping with the existing adjacent woodland. The woodland proposed woodland replanting area is shown in Figure 1-3 and the following species and composition will be planted.

- Pure groups (30-40 trees) of alder (50%), grey willow (10%) & downy birch (10%).
- Groups interspersed alternately (to improve stability & robustness, & to prevent the development of an alder monoculture).
- Pedunculate oak (10%) on drier areas.
- Hawthorn (5%) scattered throughout.
- Minor species (15%) to comprise at least two of the following, positioned between the above pure groups: holly, hazel, guelder rose.

The planting of 2.89ha of native tree species will result in an increase of approx. 0.75ha of woodland within the Site, accounting for the felling of wet willow-alder-ash woodland, bog woodland, immature woodland and scrub during the construction phase. While this habitat will develop into a habitat of minimum Local Importance (Higher Value) it has the potential to form a habitat of greater significance. Monitoring of the planted area will allow for the assessment of this habitats value to be made. The planting of 2.89ha of woodland habitat will also provide potential foraging, commuting and resting habitat for a range of faunal species such as badger, pine marten, nesting birds and pollinators.

2.2.1 Maintenance of Newly Planted Woodland Habitat

Maintenance of the proposed woodland planting will be followed out as per the *Native Woodland Establishment GPC9 & GPC10 Silvicultural Standards* (Department of Agriculture, Food and the Marine, 2015).

The new woodland habitat will be protected from browsing by livestock and wildlife (i.e. deer), through the erection of new stockproof and deer proof fencing where required, which should be at least 5m away as required.

2.3 Monitoring

To confirm that habitat creation and enhancement has been successful the above outlined woodland replanting scheme will be monitored by a qualified ecologist at the following intervals:

- 6 Months,
- 1 Year,
- 2 Years.
- 3 Years,
- 4 Years,
- 5 Years.

At the end of the 5-year monitoring plan as outlined above, the Project Ecologist will assess the need for and frequency of further monitoring of the woodland replanting area in agreement with the wind farm operator. In order to carry out monitoring, a qualified ecologist will conduct inspections and relevés of the planting area at the above outlined temporal intervals following the main growing season (i.e. in September). These inspections and relevés will be recorded and entered into a monitoring report. The collected information will inform the success of the proposal allow for adaptive intervention if it is deemed necessary e.g. if any shrubs are dead or damaged these will be replaced using the same species within the next planting season. Monitoring will be undertaken in partnership between the developer,

the Project Ecologist, and the Landowner. The proposed management actions will be conveyed to the developer and the relevant landowner, and management alterations implemented as required to achieve the targets of the management plan.

3. LINEAR HABITAT REPLANTING

3.1 Hedgerow and Treeline Loss

The majority of hedgerow/tree habitat loss is associated with habitat buffering measures required to avoid impact on bats as per NatureScot recommendations. The proposed vegetation removal to prevent impacts on bats is summarised in Table 3-1 below. Linear vegetation loss associated with construction of the Proposed Project infrastructure measures 1,155m in total and is shown on Figure 1-1.

Woodland and forestry felling and replanting associated with the bat felling buffer has been addressed in Section 2 of this report.

Table 3-1 Assessment of Linear Habitat Features within Turbine Buffers

Turbine No.	Length of Proposed Removal
Turbine 1	None
Turbine 2	None
Turbine 3	184m Hedgerow (WL1) 117m Treeline (WL2)
Turbine 4	96m Hedgerow (WL1)
Turbine 5	117m Hedgerow (WL1)
Turbine 6	None
Turbine 7	None
Turbine 8	None
Turbine 9	None
Turbine 10	None
Turbine 11	None

The remainder (641m) of hedgerow/tree habitat loss is to facilitate road new access roads, turbine delivery route and construction works associated with the Proposed Project.

It is proposed to create new hedgerow features within the Site. A total of 1,875m of linear hedgerow and treeline habitat is proposed to be created within the Site. This habitat creation will offset the 1,155m loss of this habitat and also provide a significant habitat net gain, once the planting has established. Overall, the proposed replanting will result in a net gain of approximately 720m in the linear landscape features within the Site. Planting will be of semi-mature specimens to ensure connectivity gains are immediate and will be indigenous to the local area.

3.2 Timing of Works

Hedgerow clearance works will be conducted in line with the provisions of Section 40 of the Wildlife Acts 1976 (as amended). No hedgerows will be removed during the bird nesting season (1st March to 31st August).

3.3 Proposed Linear Habitat Replanting

The locations in which the proposed replanting of hedgerow which will be allowed to develop into treelines will take place is presented in Figure 1-3. There is an extensive network of existing linear landscape features in the wider area that will be retained, and the proposed replanting will enhance connectivity across the Site and wider landscape. Planting will be of semi-mature specimens to ensure connectivity gains are immediate and will be indigenous to the local area. Such species include hawthorn (*Crataegus monogyna)* which will make up approx. 75% of the hedgerow mix. The ideal native hedge is made up of 75% hawthorn and 25% of at least four other species[2]. Other species which will be included are:

- Spindle (*Euonymus europaeus*)
- Dog rose (*Rosa canina*)
- Hazel (*Corylus avellana*)
- Elder (*Sambucus nigra*)
- Blackthorn (*Prunus spinosa*)

When planting new hedgerow, plants will be closely spaced (a maximum of 50cm apart) and planted in a staggered row. The new hedgerow will need to be protected from browsing by livestock, through the erection of new stockproof fencing where required, which should be at least 1m away from the hedge, and on each side if required.

In addition, standard tree species including oak (*Quercus robur*), Birch (*Betula pubescens*), Rowan (*Sorbus aucuparia*) and Scot's Pine (*Pinus sylvestris*) will be planted along the hedges and will be allowed to develop into treelines.

The proposed planting of 1,875m of hedgerow and treeline habitat as outlined in the preceding sections will result in the creation of an additional 720m of linear vegetation habitat within the Site. The planting of additional hedgerow/ treeline will serve to enhance the linear habitats within the site due to increased species diversity compared to that to be lost, will benefit wildlife and due to the increase of 814 linear metres over that to be lost, will result in a net gain in this habitat within the Site.

Improving hedgerow and treeline availability will increase the commuting route bats use to connect roosting sources with foraging availability. Linear features allow bats to navigate across a landscape while providing protection from predators like Owls and Hawks. Predators rely on hunting bats where gaps or open space exist. Bolstering hedgerow and treelines reduce and remove gaps to provide more consistently safe commuting routes for bats. Bat have been shown to avoid crossing a linear feature gap with a distance of 3m. Increasing the treeline and hedgerow linear habitat by 814m improves the commuting and foraging habitat availability, and offers better predator protection, resulting in a positive net gain for bats. Improving the diversity of the hedgerow and treelines will allow a more diverse and abundant habitat for insect species. Inspect species that breed and exist within the tree habitat are an important food source for bats.

3.3.1 Maintenance of Newly Planted Hedgerow

In order to facilitate the successful establishment of the new hedgerow and trees to be planted within the Site, and to promote biodiversity value of the new hedgerow the following measures are proposed:

- New hedgerow shrub planting will be kept weed and litter free until the new plants are established, particularly from ruderal weeds. Healthy growth will be maintained by allowing the

[2] *NBDC – Pollinator-friendly Management of Wind Farms – National Biodiversity Data Series No. 25*

plant to occupy as much of the planting areas as possible to allow them to achieve as close their natural form as possible.

- During spring and autumn maintenance periods all trees and plants will be checked and adjusted/replaced as required, soil firmed, and any dead wood present removed back to healthy tissue and mulch added if required. Where tree stakes and ties are no longer required these will be removed to avoid damage to the tree.
- During the first growing season, all standard trees/ semi-mature trees will be watered regularly during any prolonged dry periods during the growing season (i.e. in April, May, June, July and August). During the second growing season the trees will be kept well-watered as often as required, particularly during June, July and August.
- New hedgerows should be cut annually, with the cutting height raised by 10-15cm each year. This will allow the plants to flower and produce berries whilst preventing the height of the hedgerow from increasing too rapidly.
- Any tree, hedge or shrub that is removed, uprooted, destroyed or that becomes seriously damaged, defective diseased or dead shall be replaced in the same location with another plant of the same species and size as that originally planted. All such replacements shall be carried out within the first planting season following the loss.

3.4 Monitoring

Hedgerows and replanted trees will be inspected following the main growing season (i.e. in September) for the first five years of growth, where the requirement for replacement planting will be assessed. If any shrubs are dead or damaged these will be replaced using the same species within the next planting season. Recommendations for ongoing or remedial management required will be specified within an Environmental and Ecological Report.

4. PEATLAND ENHANCEMENT

4.1 Peatland Loss

Proposed Turbines 6, 7, 10 and 11 and associated works areas, four proposed peat repository areas, one construction compound and the proposed roads associated with these areas will lead to the loss of approximately 7.73ha of Cutover bog habitats that do not conform to any Annex I habitat. This equates to 7.4% of the total area of cutover bog within the site. The areas of uncut and drained Raised bog (PB1) have been avoided as part of the design of the wind farm, therefore there will be no loss of this habitat.

Turbine 11 is located within an area that has been mapped in the NPWS Article 17 mapping as Degraded raised bog still capable of natural regeneration [7120]. However the habitat in this area no longer conforms to this classification. Relevés at this turbine base found that the cutover bog was >80% bare peat with only toadrush (*Juncus bufonius*), hare's tail cottongrass (*Eriophorum vaginatum*) and ling heather (*Calluna vulgaris*) recolonising, with no non-vascular plants present (Plate 4-1). The Turbine 10 hardstand and access road also partially overlap with this Article 17 area, however the area of T10 was also found to no longer conform to this designation. Relevés at this location found bare peat comprised 8% of the ground cover with the only species present including cottongrass (*Eriophorum angustifolium*), ling heather (*Calluna vulgaris*), cross leaved heath (*Erica tetralix*) and compact rush (*Juncus conglomeratus*) and two mosses (Plate 4-2). These relevés are outlined in detail in Appendix 6-1 of this EIAR.

Plate 4-1 Turbine 11 is located in an area of Article 17 degraded raised bog, now consisting primarily of bare peat

Plate 4-2 Turbine 10 is located in an area of cutover bog consisting primarily of bare peat and a high cover of cottongrass

4.2 Proposed Reseeding Areas

Where there is a requirement to excavate and remove cutover bog habitats that support peatland vegetation, the excavated sod will be retained with vegetation intact and placed over the top of peat repository areas. This will speed up the recolonisation of these areas and also reduce run-off potential.

4.3 Proposed Peatland Enhancement

An area of approximately 11.6ha of uncut raised bog has been identified for habitat enhancement. Although uncut, the habitat has been heavily drained through the insertion of parallel drains. This area is located in the southeast of the Site (Plate 4-3) and adjoins a large area of uncut raised bog which has not been drained in a similar manner. It is proposed to rewet the area of uncut, drained raised bog identified in Figure 1-3 through drain blocking measures. This area has been subject to extensive drainage in the past in order to facilitate the cutting of peat, and therefore has a highly altered hydrological regime. A relevé within this area found species including ling heather, deer grass (*Trichophorum germanicum*), cottongrass, carnation sedge (*Carex panicea*), purple moor grass (*Molinia caerulea*), cross leaved heath and bog asphodel (*Narthecium ossifragum*) as well as the bryophytes acute leaved bog moss (*Sphagnum capillifolium*), red bog moss (*Sphagnum capillifolium* ssp. *rubellum*), blunt-leaved bog moss (*Sphagnum palustre*) and reindeer lichen (*Cladonia portentosa*).

The area of raised bog proposed for enhancement is shown in Figure 1-4, and is located within the area of mapped Article 17 Degraded raised bog still capable of natural regeneration [7120].

Plate 4-3 The area of raised bog to be restored

It is proposed to undertake drain blocking within this area of raised bog. The purpose of this measure is to raise the water table in the drains, and in adjacent areas in order to re-establish wetter conditions associated with more intact Raised Bog.

Drain blocking will be carried out under the supervision of the project geotechnical engineer, project hydrologist and project ecologist.

In order to facilitate the re-establishment of peatland vegetation within these areas, and maintain an effective hydrological regime, the following measures are proposed in these areas:

- Prior to drain blocking works taking place, the proposed enhancement area will be surveyed by a suitably qualified ecologist and hydrologist to identify drains to be blocked. A dam will be placed every 10cm drop in elevation with a minimum of three and maximum of ten dams per 100m. A topographic survey will be carried out in advance of drain blocking to identify and mark locations for dams. The drains in this area are shown in Appendix 1.
- Drain blocking will be undertaken on a local scale, within the proposed enhancement area. Where machine access is possible and significant erosion by water flow in the existing drains is not anticipated, this will be achieved by installing peat dams within the existing drainage ditches. This will maintain, enhance and restore the favourable baseline hydrological and ecological conditions within the enhancement area. Installation methodology as outlined in Appendix A of Mackin *et al.* (2017) are as follows:
    - Appropriate machine tracking routes will be identified prior to commencement of works, with the use of off-road vehicles restricted to the proposed new site access track as much as possible. The number of machine passes will also be minimised.
    - Scraw will be removed from the area of the dam (placed close-by for replacement later) and peat will be cleared from both sides of the drain. Scraw will also be removed from an area behind machine to be used as a borrow pit.
    - A key will be cut in the drain, ensuring that this is wider than the actual drain (c. 50cm either side).

- Peat will be dug from the borrow pit and placed into the drain, compacting as additional layers are added. Only deeper, more compacted peat will be used to build the dam. The dam will be built at least 30-50cm above the surface of the bog to allow for subsequent shrinkage of the peat as it dries and extend the sides at least 50cm into the bog.
- The scraw will then be replace and compacted on the top and sides of the dam to stabilise the dam and prevent erosion.
- The borrow pit will then be re-profiled and backfilled with the peat removed from sides of drain to form the key and any loose peat from the borrow pit. Any remaining scraw will then be replaced and compacted into the borrow pit.
- An example of peat dams proposed is shown in Plate 4-4. The methodology for peat dam construction, as per (Mackin *et al.,* 2017) is provided in Plate 4-6. A graphic of the desired completed peat dam is shown in Plate 4-7.
- Peat damming has been proven very effective at many bogs. Success in restoring active raised bog will depend on surface slope, flow patterns and extent of vertical losses of water through the peat to depth. The build quality of the dam will also have a significant influence on the success in restoring active raised bog. Poorly constructed dams may fail completely or fail to maintain a high water level. If there is significant water flows in the drain this can cause erosion of the dams. In cases such of this consideration should be given to using plastic pile to reinforce and protect the peat dams.

- Where peat dam construction is not possible, plastic dams may be installed by hand, especially in areas where peat dams may erode (as outlined above), or where machine access is not possible. Installation methodology as outlined in Appendix A of Mackin *et al.* (2017) are as follows:
  - Plastic dams are typically installed by hand using lengths of inter-locking plastic piles. These can be supplied in varying lengths and if necessary cut to size depending on the depth of the drain. It is important that the piles are long enough to extend sufficiently below the base of the drain in order to be secure and minimise water flow under the base of the dam. This may vary depending on the characteristics of the drain.
  - The first plastic pile is pushed into the centre of the drain, ensuring it remains vertical. This should then be driven further into the peat until it is held firm using a large rubber mallet (if necessary protect the top of the plastic using a timber batten).
  - Once the centre pile is in a secure position, adjacent piles are guided into position, being pushed into the peat and using the rubber mallet to drive into a firm position.
  - The dam should extend beyond the width of the drain into the bog, typically by a minimum of 50cm to prevent water flowing around the dam and eroding the sides of the drain.
  - Once all piles have been positioned and are secure they will be driven to a final position, starting from the centre until all piles are approximately 30cm above the level of the surface.
  - This plastic will extend at least 50cm below the base of the drain if the peat is very firm. If the peat is weak the plastic should be driven in further until the plastic is held secure.
  - If significant flow is expected which could cause erosion around the dam, a notch for water to overflow should be created by driving the centre pile(s) slightly further until it is below the level of the adjacent bog surface.
  - An example of a plastic dam is shown in Plate 4-5. The methodology for plastic dam installation is provided in Plate 4-8.
  - Plastic damming has been proven very effective at many bogs where it has been used and installed correctly, however it is very ineffective if plastic is not installed deep enough into the drain or does not extend far enough laterally into the bog. In some areas where significant water level fluctuations occur a gap may open up between the peat and plastic allowing increasing water losses over time.

In addition, the following measures will be adhered to during the enhancement process:

- Maintenance requirements are low providing dams are installed correctly. Most damage will typically occur within the first year of installation during times of high flow. This may require a survey to check dam integrity and identify locations where dams require replacement or where enforcement is required.
- No additional drainage will be installed in proximity to these habitat areas during the lifetime of the development.
- All works will be preceded by a toolbox talk to the enhancement team by the project ecologist to ensure all measures are implemented in full.
- Peat extraction within the proposed peatland reinstatement area will not be permitted.
- Burning and dumping will not be permitted.
- The rehabilitation area will be monitored (as described below) to assess the success of the rehabilitation plan.

The proposed rewetting and enhancement of 11.6ha of raised bog as outlined in the preceding sections will offset the loss of approximately 7.73ha of Cutover bog (PB4) habitats that will be lost during the construction phase of the Proposed Project, enhancing the current ecological condition of the raised bog habitat and benefitting the adjoining uncut raised bog which has not been subject to the same extensive drainage. Peatlands are considered one of the most important ecosystems worldwide, owing to their biodiversity value and ecosystem functions (water filtration and supply; potential for climate regulation via atmospheric carbon sequestration and storage). The installation of drain blocks across this area of raised bog will encourage the raising of the water table and, as a result, the recolonisation of positive active raised bog indicator species. The rewetting of this area will also provide potential suitable habitat for a range of faunal species including amphibians and ground nesting birds.

Plate 4-4 Example of peat dams to be used for on-site drain blocking

Plate 4-5 Example of plastic dams to be used for on-site drain blocking where peat dams are not suitable

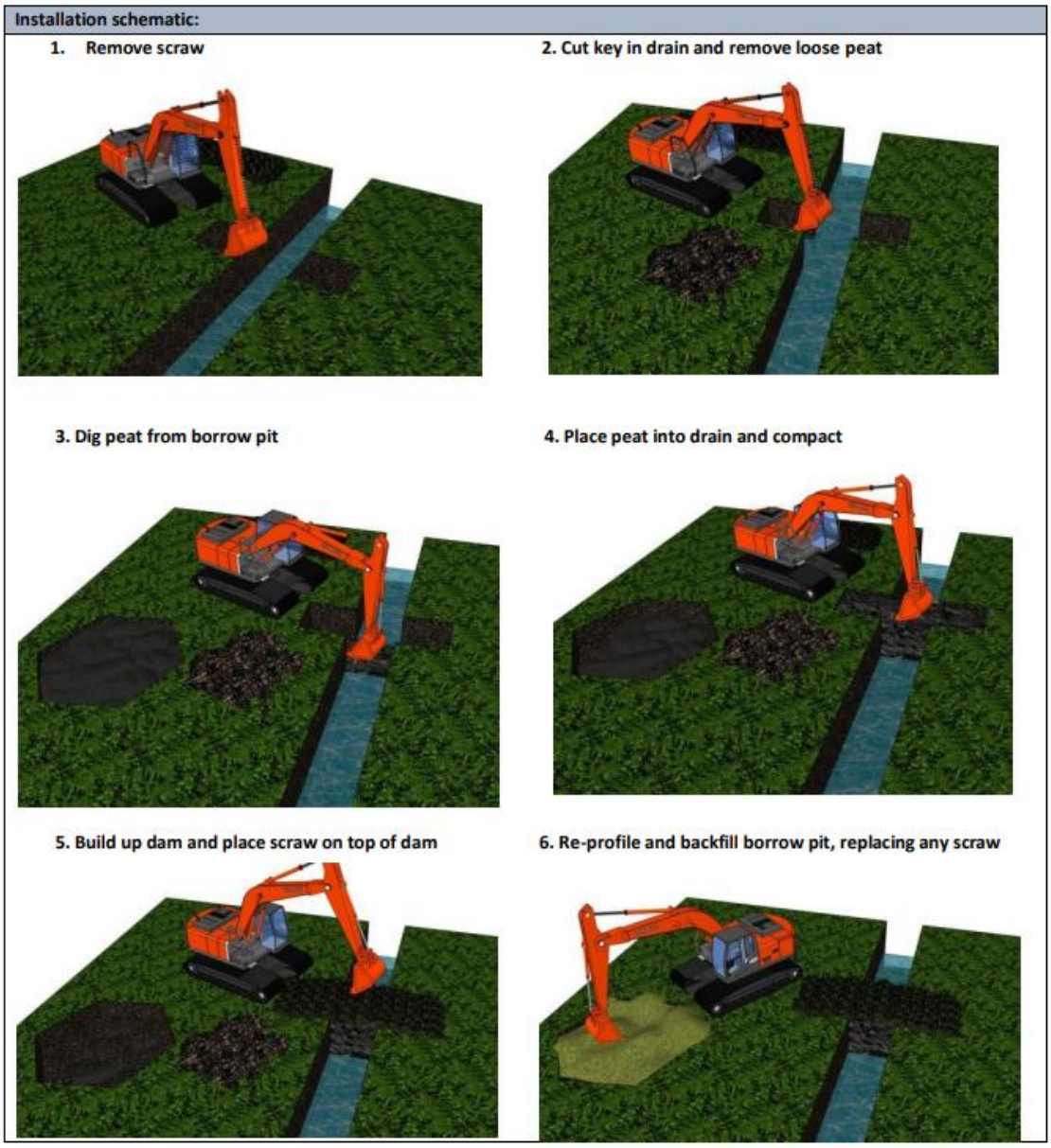

Plate 4-6 Methodology for peat dam construction (Source: Mackin et al., 2017)

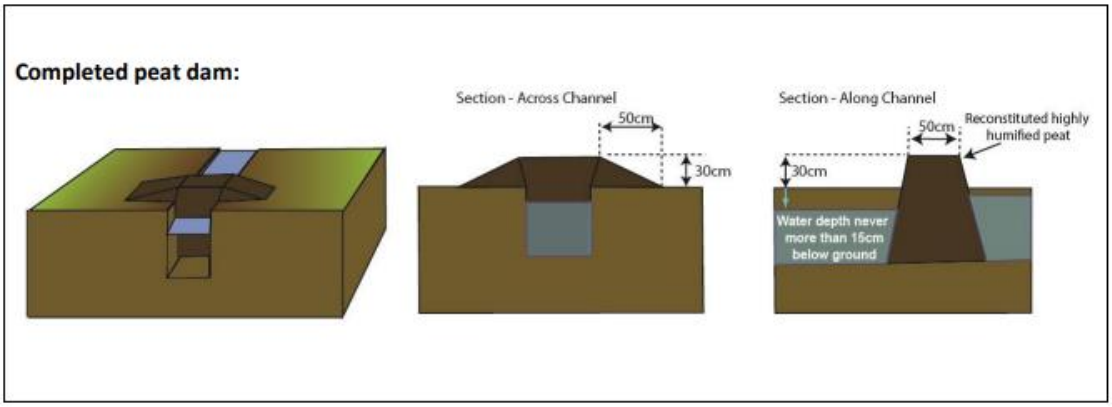

Plate 4-7 Drain blocking by machine (Source: McDonagh, 1996)

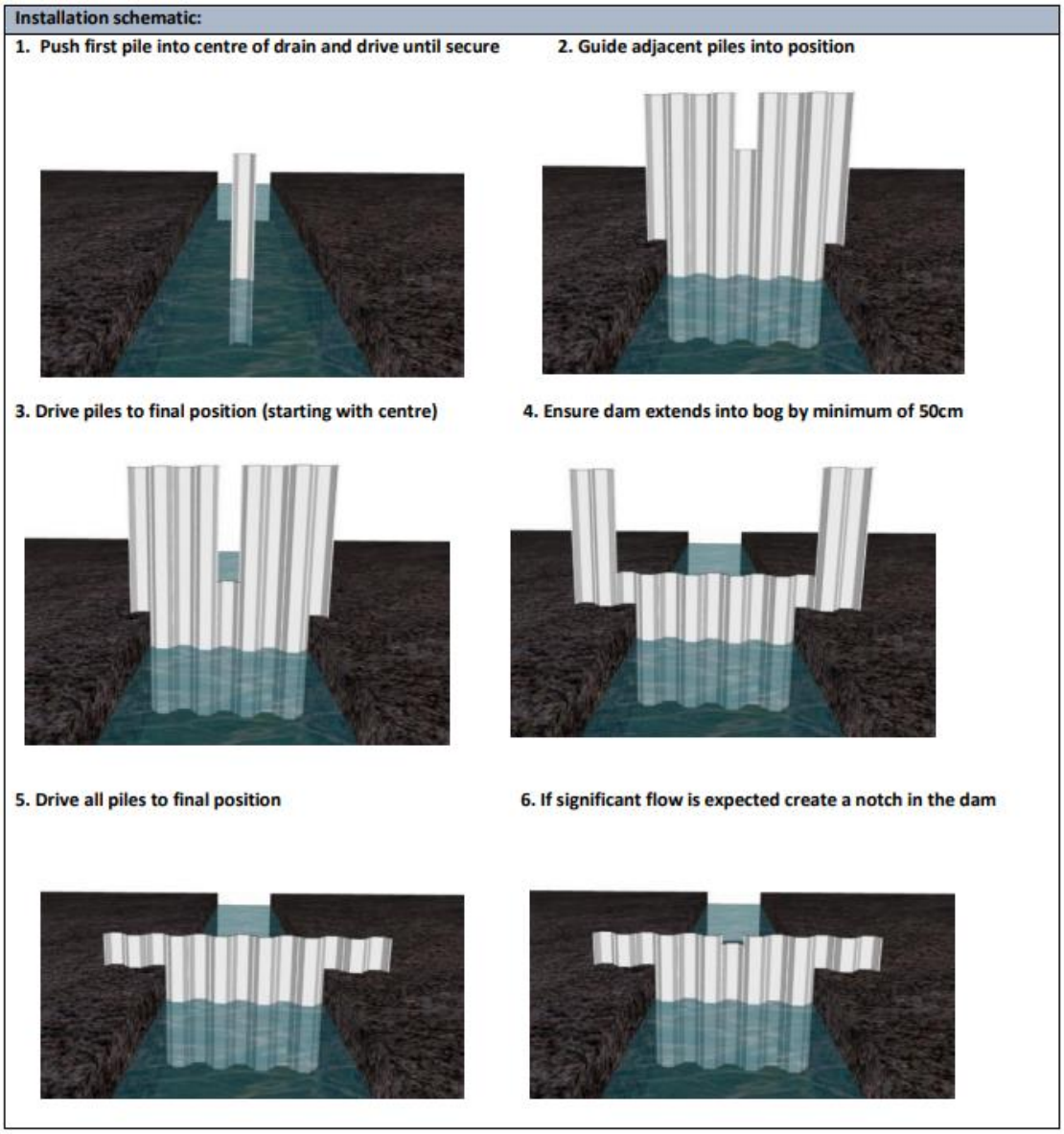

Plate 4-8 Methodology for plastic dam installation (Source: Mackin et al., 2017)

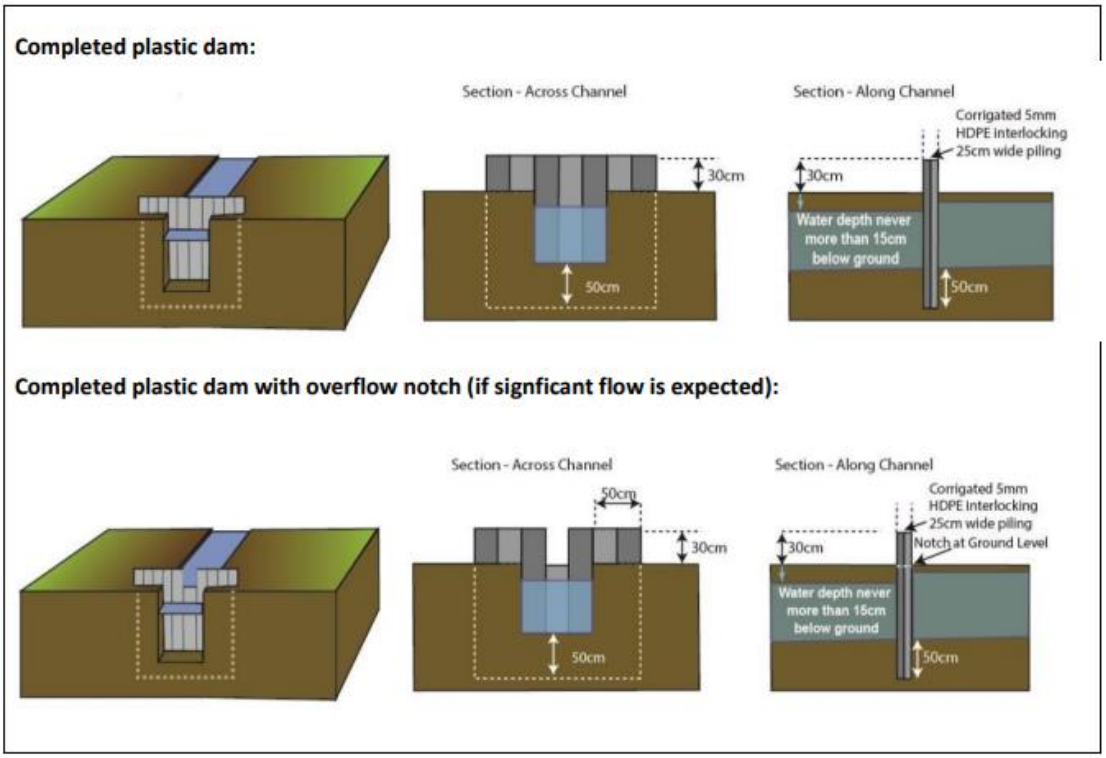

Plate 4-9 Drain blocking using plastic dams (Source: McDonagh, 1996)

4.4 Monitoring

Prior to the commencement of the habitat enhancement measures described in this Plan, permanent vegetation monitoring plots will be established within the management areas. The monitoring plot locations will be selected using stratified random sampling. This will allow the monitoring plots to be representative of microtopography and vegetation cover, sampling areas from the wettest, intermediate and driest parts of the management areas. Monitoring plots will be surveyed and classified using the relevé method as per the National Survey of Upland Habitats (Perrin *et al.*, 2014) with plot sizes being 2m x 2m. Biotic and abiotic parameters that form baseline indicators of ecological and hydrological condition of the bog will be recorded. Monitoring plots will be marked out permanently using fencing posts and their location recorded using GPS. The number of monitoring plots will be determined by the level of plant community heterogeneity identified following felling/drain blocking. However, it is proposed that a minimum of ten 2m x 2m monitoring plots will be established across the enhanced areas.

Monitoring plots will be surveyed once annually during the first five years of the windfarm and at 5 year intervals for the lifespan of the windfarm (35 years) by a suitably qualified ecologist.

Habitat data gathered during the monitoring surveys will be classified and analysed according to the methodology provided within the following documents:

- Vegetation Description and Data Analysis: A Practical Approach, 2nd Edition (Kent, 2011)
- The Habitats of Cutover Raised Bog, Irish Wildlife Manuals No. 128 (Smith and Crowley, 2020)
- Raised Bog Monitoring and Assessment Survey 2013, Irish Wildlife Manuals No. 81 (Fernandez *et al.*, 2014)

Hydrological monitoring will also be required to assess the effectiveness of enhancement works. Water levels within areas where drains are blocked will be recorded bi-annually during the first five years of the windfarm and at 5-year intervals for the lifespan of the windfarm (35 years). A number of dipwells

or piezometers will be inserted on the peatland to monitor the height of the water table. These will be constructed from 52mm internal diameter PVC. To stop peat filling the tube from the base, the pipe will be covered with gauze affixed with tape. This will be done prior to restoration to allow monitoring of water levels within both the restoration and enhancement areas. In this way, any positive impacts on the local hydrology can be verified and quantified.

5. GRASSLAND MANAGEMENT

5.1 Grassland Loss

Approximately 0.22ha of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] will be lost in order to accommodate the construction of new site road located to the east of Turbine 1. The loss will be located at the very edge of this habitat adjacent to an existing field boundary. It will avoid fragmentation of this habitat and will be confined to a degraded section at the edge of the habitat area.

In order to minimise the loss of Molinia Meadow habitat, the area required to facilitate construction of the road will be fenced off prior to construction and no access to the meadow outside the fenced area will be permitted.

5.2 Proposed Enhancement measures

The remaining 6.17ha of Molinia Meadows habitat that will be retained as part of the Proposed Project, will be subject to the following measures to ensure that it is protected and enhanced during the lifetime of the project:

1. Undertake grazing at low stocking levels avoiding the main flowering period of May to July.
2. There will be no application of fertilizer
3. There will be no additional drainage of the field or surrounding area
4. If appropriate, the meadow will be cut for hay each year – ensuring that the hay is removed.

5.3 Monitoring

The Molinia meadows will be surveyed once annually during the first five years of the windfarm and at 5 year intervals for the lifespan of the windfarm (35 years) by a suitably qualified ecologist. The field will be assessed following a methodology as set out in the Irish Semi Natural Grassland Survey (O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.). The assessments will include a condition assessment for the Annex I habitat. Where necessary, recommendations will be made for changes in management to ensure that the habitat conservation status of the habitat is optimised.

6. CONCLUSION

Sections 2, 3, 4 & 5 describe the Biodiversity Management and Enhancement Measures proposed for the Proposed Project. The measures described in this BMEP will serve to offset impact on linear vegetation (treeline and hedgerow), woodland and scrub habitats, cutover bog habitats and *Molinia* meadows associated with the Proposed Project and provide a net gain of both linear and woodland habitats within the Site. A total net gain of 720m of linear hedgerow and treeline habitat is proposed and a net gain of approximately 0.75ha in woodland habitat will be established within the Site. The planting of linear vegetation and woodland within the Site also provides additional habitat for fauna including birds, bats and terrestrial mammal species such as badger and pine marten. Management, protection and enhancement of *Molinia* meadow will also be undertaken throughout the lifetime of the developments.

This BMEP has set out measures to be implemented during establishment and management phases to ensure that measures are successful. The success of these measures will be evaluated through a detailed monitoring and reporting programme.

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