Appendix 6E

Biodiversity Management Plan

MWP

Biodiversity Enhancement Management Plan (BEMP)

Ballycar Wind Farm

Ballycar Green Energy Ltd

January 2024

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1. Introduction

This is a Biodiversity Enhancement Management Plan (BEMP) that has been prepared for the proposed development. The proposed development proponent is committed to enhancing the condition and extent of certain habitats in the habitat management area and provide compensation for any negative aspects of the development on flora and fauna as identified in the Chapter 6 Biodiversity of the Environmental Impact Assessment Report (EIAR). The purpose of this BEMP is that biodiversity at the developed wind farm site is in a better condition after the development of the project than is currently the case, through implementation of measures during the construction and operation stages. This document identifies the important habitats within the Proposed Development site and collates all relevant information on enhancement and management measures in relation to biodiversity within the site. The habitat management area is defined as the Site Boundary as in Figure 1, corresponding to those lands under the control of the developer/landowners. As all measures being proposed are within the existing landholding boundaries, the measures will be implemented by the developer in conjunction with the landowners and the Ecological Clerk of Works (ECoW). Measures outlined in this document have been agreed with the individual landowners and will be implemented by the operator in conjunction with the landowners and overseen by project ecologist. The project ecologist will undertake to report the success or otherwise of said measures via operational compliance to the National Parks and Wildlife Service (NPWS) and Clare County Council.

This document sets out the basis of the BEMP, where the information to inform this BEMP was sourced, the enhancement and management measures, and the monitoring required to ensure Biodiversity Net Gain (BNG). This BEMP aims to promote maximum biodiversity gain over the lifetime of the development including measures for important habitats and species occurring within the site, the incorporation of pollinator protection measures into the ECoWs' scope, the inclusion of an Invasives Species Management Plan (ISMP), and ensuring minimal disturbance to sensitive habitats within the site.

1.1 Background

This BEMP has been prepared in compliance with the 3rd National Biodiversity Action Plan (NBAP) (2017 – 2021) (DCHG, 2017). The Clare County Biodiversity Action Plan (2017 – 2023) is informed by the seven strategic objectives and associated targets of the third National Biodiversity Action Plan. Of those seven objectives, Objective 4 is most relevant to the Proposed Development site highlighting the importance of conservation and restoration of biodiversity and ecosystem services in the wider countryside.

Objective 4 of the NBAP has defined a number of targets to protect the environment:

- Optimised opportunities under agriculture and rural development, forestry and other relevant policies to benefit biodiversity;
- Principal pollutant pressures on terrestrial and freshwater biodiversity substantially reduced by 2020;
- Optimised benefits for biodiversity in Flood Risk Management Planning and drainage schemes;
- Harmful invasive alien species are controlled and there is reduced risk of introduction and/or spread of new species; and
- Improved enforcement of wildlife law.

1.1.1 Scope of Biodiversity Enhancement Plan

The first target under Objective 4 of the NBAP includes the following;

'*Optimised opportunities under agriculture and rural development, forestry and other relevant policies to benefit biodiversity*'.

The enhancement and management measures that are outlined below are of benefit to various habitats and species that have been already identified at the proposed development site. This BEMP focusses on those habitats and species identified as Important Ecological Features (IEFs) i.e. habitats and/or species evaluated as Locally Important (higher value) or greater and likely to be impacted significantly by the proposed development. Only IEFs are considered in the BEMP because of the low ecological value of lesser habitats. It is noted that buildings identified as IEFs are outside the zone of impact of the proposed development so are not considered.

This plan includes the management and enhancement of an area of peatland habitat, occurring in the northwest of the site, comprising blanket bog and heath mosaic. Exclusion of important biodiversity areas from future development/forestry operations will be an integral part of biodiversity preservation at the site. The plan also includes measures for the enhancement of sections of riparian habitat within the site, enhancement of existing hedgerows and treelines, and creation of new hedgerows and treelines. A key concept in this BEMP is that with improvements in the quality and extent of habitats of value to animals, local fauna will also benefit.

A management plan and monitoring program has been set out in this BEMP.

With successful implementation of the measures in this report, BNG can be expected within the site. This is demonstrated through an assessment of habitat loss versus habitat gain. All works will be as environmentally friendly and as maintenance-free as possible.

1.1.2 Habitats at the Site

The following habitat information is summarised from the Chapter 6 Biodiversity of the EIAR. For additional information, including footnotes not required for this BEMP (omitted here for brevity), refer to the biodiversity chapter.

The predominant habitats within the study area are conifer plantation (WD4) in the centre and northern areas of the site and improved agricultural grassland (GA1) dominant in the west, south and east of the site. Other habitats and mosaic habitats are interspersed throughout the study area, with the northwestern area of the proposed development site containing wet heath and bog habitats, woodland habitats in the west, southwest and southeast of the site and built habitat located in pockets in the west, southwest, and east. The limited peatland habitat area occurring in the northwest of the study area has been damaged to some extent by drainage associated with local agriculture operations.

The study area comprises two hydrometric areas divided between eastern and western components. These areas are located in Hydrometric Area (HA) 25 (Lower Shannon) and HA 27 (Shannon Estuary North). The eastern component of the proposed development, is within the North Ballycannan_010 subbasin. This subbasin has an area of ca. 26.5 km^2. The primary watercourses in this area are, from east to west the 3rd order South Ballycar Stream (EPA code 25S75) and North Ballycannan Stream (EPA code 25N17). Along stretches of these watercourses, some woodland comprising native tree species occur.

The western component of the proposed development is within the Crompaun (East)_010 subbasin, a coastal drainage unit. The main watercourse is the 3rd order Crompaun [East] Stream.

Field surveys identified the habitat types within the study area. The Fossitt (2000) categories and codes for the ecologically important habitat types recorded within the site boundary (IEFs: local importance, high value or higher) are listed in **Table 1** below. **Figure 1** below shows a habitat map of the site area.

Table 1: Fossitt (2000) habitat types identified as IEFs in study area and impact (note: all evaluated as locally important, higher value; mosaics of wetheath identified as National Importance).

Fossitt Habitat Type	Location/Distribution in Study Area	Area of habitat (Ha)	Description of impact
Buildings and Artificial Surfaces (BL3)	Comprises existing farm buildings and dwellings, located primarily at the periphery of the study area.	1.73	Loss of 0.58ha of this habitat throughout comprising existing tracks, farm tracks and surfaces. No buildings will be demolished as part of the proposed development.
Dry-humid Acid Grassland (GS3)	In more upland sections	8.12	Direct loss of 2.22ha at T1 and T3 due to hardstands.
Wet Grassland (GS4)/ Wet Heath (HH3)	Occurs throughout	0.29	Only a minimal area lost 0.0009ha due to hard stand at T1
Scrub (WS1)	Pockets occurring throughout	7.19	Direct loss 1.62ha at T3, T4 and T7
Mixed Broadleaf Woodland (WD1)	Throughout - largest stand occurring in the centre. Southeast border of the site continuing south and southeast beyond the boundary of the study area. Bounding the upper-most reaches of the Cappateemore East stream.	0.05	Direct loss of 0.045 ha due to track construction between T2 and T4. The area of woodland to the east of T2 will be preserved as it occurs in a minor valley and felling of this woodland for bat buffer purposes would result in fragmentation of a locally unusual habitat.
Wet Heath (HH3)	North of study area, outside the development footprint	0.01	No direct loss, though located close to development, encroachment from works area will not occur.
Upland Blanket Bog (PB2)/Wet Heath (HH3)	Small section in the northwest of site, outside the development footprint	0.46	No direct loss, though located close to development, encroachment from works area will not occur
Fossitt Habitat Type	**Location/Distribution in Study Area**	**Length of habitat (m)**	
Hedgerows (WL1)	Bordering field boundaries and adjoining drainage ditches	5,469	Loss of 849m due to infrastructure and application of bat buffering.
Treelines (WL2)	Bordering field boundaries and adjoining drainage ditches	595	Loss of 15m due to infrastructure and application of bat buffering.
Eroding/Upland Rivers (FW1)	Three mapped waterbodies,	1,106	Habitat alteration to 158m due to track construction (streams culverted).
Drainage Ditch (FW4)	Northwestern extent of site	504	Loss of 58m due to hard stand construction at T1.

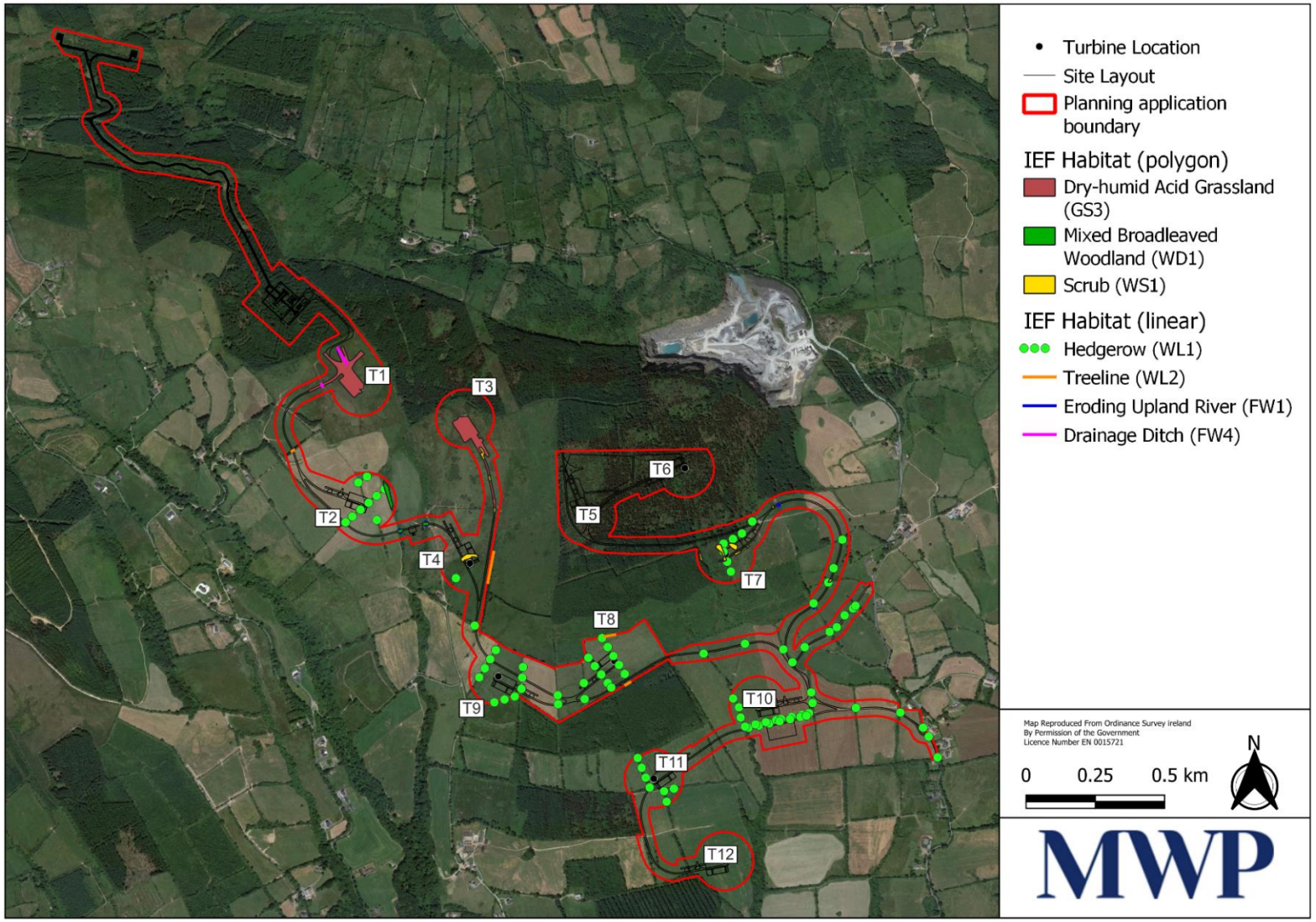

Figure 1: Map of IEFs impacted by the proposed development

1.2 Information Sources

The primary documents informing this BEMP were:

- 'Planning for development: What to consider and include in Habitat Management Plans' (Nature Scot, 2016);
- 'Best practice in raised bog restoration in Ireland' (Mackin et al., 2017);
- National Peatlands Strategy (NPWS, 2017).

Enhancement measures pertaining to increasing the biodiversity value of the site for pollinators has been designed with regard to the NBDC Data Series Guidance 'Pollinator-friendly management of wind farms'. The website of the Royal Society for the Protection of Birds (RSPB)[1] was also accessed for guidance on enhancement measures.

2. Enhancement Measures

A range of habitat enhancement measures are deemed feasible at the proposed development site, which pertains to the land holdings (folios) of the landowners involved in the development. The map shown in **Figure 2** illustrates the enhancement measures which will be implemented. These are discussed in the sections hereunder. Where areas require exclusion, this will be in the form of fencing. A suitably qualified ecologist (member of the Chartered Institute of Ecology and Environmental Management) will be engaged to:

- explain the aims of the enhancement measures to the relevant landowners;
- mark out or guide the marking of exclusion areas; and
- advise landowners on the management of the enhancement areas.

Ballycar Green Energy will be responsible for:

- disseminating information to relevant landowners regarding the commitment to agri-environmental schemes;
- assisting the relevant landowners in the recruitment process of these agri-environmental schemes; and
- procuring the services of a suitably qualified ecologist to engage with the relevant landowners.

The most common agri-environmental schemes include:

- Results-Based Environment-Agri Pilot Project (REAP)[2];
- Agri-Climate Rural Environment Scheme (ACRES)[3]; and
- The Eco-scheme[4].

REAP is an agri-environment pilot project that pays farmers to maintain and improve the environmental conditions of their land. Farmers bring in between 2ha and 10ha of land which will be scored in year one to establish its environmental condition. Farmers will work with their advisers to undertake environmental improvement works on the land that can increase the environmental score in year two. REAP will focus on

[1] https://www.rspb.org.uk/
[2] https://www.teagasc.ie/environment/schemes--regulations/reap/
[3] https://www.gov.ie/en/service/f5a48-agri-climate-rural-environment-scheme-acres/
[4] https://www.gov.ie/en/service/e5ed0-eco-scheme/

improving existing farm features rather than the creation of new features and habitats. Farms with higher environmental scores will receive larger payments.

The Agri-Climate Rural Environment Scheme (ACRES) will deliver significant long-term environmental improvement through participation by a significant number of farmers on the most appropriate land, with each making a strong improvement on their farm. Using a habitats-based approach, delivered through both prescription and results-based actions, ACRES will contribute significantly to achieving improved biodiversity, climate, air and water quality outcomes.

ACRES is Ireland's new agri-environment climate scheme under Ireland's CAP Strategic Plan. This new €1.5 billion flagship agri-environment scheme is a farmer-friendly scheme to help address biodiversity decline while delivering an income support for up to 50,000 farm families in Ireland.

The Eco-Scheme has been introduced for the first time as part of the CAP Strategic Plan 2023-2027. This voluntary annual scheme is open to all active farmers to participate in. To qualify for payment, farmers have to undertake specific agricultural practices on their farms. The aim of the Eco-Scheme is to reward farmers, from all farming sectors and from different levels of intensity, for undertaking actions that are beneficial to the climate, environment, water quality and biodiversity.

Table 3 gives details on the quantities of habitats to be removed and gained by the proposed development, as well as the resulting net gain.

Biodiversity net gain is an approach to deliver measurable improvements by creating or enhancing habitat value in association with a proposed development. In this case, enhancement measures throughout much of the site will provide an overall net gain/no net loss in habitat area by providing additional enhancements to already-present habitats and through the creation of new areas of development for biodiversity. In doing so, a net gain/no net loss in biodiversity area will be achieved that will improve the immediate quality of biodiversity on the site and wider environment and ecosystem services, whilst aligning with targets in cognisance of national and regional biodiversity objectives. Overall net gain for this project will be considered in light of positive habitat area achieved overall taking into account the greater proportion of habitat beyond that which already exists within the proposed development site prior to development and beyond that which would exist in a do-nothing scenario.

The practice of biodiversity net gain at the proposed development site has been undertaken in consideration of the objectives set out for biodiversity in the Clare Biodiversity Action Plan 2017 – 2023 through the promotion of best practices to avoid or minimise threats to biodiversity and undertaking best practice management for biodiversity in general and also in relation to the enhancement of linear habitat features and watercourses. Measures taken to improve biodiversity within the proposed development also align with several objectives of the National Biodiversity Plan 2017 – 2021 including Action 1.1.3 of Objective 1 which details a moving to no net loss target for biodiversity in plans through strategies, planning, mitigation measures, appropriate offsetting, and/or investment in Blue-Green infrastructure. More broadly Objective 4 of the National Biodiversity Plan has been considered in relation to Action 4.1.8 Implementation of the All-Ireland Pollinator Plan, with particular attention given to guidance set out in the pollinator-friendly management of wind farms (NBDC, 2022).

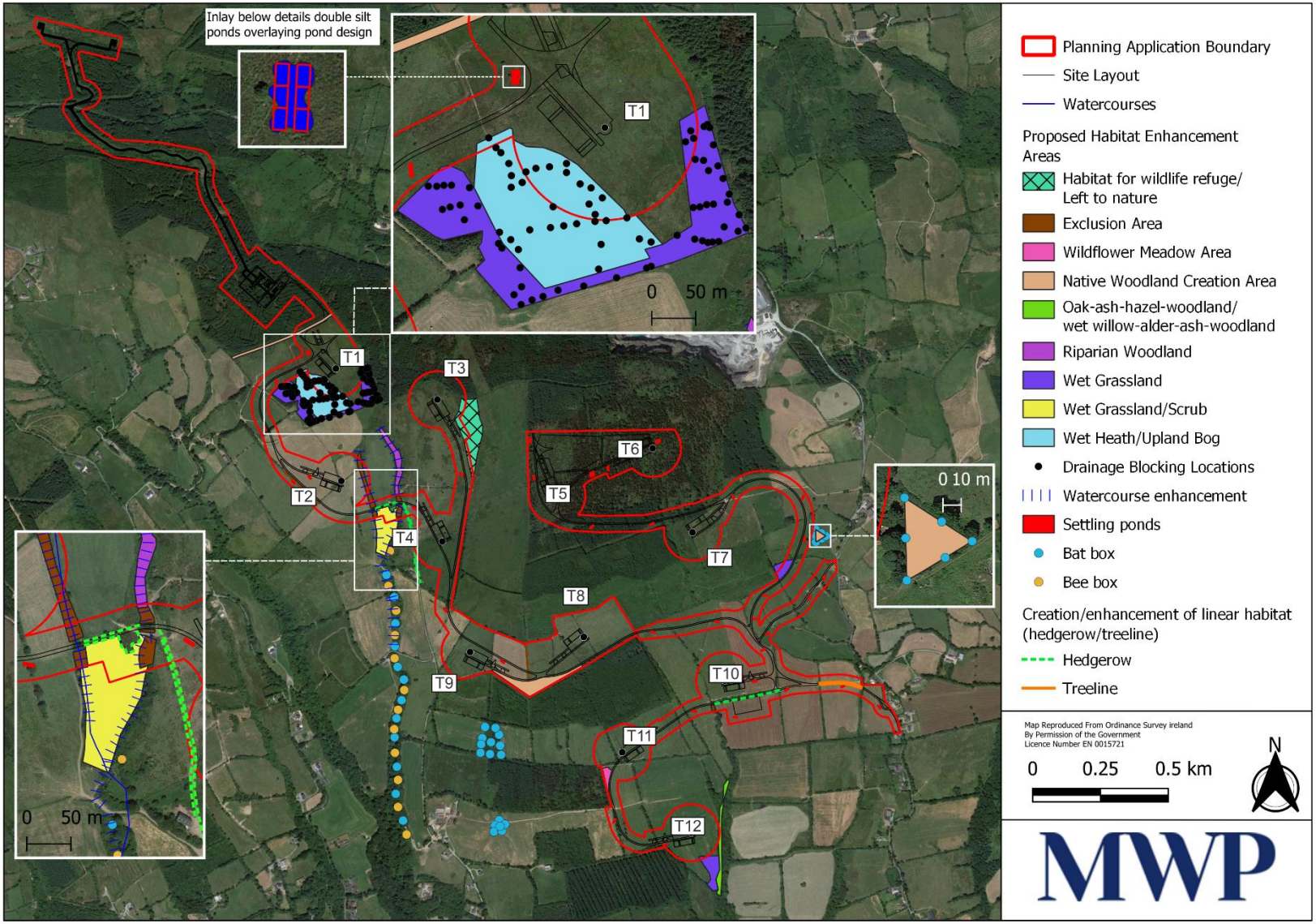

Figure 2: Proposed biodiversity measures at the proposed development

Table 2: Measures implemented with reason/objective and measurable area of creation

Measure	Reason/Objective	Area/ Length/ Number (ha/m/no.)
Native woodland tree planting area	Enhance native and local faunal and floral biodiversity. Areas will be planted with native shrubs and trees to restore and eventually improve structure and connectivity along and between linear features	1ha
Habitat for wildlife refuge/ left to nature	Area of dry-humid-acid grassland with mosaic of scrub just east of T3 is located in proximity to valuable wet heath habitat to the east. The objective of this measure is to maintain this area as a wildlife refuge in consideration of the wet heath habitat to the east and the relatively rich area of dry-humid-acid grassland to the south of the wet heath habitat. This area will be allowed to recolonise naturally.	1.67ha
Exclusion area	Incorporates exclusion areas for the protection of watercourses, adjacent riparian woodland and wet grassland habitats, particularly from livestock.	0.5ha
Wildflower Meadow area	The creation of a wildflower habitat will support invertebrate diversity as well as native plant species diversity from supporting pollinators. The creation of this habitat will support species which are naturally occurring. Native plant species are adapted to occur in these areas and are important to pollinators.	0.2ha
Oak-ash-hazel woodland/ wet willow – alder- ash woodland	This area of linear woodland habitat has been identified in proximity to the planning application boundary near T12. This habitat will be avoided and enhanced.	0.5ha
Riparian woodland	An area of riparian woodland has been identified northwest of T4, located outside the proposed boundary application. This habitat will be maintained for biodiversity. The enhancement measures will focus on the return of this woodland to a relatively natural state by installing fencing to remove livestock grazing and installation of species representative of riparian zones to enhance ecosystem services these habitats provide.	0.5ha
Wet grassland	This area will be managed and enhanced by combining water control and appropriate land management, including the exclusion of livestock, to transform this area into a more species diverse wetland habitat. It is proposed to block drains and preferential flow pathways by reducing/reversing this area's drainage functioning. Increased wetness benefits invertebrate biodiversity and conditions for wading birds.	2.7ha
Wet grassland/Scrub	Similar objective and reasoning as that provided for wet grassland above.	1.1ha
Wet Heath/ Upland Blanket Bog	The degraded area of peatland in the environs will be re-wetted and excluded from development and from agriculture. Drains will be blocked and fencing erected to prevent the entry of animals. Drain blocking will consist of inserting a series of regularly spaced dams in the ditches. The objective of these measures is to effectively raise the water table to support the growth of peat-generating vegetation.	2.2ha
Drainage Blocking	The blocking of drains will rewet certain habitats, particularly bog/wet heath and wet grassland habitats with the objective of increasing water levels and encouraging peat-forming vegetation and increased insect and wetland bird potential.	Various points throughout the 4.9ha area combining wet grassland and wet heath/upland

Measure	Reason/Objective	Area/ Length/ Number (ha/m/no.)
		blanket bog habitat (refer to the map above)
Watercourse enhancement	The planting/creation of aquatic zones will aim to increase the ecological function of the watercourses. Fencing will be installed to keep livestock away from watercourses and woodland areas. The capacity for sediment trapping/retention will be enhanced by blocking drains thus slowing the overland flow of water, allowing for infiltration and natural filtering through vegetation before entry into the aquatic zone. Consequently, setback zones also promote biodiversity.	*c.* 880m of watercourse
Settling ponds	Water-holding features will provide additional habitat within the site for a wide variety of aquatic and terrestrial macro-invertebrates, and in turn will attract and support other biodiversity, such as amphibians.	35 ponds throughout site
Bat boxes	Provide nesting habitat for bat species	34 boxes
Bee boxes	Provide nesting habitat for bee species	12 boxes
Creation of linear habitats (Hedgerow/treeline)	The creation of linear habitats will create commuting/foraging/sheltering corridors for bats and other wildlife	1,286m

2.1 Upland Blanket Bog/Wet Heath

This peatland habitat type, a mosaic of Upland blanket bog (PB2) and Wet heath (H3), occurs within a small section in the northwest of the study area. Encroachment of Wet grassland (GS4), rank with *Juncus* spp. is apparent on all sides, particularly to the south. This grassland habitat grades into Dry-humid acid grassland (GS3) to the north and Improved agricultural grassland (GA1) to the south.

The blanket bog in this area has been greatly degraded due to efforts to 'improve' the land for cattle farming. Examples of this include attempts to dry out the land using a series of drains that crisscross the habitat at random. The hydrology of this habitat has been somewhat affected by these drains, with pockets of dried out areas present during the summer months. Efforts to 'improve' the peat area through drainage have likely resulted in an increase in heather species, particularly ling heather. Should current drainage remain in place, it is likely that this habitat will continue to transition to Wet heath (HH3) habitat. Should further methods of improvement be employed, it is likely that this habitat will transition to grassland.

While greatly degraded and in mosaic with HH3, this habitat corresponds to some extent to the National Survey of Upland Habitats (NSUH) *Calluna vulgaris - Eriophorum* spp., a sub-community of the upland bog type BB4 (Perrin et al. 2014) and the upland blanket bog has links to the following Habitats Directive Annex I habitat types:

- Blanket bog (*if active bog) [(7130));
- Depressions on peat substrates of the Rhynchosporion (7150).

In order to be considered priority habitat, according to the European Commission (2007), "The term 'active' must be taken to mean still supporting a significant area of vegetation that is normally peat forming". Peat forming vegetation include species recorded in this area; *Sphagnum* mosses and cotton grasses (*Eriophorum* spp). Given the degradation of this habitat and its gradual transition to Wet Heath (HH3) due to land management (cattle and drainage), the blanket bog habitat present here is not regarded as a priority habitat, and though the project will not result in a loss of this habitat type, its proximity to proposed turbines warrants its protection due to the presence of peat-forming vegetation and in support of objectives of the Clare Biodiversity Action Plan to "*raise*

awareness of the heritage and environmental value of bogs and to support and encourage landowners and local communities to protect their valuable bog resource" (Clare Biodiversity Action Plan, 2017-2023).

2.1.1 Enhancement Measures

The degraded area of peatland in the environs (generally south) of T1 will be re-wetted. Enhancement measures will be implemented in the area indicated by 'Upland Blanket Bog/Wet Heath' in Figure 2. The enhancement measures are to raise and maintain the water levels and exclude peatland habitats from future extensive agricultural activities/any future development. This will be achieved as follows:

- Exclude sections of peatland habitats from extensive agriculture (including cattle grazing) and any future development;
- Block drains to slow down water, thereby rewetting the area. This will be carried out in drains that occur in the perimeter and in any existing internal drainage of upland blanket bog / wet heath habitats;
- Drains will be blocked with mechanically installed peat dams where possible;
- Drains in more valuable habitat/towards the centre and where plant cannot access, such as wetter areas will be blocked with wooden dams or sand bags, or by another means using local material(s);
- Fencing will be installed to prevent trespass, and grazing animals.

Drain blocking will consist of inserting a series of regularly spaced dams in the ditches. Examples of drain blocking measures put in place as part of a project for the Wicklow/Dublin uplands called the Sustainable Uplands Agri-environment Scheme (SUAS) to slow flow are illustrated in Plate 1 and Plate 2. The number of dams will be governed by drain slope: the greater the slope the more dams required. The points depicted in Figure 2 are at 1 m elevation intervals, based on contour mapping. This density of drain blocking is a minimum. Up to three dams may be installed per meter of gradient depending on ground conditions – naturally wetter areas requiring less and drier areas requiring more.

2.1.2 Management

Adaptive management practices will be utilised. Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. To this end, there may be a requirement to increase or decrease the number of dams to alter hydrology and achieve the desired plant community that maximises peat production.

2.1.3 Expected Benefits

The dams will act as impermeable barriers that retain the water upstream: the flow is slowed down, and the water level increases in the ditch enables an increase in the water table. Raising the water levels will likely raise the water table, with the aim of improving hydrological conditions and/or reducing the rate of infiltration to depth, thereby allowing growth of peatland plants that can generate peat.

Plate 1: Series of partial blocking along drain of high gradient.

Plate 2: Wooden dam partially blocking drain.

2.2 Wet Grassland

This grassland habitat type occurs throughout the study area, frequently in mosaic with the grassland habitat types 'Improved agricultural grassland (GA1)' and 'Dry-humid acid grassland (GS3)'. Species richness varied between areas of this habitat type. In the northwest section of the study area, a band of GS4 habitat was recorded flanked by 'Upland blanket bog (PB2)/Wet heath (HH3)' habitat to the north and fields of 'Improved agricultural grassland (GA1)' to the south. Here, this habitat type is considered to be rank, characterised by cattle activity and

an abundance of rushes (*Juncus* spp.), and is considered to be species-poor overall. It is likely that wet grassland occurs here due to the 'improvement' of the peatland habitats to the north for agriculture, via past drainage. Species diversity was also considered to be low due to the dominance of *Juncus* spp. and rye grasses (*Lolium* spp.) in these areas.

2.2.1 Enhancement Measures

The tract of grassland in the environs (generally south) of T1, coinciding to the area indicated 'Wet Grassland' in Figure 2 will be re-wetted/made wetter. Drainage and agricultural improvement of this grassland likely provided better grazing and forage but has likely, however, greatly reduced suitable areas for feeding and nesting birds. The aim is to combine water control and appropriate land management (exclusion of livestock) to transform to a more species diverse wetland habitat. Drains and preferential flow pathways will be blocked as described above under Section 2.1.1. This is no more complicated than reversing or reducing the drainage function in this area.

2.2.2 Management

Wet grasslands are the products of agricultural management, usually by grazing, mowing or haying. Grazing with cattle, at a moderate intensity, as is currently the case, will continue. In combination with the enhancement measures, it is envisaged that a mosaic of tussocks and short turf that may be used for nesting by a range of wader species will be created, despite ornithology having determined the site's limited latent potential for wading species. This will also augment the invertebrate population through dunging. To avoid trampling of nests, light grazing will be maintained between mid-March and June. Although stocking rates generally in the region of one cow per hectare are recommended, it is best to use species objectives rather than set prescriptions to create the correct habitat for target species. Heavy grazing from late summer onwards will restore the required sward heights for the following year.

If grazing is not possible, cutting will be essential and will be timed for suitable dry periods after the end of the breeding season, between August and October. Cutting at least twice per year will be required if grazing is not possible. Small areas of the wettest land, or some of the ditch margins, will be left to develop taller swamp vegetation of sedge or reed. This will benefit birds such as reed buntings and water rails.

A potential problem associated with damp grassland is rush encroachment, so rush cover may require management. If rushes take up more than one-third of a fields area then grazing management, which is essential to maintaining the grassland for breeding waders, is made more difficult. Topping the whole field after the last wader chicks have fledged is the most effective first step in controlling rush infestation. It is best if the cuttings can be removed from the field. The earliest timing will depend on the birds present. If unsure, August may be considered a safe time to cut as the last snipe chicks will have fledged by then.

2.2.3 Expected Benefits

By raising water levels ideal feeding and nesting conditions may be created for some wading birds such as snipe and redshank. Habitat loss and land use change have been identified as well-known causes in wader bird population decline and the effective management of these wet grasslands may provide alternative or complementary areas for some bird species. The raising of water levels is not envisaged to create suitable habitat for waders and waterbirds which require relatively large bodies of water for foraging and breeding purposes. Waders have specific requirements for nesting and feeding and their chicks require high protein invertebrate food during the breeding season. Suitable habitat may also be created for yellow wagtails and reed buntings, while ditches may attract feeding water rails and grey herons. Re-wetting also provides valuable feeding habitat for

other farmland birds. A rich supply of insects will help species such as the tree sparrow, which rely heavily on insect food for their chicks. Appropriate management is essential to benefit any particular bird species.

2.3 Upland/Eroding River

The watercourses within the study area are mainly high gradient channels with mostly rock cobble substrates characterized by riffle pool sequences. The only aquatic vegetation recorded at the aquatic survey sites were (collectively) the bryophytes *Leptodictyum riparium*, *Conocephalum* sp., *Chiloscyphus polyanthos* and filamentous algae. These watercourses are impacted by excessive siltation as a consequence of agricultural land management and commercial forestry. The majority of the watercourses within the study area are deemed to be of little to no intrinsic value to fish species, due to their small size, culverted sections and propensity to drying out during periods of drought. The Cappattemore East Stream and a tributary of same were found to be accessible to livestock, which resulted in poached areas and regular trampling of stream substrates. The following will be implemented in relation to livestock access and associated denudation and siltation of stream substrates.

2.3.1 Enhancement Measures

A set-back zone will be created along the Cappateemore East Stream and its tributary (see **Figure 2**) to provide a buffer between these watercourses and adjacent lands. As described in the Environmental Requirements for Afforestation (DAFM, 2016), the water setback zone will be designed to create an intact and permanent buffer of natural vegetation alongside the aquatic zone[5]. The water setback breaks the 'pathway' between the source of any possible pollution and the receiving watercourse. In suitable areas, native woodland, scrub, and tree species will be planted. The setback zones, open areas and planted areas will create structural diversity and important woodland edge and open habitats for native flora and fauna. It is intended that the setback zone will allow the river banks to develop into a well-vegetated area supporting a mosaic of natural ground vegetation and pockets of native scrub/woodland, principally for the enhancement of biodiversity at the site.

2.3.1.1 Set Back Distances

A minimum setback for watercourses will be measured from the edge of the watercourse. The setback will be widened at any location onsite where local hydrology and slope increases the vulnerability of the receiving waters. In order to create as natural an edge as possible, the width of the setback will vary to avoid artificial lines. The aquatic setback distances listed in **Table 3** will apply along the Cappattemore East Stream and its tributary.

Table 3: Aquatic setback distances (adapted from DAFM, 2016)

Slope leading to the aquatic zone	Minimum set back (meters)
Flat to Moderate (0-1 in 7/0-15%)	10m
Steep (1-in-7 to 1-in-3 / 15-30%)	15m
Very Steep (1-in-3 / >30%)	20m

[5] (*An aquatic zone is defined as "Any natural river, stream of lake (but not an artificial drain) illustrated on an Ordnance Survey 6 inch map." Other water features are also protected under the Environmental Requirements for Afforestation, i.e. relevant watercourses, hotspots and drinking water abstraction points (See Forest Service Circular 12/2017 for details.)

2.3.1.2 Planting

The "*River Continuum Concept*" by Vannote et al. (1980) describes the ecological function of rivers as linear ecosystems and the effects of interruptions of their connectivity. The planting/creation of aquatic zones will aim to increase the ecological function of the watercourses.

From observations of the existing conditions of watercourses examined within the area during site visits, the following enhancements will be carried out:

- Setback areas will be allowed to re-vegetate naturally, with native seed bank, and areas slow to re-vegetate will be planted with native species, such as hazel, gorse, and willow species.
- Along stretches of sheltered and/or high gradient areas, appropriate tree planting within the setback areas will be carried out which will result in enhancement of rivers/streams via bank stabilisation, cooling/shading, and increasing allochthonous inputs into the aquatic ecosystem, and will create further habitat diversity within the setback. This will include:
    - Planting of single or small irregular groups (5-10 individual stems) of native trees/native riparian species (such as willow, gorse, hazel, and occasional alder and ash, or pedunculate oak) at strategic areas along the riparian setback.
    - This planting will not be greater than 20% of the area of the water setback.
    - Trees will be protected from grazing, as necessary. This will involve individual tree shelters/small fenced-off enclosures, as cattle use the site.
    - Trees within set back zones will be pit-planted. No cultivation will be permitted within the water setback, but, if required, soil can be imported from outside the setback, and deposited to create individual planting positions.
    - No fertiliser application will be permitted. Post-sapling growth-stage trees will be planted that will not need to compete with ground flora.
    - For the management of vegetation within set back zones, where required, herbicide use will be prohibited. Management measures can include trampling, mulching, and mats.

2.3.1.3 Siltation Reduction in Watercourses

An issue encountered on site was the access of cattle to streams which can lead to associated denudation /soil loss and subsequent siltation of stream substrates. In order to limit cattle access to rivers (as well as river associated habitat such as riparian zones) fencing will be installed to keep them away from watercourses and woodland areas. As livestock utilise rivers and streams as a source of water, installation of cattle drinkers will be required. The cattle drinkers will be linked to the water supply at farmers yards as water supply via watercourses may be insufficient during summer when flows are low and water consumption by livestock tends to be higher.

Within the setback zones, capacity for sediment trapping/retention will be enhanced by blocking drains/by slowing the overland flow of water, allowing for infiltration and natural filtering through vegetation before entry into the aquatic zone. Plate 3 below illustrates a stream/drain flowing through conifer plantation in the Slieve Bloom Mountains, with small dams installed. This concept will be used at the proposed development site to slow the water flow and limit erosion. This enhancement measure will significantly reduce the potential for any sediment release into the rivers/streams. The introduction of blocking will not pose an obstacle to fish species in watercourses, considering that none were recorded and are unlikely to occur due to the watercourse's ephemeral nature as they are prone to drying out during sunny spells. The development of setback zones as described will promote biodiversity.

Plate 3: Example of a stream/drain partially blocked to slow the flow and limit erosion/soil loss.

2.3.2 Management

Fencing will be maintained to keep livestock out of the protected areas. Maintenance of blocked drains may be required in the first five years if dams fall into disrepair and there are risks of severe erosion. The water setback zones will not be used for any purpose which might undermine its protective purpose, or which could damage the aquatic zone.

2.3.3 Expected Benefits

It is anticipated that bank vegetative cover and stability will increase thereby reducing soil loss to the subject streams. This will have positive effects on macroinvertebrate habitat quality and production. Given that sediment is perhaps the most pervasive stressor in lotic aquatic ecosystems (Davis *et al.*, 2018), the reduction of same will likely have a positive effect on invertebrate assemblages and abundances, with Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa expected to exhibit the greatest positive response to decreased sediment.

2.4 Woodland Habitat

Woodland bounding the upper most reach of the Cappateemore East Stream has an abundance of hazel trees in addition to willows. The ground flora layer comprises enchanter's nightshade (*Circaea lutetiana*), herb Robert

(*Geranium robertianum)*, honeysuckle (*Lonicera periclymenum*), ivy (*Hedera helix*), yellow pimpernel (*Lysimachia nemorum*) with some invading bramble (*Rubus fruticose agg.*).

This habitat is a biodiversity hotspot for both woodland and instream biodiversity and offers a suite of ecosystem services which justify its conservation and enhancement where it occurs within the site. The woodland habitats that are the subject of enhancement occur adjacent to the 'upland/eroding rivers' as outlined in Section 2.3, so are accessible to livestock, and as such degraded.

2.4.1 Enhancement Measures

Stretches of existing woodland occurring within the site along the Cappateemore East Stream will be managed for biodiversity. The principle enhancement measures at existing riparian woodland include;

- Maintaining existing set back zones, or increasing depending on current width of riparian zone (see Table 2 above). The existing riparian woodland will not be decreased.
- Natural regeneration will be allowed.
- In areas where existing management has modified naturalness, the enhancement measures will be focussed on returning the existing riparian woodland to a more natural state, including measures such as;
    - Elimination of any livestock grazing pressure through fencing;
    - Removal of any non-native species;
    - Where possible, linkages between woodland will be restored;
    - Slowing the flow of existing drains within the woodland (See Section 2.3.1.3).

2.4.2 Management

As for Section 2.3.2.

2.4.3 Expected Benefits

Woodland ground floral cover will increase and diversify, increasing the carrying capacity of the woodlands. Woodland wildlife, including insects (e.g. butterflies, beetles, flies), birds, and some bats will be afforded more shelter and foraging opportunities, so the abundance and diversity of these animal groups can be expected to grow.

2.5 Hedgerow & Treeline

Hedgerows and treelines delineate field boundaries and border access tracks and adjoining drainage ditches within the site. These habitat types generally link up, sometimes transitioning from one to the other along the same linear feature, forming a network extending outside the study area to the wider landscape.

Hedgerows create ecological corridors in the landscape and habitat may become isolated due to their removal. The proposed development will result in the loss of ca. 849m and 15m of hedgerow and treeline habitats, respectively. This is largely because of removal required to eliminate bat foraging habitat within a distance of up to 95m from proposed turbines to reduce risk to bats.

2.5.1 Enhancement Measures

Existing internal treelines and hedgerows will be enhanced within the site, where possible, to improve their value as commuting/foraging/sheltering corridors for bats and other wildlife, in particular those connected to the wider landscape, including woodland habitats. A total length of 1.3km of such habitat (308m of treeline and 978.4m of hedgerow) will be enhanced by additional planting at specific locations within existing poorly developed/conditioned hedgerows and treelines to enhance habitat for local bat and other faunal populations. This will comprise planting up of existing hedgerow/treeline, in particular where baseline surveys have identified linear features to be low value as bat foraging/commuting habitats. Large gaps/openings in existing linear features will be planted up with appropriate native shrubs and trees, as listed in Chapter 6 Biodiversity, to improve structure and connectivity along and between linear features. Strengthening structures vegetatively will also deter livestock from breaking through features which can damage vegetation, resulting in structural weakness and reduced connectivity. Hedgerows and treelines will be planted with native shrubs and trees to restore and eventually improve structure and connectivity along and between linear features.

2.5.2 Management

Existing hedgerows and treelines will be managed for wildlife (e.g., any cutting of hedgerows required will be undertaken to ensure that the overall structure and shape of the hedgerow provides adequate cover and shelter for wildlife). Variation in structure and height will provide habitat of higher value for wildlife. Any hedgerow maintenance will be undertaken on a 3–4 year rotational cutting cycle to ensure a continual supply of food for pollinators. Suitable cutting equipment will be used to minimise unnecessary flaying and shredding of hedgerow vegetation to reduce risk of long-term damage and disease.

Where hedgerows are maintained, they will be allowed to flower throughout the year to provide pollen and nectar to pollinators. Hedge cutting will be kept to a minimum. Any necessary hedgerow maintenance will be undertaken between November and February, in line with the NBDC Data Series Guidance 'Pollinator-friendly management of wind farms'. Hedgerow maintenance will be prohibited during the bird nesting season (March-August, inclusive), which will also have positive effects on other wildlife such as insects.

2.5.3 Expected Benefits

Hedgerows provide shelter for stock and crops and cut down wind speed, which prevents erosion. Hedgerows can help control insect pests as predatory insects overwinter in them and move into the crops in spring when aphid numbers start to increase. They also act as barriers to windborne pests, and insects in the hedgerow pollinate crops, particularly bumblebees, which need hedge banks.

2.6 Ponds

There is little in the form of standing water at the proposed development site besides drainage ditches that occur on flat ground in the environs of T1. Some of this habitat, corresponding to a length of ca. 58m will be lost due to the construction footprint, mostly at T1. To offset this loss, the following will be implemented.

2.6.1 Enhancement Measures

Silt ponds will be constructed within the site at appropriate locations as a water quality protection measure, in line with the drainage design for the proposed project. These typically have dimensions of 2m X 12m as per drainage drawings. It is proposed that all silt ponds beyond 95 m from turbines will be retained during the

operation phase, the reason being that ponds can harbour insect life and bats also need to drink water, and attraction of bats to areas close to operating turbine is not desired.

The locations of ponds to be retained, numbering 35, are indicated in Figure 2. Physical variation and heterogeneity in pond form will influence biodiversity richness. Therefore, sinuosity in pond plan is preferable to linearity, so during creation of settling ponds, banks and stone filter beds, where relevant, will be manipulated appropriately to allow for variation in shape, angle and depth. The ponds will have a minimum surface area of 24 m^2, and where conditions allow, they will be made larger. At two locations, where two settling ponds are proposed side by side (west of T1, and between T5 and T6) these will be merged to create single larger ponds at least 90 m^2, referred to as double pond in Figure 2. Ponds will be protected, where required, with stock-proof fencing. Silt ponds and any associated fencing will be retained following completion of construction works. All ponds will feature the following:

- at least one gradual sloping side (the more varied the slopes and the longer the shoreline, the better);
- some water of more than 60 cm deep, so it doesn't freeze over completely in the winter;
- shelves at different levels to provide varying depths for the different species which use the pond; and
- open view to the south side.

Light levels are important. Where shade is excessive, plants will not receive sufficient sunlight to encourage plant growth, while too little shading can result in excessive algal growth. Therefore, where new ponds are created, care will be taken with regard to location. The siting of new ponds under over-hanging trees or bushes will be avoided, where possible, to avoid excessive leaf litter accumulating in the pond. Ponds will be constructed under ECoW supervision.

2.6.2 Expected Benefits

These water-holding features will provide additional habitat within the site for a wide variety of aquatic and terrestrial macro-invertebrates, and in turn will attract and support other biodiversity, such as amphibians, birds and mammals. Birds will have an area to safely bathe and drink, amphibians will spawn their eggs and animals such as hedgehogs will be able to use it to escape if they should accidently fall in. Some dragonflies breed in quite small ponds, but many species of this group need a pond of more than 50 m^2. Ponds larger than 50 m^2, including double ponds can be expected to be used by a range of breeding dragonflies and damselflies.

2.7 Creation of Invertebrate Refugia (Deadwood/Log-Piles)

Any large pieces of timber (sections of tree-trunks/large branches) generated from felling to facilitate construction, which are not required to be removed off-site, will be retained and stacked in piles at appropriate locations within the site to create refuge habitat for species such as hedgehog and other small mammals, as well as invertebrates. Dead wood creates suitable habitat conditions for a wide variety of invertebrates and their larvae, which provide a food source for other fauna, including mammals and birds. These wood pile features will be constructed under ECoW supervision. Appropriate stacking of timber and selection of deadwood log-pile locations will ensure that conditions remain suitably damp for insects (e.g., positioning in partly-shaded locations, part-burying some logs etc).

2.8 Bats

The vegetation within the bat buffer zones identified around turbines will be managed and maintained during the operation of the wind farm. These areas will be kept clear by mechanical means (mowing) only and maintained on an annual basis in the same condition as during the first clearance. The immediate surroundings of individual turbines will be managed and maintained so that they do not lead to bat collision or attract bats through the increase of prey or vegetation.

A bat-box scheme will implemented to enhance the value of the site for bats by providing additional artificial roost-sites. The bat box scheme will be initiated prior to commencement of the development (NRA, undated).

Bat-boxes (a minimum of 34) will be erected in suitable foraging habitat and will comprise a mix of bat-box designs to attract multiple bat species (e.g. Miramare boxes are designed for woodland species such as brown long-eared bat, while other designs such as the Schwegler Woodcrete bat boxes are suitable for species such as common pipistrelle, soprano pipistrelle, Leisler's bats and brown long-eared bats, all of which were recorded within the site).

The design, siting and installation of the bat-boxes will be undertaken by a bat specialist and/or the Project Ecologist/ECoW and will follow guidance in NRA conservation (NRA, undated).

2.9 Pollinators

There is considerable potential at the wind farm site to support pollinators through various management and enhancement measures. Such actions positively impact on plants and pollinators, as well as the species that depend on them. Specific measures have been suggested by NPWS in the All-Ireland Pollinator Plan (2021) which aims to make wind farms pollinator friendly. The NBDC, in conjunction with Wind Energy Ireland and Renewable NI have produced a guidance document 'Pollinator-friendly management of wind farms', which has been used here to inform enhancement measures for pollinating species.

2.9.1 Enhancement Measures

2.9.1.1 Protection of pollinator-friendly habitat

Protection of already-existing pollinator-supporting habitats that are on site will be implemented by leaving things alone as much as possible. The proposed development study area contains areas of pollinator-friendly habitat such as devil's-bit scabious, used for food by marsh fritillary (see also Section 2.10.1.7 below), and may contain other areas of habitat used by pollinators for shelter or safety. Habitats include hedgerows, wildflower areas, grass verges, and earth banks.

2.9.1.2 Maintaining Hedgerows

See Section 2.5 above.

2.9.1.3 Eliminate/reduce chemical use

Reduction of herbicide use is proposed for eradication of invasive alien plant species, such as Japanese knotweed (*Fallopia* japonica) and Himalayan balsam (*Impatiens glandulifera*) which occur within the site (See Section 2.11). Targeted application and herbicide use will be effective in limiting effects to pollinators. The frequency of the treatment of invasive plants species with herbicide will be minimized to help avoid critical times for pollinators (i.e. flowering season).

2.9.1.4 Reduction of mowing

A reduction in mowing can allow common wildflowers to grow naturally amongst longer grass and is a cost-effective method of providing food for pollinators. Excessive mowing can be reduced to maximise flowering potential, so the timing and frequency of mowing will be carefully considered. Species such as dandelion and clover provide important sources of food in early spring so restricting mowing to between September and February where possible will have an invaluable impact in protecting pollinators. See Section 2.2.2 for more detail on mowing.

2.9.1.5 Nesting habitats for wild bees

Leaving long grass uncut along the base of hedgerows from March – October will allow bumblebees to establish nesting habitat. These areas will be cut/managed in late autumn/winter as the colonies die-off and while the queen hibernates for the winter.

Mining solitary bees nest in bare earth and the creation of earth banks on the edges of access tracks will provide an ideal location for such nests. The banks will be stable and created away from areas prone to soil erosion. Pesticide use will never be used on nesting sites.

Nesting habitat for cavity-nesting bees will be made by drilling small holes in south or east-facing wooden fence posts. A minimum of 12 bee boxes with different aperture sizes (to accommodate different bee species) will also be installed along the well sheltered Cappateemore East Stream corridor.

2.9.1.6 Creation of Wildflower Habitat

Linear sections adjacent to the proposed internal access tracks, and reinstated areas around turbines will be allowed to be colonised with local plants through natural dispersion and germination. In consideration of the collision risk assessment for bats, which the bat survey report considered to be of slight negative effect at a local level to bats (see Appendix 6A for further details), it is not considered that the establishment of natural plants along internal access tracks will result in significant impacts to at-risk bat species. Similarly, birds are also not envisioned to be significantly affected as a result of increased collision risk due to the establishment of linear plant sections along access tracks. Collision risk for birds was only considered for species with particular sensitivities to collision impacts and on account for the level of activity of that species on site. Birds are considered at risk when their flight paths overlaps with the rotor blade sweep of a turbine and the majority of species using linear features, such as passerines, are less susceptible to collide with blades than non-passerines, i.e., those considered for collision risk assessment such as raptor species.

According to the NBDC and All-Ireland Pollinator Plan[6], encouraging native plants to flourish is the best option for pollinators, and indeed all biodiversity. There will be no seeding using bought seeds whether that's grasses or 'wildflower' mixes. Disturbed ground will not be intentionally compacted by excavator buckets or otherwise to allow seeds of local provenance to establish plants. This approach will support species which are naturally occurring. Native species are the ones which are adapted to be there and are important to pollinators and other wild animals.

2.9.1.7 Marsh fritillary and other butterfly species

Good condition habitat for marsh fritillary is characterized by a patchwork of short vegetation and longer tussock-forming grasses where wildflowers and devil's bit scabious (*Succisa pratensis*) are prominent. A small pocket of this habitat type was identified close to the proposed location of T7 during walkover surveying of the site

[6] https://pollinators.ie/the-importance-of-species-rich-meadows-and-grasslands-even-mini-ones/

undertaken by ecologists in August 2022. No adult, eggs, larvae, or pupae life stages of marsh fritillary were identified in the area occupied by devil's bit scabious.

Where suitable marsh fritillary habitat occurs in close proximity to the proposed infrastructure, side casting of material will be to the side opposite to where the aforementioned habitat occurs under ECoW guidance. This will ensure that there is no potential for direct or indirect impacts on potential marsh fritillary habitat. This measure will also protect existing suitable habitat for other lepidoptera/pollinator species of local importance.

2.9.1.8 Awareness

Actions to provide an increasingly pollinator-friendly environment will be encouraged. This will include the establishment of signage in the community, partnerships with local groups who could support the aims of the All-Ireland Pollinator Plan and informing local farming communities of the importance of pollinators to agriculture and their involvement.

Awareness within the workforce is also key for protection and management of pollinator habitats within the site over the timeline of the project. Toolbox talks will be provided for the workforce by the ECoW as necessary.

2.10 Invasive Plant Species

During ecological field surveys of the site, two invasive species listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) were recorded; Japanese knotweed and Himalayan balsam.

An Invasive Species Management Plan (ISMP) (Appendix 6F) has been produced as part of the assessment of the potential impacts of the proposed development on the flora and fauna of the receiving environment as part of the Environmental Impact Assessment Report (EIAR).

3. Monitoring

A monitoring programme for areas of habitat enhancement and other biodiversity enhancement measures will be developed by the Project Ecologist/ECoW. This monitoring programme will be implemented during the cconstruction phase and will continue into the post-construction phase. It will evaluate the success of biodiversity enhancement measures within the site.

The specified biodiversity enhancement measures under each management feature will be carried out by the wind farm operator in conjunction with the ecologist and relevant landowners, for which their agreement to these prescriptions has been secured as part of the associated letters of consent.

Monitoring of the effects of enhancement measures on peatland (as outlined in Section 2.2.1 above) will be an important part of monitoring and will involve measuring changes as outlined in the 'Expected benefits' of Section 2 against the baseline situations described in Chapter 6 Biodiversity (also summarised in Section 2). For example, for peatland (Section 2.1), the following will be documented;

- Vegetation monitoring, to monitor the recovery of the bog vegetation, and
- Hydrological monitoring, carried out to assess the hydrological recovery of the peat.

A BEMP report will be compiled at the end of each monitoring year detailing the findings of all management and monitoring activities. The BEMP monitoring report will present a summary of the activities undertaken over the course of each monitoring year, stating whether these activities meet the requirements of the BEMP and relevant planning conditions. Monitoring and reporting on the BEMP measures will be undertaken by independent,

suitably experienced and qualified ecologists employed by the wind farm operator. The BEMP will be considered as a dynamic document and will be reviewed at the end of each monitoring year and modified as required, pending submission to and approval by Clare County Council and NPWS.

Monitoring measures for IAPS are outlined in detail in the ISMP (Appendix 6F). Specific additional monitoring will be carried out for the receptors hereunder.

3.1 Watercourses

Prior to any construction activity being carried out, the subject part(s) of the Proposed Development site will be inspected for areas that may be prone to siltation of nearby rivers/streams and drains as appropriate. Where necessary, check dams, sand-bags and/or silt fences will be installed in adjacent trackside drainage ditches to ensure an optimum standard of water running into adjacent streams from the trackside drainage. During the construction phase of the project, visual monitoring will help to ensure that the mitigation measures that are in place to protect water quality are working effectively. Water quality in the streams and outflow from the drainage and attenuation system will be monitored. Field-testing and laboratory tests will be carried out if there are signs that mitigation is not working properly, based on visual monitoring. Surface water quality mitigations will be checked at least once per week during the construction stage and required (more than once daily) if there is significant surface water on site after heavy rainfall events / periods. Post-construction monitoring measures in relation to water quality are outlined in Section 6.5.2 of Chapter 6 Biodiversity of the EIAR and involves biological water quality and fish monitoring.

3.2 Bats

Post-construction surveys will be carried in order to assess the effectiveness of the mitigation measures. Post construction surveys shall take place on the first, second, third, tenth and fifteenth year of the operational phase and shall include the following elements:

- Fatality searches for bats;
- Post construction monitoring of the bat activity within the proposed site; and
- Monitoring of proposed bat boxes by a qualified ecologist, and relocation of any boxes with no evidence of use in the first year of construction.

The NPWS will be contacted to discuss the full scope and timing of these post construction surveys prior to the completion of the construction phase. Post construction bat monitoring will be developed in line with recommendations in Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH 2019).

3.3 Birds

Post-construction bird monitoring will take place to establish whether the construction and operation of the proposed Development has had effects on the bird species associated with the Site prior to construction (as shown by the baseline surveys in the 2019-2023 period). The monitoring programme will comprise the following:

- Flight activity surveys;
- Transect survey within the site; and
- Collision searches.

4. Conclusion

With implementation of and documentation of enhancement measures, it is likely that there will be an overall biodiversity net gain (BNG) at operation stage when compared to the existing situation in the short (1-7 years) to medium term (7-15 years). Hedgerow, scrub and woodland will take time to establish, grow and mature and will become more ecologically significant in proportion to age. Table 3 and Table 4 give the areas and lengths of IEF habitats to be removed and gained with the Proposed Development respectively.

Overall, it can be seen that there will be an overall net gain.

Table 4: Area of IEF habitats removed and gained with the Proposed Development

Habitat Type	Area of habitat to be removed (Ha)	Habitat gain /benefit (Ha)	Net gain (Ha)	Description/ rationale
Woodland and Scrub habitats and mosaics				
Mixed broadleaved woodland (WD1)	0.048	1.36	1.31	Most of the woodland is currently accessible to livestock so additional planting and fencing off will have positive effects on overall woodland ecology. Given sufficient time, woodland would develop in the wildlife refuge area, though not accounted for in net gain as not targeted for this habitat, the scrub being replaced – see scrub.
Riparian Woodland (WN5)	N/a	0.5	0.5	An area of riparian woodland will be enhanced to return to its natural state by natural regeneration or some planting of riparian species. Wildlife will be omitted form area.
Scrub (WS1)	1.62	See habitat creation/ wildlife refuge	-1.62	Scrub already occurs in the area wildlife refuge area in the east environs of T3. The area of scrub will increase as the existing scrub expands it range, potentially entirely occupying the refuge and eventually succeeding to woodland
Oak-ash-hazel woodland/ wet willow-alder-ash woodland (WN2/WN6)	N/a	0.5	0.5	Area of native mosaic woodland of oak-ash-hazel and wet willow-alder-ash is excluded from the proposed application boundary to ensure its natural state is maintained.
Grassland/Wetland habitat and mosaics				
Dry-humid Acid Grassland (GS3)	1.96	0	-1.96	There will be no creation of or compensation for this habitat, but there will be an overall net gain when the other gains are taken into account. It is considered that this habitat has lower carrying capacity for wildlife than the more successive / developed habitats scrub and woodland.
Upland Blanket Bog (PB2) / Wet Heath (HH3) /	0	2.16	2.16	Drain / preferential flow blocking in area to south of T1 and fencing off / exclusion.
Wet grassland (GS4) and Wet Grassland/Scrub	0.0009	3.8	3.8	Drain / preferential flow blocking in area to south of T1, south of T12 and along track between T10 and T7, and managed either by mowing or livestock density/frequency.
Other IEF				
Habitat creation/Wildlife refuge	N/a	1.67	1.67	This area includes one parcel of dry-humid-acid grassland with mosaic of scrub to the east of T3. Existing scrub will expand and is expected to eventually succeed to woodland. As the scrub and successive woodland habitat mature, the carrying capacity for wildlife in this area will increase.

Habitat Type	Area of habitat to be removed (Ha)	Habitat gain /benefit (Ha)	Net gain (Ha)	Description/ rationale
Drainage ditch (Ponds)	58 (58m long of drainage ditch X ca. 1 m wide)	565	507	The drainage ditch habitat of value has links to ponds, with both habitats an IEF for frogs, aquatic plants, insects and mammals. Using the settling ponds for this purpose will greatly benefit aquatic and other wildlife throughout the site.
Wildflower Meadow	Na	0.15	0.15	Creation of a parcel of land for the establishment of wildflowers area for enhancing habitat for pollinators and invertebrate biodiversity.
Bat boxes	n/a	Installation of 34 bat boxes in woodland	Bat roosting habitat	No bat roosts in buildings will be lost, so bat boxes will augment the available roost habitat in the study area
Bee boxes	n/a	Installation of 12 bee boxes in woodland	Bee nesting habitat	Increase habitat available for solitary bees

Table 5: Length IEF habitats to be removed and gained with the Proposed Development

Habitat Type	Length of habitat removed (m)	Habitat gain /benefit (m)	Net gain (m)	Description/rationale
Hedgerows (WL1)	849	978	129	Implementation of bat foraging buffers are the primary reason for hedgerow loss, associated with mostly straight hedgerows. Hedgerows of a length of 978m will be planted to link up with the undisturbed existing hedgerows and reconnect the severed habitats, yielding an overall net gain of 129m of hedgerows.
Treelines (WL2)	15	308	292	15m of treeline will be removed and an additional 308m of native treeline will be planted. This yields an overall net gain of 292m of treeline.
Eroding/upland river (FW1)	158 (alteration as opposed to lost)	840m	682	No watercourse habitat will be created, but the existing stream corridor which is accessible to cattle and damaged as a consequence (loose and bare soils) will be protected as per Section 2.3.1.3. This will benefit ground cover and bank stability, thus improving water quality and instream habitat for aquatic macroinvertebrates.

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