GARRANE GREEN ENERGY PROJECT
AT GARRANE, CO. LIMERICK

BIODIVERSITY ENHANCEMENT
AND MANAGEMENT PLAN

6th AUGUST 2025

Prepared for

Garrane Green Energy Ltd.

by

BIOSPHERE ENVIRONMENTAL SERVICES

by

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1.0 INTRODUCTION

1.1 Background

This Biodiversity Enhancement and Management Plan (BEMP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the proposed Garrane Green Energy Project, Co. Limerick. Full details of the Project are given in **Chapter 2** of the EIAR.

As part of the Project, there will be a total loss of 1,649m of hedgerows, with 1,008 m to facilitate the construction of the project and 641 m to provide buffers around the turbines to reduce risk of collision to bats.

Mitigation for loss of hedging will be provided by an extensive planting and enhancement programme, which is the subject of this BEMP.

The area for the BEMP is entirely within the Redline Boundary for the Project.

The programme described in this report will be implemented in accordance with published guidance and best practice, namely:

- SNH (now NatureScot) "Planning for development: What to consider and include in Habitat Management Plan – Guidance" (Version 2, March 2016).
- CIEEM (2023) Briefing Paper on 'Biodiversity Enhancement for New Developments in Ireland', (the "CIEEM Guidance")

During the preparation of this BEMP, reference was made to the following:

- Limerick Development Plan 2022-2028, and specifically section 6.3.5: "Trees, Tree Preservation Orders and Hedgerows".
- Limerick Biodiversity Action Plan, 2025-2030.

1.2 Outline Description of Proposed Wind Farm Site

The Project site is located in south Co. Limerick and just north of the Cork-Limerick County border. It lies approximately 2 km north of Charleville, Co. Cork, and just over 2 km south of the village of Bruree in Co. Limerick. The Site is situated within the townlands of Garrane and Garrose in the north and Ballynagoul and Creggane in the south. The Redline Boundary of the Wind Farm Site covers a total area of 158.75 ha. The Wind Farm Site is accessed via the N20 to the west and the L1537 to the east.

The Wind Farm Site is situated within a largely agricultural landscape, with pastoral farming of varying intensity carried out throughout the entire site. Topography within the site is generally flat to gently undulating, ranging from approximately 55 m to 65 m OD, with a gentle fall towards the River Maigue. Superficial soils present within the Redline Boundary largely consist of lake (lacustrine) deposits and river deposits (alluvium). The northern and southern extents of the site are underlain by glacial till, with small pockets of gravels present elsewhere.

On a regional scale, the Wind Farm Site is located in the Shannon Estuary South surface water catchment within Hydrometric Area 24 of the Shannon River Basin District (for details of drainage see **Chapter 10: Hydrology and Hydrogeology).** Locally the Wind Farm Site is located within 2 no. principal sub-catchments of the Maigue River: the Maigue_SC_020 to the east, and the Maigue_SC_010 to the west (a small area in the north of the Site is mapped in the Maigue_SC_040).

Within the Maigue_SC_010 sub-catchment, the Site is mapped in the Charleville Stream_020 WFD river sub-basin. The Charleville Stream is a 2nd order stream which more or less dissects the Site, flowing from south to north before discharging into the Maigue River. The Maigue River itself flows to the east under the N20 at Creggane Bridge, and dissects the northwestern section of the Site. After flowing eastwards, it veers to the north downstream of the confluence with the Charleville and Graigues streams.

Within the Maigue_SC_020 sub-catchment, the Site is mapped in the Maigue_030 river sub-basin. The main drainage feature in this area is the Loobagh River which enters the Site from the east, flowing under the L1537 at Garroose Bridge and westwards to discharge into the Maigue River. A small locally unnamed stream, also referred to by the EPA as the Loobagh, is mapped to originate in this area of the Site and flows to the north before discharging into the Maigue River just south of the confluence of the Maigue River and the main Loobagh River.

Downstream of the Site, the Maigue River continues to the north, flowing through Bruree and Croom before becoming tidal at Adare, approximately 20 km northeast of the Site (straight line distance).

Ecologically, the area in which the Wind Farm Site is located is dominated by agricultural grassland, which varies from Improved agricultural grassland (GA1) to Neutral grassland (GS1) and Wet grassland (GS4) depending on intensity of current and recent management. The varying levels of management has resulted in marked differences in the grassland swards to the west (improved) and east (unmanaged) of the Charleville stream. The fields are mostly bounded by Hedgerows (WL1), which are typically of a low stature and often of low species diversity due to the absence of recent management. Treelines (WL2) are also represented though are limited in their occurrence on site. Several very mature poplar and willow tree standards are a feature of the site. The watercourses

within the study site are all classified as Depositing/lowland rivers (FW2). Drainage ditches (FW4), often of substantial depth and width, are associated with most of the field boundaries.

From a wider conservation perspective, the dominant ecological features of the region are the upland Ballyhoura Mountains complex to the south-southeast, the River Blackwater system to the south, and the River Shannon estuarine system to the north.

1.3 Objective of the BEMP

Objective no. 1

To offset the loss of hedgerows and treelines by a like-for-like planting programme.

Objective no. 2

To increase the biodiversity of the site by the enhancement and re-vitalisation of existing hedgerows and by the planting of native woodland.

1.4 Statement of Authority

This BEMP has been prepared by Brian Madden, with expertise on mitigation for bats provided by John Curtin.

Brian Madden BA Mod. (Hons.), PhD, MCIEEM

Brian graduated in Natural Sciences from the University of Dublin in 1984 and earned a Ph.D degree from the National University of Ireland for his research on ecosystem processes in raised bogs. Since 1994, Brian has been the principal ecologist with BioSphere Environmental Services.

Brian has carried out botanical surveys and habitat assessments for most terrestrial habitats which occur on the island of Ireland. He is also an experienced ornithologist, with particular interest in birds of peatland and wetland habitats.

BioSphere Environmental Services has been involved in energy related projects, and particularly wind farms, since the 1990s. Many of the projects have included Biodiversity Enhancement and Management Plans, including Castlepook Wind Farm, Co. Cork, Oweninny Wind Farm, Co. Mayo and Eglish Wind Farm, Co. Tyrone.

John Curtin, BSc Environmental Science (NUI Galway)

John has been carrying out bat surveys and providing mitigation for impacts on bats at wind farm sites since 2012. He has completed all standard training for such work through Bat Conservation

Ireland, Bat Detector Workshop and Bat Handling Workshop. John holds the relevant licences for handling and photographing bats.

Examples of energy projects that John has provided bat assessments and mitigation for include Yellow River Wind Farm, Co. Offaly, Boggeragh Wind Farm, Co. Cork, Cappawhite B Wind Farm, Co. Tipperary and Glenmore Wind Farm, Co. Clare.

2.0 PLAN DETAILS

2.1 Description of hedgerows and treelines

Ecologically, hedgerows are a prominent feature of the Garrane Green Energy Project site and provide habitat and commuting corridors for a range of wildlife. The hedgerow resource of the site is rated as of Local Importance (higher value).

As described in **Chapter 6, Section 6.3.3.3** of the EIAR, the quality of the hedgerows varies across the site according to the intensity of current and past management. Some are of average height (c.4-6 m) and structure, and may be with or without tree standards (see **Plate 1**).

However, most of the hedgerows in the eastern sector of the site have not been maintained in recent years and are no longer stock-proof due to substantial gaps or part removal in places (these can be described as intermittent or remnants) (see **Plate 2**). Most have grown higher than the typical hedge height of c.4-6 m and are also expanding in width at the base. Diversity of herbaceous species within such hedgerows is low due to the dominance of brambles in the ground layer.

In contrast, the hedgerows in the western sector of the site are maintained at a low height (2-3 m), while some in the northern sector have been recently cut back to near ground level (see **Plate 3**). Hedging also occurs along sections of the watercourses, though this is in parts intermittent, such as along sections of the Charleville stream. However, the hedging along the southern section of the Charleville stream (both sides of stream) forms a canopy and provides good riparian habitat. Also, hedging and treeline along the River Loobagh channel, which forms the northeast boundary of the site, provides good riparian habitat.

The main tree/shrub species are hawthorn *Crataegus monogyna,* blackthorn *Prunus spinosa,* ash *Fraxinus excelsior,* sycamore *Acer pseudoplatanus*, hazel *Corylus avellana,* elder *Sambucus nigra* and willow species (mostly grey willow *Salix cinerea* subsp. *oleifolia,* as well as goat willow *Salix caprea* and eared willow *Salix aurita)* and gorse *Ulex europaeus*. Less common tree/shrub species include downy birch *Betula pubescens*, alder *Alnus glutinosus*, holly *Ilex aquifolium*, rowan *Sorbus aucuparia,* elm *(Ulmus spp.)* and crab apple *Malus sylvestris*.

Ash is the principal tree standard (most showing signs of ash dieback disease). A treeline of mature poplar, probably a hybrid of black poplar *Populus nigra*, and a large willow (probably crack willow *Salix fragilis*) occurs to the north of the location for the proposed substation (see **Plate 4**). A specimen mature willow occurs in the hedge to the west of the location for the substation. Three very large specimen poplar trees occur within the hedging in the southern sector of the site (see **Plate 5**). Treelines of mature poplar, along with willow and ash, occur along the most northerly stretch of

the Maigue River within the survey area, and also outside of the redline boundary along the meander section of the River Loobagh leading to the confluence with the Maigue. Pines have been planted in treelines in the northernmost sector the site.

Ivy *Hedera helix* is often frequent on the larger trees, with bramble a very common component of the understorey and ground layers. Wild roses (*Rosa* spp.) and honeysuckle *Lonicera periclymenum* are a feature of the understorey.

Herbaceous species occurring within the ground layer include hogweed *Heracleum sphondylium*, nettle *Urtica dioica,* bush vetch *Vicia sepium*, cleavers *Galium aparine*, lesser celadine *Ranunculus ficaria,* primrose *Primula vulgaris,* herb Robert *Geranium robertianum*,and lords and ladies *Arum maculata*. The fern species *Dryopteris dilatate, Dryopteris filix-mas* and *Phyllitis scolopendrium* are present within hedgerows.

The hedgerows are typically laid on clay banks and are usually associated with a drainage ditch (as part of field boundary).

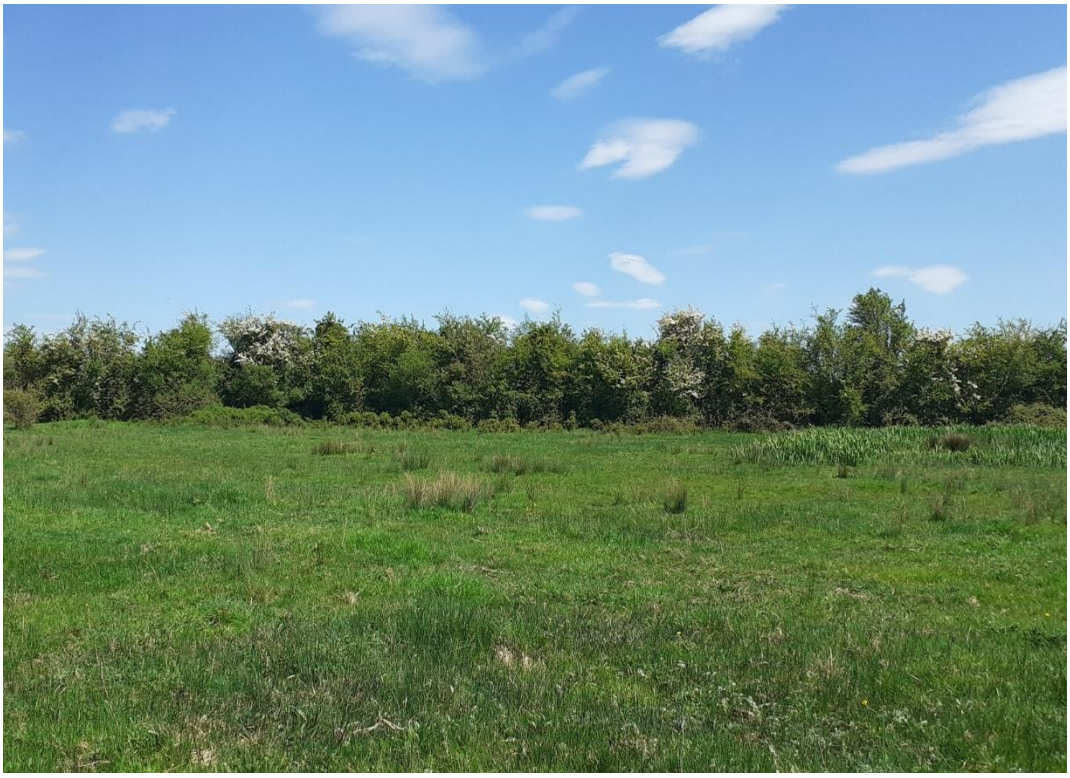

Plate 1: View of a low hedge without tree standards in southern sector of site (near T01 location, May 2024).

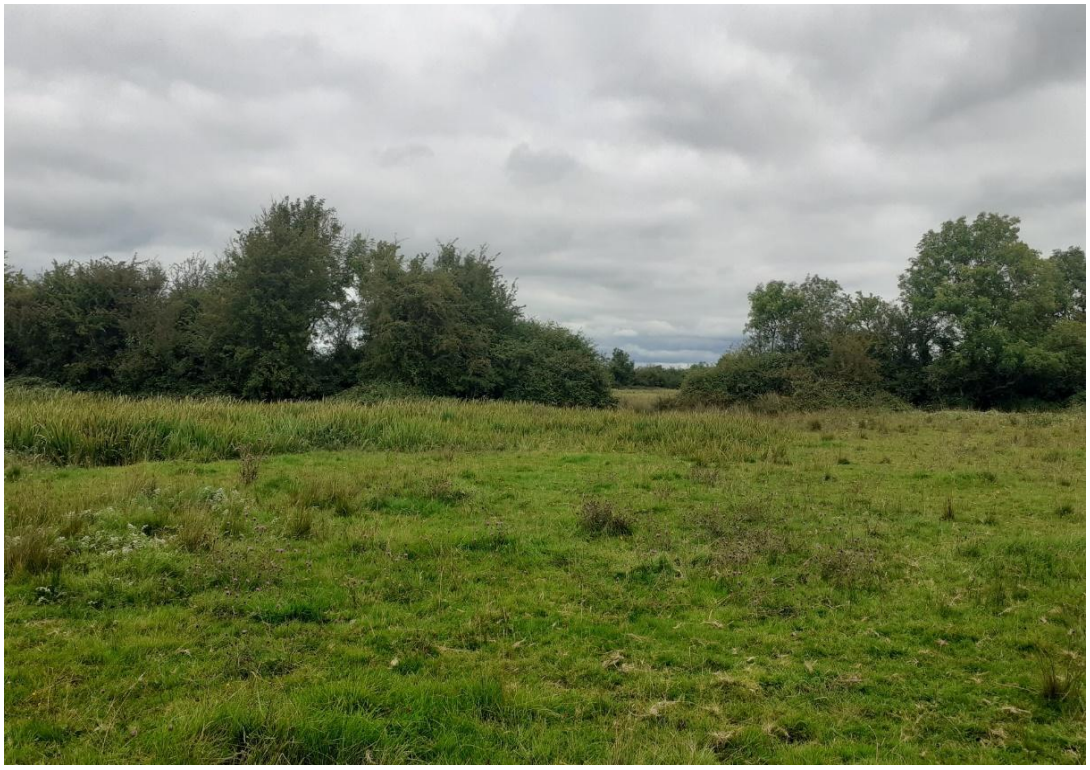

Plate 2: The hedgerows in the eastern part of site have not been managed in recent years and are increasing in height and width. Gaps are present in places (August 2023).

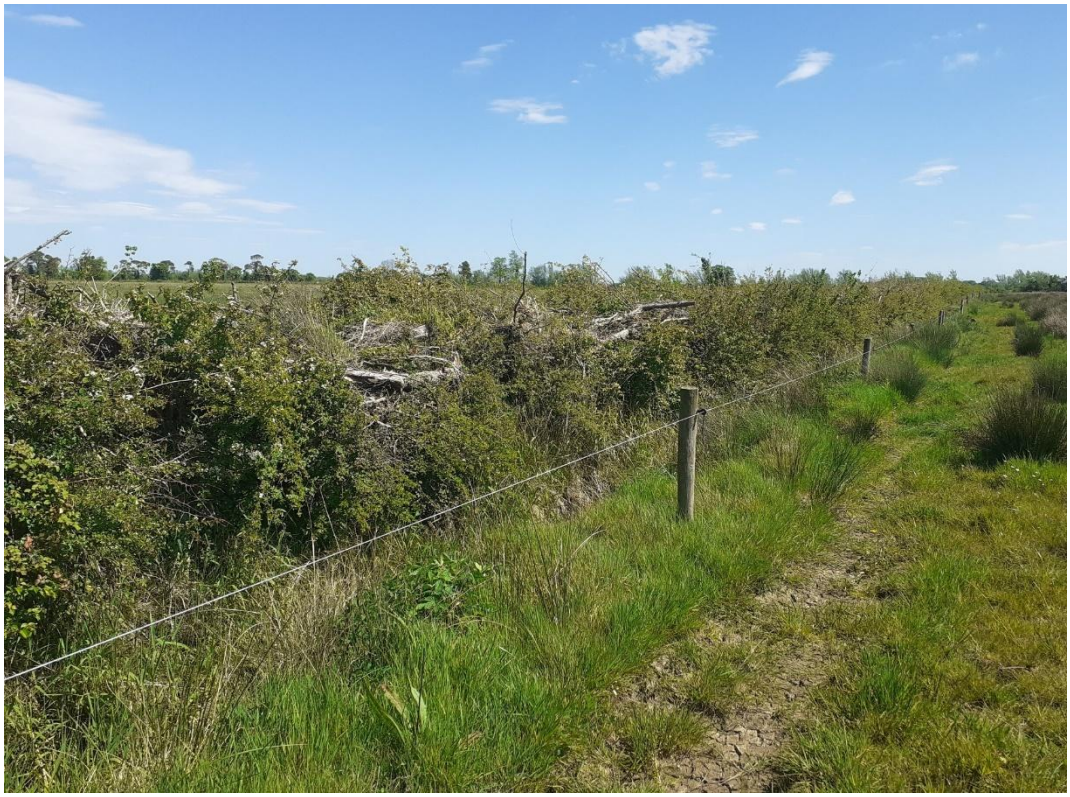

Plate 3: View of hedgerow in northern sector of site (T08 location) which had been severely cut back (May 2024).

Plate 4: A mature treeline occurs along the northern boundary of field where the proposed substation is location. This is mostly of poplar, with some willow (May 2024).

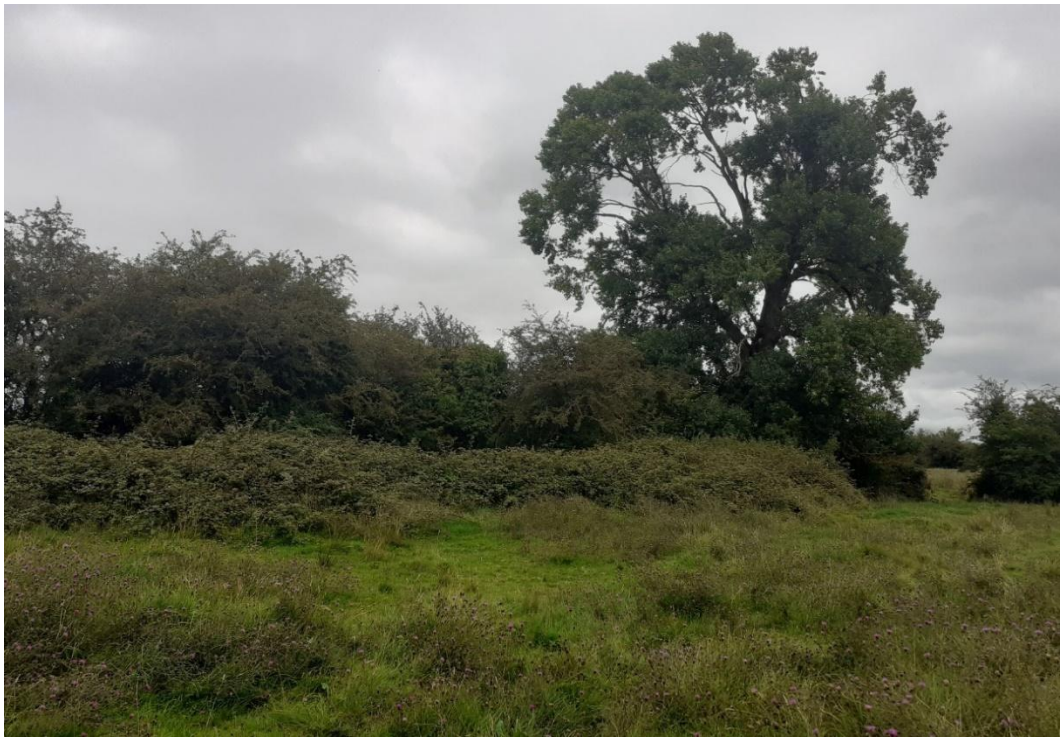

Plate 5: View of large specimen poplar tree at location for T02. The associated hedgerow is unmanaged and the base heavily overgrown with bramble. (June 2022).

2.2 Impacts on hedgerows by the Project

The Project will result in the permanent loss of an estimated 1,008 m of hedgerow to facilitate the construction of the wind farm infrastructure, including internal access tracks and access points from public roads. In addition, an additional 641 m of hedging outside of the civil works area will be removed for the purpose of providing bat buffers around turbines (as relevant) to minimise collision risk (see **Section 6.5.6.1 of EIAR**).

The hedgerows affected are typical of the area (see **Section 6.3.3.8**), being mostly on low banks and associated with field ditches. As noted, some of the hedge sections to be removed are in an unmanaged state and are no longer stockproof. A section of mature treeline will be breached to the north of the substation (see **Plate 4**), while a large specimen poplar will be removed at T02 location (see **Plate 5**).

Hedgerows, treelines and individual trees are important habitats in the local area, rated Local Importance (higher value), and support a range of flora and fauna species including breeding and feeding birds, foraging bats, small mammal species and invertebrates.

The Limerick Development Plan 2022-2028 recognises the importance of trees and hedgerows in section 6.3.5: “Trees, Tree Preservation Orders and Hedgerows”. OEH O10 Trees and Hedgerows notes the following:

It is an objective of the Council to:

a) Retain and protect amenity and biodiversity value of the County and City by preserving as far as possible trees, woodlands and hedgerows, having regard to the significant role that trees and hedgerows play in local ecology, climate change and air quality and their contribution to quality place making and the associated health and wellbeing benefits.
b) Require, in the event that mature trees or extensive mature hedgerow is proposed to be removed, that a comprehensive tree and hedgerow survey be carried out by a suitably qualified tree specialist to assess the condition, ecological and amenity value of the tree stock/hedgerow proposed for removal and to include mitigation planting and a management scheme. The Council will seek in all cases to ensure when undertaking development, or when permitting development, that the loss of, or damage to, existing trees is minimised.
c) Require the planting of native trees, hedgerows and vegetation and the creation of new habitats in all new developments and public realm projects. The Council will avail of tree planting schemes administered by the Forest Service, in ecologically suitable locations, where this is considered desirable.

The importance of retention and protection of hedgerows and trees, as well as the planting of new native trees and shrubs, is also highlighted in the Limerick Biodiversity Action Plan 2025 – 2030 and

in the Limerick City and County Tree Policy 2024 – 2030 (specifically Section 11: Trees and Development).

In the absence of mitigation, the significance of the loss of hedgerows due to the Project is rated as an Adverse Significant Effect of Permanent Duration at a Local level of importance.

2.3 Mitigation for loss of hedgerows by Project

The calculated loss of hedgerows will be offset through an extensive planting and enhancing scheme, as well as a programme to re-vitalise existing unmanaged hedgerows, within the Redline boundary of Site.

The following is proposed:

Planting of new hedging:	1,620 m
Enhancement of existing hedging:	1,359 m
Re-vitalisation of existing hedging:	4,074 m
Total	**7,053 m**

This BEMP also includes for the planting of a plot (c.**0.67 ha**) of native woodland in proximity to the substation location to offset effects on bats (see Figure 1). This will benefit all wildlife, including small mammal species, birds and invertebrates, as native woodland habitat is presently absent from the site.

With the planting, enhancement and re-vitalisation of 7,053 m of hedging/treeline, as well as a native woodland plot of 0.67 ha, the permanent loss of 1,649 m of hedgerow as a result of the Project is adequately off-set.

This mitigation and biodiversity enhancement within the site is in line with Objective EH O10 “Trees and Hedgerows” of the Limerick Development Plan 2022-2028.

2.4 Planting methodology

The locations for the planting of new hedging and hedgerow enhancement, as well as the native woodland, are shown in **Figure 1**.

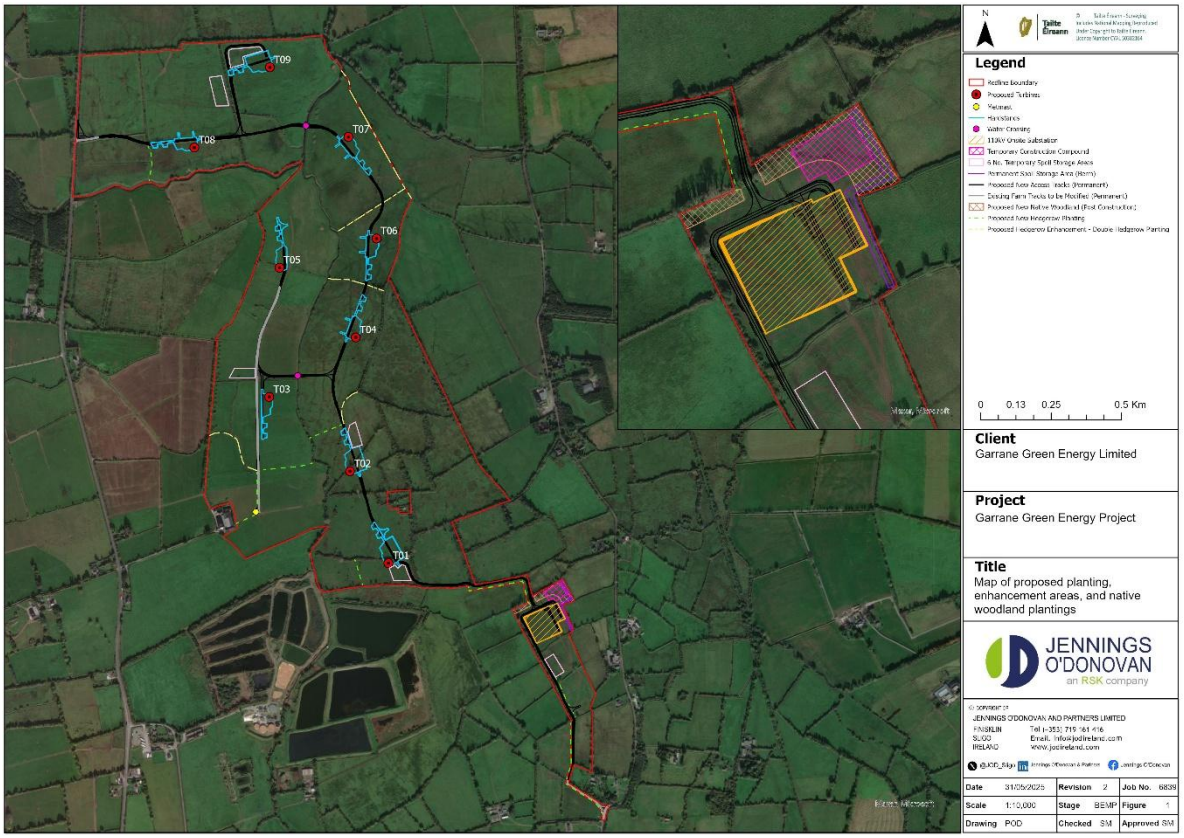

Figure 1. Drawing of proposed hedge planting and enhancement areas, as well as native woodland plot.

The planting programme will follow best practice, including guidance from:

- the Department of Agriculture, Food and the Marine Agri-Climate Rural Environment Scheme (ACRES[1])
- Teagasc (Native Tree Area Scheme[2])
- Hedgerows for Pollinators[3]
- Pollinator-friendly management of Wind Farms[4]
- Hedgerow Management: Best Practice Guidelines" from Farming for Nature[5].
- Irish Hedgerows: Networks for Nature (2004)

In particular, the publication "Irish Hedgerows: Networks for Nature" (2004) provides an excellent overview of Irish hedgerows and their importance.

The planting programme will be co-ordinated and supervised by an ecologist and will be carried out by a registered contractor. All plantings will consist of native Irish species (as listed below) from certified Irish genetic stock. The landscaping contractor is required to be informed well in advance to allow the acquisition of suitable native stock.

Planting will be in the appropriate season, namely late-autumn and winter.

2.4.1 Hedgerows

The species will be typical of hedgerows of the local area, and all are useful biodiversity species. The species will be selected from the following:

- Hawthorn *Crataegus monogyna*
- Blackthorn *Prunus spinosa*
- Hazel *Corylus avellana*
- Alder *Alnus glutinosa*
- Holly *Ilex aquilifolium*
- Rowan *Sorbus aucuparia*
- Grey willow *Salix cinerea* subsp. *oleifolia*
- Downy birch *Betula pubescens*

[1] 2023 - Hedgerows and ACRES requirements - Teagasc | Agriculture and Food Development Authority
[2] https://www.teagasc.ie/crops/forestry/grants/native-tree-area-scheme/
[3] National Biodiversity Data Series No. 7
[4] National Biodiversity Data Series No. 25
[5] Hedgerow management - Farming for Nature

- Guelder rose *Virburnum opulus*
- Spindle *Euonymous europaeus*
- Crab apple *Malus sylvestris*
- Pedunculate oak *Quercus robur*
- Wild cherry *Prunus avium*
- Black poplar *Populus nigra*
- Aspen *Populus tremula*

Hawthorn and blackthorn will be the dominant species, comprising up to 40% of the plantings. Hazel, alder and willow will be the principal secondary species, comprising approximately 15% each, with the remainder made up of other species.

Tree standards will be pedunculate oak and wild cherry, and, as available, occasional black poplar and/or aspen.

Preferably, the new hedges will be planted on clay banks as this will maximise habitat diversity.

The plantings will be fenced off from livestock at least until they are fully established.

Early management

Monitoring and maintenance will occur yearly for up to five years from planting after the main growing season (i.e. from late September / October onwards) and any plants that fail will be replaced on an annual basis ahead of the next growing season.

The proposed management measures for hedgerow establishment and thereafter maintenance will be conveyed to each landowner and management alterations implemented as required by the Developer to achieve the targets of this BEMP.

2.4.2 Woodland

The location for the native woodland, which measures 0.67 ha, is at two plots to the north of the substation site. An existing tall treeline and associated drainage channel occurs here along the northern boundary (see **Plate 6**), with hedging to the east and west. The tall treeline is mainly of poplar and willow species. The field is presently dominated by wet grassland used for grazing.

The principal tall tree species to be planted is pedunculate oak. Wild cherry will be a secondary species. For tall trees a minimum tree planting spacing of 3 x 3 metres is required, giving a planting density of 1,100 trees per hectare.

Smaller tree species will include alder, hazel, rowan and holly – these can be planted at higher densities and also less formally, with varying spacing between stands or groups of trees.

Ground preparation will be limited to inverted (or scrap) mounding, shallow ripping, pit planting and auger planting.

Fertiliser application will not be permitted.

The control of competing vegetation is critical for the establishment and growth of young trees. Inadequate vegetation management will result in mortality, loss of growth and vigour and the need for further inputs during the establishment process. This will be done manually using basic tools such as slash hook or bill hook or by pulling away by hand herbaceous material (grasses etc[6]). Monitoring and maintenance will occur yearly for up to five years from planting with tree thinning and coppicing between 5-15 years. The entire plot will be fenced to protect from stock animals.

Any trees that fail within the first five years of planting will be replaced on an annual basis.

The proposed management measures for woodland establishment and thereafter maintenance will be conveyed to the landowner and management alterations implemented as required by the Developer to achieve the targets of this BEMP.

[6] Teagasc "Vegetation Control in Farm Forestry", Farm Forestry Series No. 2, Crops, Environment and Landuse Programme)

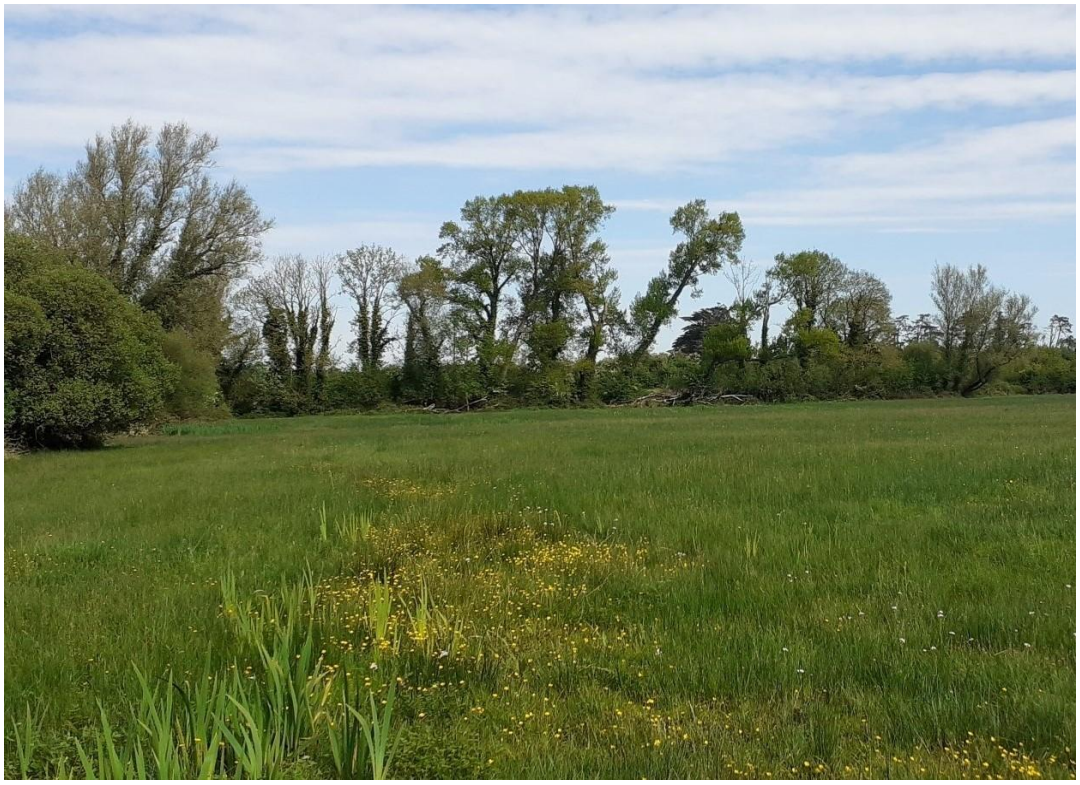

Plate 6: View from within substation field looking northwards towards treeline of poplar and willow (to be retained), which will skirt the native woodland plot (May 2024).

2.5 Hedgerow re-vitalisation

The hedgerows in the eastern sector of the site (east of Charleville Stream) are in an unmanaged state and have largely lost their shape and structural diversity. Along many stretches the base has widened out with the spread of blackthorn, hawthorn and dense bramble. This has particularly affected the herbaceous component of the ground layer, which is now largely absent or very poorly developed. Also, in these situations existing ditches are totally shaded. Gaps are present in some hedgerows. Examples of unmanaged hedgerows are shown in **Plates 2, 5** and **7**.

In general, existing hedgerows are always of higher ecological value than newly planted hedgerows. In the present case, most of the hedgerows are shown as field boundaries on the Ordnance Survey First Edition map series (surveyed between 1828 and 1834) and thus have considerable antiquity.

It is proposed that these hedgerows, which have a total length of approximately 4,074 m, will be re-vitalised over a period of approximately 3 years and subsequently managed sensitively for the lifetime of the wind farm project.

The approach will be that in Year 1 the ecologist will select approximately one-third of the hedgerows at various locations for cutting in the period late October (say 20th onwards) to end of February. This

will ensure all nesting is complete and that birds have had an opportunity to feed on the early winter berry crop. Also, many flying insects will have completed their life cycle. A similar rotation will continue in Year 2 and Year 3.

The cutting will be by a contractor with experience in hedge cutting. Preferably, cutting will be completed by using a circular saw as this results in a cleaner cut than a flail cut.

The objective is to aim for a hedge with a height of up to 4-6 m and a wide base. The optimum shape would be triangular or 'A' shaped. In the present case, much of the dense bramble and expanding blackthorn and hawthorn will need to be removed (such as shown in **Plate 7**) prior to the actual cutting and shaping of the hedge. Existing tall trees will be retained (though many of the ash are showing signs of ash dieback). It is noted that cutting will take a sensitive approach and severe cutting will be avoided. An ecologist will work with the contractor so as to maximise the existing value of the hedgerows. For instance, where wet ditches are present, some strips of overhanging hedging may be cut back further than others so as to allow maximum light penetration.

The hedges cut in Year 1 will be revisited in Year 4 when a light trim and perhaps further shaping may be required. This 3-year cycle of hedge management will be repeated for the lifetime of the project.

The ecologist will select a series of representative hedge sections for monitoring of plant species and especially herbaceous plants. This monitoring would be repeated at 3-year intervals.

At the end of each cutting period in Years 1 to 3, gaps present will be identified and these will be filled in the next planting season.

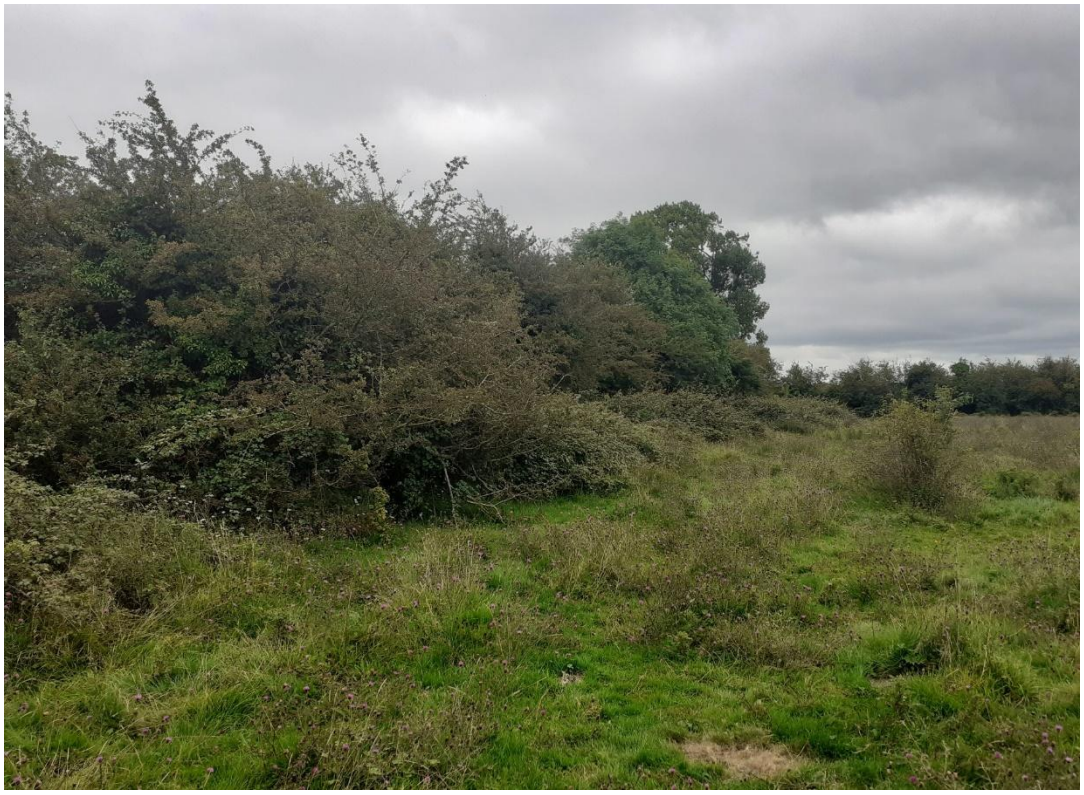

Plate 7: View of overgrown hedge with dense bramble growth – herbaceous species (such as primrose, lesser celandine) are almost totally absent from hedge base (May 2024).

3.0 REPORTING

Reports detailing the works carried out and associated monitoring will be prepared in each monitoring year[7] of the plan and thereafter at 3-year intervals. The reports will include a review of the success of the planting and enhancement schemes along with any suggestions for amendments to the BEMP (if required). Reports will be submitted to Limerick City and County Council for review.

Note that this BEMP should be considered as a live document to be reviewed and modified as required, pending submission to and approval by Limerick City and County Council.

Implementing and managing the plan will be the responsibility of the wind farm operator. It is the wind farm operator's obligation to uphold the objectives included in this management plan, to be accountable for the maintenance of the habitats that will be created and monitoring of the species as specified in Chapter 6: Biodiversity, Section 6.10.2.2 and Chapter 9: Ornithology, Section 8.7.3.1.

[7] i.e., Years 1 to 5 during early establishment of new hedgerows and native woodland

Monitoring and reporting on the measures will be undertaken by independent, suitably experienced and qualified ecologists employed by the wind farm operator, with reporting submitted to Limerick City and County Council on behalf of the wind farm operator.

4.0 CONCLUSION

The BEMP for the Garrane Wind Farm project will offset the loss of hedgerows and treelines (total 1,649 m), which is required to facilitate the construction of the Project (1,008 m) and to provide buffers around turbines to reduce the risk of collision for bats (641 m).

With the planting of approximately of 1,620 m of new hedgerows to offset the loss, plus the enhancement of a further 1,359 m of hedgerows and the re-vitalisation of existing unmanaged hedgerows (approximately 4,074 m), as well as the planting of 0.67 ha of native woodland as bat mitigation (a habitat that is presently absent from the site), a Positive effect for biodiversity within the site will accrue over time. With this extensive planting and enhancement programme, the Plan recognises and highlights the importance of hedgerows, trees and native woodland habitats.

The enhancement measures proposed within this BEMP combined with effective management as specified will lead to the provision of a net gain for biodiversity. More habitat will be created and enhanced than those that will be impacted as part of the Project.

The success of these measures will be evaluated through a detailed monitoring and reporting plan, which will be submitted to Limerick City and County Council as evidence of compliance.

The objectives for the Plan are achievable, as the methods to be used are straightforward and follow best practice.

It is noted that the Plan will allow for remediations and/or modifications to ensure that the objectives are being achieved throughout the lifetime of the Project.

5.0 REFERENCES

Fossitt, J. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny.

Hickie, D. (2004) Irish Hedgerows: Networks for Nature. Published by Networks for Nature, Dublin.

SNH (now NatureScot) “Planning for development: What to consider and include in Habitat Management Plan – Guidance” (Version 2, March 2016).