

APPENDIX 6.1 MARSH FRITILLARY SURVEY REPORT

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1 INTRODUCTION

This report details the findings of field surveys to identify the presence or otherwise of marsh fritillary (*Euphydryas aurinia*) at the Carrigeen Renewable Energy Development Wind Farm Site.

The marsh fritillary is a species protected at both European and National level in Ireland. It is listed on Annex II of the EU Habitats Directive (92/43/EEC), transposed into Irish law under the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, and is also protected under the Wildlife Acts, as amended (1976 and 2000). This butterfly species is closely associated with the distribution of suitable stands of *Succisa pratensis* (devil's-bit scabious), the food plant of the marsh fritillary larvae.

During habitat surveys completed at the Wind Farm Site during 2023 and 2024 *Succisa pratensis* was noted as frequently to abundantly occurring within a sward of rushes and grasses in proximity to the section of the proposed wind farm layout connecting the Wind Turbine T8 to T9 (see **Figure 1.1** for location). As such it was considered appropriate to undertake detailed field surveys to establish the presence or otherwise of this species within the proposed Wind Farm Site.

The remainder of this report outlines the results of a desk review of previous marsh fritillary records surrounding the site and field surveys undertaken within the proposed Wind Farm Site during May and September 2025. A concluding assessment of the likely implications of the Project to the conservation status of the marsh fritillary butterfly is also provided.

2 DESKTOP REVIEW OF MARSH FRITILLARY

2.1 ECOLOGY

2.1.1 Habitat

The marsh fritillary breeds in a variety of habitats including damp, acidic grassland and peatlands where the host plant *Succisa pratensis* is abundant. A moderate to high coverage of this plant is essential, with a minimum of three plants per m² considered necessary for suitable habitat. Marsh fritillary habitat is generally dominated by tussocky *Molinia caerulea* pastures, or on more neutral soils by *Deschampsia cespitosa* (Bulman, 2001). Breeding habitats are also known to occur in chalk grassland in the south of England. Sward height is also a critical factor in habitat suitability with an un-intensively grazed sward of between 10 – 25cm with low scrub cover providing the most suitable habitat (NPWS, 2013).

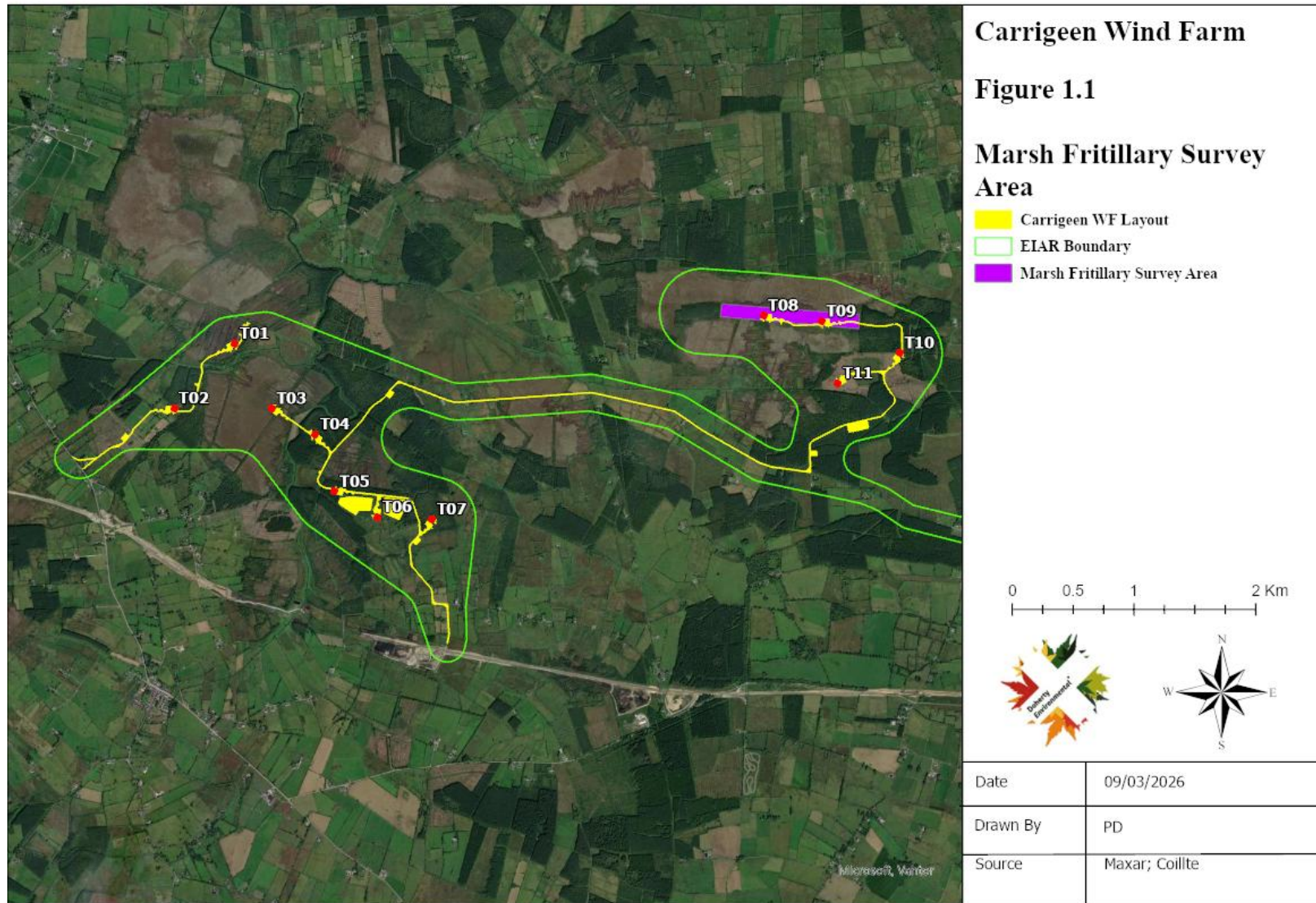


Figure 1.1: Marsh Fritillary Survey Area

Lavery (1993) who undertook detailed survey work of marsh fritillary in Counties Kerry, Cork and Limerick listed two distinct grassland biotopes in which the marsh fritillary occurs. These include traditionally managed damp acidic grassland and unimproved calcareous grassland.

Within damp acidic grasslands Lavery (1993) noted the importance of grazing and stated that the cessation of grazing in such habitat is detrimental to marsh fritillary colonies. Without appropriate grazing these habitats quickly exhibit natural successional changes with encroachment of scrub and build-up of grass tussocks, which in a few years, completely shade the foodplants. Such sites become overgrown and “*wholly unsuitable to the survival of this species*” (Lavery, 1993).

During recent national surveys many webs have been found in association with tussocks and hummocks indicating that structure in the vegetation is important for marsh fritillary colonies. It has been suggested that these tussocks and hummocks provide support for webs and protect colonies from variation in water levels and exposure (Woodrow & Allen, 2012).

The occurrence of suitable damp acidic grasslands that maintain traditional management practices is largely restricted to the west of Ireland. The marsh fritillary colonies associated with damp acidic grasslands generally occupy small, enclosed and isolated sites within areas of intensive land management.

The unimproved calcareous habitats that support marsh fritillary colonies in Ireland are restricted to the Burren, the glaciated plains and eskers of the midlands and less disturbed coastal dune systems of the west of Ireland. These habitats have been traditionally managed for summer cattle grazing which provides suitable conditions for the development of abundant stands of *Succisa pratensis*. These sites support large colonies of marsh fritillary whose conservation is important at a national and European level. Many of these sites have now been designated as candidate Special Areas of Conservation (cSAC).

On a national scale the overall area of occupied habitat and habitat quality for this species is considered to be sufficient and in favourable conservation condition (NPWS, 2025).

Examples of habitat representative of the damp acidic grassland biotope as described by Lavery (1993) were identified along the section of the proposed wind farm infrastructure

between Wind Turbines T8 and T9. The cutover raised bog habitat at this location now supports a sward of rushes and grasses with a mixture of herb species including *Succisa pratensis*.

2.1.2 Diet

While the adults of the marsh fritillary have a varied diet (they have been observed feeding on many forb with *Ranunculus* sp., *Cirsium* sp., *Rubus* sp., *Myosotis* sp. being the most frequently visited), the larvae are generally considered to be monophagous (*i.e.* only feeding on one plant), restricting their diet to the leaves of *Succisa pratensis*. However, the larvae have also been recorded feeding on other species such as *Knautia arvensis* (field scabious) and *Scabious columbaria* (small scabious) in drier chalk grasslands. Donovan (1936) also recorded them feeding on *Plantago* spp. in Co. Fermanagh when supplies of *Succisa* were exhausted.

2.1.3 Lifecycle

Upon hatching in late summer, the larvae spin a web at the base of the host food plant and continue feeding until early September. The larvae feed and bask gregariously during warm days. Direct sunlight enables the larvae to feed outside their protective webbing and to feed more rapidly. The effects of direct sunlight on the feeding behaviour of the larvae is of particular relevance when assessing habitat quality. Areas of high sward, above 25cm, with higher levels of shading in the lower sections of the *Succisa* foodplant are considered to reduce the quality of habitat for larvae. Conversely the larvae are considered to favour a shorter sward and open vegetation structure that promotes feeding outside the larvae web as well as basking. Fowles (2005) defined good habitat condition as grassland habitats where vegetation height is within the range of 12 – 25cm with abundant *Succisa pratensis*. An additional advantage to larvae of a lower sward and a decrease in shading is the increased likelihood of the host *Succisa* plants developing larger leaves, upon which females prefer to deposit their eggs (Schtickzelle *et al.* 2005).

By early September the larvae construct a dense hibernaculum web at the base of the vegetation layer and over-winter in this state. The larvae begin to emerge from the hibernation web during sunny and warm days in February. Throughout the spring and early summer the larvae colonies fragment and eventually the larvae become solitary feeders. Adult marsh fritillary emerge in mid-May and can be seen on the wing in Ireland from this time through to the end of June, with the peak emergence period being in late May and early June (Lavery, 1993).

2.1.4 Dispersal

Populations of marsh fritillary, like many other butterfly species, are characterised by meta-population dynamics. The metapopulation is defined as a network of local populations occupying discrete habitat patches, where all local populations have a substantial probability of extinction (Bulman, 2001). When extinction occurs patches may be re-colonised by individuals dispersing from other occupied patches. Patch size and the habitat quality of the patch are known to influence population size, which fluctuates on a yearly basis within occupied patches.

The colonisation of extinct patches is dependent on the distance to the nearest local population as the rate of immigration decreases with increasing distance. Isolated patches will have a low probability of being re-colonised while connected patches will have a high probability of colonisation. The relatively sedentary nature of the marsh fritillary is particularly relative to the likelihood of patch colonisation. Porter (1981) recorded average movements of less than 100m within one study site. Wahlberg *et al.* (2002) studied marsh fritillary populations in Finland and recorded a maximum dispersal of 510m for females and 1.3km for males. Warren (1994) recorded colonisations of suitable habitat patches at much greater distance of between 5 and 20km from the home colony.

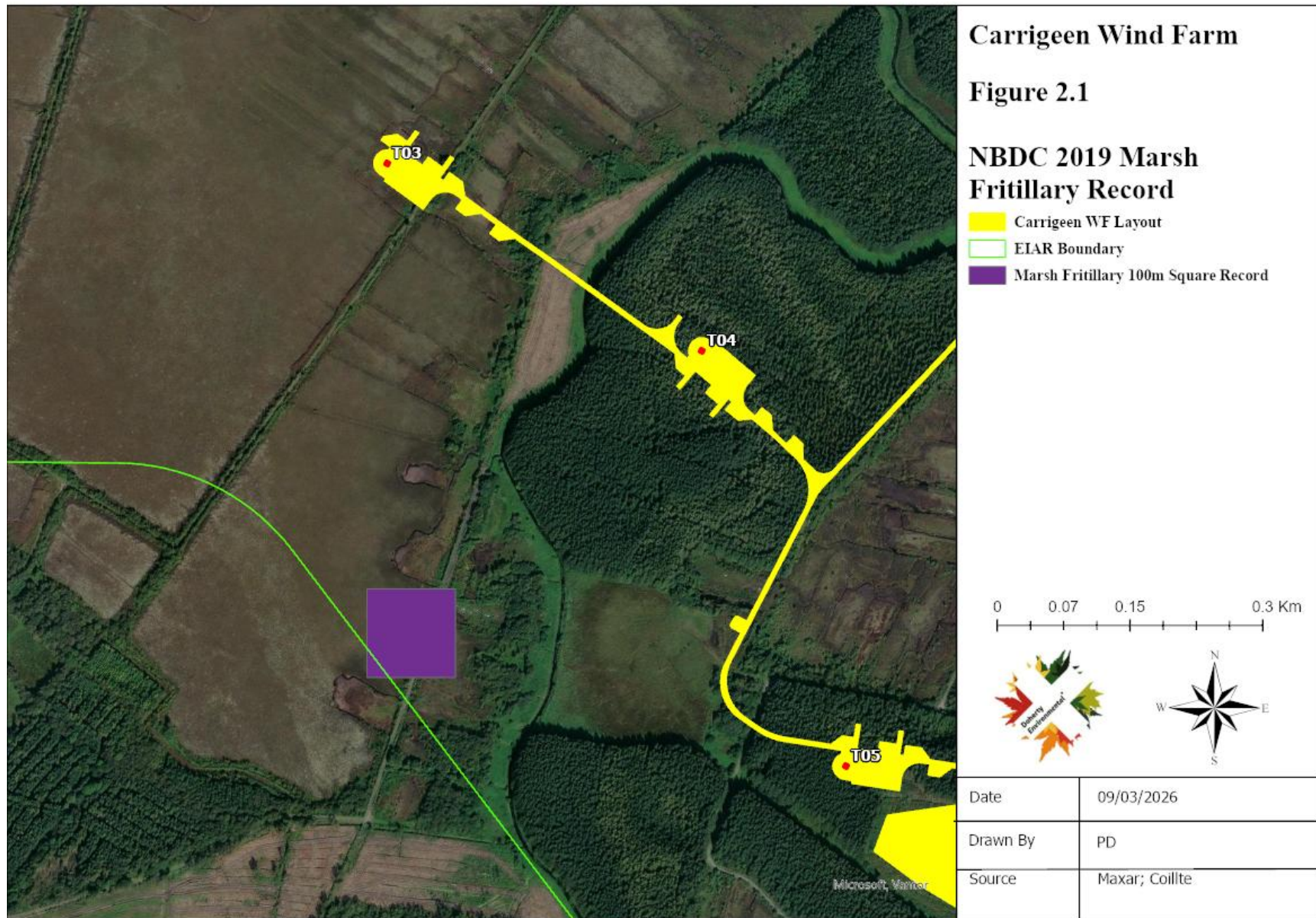
The egg load of female marsh fritillary may explain the relatively sedentary nature of this species. Due to this load female marsh fritillary are not very mobile and generally lay their eggs in a single batch a short distance from their place of emergence (Porter, 1981). The laying of eggs by female marsh fritillary in single batches may also be another reason for the low dispersal rate of this species.

2.1.5 Data-search Results

Following a search of National Parks and Wildlife Service (NPWS) protected species records and Biodiversity Ireland distribution maps six detailed historical records of marsh fritillary were identified within 4 no. hectads within which the proposed Wind Farm Site is located. There are historical records for marsh fritillary in the two hectads M78 and M79.

One no. record is held for M78. This is located within the EIAR Boundary, within the 100m grid square M758893, the nearest point of which is situated approximately 360m to the south of the proposed wind farm footprint. This record of marsh fritillary larvae was recorded during March 2019. The location of the 100m square with respect to the wind farm layout is shown on **Figure 2.1**. The habitats occurring at this location is representative of uncut, degraded raised bog and wet grassland. No examples of suitable marsh fritillary occur

within the wind farm layout to the north of this location. The habitat at T3 and along the access road between T3 and T4 to the north of the marsh fritillary record location are representative of cutover raised bog dominated by bare peat and pioneering vegetation with *Succisa pratensis* absent from the sward, scrub and recently-felled conifer plantation.



Four no. records are held for M79. The nearest record in this hectad is from an area of cutover raised bog c. 1.4km to the northwest of the wind farm eastern parcel. This record is from 2012, with <10 marsh fritillary being recorded. Other records from this hectad have been recorded from the shores of Lough Gara (2017, 2 adult marsh fritillary recorded); Inchmore, Monasteraden, Sligo (2019, 1 adult marsh fritillary recorded); and Ardagh Bog (2006, 1 adult marsh fritillary recorded).

No records for marsh fritillary are held for the hectad M88.

One record of marsh fritillary has been recorded from M89. This recorded from a site in the townland of Knockroe in 2017 when 1 adult marsh fritillary was recorded.

3 SURVEY METHODOLOGY

3.1 ADULT ACTIVITY SURVEY

The site was visited during suitable conditions on the 15th May 2024 and on the 6th June 2025. Weather during both surveys were suitable for undertaking a survey of adult marsh fritillary on the wing. During both surveys bright and sunny spells with warm temperatures between 17 – 20°C prevailed. There were occasional rain showers during these surveys.

The surveys focused on areas of the site where the larvae foodplant *Succisa pratensis* was noted during initial habitat surveys in 2023/2024. The area of search was along the footprint of the wind farm infrastructure between the proposed Wind Turbines T8 and T9 and to the west of T8.

The adult flight survey method was based on a W-shaped transect methodology as used for the Habitat Condition Assessment for Marsh Fritillary and described in the Manual for Butterfly Monitoring (Butterfly Conservation Europe, 2012). A continuous W transect line was walked through the area of cutover raised bog habitat. A representation of the transect line is shown on **Figure 3.1**, with wider zig-zags walked in areas of low vegetation cover dominated by bare peat and narrower zig-zags walked in areas of vegetation cover with *Succisa pratensis*. The transect was approximately 2km in length and took c. 2 hours to complete with stops to observe for any flying or basking marsh fritillary being made randomly but at regularly spaced locations along the transect.

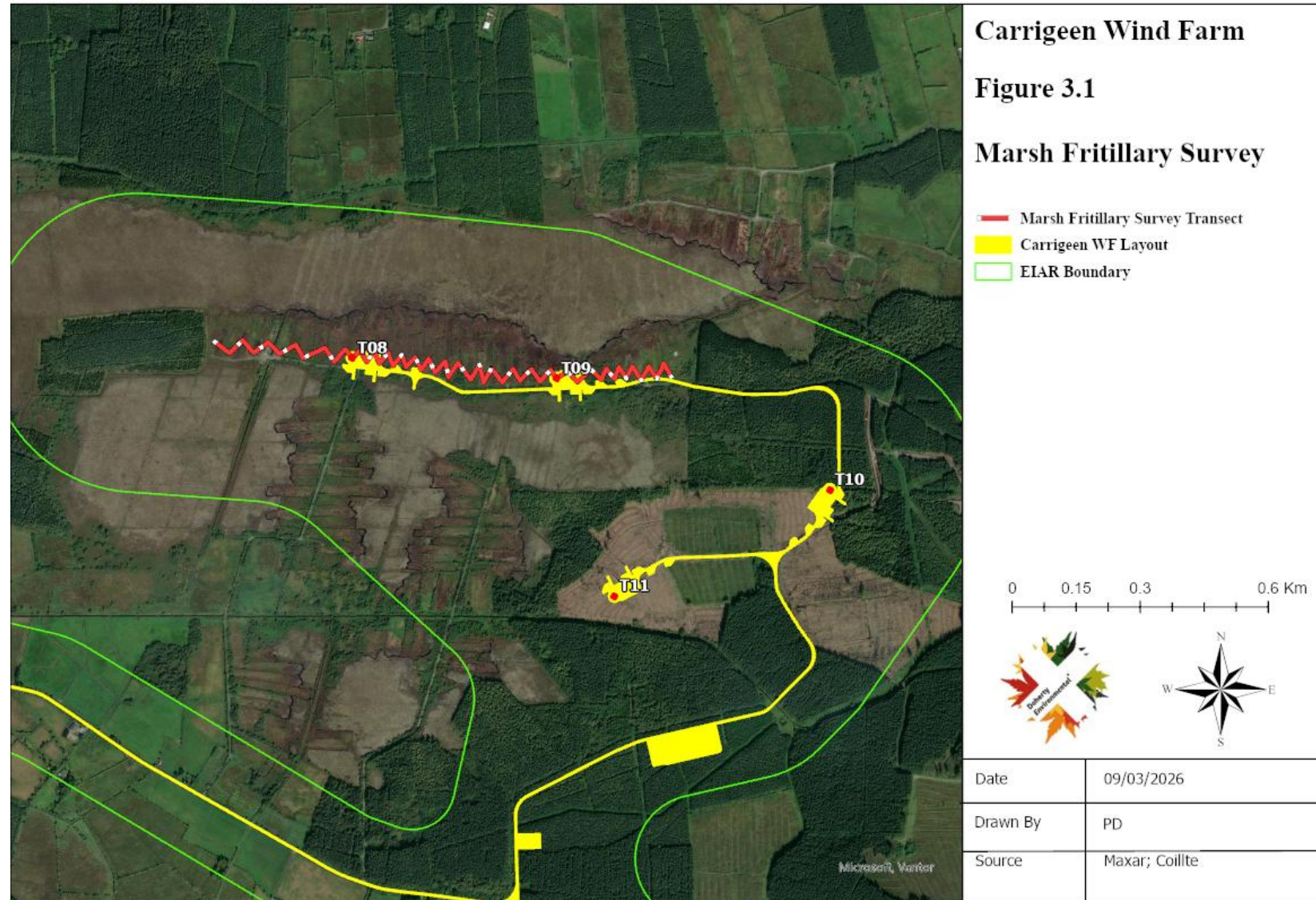


Figure 3.1: Marsh Fritillary Survey

3.2 SUCCISA PRATENSIS/LARVAE WEB SURVEY

Site surveys for marsh fritillary larvae were undertaken in late summer, early autumn during August and September 2025. These surveys were completed to search for the presence or otherwise of larvae webs on stands of *Succisa pratensis*. The 2025 larvae web survey was completed on the 28th August and 10th September 2025. These surveys involved identifying dense patches of *Succisa pratensis* within the rushy grassland sward of the cutover raised bog habitat and searching the lower basal leaves of the plants for the presence of marsh fritillary larvae webs.

3.3 HABITAT CONDITION

The quality of the habitat present along the transect to support marsh fritillary colonies was also assessed during this survey. Habitat quality is defined according to Fowles (2005). Under this system habitats are categorised according to a hierarchy based upon the condition of patches to support breeding colonies. This hierarchy ranges from Good Condition Habitat to Unsuitable Habitat. Definitions for each of the six categories within this hierarchy are taken from Fowles (2005) and are as follows:

Good Condition Habitat (GC)

Grassland where, for at least 80% of sampling points, the vegetation height is within the range of 12-25cms and *Succisa pratensis* is present within a 1 m radius. Scrub (>0.5 metres tall) covers no more than 5% of area. Habitat patches in this condition will constitute the most important breeding areas for marsh fritillaries within the landscape, even though higher larval web densities may sometimes occur in slightly ranker conditions, as maintenance of appropriate grazing levels (0.3-0.4 livestock units by cattle or ponies) will sustain vegetation structure in the long term.

Suitable (Under-grazed) Habitat (SU)

Grassland where *Succisa pratensis* is occasional/frequent/abundant and vegetation height is above 25cm, or in which sward height is between 12-25cm but scrub (>0.5m tall) covers more than 5% of area. Such habitat is capable of supporting marsh fritillaries in its current condition but its significance will decline over a 5-10 year period unless action is taken. Restoration of appropriate grazing levels (perhaps requiring initial management in the form of mowing or patch burning before the introduction of stock) should improve habitat quality to Good Condition.

Suitable (Over-grazed) Habitat (SO)

Grassland with frequent-abundant *Succisa* but which is currently over-grazed such that the sward is below 12cm on average. Mown swards may also come under this category. Such habitat is not capable of supporting marsh fritillaries in its current condition, although short-sward rosettes may be utilised by larvae where these are adjacent to breeding habitat. Reductions in stocking density to approximately 0.3-0.4 livestock units (or cessation of mowing) should improve vegetation structure towards Good Condition in the short term.

Suitable (Sparse) Habitat (SS)

Grassland with sparse (rare-occasional) *Succisa* and vegetation height less than 25cm on average. Superficially these patches may have good vegetation structure but the paucity of *Succisa* means that they are less favoured by marsh fritillaries. Edaphic conditions may dictate the abundance of *Succisa* but this may also be due to past or current management practices, such as frequent mowing in the absence of grazing animals. If this is the case then re-introduction of grazing stock may break up the sward sufficiently to allow germination of any *Succisa* within the seed bank and Good Condition habitat may return in the near future. *Succisa* may also be rare in the sward due to a history of sheep grazing and in such instances removal of sheep may allow condition to improve quickly.

Potential (Rank) Habitat (PR)

Grassland with rare *Succisa* but which is currently under-grazed or neglected such that the sward is above 25cm on average and *Succisa* occurs as scattered plants, usually in a rank, tussocky sward. Management of such grasslands will require considerable effort (in the form of mowing, patch burning and probably scrub control) before grazing can be introduced at appropriate levels. Where landscapes are regarded as containing insufficient habitat to guarantee long-term viability of the marsh fritillary metapopulation, Potential (Rank) patches will offer the best option for habitat restoration but they are unlikely to support anything more than the occasional larval web without management.

Unsuitable Habitat (NS)

All other habitat types are mapped under this category. This will include patch types that potentially could be restored to support marsh fritillaries but this is likely to involve a considerable resource input to correct former agricultural practices or to alter soil hydrology.

3.4 SURVEY LIMITATIONS

No survey limitations were encountered during the 2024 and 2025 surveys.

4 RESULTS

4.1 ADULT FLIGHT SURVEY

4.1.1 2024 Survey Results

No adult marsh fritillary were recorded during the transect survey of the four wet grassland fields supporting stands of *Succisa pratensis* during the May 2024 surveys.

4.1.2 2025 Survey Results

No adult marsh fritillary were recorded during the transect survey of the four wet grassland fields supporting stands of *Succisa pratensis* during the June 2025 surveys.

4.2 SUCCISA PRATENSIS/LARVAE WEB SURVEY

Stands of *Succisa pratensis* were searched along the survey transect shown on **Figure 3.1**. No marsh fritillary larvae webs were recorded on the leaves of *Succisa* plants. Where the ground cover is not dominated by bare peat the vegetation structure was similar consisting of a high un-grazed sward dominated by tussocky grasses and/or rushes. The sward is generally higher than 25cm and approaching 50cm along much of the vegetated areas. Tracking across the sward by turbary related machinery was also noted during the survey (see **Appendix 1: Plates**).

Under the Fowles classification system of habitat quality along the transect most closely corresponded to the classification Suitable Under-grazed Habitat (SU). The conditions along the transect were also representative of the ungrazed marshy/acidic grassland habitat on cutover raised bog as defined by Lavery (1993). Lavery considered this habitat to be unsuitable for the survival of marsh fritillary.

5 CONCLUSION

No adult marsh fritillary were recorded within survey area previously identified as supporting stands of *Succisa pratensis* during baseline habitat surveys in 2023 and 2024. The habitat condition occurring in this area where *Succisa pratensis* is frequent to abundant in the sward is considered to be unsuitable for supporting marsh fritillary due to the dominance of an ungrazed high sward dominated by rushes and tussocky grasses with limited structural variation. As noted in **Section 2** above, such habitat has been described by Lavery (1993) as being wholly unsuitable to the survival of marsh fritillary colonies.

The 2019 record of marsh fritillary indicates the presence of suitable habitat for marsh fritillary overlapping with the EIAR Boundary to the south of the wind farm infrastructure in the western parcel. It is noted that, as per **Section 2.1.5** above, the presence of such

suitable habitat for marsh fritillary does not occur to the north of the location of this recorded presence (i.e. within the footprint of the wind farm layout at T3 to T4).

5.1 RECOMMENDATIONS FOR FUTURE ENHANCEMENT

It is recommended that prior to construction works commencing on the Wind Farm Site the construction footprint of the wind farm is re-surveyed to confirm the extent of swards supporting frequent to abundant stands of *Succisa pratensis*. Where stands of vegetation supporting frequent to abundant *Succisa pratensis* are identified they will be subject to marsh fritillary surveys in the form of adult flight surveys and larvae searches. Where these searches indicate the continued absence of marsh fritillary the vegetation occurring in such areas will be cleared under supervision by the Project Ecological Clerk of Works (ECoW).

In the event that vegetation subject to the above searches is identified as supporting a marsh fritillary colony, vegetation clearance and construction works will only be permitted to proceed under a European Protected Species derogation licence issued by the Department. An application for such a licence will be required to be made to the Department and the application will set out all necessary mitigation measures to ensure that the vegetation clearance and works do not result in any net loss of habitat for marsh fritillary.

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Appendix 1: Plates



Plate 1: View of east from western end of the marsh fritillary transect showing bare peat in the foreground and tall marshy grassland in the background



Plate 2: View of Juncus effusus cover and bare peat approaching T08 location



Plate 3: View of dense undergrazed SU habitat between T08 & T09 with turbary machinery rutting



Plate 4: View west towards T08 showing tall, undergrazed SU habitat



Plate 5: View of frequent to abundant Succisa pratensis cover within tall undergrazed sward



Plate 6: View of variable sward with recolonising vegetation on bare peat