

## Appendix 8-9: Outline Habitat Management Plan

### Executive Summary

This appendix supersedes the original February 2022 submission document. Environment Systems Ltd was commissioned by EDF Renewables to provide information for an Outline Habitat Management Plan (OHMP) in respect of the proposed Garn Fach wind farm in Powys.

This OHMP sets out broad measures for habitat restoration within the site, including enhancement of existing habitats and the creation of new habitats. This document aims to lay out benefits to biodiversity at the landscape scale and benefit ecosystem services. The main objective is to achieve Biodiversity Net Gain.

Broad habitat types and species of value that are covered in this OHMP are:

- blanket bog;
- wet modified bog;
- acid flush and fen;
- great crested newt; and
- several bird species, such as golden plover, red kite, curlew and kestrel.

Biodiversity Net Gain will be achieved through the:

- [protection of all habitats during construction](#);
- restoration of degraded habitats;
- creation of habitats of higher distinctiveness;
- creation of more suitable habitat conditions in the southern parcel for a number of ecological receptors named above;
- strengthening of connectivity across the site for terrestrial fauna (excluding bats);
- monitoring of any habitat enhancement to ensure the habitat remains appropriate for the intended receptor;
- provision of refuges for invertebrate fauna; and
- nestbox provision and thus habitat enhancement for red kite and kestrel.

It is important to note that this OHMP does not include measures for bats such as planting trees, nor the placement of bat boxes. This approach has been adopted so as not to create additional risk of bat mortality through direct collisions / barotrauma.

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# 1 Introduction

## 1.1 Background and Proposals

- 1.1.1.1 This Outline Habitat Management Plan ('OHMP') has been produced for the purposes of consideration alongside other technical documents as part of the submission for consent for the proposed Garn Fach wind farm in Powys, hereafter known as 'the Site'. The OHMP sets out proposed measures for habitat restoration within the study area. The study area is the area within the site boundary, hereafter known as 'the Site', as shown in Figure 1. The centre of the Site is situated at National Grid Reference (NGR) SO 04417 80052.
- 1.1.1.2 The OHMP includes measures whereby the enhancement of existing habitats and the creation of new habitats, deliver multiple benefits adopting an ecosystem approach. The OHMP seeks to set out biodiversity benefits at the landscape scale, while simultaneously benefiting ecosystem services. These include flood protection (wetlands and bog habitats), water quality (siltation, diffuse pollution) and carbon storage (bog habitats). Habitat enhancement will deliver for biodiversity and enhance habitat networks.
- 1.1.1.3 The proposed development ('Proposed Development') will consist of the siting of 17 wind turbines, with tip heights of 149.9m. Other associated infrastructure is proposed to be installed, such as a control building and electricity substation; energy storage facility; access tracks; buried cabling; crane hardstandings and borrow pits.
- 1.1.1.4 An Ecological Impact Assessment (EclA) and Ornithological Impact Assessment (OIA) were produced in 2021 and supported by a number of technical ecological appendices, including a range of protected species surveys and ornithological studies. These data were used in the preparation of this OHMP.

## 1.2 OHMP Delivery and Planning Framework

- 1.2.1.1 It is anticipated that this OHMP will be a live document that is able to be modified post-submission and pre-construction, as well as potentially during and post-construction, as a result of any time lapse between OHMP production and commencement of works. In addition, consideration must be given to any minor changes in infrastructure layouts and priorities within the Proposed Development's footprint, as well as in response to any outcomes of monitoring efforts undertaken. New opportunities for habitat management and enhancement may become apparent during the life-time of the Proposed Development, and previously proposed actions may become redundant.
- 1.2.1.2 Part 1, Section 6 of the Environment (Wales) Act 2016 states that by 2023 Wales will have a published biodiversity net gain strategy (BNG), as part of its Nature Recovery Action Plan (NRAP). Limited information is available on what this strategy will look like, therefore no specific prescriptions are given in this document. However, general prescriptions are provided, which can be agreed upon via planning conditions at a later date.
- 1.2.1.3 The OHMP will inform the Habitat Management Plan (HMP) proper, which will be secured as part of the planning consent for the Proposed Development via a planning condition.

## 1.3 Aims of the OHMP

- 1.3.1.1 This OHMP has been completed following best practice guidance from Scottish Natural Heritage / SNH (2016). As part of the BNG strategy published and in use in England, all habitats must be considered as part of the calculations, inclusive of linear habitats and waterways, and also considers species-specific enhancements (Baker, Hoskin & Butterworth, 2019).
- 1.3.1.2 Broad habitat types and species of value that are initially considered in the OHMP are:
- Blanket bog;
  - Wet modified bog;
  - Acid flush and fen;
  - Great crested newt; and
  - Several bird species, such as golden plover, red kite, curlew and kestrel.
- 1.3.1.3 The main objective of the plan is achievement of Biodiversity Net Gain (BNG) across the site. This will be achieved through the:
- [Protection of all habitats during and post construction;](#)
  - [Restoration of degraded habitats, including the prevention of the drying of blanket and wet modified bog, which will also improve the current fragmented nature of the habitat across the site;](#)
  - Creation of habitats of higher-distinctiveness;
  - Creation of more suitable habitat conditions in the southern parcel of the site for a number of ecological receptors such as golden plover, curlew and great crested newt;
  - Strengthening of connectivity across the site for terrestrial fauna (excluding bats) via:
    - enhancement of linear features such as riparian habitats, hedgerows and field margins;
    - where the above is not possible, installation of man-made features such as culverts;
    - creation of a variety of features such as hibernaculae and other refuges;
  - Monitoring of any habitat enhancements, improvements or additions, particularly with reference to great crested newt, to ensure the habitat remains appropriate for the intended receptor;
  - Habitat enhancements for the purpose of strengthening connectivity between ponds on-site and off-site, for great crested newt; and
  - Nestbox provision and thus habitat enhancement for red kite and kestrel.
- 1.3.1.4 It is important to note that the OHMP does not include measures for bats, such as planting trees to enhance connectivity nor the placement of bat boxes. This has been adopted so as not to create additional risk of bat mortality through direct collisions/barotrauma. It was concluded that, at least until it is possible to more accurately predict impacts to bats, for example following several years of acoustic monitoring and carcass searches (please refer to the relevant EclA, section 8.7.31), then proposed habitat management measures will not actively encourage bats to use the site.

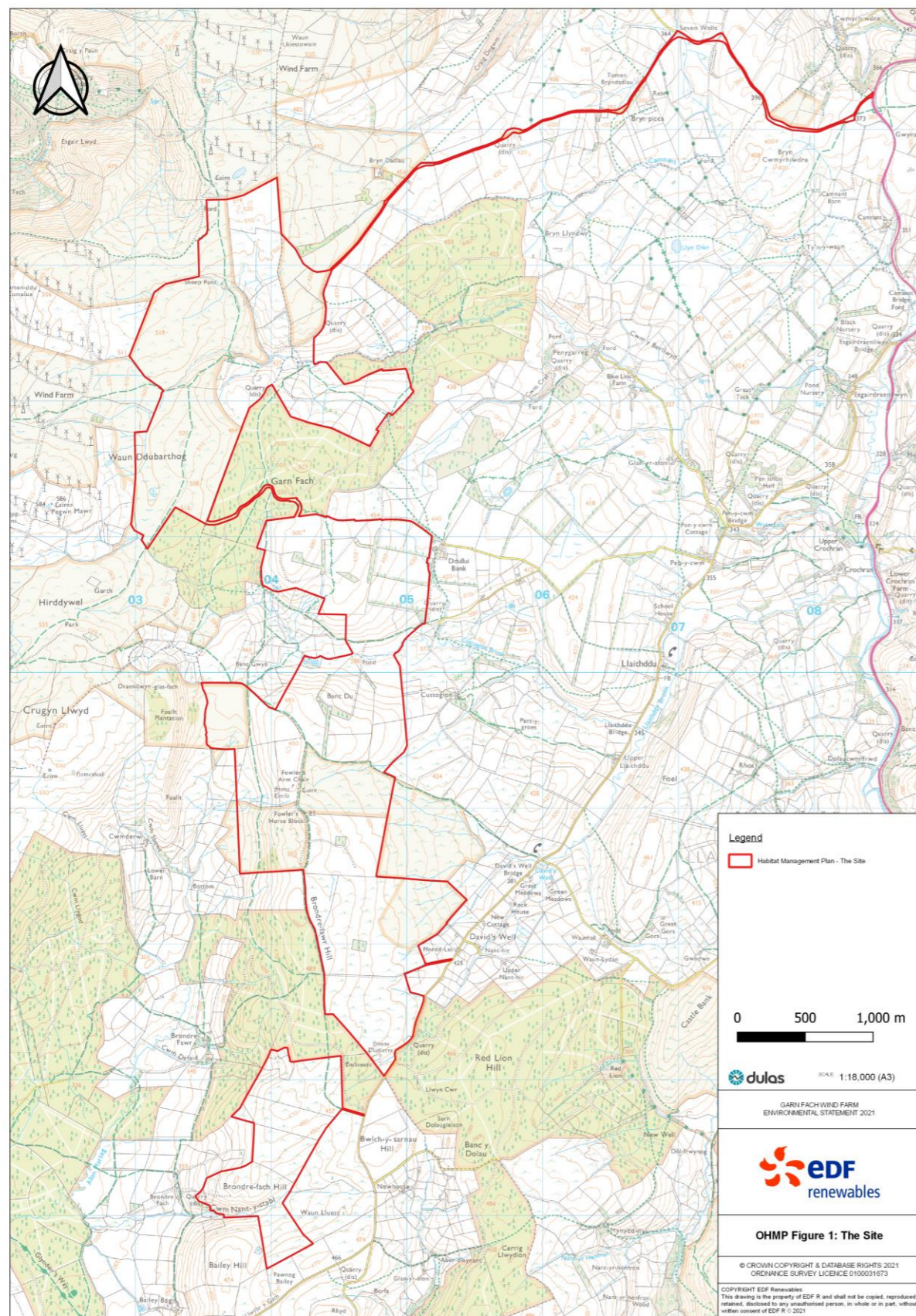


Figure 1: The Site

## 2 Aims, Objectives and Management Prescriptions

2.1.1.1 In this section, the Aims define the general OHMP goals, with relative Objectives to further define the Aims into quantifiable targets. The Prescriptions detail the management works to be implemented to achieve the Aims and Objectives.

### 2.2 Biodiversity Net Gain (BNG)

#### Summary

- 2.2.1.1 The main Aim and Objective is to achieve and deliver Biodiversity Net Gain as part of the Development.
- 2.2.1.2 At the time of the preparation of the OHMP, no specific habitat nor hectareage / area of habitat is provided for restoration or creation is given for the specific goal of achieving BNG. This is on account of the likelihood of construction of the Development not commencing immediately; conditions on the Site may evolve from the baseline at the time of construction commencement, and any prescriptions presented at this stage may become null and void at the time of commencement.
- 2.2.1.3 Other recommendations and prescriptions in this OHMP may contribute to BNG, however, as this document is in Outline form such prescriptions are recommended to be read in parallel with the BNG aim.
- 2.2.1.4 Full details of habitats and areas to be restored, improved and created will be provided in the full Habitat Management Plan (HMP) which will be secured via planning condition.

#### Details

- 2.2.1.5 BNG must consider all habitats present on site.
- 2.2.1.6 Habitats with high distinctiveness named on Section 7 of the Environment (Wales) Act 2016 include Blanket Bog and Upland Flushes, Fens and Swamps. Excellent examples of blanket bog can be considered as Annex I habitats; [the habitats on site that will be affected by the development, are considered to be poor quality, degraded forms of Annex I habitats, with very little Sphagna present within the habitats. With the implementation of active management, they have the capability of being restored to good examples of Annex I blanket bog.](#)
- 2.2.1.7 General Aims, Objectives and Prescriptions for Blanket Bog (inclusive of wet modified bog) and Upland Flushes are provided below. These will be updated and given a greater level of detail in the full HMP.

#### Rationale

- 2.2.1.8 [Within the updated information submitted as part of the SEI, the following blanket bog habitat loss is predicted:](#)
  - Direct loss of 1.482 Ha of blanket bog habitats due to infrastructure;
  - Potential modification of 5.163 Ha of blanket bog due to drainage effects during the lifespan of the Proposed Development

2.2.1.9 The following Aim outlines criteria for identifying and delivering ecological enhancement in the form of blanket bog habitat restoration measures in order to deliver net positive effects. The aim would be to contribute a greater area than that which is predicted to be affected by the Proposed Development, providing additional enhancement to the surrounding landscape.

2.2.1.10 Peat management and reinstatement during and following construction are detailed separately in the Outline Construction Environmental Management Plan and Outline Peat Management Plan (OPMP).

#### **Aim 1: enhancement of blanket bog, wet modified bog and flush habitats**

##### **Objective 1.1 (Bog)**

2.2.1.11 Increase the abundance and distribution of *Sphagnum* mosses, particularly key indicator species such as *Sphagnum papillosum*, *Sphagnum capillifolium*, *Sphagnum cuspidatum* and *Sphagnum magellanicum*.

##### **Objective 1.2 (Bog)**

2.2.1.12 Increase abundance of dwarf shrub species such as bilberry *Vaccinium myrtillus* and crowberry *Empetrum nigrum*.

##### **Objective 1.3 (Flush)**

2.2.1.13 Increase diversity of sedge species *Carex* sp. including indicator species such as *Carex echinata* and *C. rostrata*, as well as *Sphagnum* mosses, particularly *Sphagnum papillosum*, *S. squarrosum*, *S. auriculatum* and *S. recurvum*.

##### **Prescription 1.1**

2.2.1.14 Dam active drains in the areas within the northern parcel of land, with reference to Appendix 2 of the OPMP, that would aid in raising the water level sufficiently to create favourable conditions for the *Sphagnum* spp. described above to colonise. Active measures to introduce such species will be considered, however, if suitable habitat conditions are recreated then this may occur through natural colonisation. Monitoring of the effectiveness of the dams is recommended in 5-yearly intervals, on the basis of observation by Gaffney *et al.* (2020) on re-wetting of bogs using dams. The first monitoring visit is recommended 5 years following installation.

2.2.1.15 There are areas of wet modified bog throughout the Site that contain drainage grips. There are a number of methods to block these drains so as to restore natural drainage patterns slowing down the movement of water, encourage re-vegetation of the bog surface / and to support competitiveness of bog species other than *Molinia* which prefers to grow over moving water, reduce erosion and contribute to natural flood management, such as:

- Peat dams: using a plug of peat to hold back the water to encourage silting, which can rapidly become colonised by peat forming sphagnum species.
- Solid dams: dams can be constructed using solid materials such as corrugated plastic sheeting, plastic piling and wooden structures. The use of plastic will be given lower ranking preferential when considering options and will be adopted as a last resort.

- Blocking: bales of plant material such as rush or heather can be used to block grips and slow down the rate of water flow, thus encouraging silting.

##### **Prescription 1.2**

2.2.1.16 Trench bunding is proposed across the northern parcel of the Site to improve and restore the degraded bog habitat. The bunds will form an effective hydrological boundary, restricting both surface and sub-surface flow from the bounded areas and increase groundwater levels. This will allow re-wetting of the proposed areas to encourage the growth of peat forming species.

2.2.1.17 This will be achieved using an internal (subsurface bund) and a surface bund (both constructed of compacted peat). The height and width of the bunds is not specified at this stage and should be constructed according to the enclosed area and local topography. Areas potentially suitable for bunding have been identified, as shown in Figure 3 of Chapter 10 of the Supplementary Environmental Information (SEI). The proposed bunds contain an estimated area of 31.6ha.

2.2.1.18 It is noted that the areas are at present indicative only and exact locations will be confirmed in the detailed design stage. The lines labelled as bunds do not necessary represent continuous features, but rather may represent the leading edge of cells of smaller bunds (thus reducing the risk of bund failure).

##### **Prescription 1.3**

2.2.1.19 Localised stock fencing will be erected where necessary to achieve Aim 1.

##### **Prescription 1.4**

2.2.1.20 Where the wetter, deeper peat areas are located within the Site, to the west of Waun Ddubarthog (not being affected by the Proposed Development), this area is already fenced but contains small areas of conifer regen (Error! Reference source not found.). These trees should be removed. This area is currently fenced off under a Glastir agri environment scheme which will expire in 2029 when the fence will be expected to be removed and the sheep allowed to roam. With the wind farm prescriptions, the fence will be maintained, ensuring the benefits are prolonged through the lifetime of the development.

##### **Prescription 1.5**

2.2.1.21 Outside the scope of the Proposed Development, the following activities are recommended to be prohibited within bog habitats, on account of their detrimental impact on such habitat (Bain *et al.* 2011):

- Cutting of new drains;
- Planting of trees;
- Surpassing recommended grazing densities;
- Burning;
- Application of insecticides, fungicides or other pesticide;
- Roll or chain-harrow;
- Conduct earth-moving activities;
- Use for off-road vehicular activity;
- Construction of developmental activity; or
- Storage of materials/machinery.

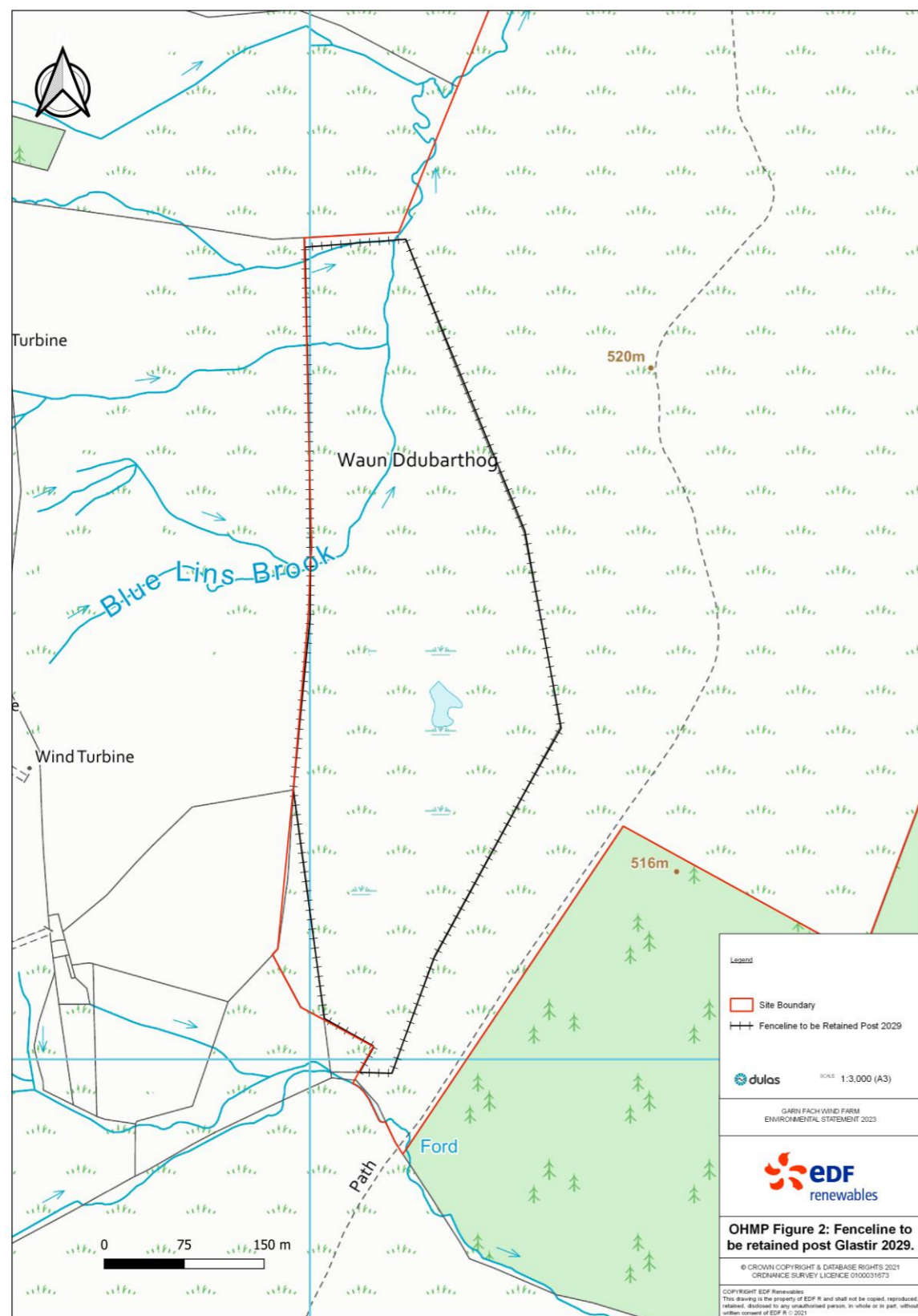


Figure 2: Area where the fence is to be retained post Glastir Agri-Environment Scheme 2029.

## 2.3 Enhancement of Southern Parcel

2.3.1.1 The Proposed Development comprises three separate parcels: the northern, central and southern. Active development will occur on the northern and central parcels; the southern will not be impacted by physical development, with its purpose being a suitable area for enhancement measures for various ecological receptors. Similarly, sections of the northern parcel will be subject to some enhancement measures. The measures are designed to target the following ecological receptors but will benefit others associated species:

- Golden plover
- Curlew; and
- Great crested newt.

2.3.1.2 Curlew are a wading species and use their long bill to probe the ground for invertebrates, while their chicks learn to feed on surface insects and spiders, and learn to probe in shallow ponds and pools (RSPB, undated). Nesting curlew require tall vegetation for nesting (RSPB, undated) although dense vegetation is generally avoided. Nest predation is the leading cause of nest failure (Grant *et al.* 1999). Aerial predators such as corvids accounted for 9% of nest failures as observed by Norrdahl *et al.* (1995), where kestrel predation only accounted for <6%. Valkama, Currie & Korpimäki (1999) indicate that nest predation is higher in areas of mixed farmland/woodland. The southern parcel is approximately 1.5km in length, and borders coniferous forestry at its northern extent. Valkama, Currie & Korpimäki (1999) do not estimate a safe distance from woodland, although Berg (1992) observed that nest sites were further away from woodland than at random sites with a median distance of 150m. This data indicates the southern parcel is of a suitable size to support nesting curlew.

2.3.1.3 Golden plover were not recorded to be breeding on site, although it was assessed that foraging habitat would be lost as a result of the Proposed Development (please refer to the relevant OIA). Therefore, initiatives will focus on foraging habitat.

2.3.1.4 Great crested newt were found to be breeding in ponds on site. No ponds will be directly impacted as a result of the Proposed Development, although there is a potential loss of connectivity across the landscape. Habitat enhancement measures are outlined in this section.

2.3.1.5 The southern parcel comprises a variety of habitats, which predominately consist of improved grassland, semi-improved acid grassland and marshy grassland. Small areas of wet modified bog and dry acid heath are present across the area. A Phase 1 habitat map is provided in Figure 3 for reference.

### Aim 1: Enhance terrestrial habitat for curlew, golden plover and great crested newt

#### Objective 1.1

2.3.1.6 Increase abundance of invertebrate species present.

#### Objective 1.2

2.3.1.7 Increase opportunities for terrestrial amphibians to shelter within the parcel.

**Prescription 1.1**

- 2.3.1.8 Two hibernacula will be created within the southern parcel. One is to be located close with the existing pond in the woodland to the north, previously referred to as 'Pond 4', and another further west as shown in (Figure 4) Figure 8.17a (V2.0).
- 2.3.1.9 An additional two hibernacula will be constructed within the currently fenced area surrounding the Pond 3 cluster as described in section 2.4.2 below (Figure 5)
- 2.3.1.10 These will be made from logs, stones, inert rubble, soil and turf. These are proposed to be entirely stock-fenced to prevent interference from livestock. Construction will follow instructions and suggestions laid out in the section entitled 'Special Newt Conservation Measures' (Langton, Beckett & Foster, 2001). Locations proposed are provided in Figure 4 and Figure 5.
- 2.3.1.11 Where the bridleway intersects the areas marked for enhancements, measures will be put in place to ensure access is maintained such as the provision of gates on either side of the fenced off area.
- 2.3.1.12 It is also recommended to plant native wildflower seeds, ideally locally sourced across the top of the hibernacula (Welsh Wildlife Trust, undated). Once germinated, this will attract a range of invertebrate fauna to the site, and will aid in creating a cohesive and sturdy structure.

**Aim 2: Provide natural predator deterrents for curlew****Objective 2.1**

- 2.3.1.13 Reduce overall risk of predation of curlew nests.

**Prescription 2.1**

- 2.3.1.14 Norrdahl *et al.* (1995) observed that curlews nesting nearer a kestrel nest experienced a slightly higher success rate than those who nested further away from a kestrel nest. Kestrels were also only considered to be a threat during a short timespan, as they do not prey on eggs and are discouraged by the large size of adults and older juveniles. Berg (1992) states that chicks are able to move with their parents to safety, up to 1.5km from the nest.
- 2.3.1.15 It is therefore recommended to erect a kestrel nestbox as close to the edge of the forestry to the north as possible, whilst remaining within The Site's red line boundary.

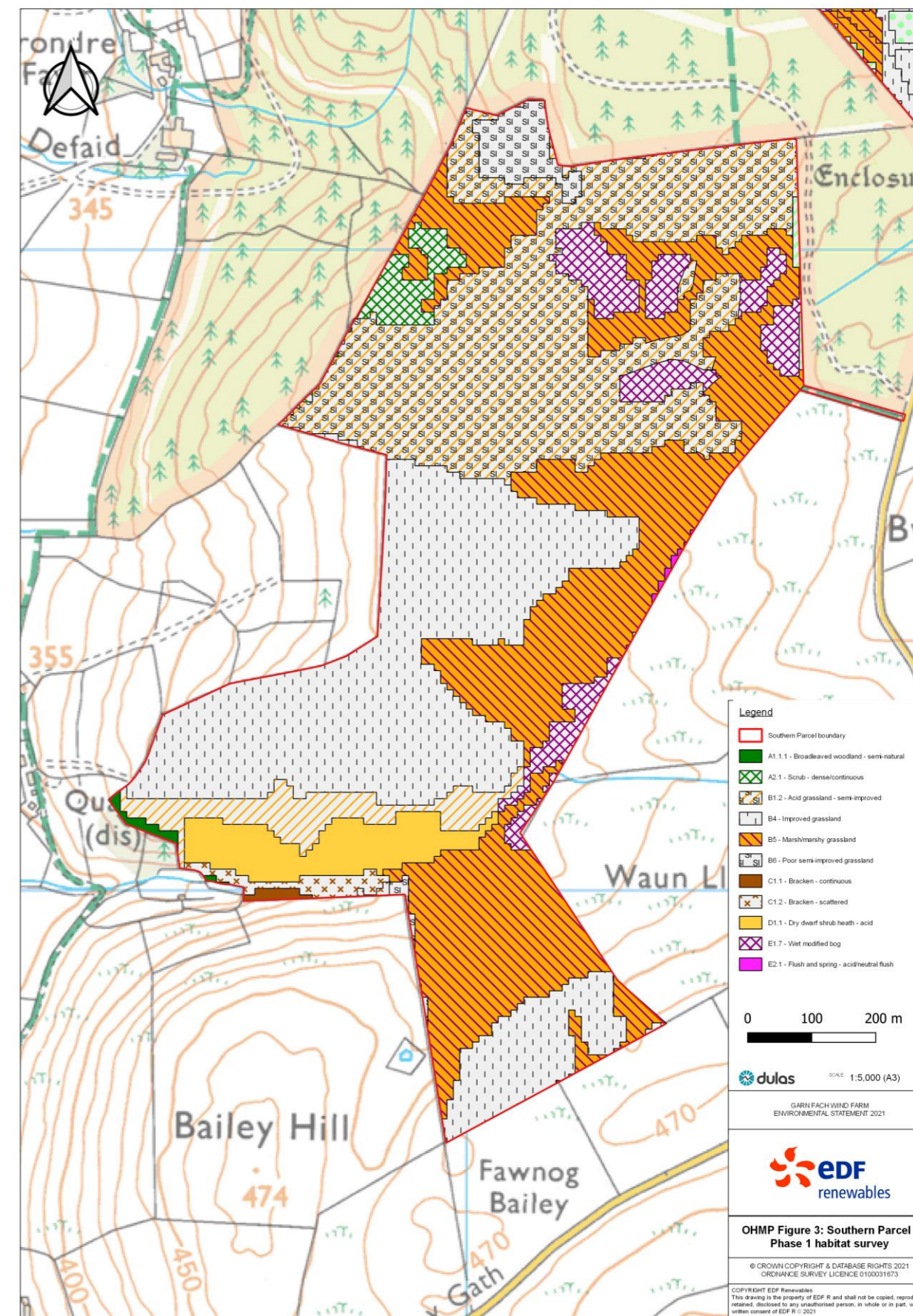


Figure 3: Phase 1 habitat map for Southern Parcel

**Aim 3: Create aquatic habitats to benefit curlew and great crested newt**

**Objective 3.1**

2.3.1.16 Encourage great crested newts to the habitats within the southern parcel.

**Objective 3.2**

2.3.1.17 Increase diversity between aquatic and terrestrial habitats within the southern parcel.

**Prescription 3.1**

2.3.1.18 Construct two ponds suitable for great crested newts in accordance with the section entitled 'Construction of Breeding Ponds' within the Great Crested Newt Conservation Handbook (Langton, Beckett & Foster, 2001). Broadly, the ponds must be of varying depth, with one area exceeding 1m in depth to allow newt activity throughout the year. The ponds must contain shallower areas and a very shallow, sloping shelf to enable easier access by amphibians. The ponds margins will be sown with appropriate marginal floral species, and the ponds encouraged to support aquatic plants. A full recommended plant species list will be provided in the HMP proper.

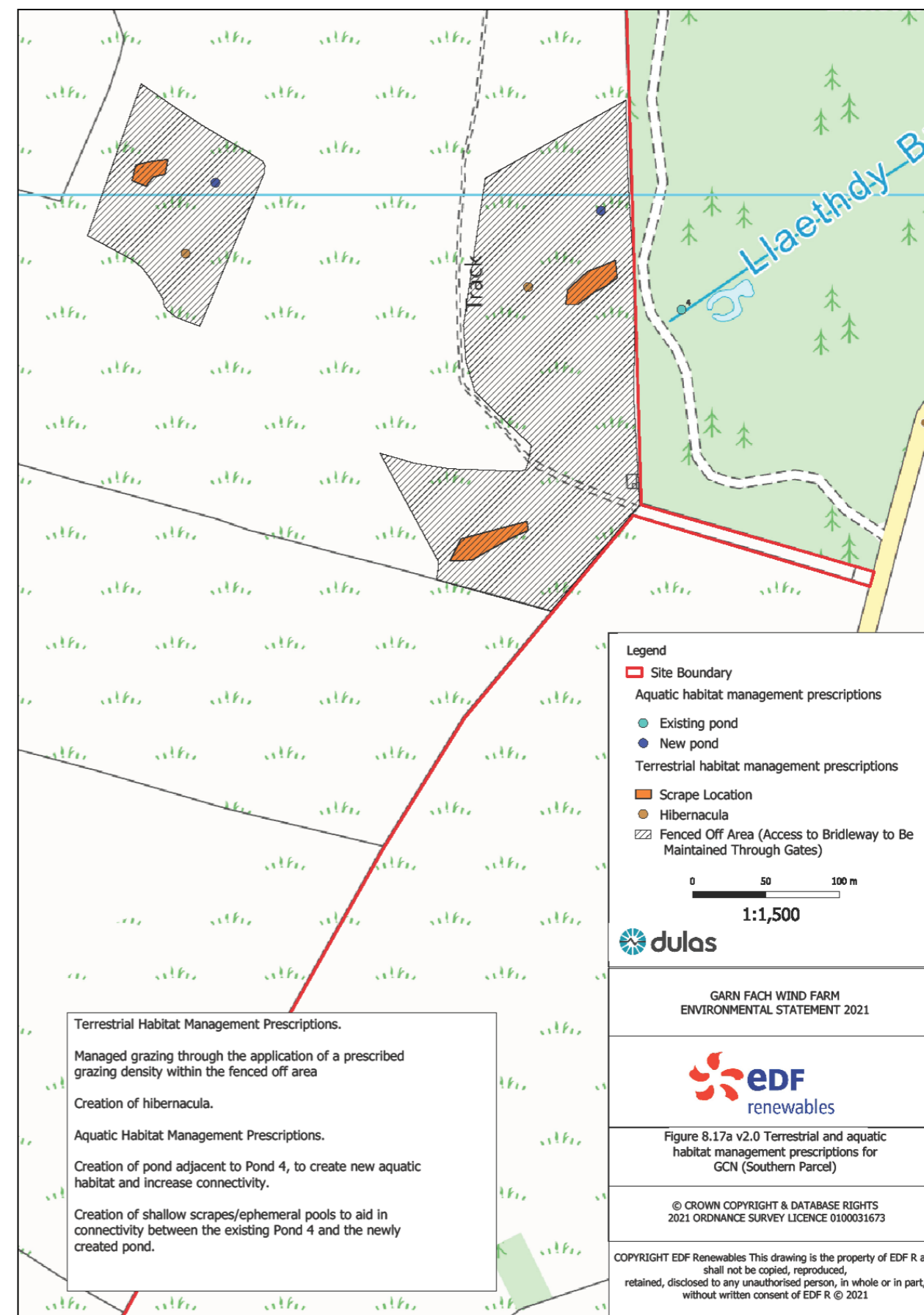
**Prescription 3.2**

2.3.1.19 Create a series of shallow scrapes / ephemeral pools to benefit great crested newts and nesting curlew. Curlew chicks will benefit from shallow water on site to practice their probing skills, with the water encouraging invertebrate life. Naturally wet areas must be identified on site, as it will be easier to encourage water to remain in areas where it occurs naturally. The Phase 1 habitat survey / NVC survey for the parcel undertaken for the purposes of the EclA is a useful guide (Figure 3) as it details the locations of B5 marshy grassland and E1.6.1 wet modified bog.

2.3.1.20 To enable this objective, it is recommended that some of the existing drainage grips in the south-eastern area of the southern parcel are dammed. This will aid in water retention, and will enhance the wetter habitats already present (more detail is presented within Section 2.1.4 of this TA).

**Prescription 3.3**

2.3.1.21 Trench bunding (described under Section 2.1.4, Prescription 1.2) is proposed across the northern parcel of the Site to improve and restore peat habitats. The habitat improvements from the re-wetting to encourage the growth of peat forming species will provide suitable good quality terrestrial habitat for GCN and curlew.



**Figure 4: Figure 8:17a v2.0 Proposed terrestrial and aquatic habitat management prescriptions in the Southern Parcel**

## 2.4 Strengthen connectivity across the Site

- 2.4.1.1 In order to allow easier access across the Site by terrestrial fauna, and in part to assist in the achievement of Biodiversity Net Gain, the strengthening of connectivity across the Site is assessed to be a positive aim.
- 2.4.1.2 Where linear habitats such as hedgerows and riparian habitats are present, strengthening will involve improving and enhancing the features themselves to link any gaps between them. Sacrificing small, linear areas of land along the linear features to create a buffer-strip or diverse field margin will also contribute to this aim.
- 2.4.1.3 Lastly, it is envisaged that hibernaculae and other refuges will be constructed within this network across the site, to provide resting places and safe refuge for terrestrial mammals, amphibians and invertebrates.
- 2.4.1.4 It must be noted that tree planting is not considered as a method to strengthen connectivity, to discourage usage of the Site by bats.

### Aim 1: Facilitate easier movement of terrestrial fauna across the entire Site

#### Objective 1.1

- 2.4.1.5 Strengthen the vegetative links between the three parcels by creating a 'green super-highway'

#### Objective 1.2

- 2.4.1.6 Where no vegetative connection is able to be strengthened, created or enhanced (likely due to positioning of the Development's infrastructure), human-made features such as culverts will be installed to facilitate continued movement of fauna.

#### Objective 1.3

- 2.4.1.7 Provide shelter for various terrestrial faunal species along the 'green super-highway'.

#### Prescription 1.1

- 2.4.1.8 Identify a route for the 'green super-highway' across the site with input from the Project Ecologist or ECoW, through study of the habitat classification maps and proposed Development footprint.

- 2.4.1.9 The route must avoid large features of infrastructure, such as turbines, structures, substations, energy storage buildings and other 'permanent' features, due to considerations for structural integrity.

#### Prescription 1.2

- 2.4.1.10 Once identified, feasibility of the route must be confirmed with both the landowners and the developer, and then agreed with both parties and NRW.

- 2.4.1.11 Specific linear areas of habitat to be sacrificed for the creation of buffer areas or field margins must be agreed with landowners, and will ideally be stock-fenced to prevent overgrazing.

- 2.4.1.12 Management to improve condition of hedgerows or other habitat must also be devised, once the route is known, and also agreed between landowner and developer.

#### Prescription 1.3

- 2.4.1.13 Where the route intersects with other features of proposed Development infrastructure (access track, other areas of hard standing) the design considerations must include for a culvert or similar to be installed underneath to permit continued access by fauna.

- 2.4.1.14 Culvert design is recommended to follow the specifications in the GCN Conservation Strategy (Technical Appendix 8-10).

#### Prescription 1.4

- 2.4.1.15 Create various designs of hibernaculae integrated within the 'green super-highway'. These are proposed to be entirely stock-fenced to prevent interference from livestock. Construction will follow instructions and suggestions laid out in the section entitled 'Special Newt Conservation Measures' (Langton, Beckett & Foster, 2001).

#### Prescription 1.5

- 2.4.1.16 Install a variety of features for the benefit of invertebrate fauna, such as 'bug hotels' and other refuges. Features must be installed in appropriate positions and facing suitable aspects.

## 2.5 Strengthen connectivity between ponds.

- 2.5.1.1 Indirect impacts to great crested newts from the development include fragmentation of habitats and potential severance of potential dispersal routes between the Pond 3 cluster and Pond 6, the nearest known pond, located 1.5km to the east. It is considered that the great crested newt population observed in the Pond 3 cluster are relatively isolated in the landscape and at risk of experiencing a genetic bottleneck (Anderson, Fog & Damgaard, 2004) and therefore collapse of the population (Caplins *et al.* 2014).

- 2.5.1.2 At present, habitat that occurs along the margins of the Custogion Brook is suitable for great crested newt terrestrial movement. However, the existing access track crosses the Brook and will be reinforced and redesigned to enable it to take construction and operational vehicular activity.

### Aim 1: Allow great crested newt population on site to receive new individuals, as well as allow existing members of the population to disperse.

#### Objective 1.1

- 2.5.1.3 Strengthen terrestrial link between the Pond 3 cluster and Pond 6.

#### Objective 2.2

- 2.5.1.4 Strengthen the Site's overall connectivity, particularly between the Southern parcel (Compensation Area) using the proposed 'green super-highway'.



**Prescription 1.1**

- 2.5.1.5 Install amphibian culverts beneath the access track either side of the Custogion Brook. This will allow uninhibited crossing of the access track by amphibians, including great crested newt, without risk of vehicular collision. On both sides of the access track and either side of the entrance to the culvert, a guide wall / linear deflector feature must be installed to guide GCN into the culvert and prevent them from crossing over the top. The top wall or 'ceiling' of the culvert is to be a porous metal grille to allow rainfall to enter the culvert, to keep the interior damp.
- 2.5.1.6 Success of amphibian culverts is documented in a variety of empirical studies (for example, Karthaus, 1985; Dexel, 1989; Langton, 1989; Rosell *et al.* 1997) although it is noted that the design of the culvert and guide fence is critical in the success of the scheme (Meinig, 1989).
- 2.5.1.7 Details of the culvert design and guiding fence are provided in the GCN conservation strategy (Technical Appendix 8.10).

**Prescription 1.2**

- 2.5.1.8 Construct habitat enhancement features to provide terrestrial habitat suitable for great crested newt throughout the year. This will provide additional terrestrial shelter for great crested newts travelling between the two ponds to shelter en-route, decreasing risk of predation or desiccation.
- 2.5.1.9 Two hibernacula are recommended to be constructed, made from logs, stones, inert rubble, soil and turf. These are proposed to be entirely stock-fenced to prevent interference from livestock. Construction will follow instructions and suggestions laid out in the section entitled 'Special Newt Conservation Measures' (Langton, Beckett & Foster, 2001). Locations proposed are provided in Figure 5.

**Prescription 1.3**

- 2.5.1.10 For prescription(s) relating to the proposed 'green super-highway' please refer to Section 2.4

**Aim 2: Encourage great crested newt to breed on site and remain within the vicinity of the Pond 3 cluster.**

**Objective 2.1**

- 2.5.1.11 Enhance terrestrial habitats surrounding the Pond 3 cluster.

**Objective 2.2**

- 2.5.1.12 Prevent degradation of the terrestrial habitat surrounding the Pond 3 cluster.

**Prescription 2.1**

- 2.5.1.13 Create habitat enhancement features to provide more high-quality terrestrial shelter in close proximity to the ponds, to encourage higher numbers of great crested newt.
- 2.5.1.14 It is recommended that two more hibernacula are constructed within the currently-fenced area of surrounding the Pond 3 cluster. These will follow the same construction and method as previously described, laid out by Langton, Beckett & Foster (2001). Proposed locations are provided in Figure 5.

**Prescription 2.2**

- 2.5.1.15 During the 2020 population size class assessment, whilst the Pond 3 cluster was surrounded with stock fencing, sheep had still managed to breach the fence. It is recommended that the existing stock fencing and gate are upgraded, to prevent future degradation of the habitat, and checked on a regular basis in line with standard stock management practice. It is also recommended that managed grazing as a practice is undertaken within the area once a year, to control the vegetation but not decimate it.

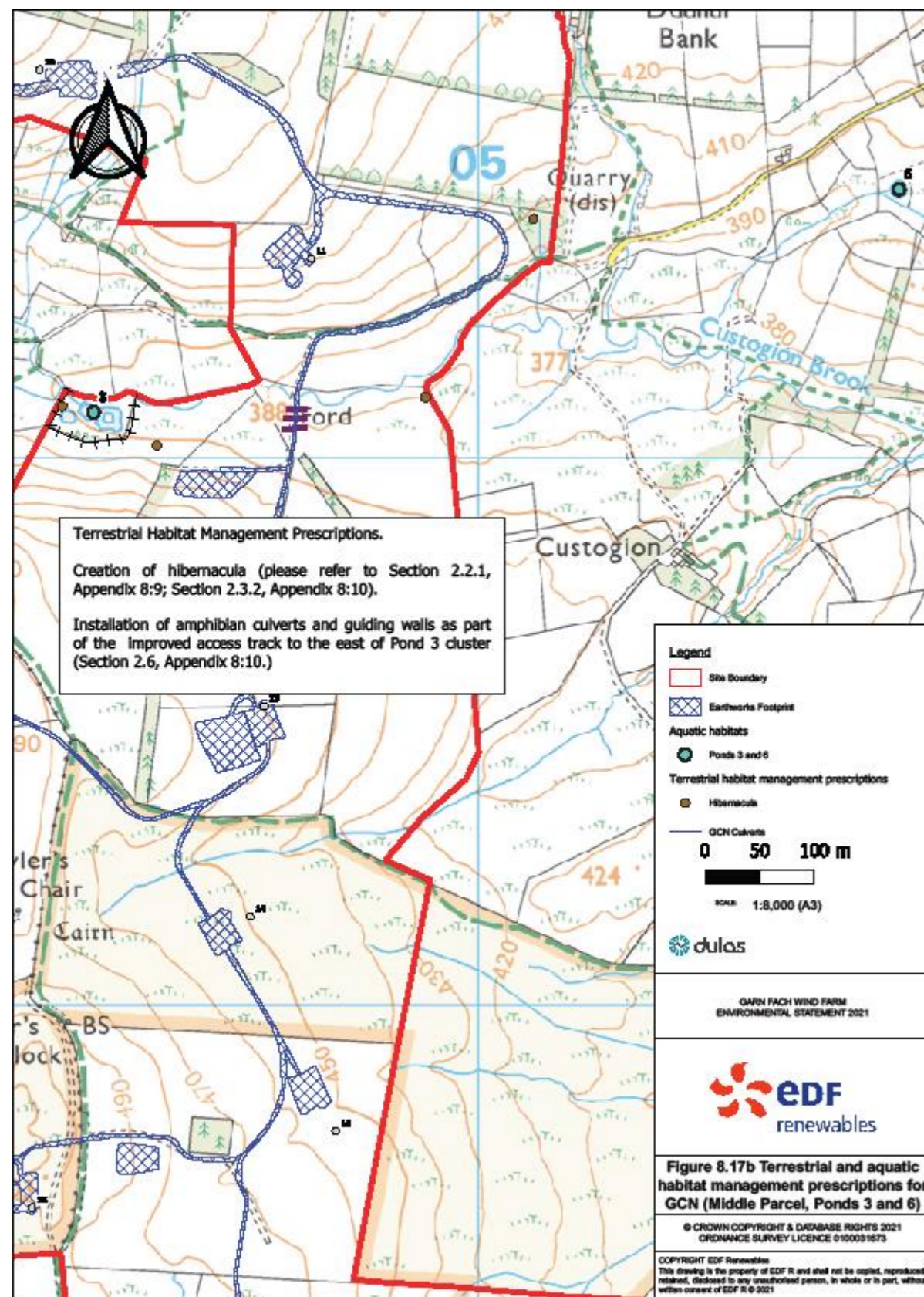


Figure 5: Figure 8.17b of the EclA, highlighting locations of proposed hibernacula and culverts

### 3 Monitoring

3.1.1.1 Methodology for all monitoring effort will be agreed in advance with Natural Resources Wales and any other relevant statutory consultees.

#### 3.2 Vegetation surveys

3.2.1.1 Vegetation surveys undertaken by a suitably qualified and experienced ecologist would monitor the success of bog habitat restoration and enhancement, and highlight the need for any further management measures. Surveys would collect data on the structure and composition of the vegetation, and plant species abundance and diversity from permanent quadrats in the restored areas.

3.2.1.2 Monitoring would commence in the summer of year 1 of the implementation of the HMP proper (during the first year of operation of the Proposed Development) and would be repeated during the operational life of the Proposed Development, i.e. following initial baseline surveys in year 1, surveys would also occur in years 5 and 10 on the basis of similar observations made by Gaffney et al. (2020). The requirement for longer-term monitoring would be subject to the ongoing review of the results and agreements with statutory consultees. This is relevant for both habitats with the northern and central parcels as well as within the southern parcel.

3.2.1.3 Monitoring of drainage damming to record progress in completion of the physical works to install, maintain and where necessary repair such features. This monitoring would be best completed by wind farm operations staff over the course of the first five years of operation of the wind farm. Any faults or issues identified during this monitoring would be addressed as soon as possible.

#### Peat Dam and Trench Bund Monitoring

3.2.1.4 Any peat dams and trench bunding within the Site would be inspected by a suitably qualified ecologist during installation and each year thereafter until Year 3 of operation, reducing to one inspection every five years during the remainder of the operational period.

3.2.1.5 Any leakage around dams or failing dams/trench bunds would be notified and remedial measures, such as extending dams or re-building the trench bunds, would be considered.

3.2.1.6 After ten years an assessment should be made to identify whether further locations for additional dams/trench bunding would provide further improvements to habitat quality.

### 3.3 Southern Parcel

#### Habitat Features

3.3.1.1 Monitoring of terrestrial habitat for the presence / likely absence of GCN is more difficult as the animals are highly secretive during the day. Due to the ecological nature of the monitoring work, it is recommended that monitoring is conducted by an ecologist.

3.3.1.2 Therefore, the integrity and condition of the habitats and features will be appraised each year of the lifetime of the Development, rather than searching for the presence of individual newts; such searching activity may negatively impact the habitat feature in question.

3.3.1.3 Condition assessments may follow the methodology for the Biodiversity Net Gain Metric. Photographic evidence will be taken to make visual comparisons. Stock fencing that surrounds the hibernacula features will be inspected to ensure effectiveness and repairs recommended where necessary. A log detailing all inspections made and any actions taken will be kept by the person conducting the monitoring, which will be passed to the licensee / developer. It is the licensee / developer's responsibility to action any remedial works.

#### **Invertebrate abundance**

- 3.3.1.4 An entomological survey is recommended to be conducted across the southern parcel at the time that the management prescriptions are implemented, in order to gather baseline data.
- 3.3.1.5 Surveys should include for ground-dwelling invertebrates as well as for those that fly, following best-practice guidance and recognised methodologies for various taxological groups.
- 3.3.1.6 Following the initial survey, repeat efforts are recommended in years 2, 3, 5 and 10 of the operational life of the Development, with any additional requirement for monitoring identified toward the end of the monitoring period.
- 3.3.1.7 It is advised that such surveys are conducted by an experienced entomologist or entomological surveyor.
- 3.3.1.8 The main objective of this monitoring will be to assess the diversity of invertebrate species within the southern parcel and to establish the success of the aims of this document.

#### **Birds**

- 3.3.1.9 A four-visit upland breeding bird survey should be completed in years 1, 2, 3, 5 and 10 of the operational life of the Development, with any additional requirement for monitoring identified toward the end of the monitoring period. Surveys will be undertaken by a suitably experienced and qualified ecologist or ornithologist, and will observe standard breeding bird survey methodologies.
- 3.3.1.10 The main objective of this monitoring will be to assess the status of breeding curlew on the southern parcel and to establish the success of the habitat management measures.

#### **Great crested newt**

- 3.3.1.11 To allow the chance of great crested newt to disperse throughout the landscape and find the new pond, it is recommended that the first five years' monitoring of the pond comprises an appraisal of the condition of the pond only. This can be done by conducting Habitat Suitability Assessments (HSI) for the pond. The new pond and any scrapes/ephemeral ponds must be given a numerical reference, and must be added to the Wales Great Crested Newt Monitoring Scheme.
- 3.3.1.12 Following conclusion of the five years' HSI assessments, a further five consecutive years' effort of presence / absence surveys will be undertaken to establish success of the habitat management. A modified methodology is recommended to avoid disturbing GCN in new habitat, with two methods only proposed during each effort: torchlight surveys and egg searches. Egg searches may be augmented by the use of egg-strips.

3.3.1.13 If great crested newt presence is detected in any of these five years, the surveys will automatically progress to a population size class assessment.

3.3.1.14 If great crested newt presence is detected, a further two years' monitoring is recommended in alternate years. For example, if presence is detected in year 3 of presence / absence surveys, then a population size class assessment will be completed in year 3, and then in year 5 and 7.

3.3.1.15 If great crested newt presence is not detected in any of these five years, remedial action will be taken to increase the likelihood that GCN will colonise the pond.

3.3.1.16 Full details of the monitoring effort are provided in the great crested newt conservation strategy – Technical Appendix 8-10, inclusive of thresholds against which the results of the monitoring effort will be compared to assess whether remedial action is required.

### **3.4 Habitat Connectivity within the Site**

#### **Condition of the Proposed Features**

- 3.4.1.1 Monitoring of terrestrial habitat for the presence / likely absence of GCN is more difficult as the animals are highly secretive during the day. Due to the ecological nature of the monitoring work, it is recommended that monitoring is conducted by an ecologist.
- 3.4.1.2 Therefore, the integrity and condition of the habitats and features will be appraised each year of the lifetime of the Development, rather than searching for the presence of individual newts; such searching activity may negatively impact the habitat feature in question.
- 3.4.1.3 Condition assessments may follow the methodology for the Biodiversity Net Gain Metric. Photographic evidence will be taken to make visual comparisons. Stock fencing that surrounds the hibernacula features will be inspected to ensure effectiveness and repairs recommended where necessary. A log detailing all inspections made and any actions taken will be kept by the person conducting the monitoring, which will be passed to the licensee / developer. It is the licensee / developer's.

#### **Presence of Great Crested Newt**

- 3.4.1.4 Surveying for the presence of terrestrial great crested newt is typically time-consuming and yields poor results in comparison with actual population sizes (English Nature, 2001). Monitoring methods stated here are proposed as a complimentary method in addition to the monitoring of the condition of the features.
- 3.4.1.5 Following the commencement of operations, three years of monitoring of the success of the hibernacula will be established. This will be done by way of 1m x 1m square carpet tiles, placed strategically around all four proposed hibernacula within the Site. These squares will be placed within any proposed stock fencing, to prevent interference. Great crested newts will shelter beneath these tiles, with any rain enhancing their efficacy as they will prevent desiccation of amphibians by holding water. These squares will be checked monthly for a period of 3 years by a licensed ecologist, in all months aside from November, December, January and February.

### 3.5 Reporting

- 3.5.1.1 Reports will be submitted to Natural Resources Wales no later than six months following the survey in each monitoring year. The reports would highlight the management measures completed to date, the results of the surveys and any measures proposed for the next reporting period. The results would be regularly reviewed by the HMP management team, in consultation with landowners, to ensure the HMP objectives are being met and to determine any appropriate amendments, where practicable.

### 3.6 Ecological Compliance Audit

- 3.6.1.1 An Ecological Compliance Audit will be implemented for all ecological avoidance, mitigation and compensation works. For each identified ecological feature the audit shall identify Key Performance Indicators (KPI's) that are to be used for the purposes of assessing and evidence compliance to all identified ecological actions.

## 4 References & Bibliography

- Andersen, L. W., Fog, K., & Damgaard, C. (2004). *Habitat fragmentation causes bottlenecks and inbreeding in the European tree frog (Hyla arborea)*. Proceedings of the Royal Society of London. Series B: Biological Sciences, 271(1545), 1293-1302.
- Bain, C.G., Bonn, A., Stoneman, R., Chapman, S., Coupar, A., Evans, M., Gearey, B., Howat, M., Joosten, H., Keenleyside, C., Labadz, J., Lindsay, R., Littlewood, N., Lunt, P., Miller, C.J., Moxey, A., Orr, H., Reed, M., Smith, P., Swales, V., Thompson, D.B.A., Thompson, P.S., Van de Noort, R., Wildson, J.D., and Worrall, F., (2001) *IUCN UK commission of inquiry on peatlands*. IUCN UK Peatland Programme, Edinburgh
- Baker, J., Hoskin, R., & Butterworth, T. (2019) *Biodiversity net gain. Good practice principles for development. Part A: A practical guide*. CIRIA, London
- Berg, Å. (1992). *Factors affecting nest-site choice and reproductive success of Curlews Numenius arquata on farmland*. Ibis, 134(1), 44-51.
- Caplins, S. A., Gilbert, K. J., Ciotir, C., Roland, J., Matter, S. F., & Keyghobadi, N. (2014). *Landscape structure and the genetic effects of a population collapse*. Proceedings of the Royal Society B: Biological Sciences, 281(1796), 20141798.
- Dexel R. (1989) *Investigations into the protection of migrant amphibians from the threats from road traffic in the Federal Republic of Germany - a summary*. Amphibians and Roads: Proceedings of the Toad Tunnel Conference, Rendsburg, Federal Republic of Germany, 43-49.
- English Nature (2001) *Great crested newt mitigation guidelines*. English Nature, Peterborough
- Gaffney, P. P., Hugron, S., Jutras, S., Marcoux, O., Raymond, S., & Rochefort, L. (2020). *Ecohydrological change following rewetting of a deep-drained northern raised bog*. Ecohydrology, 13(5), e2210.
- Karthus G. (1985) *Schutzmaßnahmen für wandernde amphibien vor einer gefährdung durch den Straßenverkehr - beobachtungen und erfahrungen*. Natur und Landschaft: Zeitschrift für Naturschutz und Landschaftspflege, 60, 242-247.
- Langton T. (1989) *Tunnels and temperature: results from a study of a drift fence and tunnel system for amphibians at Henley-on-Thames, Buckinghamshire, England*. Amphibians and Roads: Proceedings of the Toad Tunnel Conference, Rendsburg, Federal Republic of Germany, 145-152.
- Langton, T.E.H, Beckett, C.L, Foster J.P, (2001). *Great crested newt conservation handbook*. Froglife, Halesworth. ISBN 0952110644
- Meinig H. (1989) *Experience and problems with a toad tunnel system in the Mittelgebirge region of West Germany*. Amphibians and Roads: Proceedings of the Toad Tunnel Conference, Rendsburg, Federal Republic of Germany, 59-66.
- Norrdahl, K., Suhonen, J., Hemminki, O., & Korpimäki, E. (1995). *Predator presence may benefit: kestrels protect curlew nests against nest predators*. Oecologia, 101(1), 105-109.

Rosell, C., Parpal, J., Campeny R., Jove S., Pasquina A., & Velasquo J.M. (1997) *Mitigation of barrier effect on linear infrastructures on wildlife*. pp 367-372 Habitat Fragmentation & Infrastructure. Ministry of Transport, Public Works and Water Management, Delft, NL

RSPB (undated) *Land management for wildlife – Curlew (Numenius arquata)*. RSPB, Bedfordshire, UK

Scottish Natural Heritage (2016). *Planning for development: what to consider and include in Habitat Management Plans – version 2*. Scottish Natural Heritage, Inverness

Valkama, J., Currie, D., & Korpimäki, E. (1999). *Differences in the intensity of nest predation in the curlew Numenius arquata: A consequence of land use and predator densities?* *Ecoscience*, 6(4), 497-504.

Welsh Wildlife Trust (undated) *How to build a hibernaculum for amphibians and reptiles*. [online] Accessed 24/06/2021. Available at: <https://www.wtwales.org/actions/how-build-hibernaculum-amphibians-and-reptiles>