Landscape and Ecological Management Plan

Solar Farm at Forest Gate, Pewsham, Chippenham

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Prepared for Eden FG Solar Ltd

by
Wychwood Biodiversity

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Table of Contents

Introduction *4*

Landscape and Ecological Management Plan *6*

Grassland habitats **6**

Diverse grassland 6

Tussock margins 7

Species-rich grassland 8

Woody habitats **9**

Hedgerows 9

Scrub 11

Woodland 13

Wetland Habitats **14**

Scrape 14

Ponds 15

Nest boxes and refugia **16**

Hibernacula and log piles 16

Bird boxes 17

Bat boxes 17

Solitary bee and insect hotels 18

Beehives 19

Maintenance schedule *21*

Monitoring *23*

Grassland habitats **23**

Woody habitats **24**

Wetland habitats **24**

Legal and funding mechanisms *25*

References *26*

Introduction

This Landscape and Ecological Management Plan has been prepared to discharge Condition 8 of planning permission PL/2021/06112 (Wiltshire Council, 2023), for the approved solar farm at Forest Gate, Pewsham, Chippenham, Wiltshire. Condition 8 stipulates that a Landscape and Ecological Management Plan (LEMP) is developed to ensure the long-term management of landscape and ecological features retained and created by the development, for the benefit of visual amenity and biodiversity for the lifetime of the scheme.

To fulfil the criteria outlined in Condition 8, this LEMP details the long-term objectives and targets, management responsibilities and maintenance schedules for each ecological feature within the development, together with a mechanism for monitoring success of the management prescriptions, and review and necessary adaptive management measures in order to attain targets. This document also includes details of the legal and funding mechanisms by which long-term implementation of the plan will be secured. This report does not include details of habitat establishment prescriptions; this information is provided in the Biodiversity Management Plan (BMP) (Wychwood Biodiversity, 2022b).

This report is divided into four principal sections:

1. **Landscape and Ecological Management Plan**: This section covers all new habitats and habitat enhancements proposed in the BMP; outlines the desired habitat classification and condition objectives for each, referring to UKHab classification criteria (Butcher et al, 2020) where possible; and provides corresponding management prescriptions to achieve the objectives.

2. **Management Schedule**: This section is presented in two management tables. The first table indicates the recommended timings that each management activity should take place and the second table specifies the years and regularity in which these activities should take place over the lifespan of the installation.

3. **Monitoring Plan**: This section provides a summary of the monitoring plan, drawing from the monitoring report (Wychwood Biodiversity 2023a) and details the remedial measures required to address issues with the developing habitats, should they arise.

4. **Legal and Funding Mechanisms**: The final section details the legal and funding mechanisms by with long-term implementation of the plan will be secured.

This LEMP shall be implemented in full and for the lifetime of the development in accordance with the approved details.



Figure 1. Forest Gate site and field numbers

Landscape and Ecological Management Plan

This section covers all new habitats and habitat enhancements proposed in the BMP. It outlines the desired habitat classification and condition objectives for each, referring to UKHab classification (Butcher, B, 2020a) and Natural England's Habitat Condition Assessment (Natural England, 2021b) criteria where possible, and provides corresponding management prescriptions to achieve the objectives.

Grassland habitats

Diverse grassland

Diverse grassland will be established throughout the existing field of cropland (Field 7); and any areas of existing grassland within the site damaged during construction. The seed mix would comprise at least six native grass species, ideally from a suitable local source to match the existing soil conditions.

See BMP for details of grassland establishment methods (Wychwood Biodiversity, 2022b).

Long term objectives

At a minimum, the diverse grassland should match the UKHab classification for 'modified grassland' - good condition by satisfying the following criteria:

- 6-8 vascular plant species are present per m², including at least 2 forbs (this criterion is essential for achieving Moderate or Good condition).
- A varied sward height throughout (at least 20% is less than 7 cm tall and at least 20% is more than 7 cm tall), which creates beneficial microhabitats for wildlife.
- Physical damage is evident in less than 5% of the total grassland area.
- Cover of bare ground is evident in less than 10% of the total grassland area.
- Invasive non-native plant species (as listed on Schedule 9 of WCA4) will not be present anywhere within the grassland.

With appropriate management, the botanically diverse grassland will, over time, comprise a combination of tussocks and low vegetation to provide a range of micro-habitats for invertebrates and plants that colonise through natural means. Furthermore, it is expected that the permanent grassland will improve the health of the soil and help to limit the impacts of drought and flooding in the local area.

As a broader objective, established and diverse grasslands should provide a mechanism to clean air and capture carbon, making them an important habitat to combat climate change.

Management responsibilities

Grassland throughout the solar arrays (between and underneath solar panels) will be managed with a combination of cutting (for hay if possible), and low-level sheep grazing.

- Annual cutting regime - On the existing modified grassland in Fields 1-6 and 8-10 cutting will take place once or twice a year leaving a sward height of 150mm. Typically, the cut will take place in late July, however on every third year, the cut will be undertaken in August to support

the late flowering plants. Cutting late in the season allows sufficient time for the seeds to mature and fall naturally, which regenerates the grassland and provides a key food source for several species of seed eating birds and mammals. An early season cut in March or early April may also be necessary to control weeds.

Additional occasional cutting - a cut early in the growing season may be necessary to prevent the grasses from overshadowing the solar panels. If this is required, a strip cut is recommended, which would be limited to the area beneath the leading edge of the affected panels, leaving all other areas of grassland intact. In addition, cutting may be required in Field 7 during the first 3 years. This is recommended to control weeds that have developed while the new grassland is establishing.

Following grass cutting activities, the arisings will be removed wherever possible. If removal is not feasible, a mulching mower will be used to cut, which mechanically mulches the arisings allowing them to degrade evenly across the grassland.

- Grazing - low level sheep grazing will be initiated in all fields, using no more than 6 sheep per hectare. This is the recommended stocking rate to achieve a varied sward height throughout, and to foster botanical diversity. During wetter periods, the density of livestock will be reduced to limit the amount of ground exposed through treading; exposed ground and sward break-up can lead to the colonisation of unwanted and aggressive weed species. Stock densities will be increased if there is a rise in the amount of uneaten grass, vigorous unpalatable grasses, and a reduction in low growing flora.
- Weed control - Perennial weeds such as creeping thistle will be treated if they become a widespread problem; however, with appropriate grassland management these species should disappear over time. If plant species listed by DEFRA as invasive (UK Government, 2020) are found, the advice of suitably qualified ecologist would need to be sought.

Tussock margins

Tussock grassland will be established along the margins throughout the site, between the security fence and the boundary hedgerows (excluding Field 4). The seed mix will comprise native coarse grass species and wild flowers.

See BMP for details of grassland establishment methods (Wychwood Biodiversity, 2022b).

Long term objectives

At a minimum, the diverse grassland should match the UKHab classification for 'modified grassland' - good condition by satisfying the following criteria:

- 6-8 vascular plant species are present per m^2, including at least 2 forbs (this criterion is essential for achieving Moderate or Good condition).
- A varied sward height throughout (at least 20% is less than 7 cm tall and at least 20% is more than 7 cm tall), which creates beneficial microhabitats for wildlife.
- Physical damage is evident in less than 5% of the total grassland area.
- Cover of bare ground is evident in less than 10% of the total grassland area.

- Invasive non-native plant species (as listed on Schedule 9 of WCA4) will not be present anywhere within the grassland.

With correct management, tussock grass margins will support a diverse range of insect species in abundance, which will help support birds during the breeding season, particularly those nesting in adjacent hedgerows, and potentially the margins themselves. Furthermore, the seeds produced in late summer and autumn are likely to support small mammal populations, such as field vole *Microtus agrestis* and harvest mouse *Micromys minutus*, which are the ideal quarry for barn owl *Tyto alba* and common kestrel *Falco tinnunculus*. During the winter months the tussock margins will provide a beneficial habitat for over-wintering invertebrates, particularly spiders; and hibernating reptiles and amphibians that burrow into the earth.

Management responsibilities

To maintain the desired structure and foster botanical diversity, the site margins (including all areas outside of the security fence, where possible) will be cut on rotation every 2-3 years in winter or spring, reducing the sward height to 150mm. Cutting should avoid periods of prolonged rain. It is recommended that one half of the tussock grassland margins be retained intact at any one time.

Following grass cutting activities, the arisings can be left in place throughout the margins, though ideally, they should be removed wherever possible or mulched.

Species-rich grassland

Species rich grassland will be established along the margins of Field 4, between the security fence and boundary hedgerows. The seed mix would comprise native wild flower and fine grass species sourced from local species-rich sites, or from commercial suppliers if required. The seed mix will also include yellow rattle *Rhinanthus minor*, and ideally a cover crop of cornfield annuals.

See BMP for details of grassland establishment methods (Wychwood Biodiversity, 2022b).

Long term objectives

The species rich grassland will ideally achieve the status of g3c Other Neutral Grassland - moderate condition according to UKHab Classification, by satisfying the following criteria:

1. The grassland is a good representation of the habitat type, based on the UKHab description – the appearance and composition of the vegetation closely matches the characteristics of the specific grassland type (essential).
2. The grassland will exhibit a varied sward height throughout, (at least 20% less than 7 cm and at least 20% more than 7 cm), which creates beneficial microclimates for wildlife.
3. Species indicative of sub-optimal condition and physical damage to the ground, combined, will account for less than 5% of the total grassland area.
4. If any bare ground is present, it will cover less than 5% of the total grassland area.
5. If bracken is present, it will cover less than 20% of the total grassland area.
6. If scrub is present (incl. bramble) it will cover less than 5% of the total grassland area.
7. Invasive non-native plant species (as listed on Schedule 9 of WCA4) will not be present anywhere within the grassland.

With correct management, the species rich grassland in Field 4 will develop into a valuable habitat for a range of plants and animal species, enhancing the invertebrate abundance and diversity on site, providing food for birds, bats and herptiles. The seed heads produced in late summer and autumn will serve as a foraging resource for small mammals, and seed eating birds such as yellowhammer *Emberiza citrinella* and common linnet *Linaria cannabina*, which gather in flocks after the breeding season. The grassland will support native wild flower species found in the local area, which will be important food sources for pollinating bees, butterflies, and moths. In addition, it is expected that the permanent grassland will improve the health of the soil and help to limit the impacts of drought and flooding in the local area.

As a broader objective, established and diverse grasslands provide a mechanism to clean air and capture carbon, making them an important habitat to combat climate change.

Management responsibilities

To create a suitable commuting terrestrial habitat for great crested newts, the species rich grassland will be cut each year in winter, reducing the sward height to 150mm. Arisings are to be collected and moved off the field. Cutting should avoid periods of prolonged rain.

Woody habitats

Hedgerows

Three new species rich hedgerows will be planted on site: along the security fence-line south-east of the solar farm (alongside Close Wood CWS and Derry Woods CWS); along the new west boundary of Field 3; and a wetland shrub hedge along the east boundary of Field 4, to the west of the A4. Furthermore, the existing hedgerow along the eastern boundary of Field 7 will be infilled with native shrub species; and the existing hedgerow along the eastern boundary of Field 7 will be widened by an additional 1-2m in narrow sections, using native shrub species.

See BMP for details of hedgerow establishment methods (Wychwood Biodiversity, 2022b).

A minimum of ten of the following native shrub species will be used for new hedgerows and existing hedgerow enhancements: field maple *Acer campestre*, black alder *Alnus glutinosa*, barberry *Berberis vulgaris*, European hornbeam *Carpinus betulus*, common hazel *Corylus avellana*, European spindle *Euonymus europaeus,* common honeysuckle *Lonicera periclymenum*, European crab apple *Malus sylvestris*, blackthorn *Prunus spinosa*, English oak *Quercus robur*, field rose *Rosa arvensis*, grey willow *Salix cinerea*, crack willow *Salix fragilis*, and elder *Sambucus nigra*.

For the new wetland hedgerow, the shrub species would comprise black alder, European hornbeam, and a range of willow species.

The final species lists will be confirmed in consultation with Wiltshire Wildlife Trust and other key stakeholders.

Long term objectives

Over time, the new hedgerows should match the UKHab classification of h2a hedgerow (priority habitat) - good condition. Existing hedgerows will meet the criteria for this classification where possible and will achieve good condition.

For new hedgerows only:

1. New hedgerows will comprise at least 80% UK native shrub or tree species.
2. New hedgerows will comprise a mix of 5 native shrub or tree species on average in a 30m length.

For existing hedgerows, and new hedgerows (once established):

1. Ideally, the hedgerow will be maintained to a minimum of 3m high and 3.5m wide at the base, with the aim to create an A-shaped hedgerow; considered the most valuable shape for wildlife. This shape will be thicker at the base and narrowing towards the top, allowing for more light to reach the ground flora. Further, the hedgerow should be wide enough to shelter and protect birds' nests.
2. The hedgerow will largely exhibit a dense bushy structure reaching down to ground level.
3. No gaps between the ground and base of the hedgerow canopy will reach beyond 0.5m, and will be present along less than 10% of the entire hedgerow length.
4. Gaps will comprise less than 10% of the total hedgerow length; and no canopy gaps will reach beyond 5m wide.
5. From the outer edge of the hedgerow, a minimum 1m margin of undisturbed herbaceous grassland will be present along at least 90% of the hedgerow length.
6. Plant species indicative of soil nutrient enrichment will occupy less than 20% of the ground along the hedgerow base and margin.
7. At least 90% of the hedgerow and ground along the hedgerow base and margins will be free of invasive non-native plant species (including those listed on Schedule 9 of WCA3) and recently introduced species.
8. At least 90% of the hedgerow will be free of damage caused by human activities.

With correct management, the new and existing hedgerows on site will serve as unbroken corridors of woody habitat connecting with other hedgerows and woodland in the surrounding countryside. This network of woody habitats will be particularly beneficial to commuting and foraging bats, along with hedgehogs, amphibians, and reptiles. Providing the desired shape is maintained, the hedgerows will continue to support a range of nesting birds; and provide valuable foraging habitat for birds during the winter, such as fieldfare *Turdus pilaris* and redwing *Turdus iliacus*, which will utilise the annual crop of berries.

As broader objectives, the intact hedgerows should improve the health of the soil and help to limit the impacts of drought and flooding in the local area.

Management responsibilities

Once established, hedgerows on site will be managed with a cutting regime on a 3-year cycle.

For new hedgerows only:

- Protective guards and stakes will be checked at a minimum once per year and adjusted or removed as required, with a preference for removal once hedge plants are well established. Biodegradable guards should be composted, and wooden stakes re-used or piled in suitable locations onsite, to be determined at the time.

- Where significant areas of dead shrubs are identified, it may be necessary to investigate the underlying causes of failure, which could include drainage issues, inadequate soil nutrition, or

the use of unsuitable species for that specific location. Once the underlying cause is identified and addressed, the shrubs should be replaced with species that are better adapted to tolerate such conditions.

- To encourage growth and strength at the shrub base, light trimming is to be carried out in late winter prior to the start of the bird nesting season (1st March). This activity should be undertaken on new hedgerows in years 2-5. Following this, the hedgerows will be established enough for the following the management prescriptions to be applied.

For existing hedgerows (and new hedgerows once established):

- Following a three-year cycle, cutting will take place on alternate lengths of hedgerows to ensure there is a consistent supply of winter berries for birds and mammals. Cutting alternate sides per year can also be undertaken, ensuring one side is left uncut to maximise flowering and fruiting in any year. A maximum of 50% of the hedgerows on site will be cut in any one year.
- Cutting is to be carried out in late winter to prolong habitat resources during winter but prior to the start of the bird nesting season (1st March).
- The tops of the hedgerows will be cut no lower than 3m, and if possible, hedgerows will be allowed to grow to 4m. Sides will be cut less intensively, aiming to retain a width of 3.5m.

Scrub

Areas of native mixed scrub will be planted in the following locations on site:

1. Around the new scrape in the north of Field 4.
2. Around three new ponds (one in Field 6 and two in Field 7).
3. In the southeast corner of Field 1, the south corner of Field 3, the east corner of Field 4, the west corner of Field 5, and the western corner of Field 7.
4. Around inverter buildings across the site.

Scrub areas will be planted with a combination of the following species: field maple, black alder, barberry, European hornbeam, common hazel, common hawthorn, European spindle, common holly, common honeysuckle, wild cherry, blackthorn, field rose, white willow *Salix alba*, goat willow *Salix caprea*, and elder. Scrub will be allowed to expand as far as possible into the margins and low wooden fencing will be used to prevent mowing in wider sections.

See BMP for details of scrub establishment methods (Wychwood Biodiversity, 2022b).

Long term objectives

Over time, the scrub areas should match the UKHab classification for h3h Mixed Scrub – moderate condition by satisfying the following criteria:

1. Scrub areas will comprise a mixture of species without a single species dominant.
2. Scrub areas will generally remain under 5m tall with continuous (>90%) cover.
3. At least 80% of each scrub area will comprise native shrub species, with at least three native woody species present (except common hazel, which can be up to 100% cover).

4. Where possible, no single species will comprise more than 75% of the cover (except common hazel, which can be up to 100% cover).
5. Invasive non-native plant species (as listed on Schedule 9 of WCA4) will not be present within the scrub areas, and species indicative of sub-optimal condition[1] make up less than 5% of the ground cover.
6. Where possible, the scrub areas will exhibit a well-developed edge with scattered scrub and tall grassland and or forbs present between the scrub and adjacent habitat.
7. The scrub areas will contain clearings, glades, or rides, providing sheltered edges.

With correct management, the native scrub areas will offer valuable nesting opportunities for a range of bird species, particularly warblers, such as garden warbler *Sylvia borin* and Eurasian blackcap *Sylvia atricapilla*. Dense areas can also provide suitable nesting and hibernating habitat for small mammals such as European hedgehog *Erinaceus europaeus*; and will also act as a frost proof shelter for birds, reptiles, and amphibians during harsh winter conditions.

The diverse selection of shrub species will also provide a rich foraging resource, supporting insect populations during the spring and summer for the benefit of birds and bats, and yielding berries and nuts in the autumn and winter for migratory thrushes, and small mammals.

Management responsibilities

The ground around newly planted scrub whips will require weeding, or mulching using woodchips or straw, this will limit competitive vegetation; a diameter of 1m of mulch around each plant will suppress weeds and retain soil moisture. Brambles should be retained in established areas; a species that provides a valuable nesting habitat and food source for several bird species such as the amber listed common whitethroat *Sylvia communis* and Eurasian wren *Troglodytes troglodytes*.

Scrub management should be limited to removing protective guards after 3-5 years. No cutting should be necessary in this period, as scrub can thrive when left unmanaged. An assessment may be required after the first season's growth to determine whether protective measures, such as deer fencing, will need to be implemented; excessive browsing from deer can destroy young shrubs. To limit the growth of unwanted grasses and encourage bramble growth, areas of grassland around scrub can be left uncut. Furthermore, stumps and dead trees are important for fungi and invertebrates and should be retained in woodpiles or left standing where possible. Cutting with a flail may be necessary to control scrub growth at the edge of the scrub area.

Additional scrub will be allowed to develop in the solar farm margins next to hedgerows wherever there is a suitable space. This will be achieved by ceasing mowing in such areas and allowing plants to colonise naturally. This will be reviewed after the first 3 years of site operation.

[1] Species indicative of sub-optimal condition for mixed scrub may include non-native conifers, tree-of-heaven *Alianthus altissima*, holm oak *Quercus ilex*, European turkey oak *Quercus cerris*, cherry laurel *Prunus laurocerasus*, snowberry *Symphoricarpos spp*., shallon *Gaultheria shallon*, American skunk cabbage *Lysichiton americanus*, buddleia *Buddleja spp*., cotoneaster *Cotoneaster spp*., Spanish bluebell *Hyacinthoides hispanica* and hybrid bluebells *Hyacinthoides x massartiana*. There may be additional relevant species local to the region and or site.

Woodland

Two new woodland areas are to be planted on site; these will include:

1. A woodland buffer comprising a range of native trees and shrubs that will complement species found in Derry & Close Woods. This buffer will be located north of the A4, along the south boundary of Field 10 and west boundary of Field 9, and will measure a minimum of 20m wide.
2. In a section of the Field to the south of the A4.

Both woodland areas will include the following tree and shrub species: field maple, European hornbeam, common hazel, common hawthorn, European spindle, European crab apple, wild cherry, English oak, white willow, grey willow *Salix cinerea*, crack willow *Salix fragilis,* and elder.

Wild garlic *Allium ursinum* and English bluebell *Hyacinthoides non-scripta* bulbs will also be planted between the trees, which will help encourage other woodland ground flora to colonise. See BMP for details of habitat establishment methods and woodland establishment methods (Wychwood Biodiversity, 2022b).

Long term objectives

Over time, the woodland areas should match the UKHab classification of w1g other woodland, broadleaved – moderate condition according by satisfying the following criteria (good condition can only be achieved in mature woodlands):

1. No significant browsing damage will be evident within woodland areas.
2. No invasive plant species will be present within woodland areas.
3. A minimum of five native tree or shrub species will be present across each woodland area.
4. A minimum of 80% of trees and shrubs throughout the woodland areas will be native species.
5. Tree mortality will be less than 10%, and no pests, diseases or crown dieback will be evident on trees.
6. There will be recognisable woodland NVC plant communities present within the ground layer of the woodland areas.
7. There will be no evidence of no nutrient enrichment or damaged ground within the woodland areas.

With correct management in the early stages, the woodland will develop into a biodiverse habitat with the capacity to support a range of different species: fungi, lichens, mosses, and plants, as well as birds, herptiles and invertebrates. The new woodland areas will improve connectivity by strengthening existing woody habitats and will provide a natural wooded corridor and gradient from the mature trees of the existing woodland to the grassland and scrub habitats within the solar farm.

Management responsibilities

The new tree plantings will be checked by an ecologist twice a year in the first 4 years for weeds and signs of damage or disease. To help prevent weed growth, the newly planted trees will be mulched annually using woodchips or straw, with a diameter of 1-2m around each tree.

Any damaged and diseased trees are to be replaced as required; and damaged, dead, or dying branches and suckers are to be pruned out to promote healthy growth and shape. Planting replacement trees will take place between November to March, inclusive.

Tree guards, stakes and ties are to be checked and adjusted or replaced if necessary; ensuring all new plantings remain firmly bedded in the ground after strong winds and frosts or other disturbances.

Stakes, ties, and protective guards will be removed after 3-5 years or earlier if contractor checks consider this necessary. These must not be left for longer than 5 years as they will have a detrimental effect on the trees beyond this timeframe.

Wetland Habitats

Scrape

One scrape will be created in Field 4 where existing grassland forms wetland during winter. The scrape will cover an area of approximately 20m².

See BMP for details of scrape creation methods (Wychwood Biodiversity, 2022b).

Long term objectives

The scrape will exhibit a range of depths and sloping edges designed for dabbling ducks such as Eurasian teal *Anas crecca* to use deeper parts of the water, and wading birds such as green sandpiper *Tringa ochropus* to use the shallower regions to feed.

The scrape will provide a suitable foraging habitat for wading birds, through a combination of open bare earth margins and some patches of vegetation. An overgrown margin inundated with plants such as common bullrush *Typha latifolia* will deter wading birds from foraging.

Ideally, the scrape will hold water year-round, though at a minimum, from autumn to spring, when wintering wetland species are foraging in the UK. Water levels may decrease during the summer, though efforts should be made to maintain some standing water to provide breeding habitat for invertebrates, such as dragonflies and damselflies.

Some algal blooming is expected due to high sun exposure on the water's surface, however the water must remain low in nutrients to support a diversity and abundance of invertebrates.

Management responsibilities

The scrape will be checked twice during the first year, annually for the following four years and then every three years thereafter, to assess whether management measures are required. The surveyor will assess the quality of the water; check for the presence of excess vegetation within the water and along the margins and the presence of invasive or pernicious plant species; and check for evidence that the scrape is holding water at key times of the year.

If the water quality remains poor after the first 3 years, measures should be taken to remediate, this can include adding oxygenating plants.

To prevent margin vegetation from becoming overgrown, low level livestock grazing can be implemented, if possible, though annual mowing once a year may also be required during the winter months. It is important to leave a small proportion of the edges ungrazed or uncut to allow the growth of taller marginal vegetation. This will create structural diversity and habitat variety; beneficial to invertebrates and provide cover for precocial and fledgling birds.

Any pernicious plant species found within or around the scrape will be removed manually, and no chemical herbicides will be applied. If plant species listed by DEFRA as invasive (UK Government, 2020) are found, the advice of suitably qualified ecologist would need to be sought.

If the scrape is not retaining water at key times throughout the year, the scrape should be connected to a nearby water source to ensure a consistent inflow of water.

Ponds

Three new wildlife ponds will be created on site:

1. In the south corner of Field 6.
2. In the north corner of Field 7.
3. On the eastern boundary of Field 7.

Each pond will measure approximately 5m², with varying shapes and depths (0.25 – 1m), and the marginal areas will be planted with wetland herbs such as purple Loosestrife *Lythrum salicaria* and flag Iris *Iris pseudacorus*. The spoil from pond construction will be formed into bunds or beetle banks.

See BMP for details of pond creation methods (Wychwood Biodiversity, 2022b).

Long term objectives

Ideally, over time, the new ponds, and the existing pond adjacent to Field 4, will achieve the status of G19 Pond (Priority Habitat) according to UKHab Classification by satisfying one of the following criteria:

1. Presence of species of high conservation importance: Red Data Book species, UK BAP species, species fully protected under the Wildlife and Countryside Act Schedule 5 and 8, Habitats Directive Annex II species, one Nationally Scarce wetland plant species, or three Nationally Scarce aquatic invertebrate species.
2. Supports exceptional populations or numbers of key species, i.e., supporting >30 wetland plant species or >50 aquatic macro-invertebrate species; or supporting amphibians and dragonflies listed under the criteria specified for the selection of biological SSSIs.
3. Is classified in the top PSYM (Predictive System for Multimetrics) (Smith et al, 2015) category ("high") for ecological quality (i.e., having a PSYM score >75%).

For each pond, approximately 50% of the water will be remain open and void of aquatic plants; and where possible the south edge/bank of each pond will remain open to allow sunlight to reach parts of the pond for the benefit of wildlife.

The ponds will remain free from nutrification and excessive algal growth, and invasive or pernicious aquatic, marginal and terrestrial plants.

The water level of each pond will not drop significantly or dry up entirely. This can damage the ponds ecosystem. Generally, the water levels should remain consistent throughout the year.

With appropriate management, ideally the ponds will support a diverse aquatic and marginal plant community, suitable for amphibians and a range of aquatic invertebrates; and the use by reptiles (e.g., grass snake *Natrix natrix*) and dragonflies and damselflies. Birds that favour marginal vegetation to

nesting, such as Eurasian reed warbler *Acrocephalus scirpaceus* and sedge warbler is *Acrocephalus schoenobaenus*, may use the pond edges during the breeding season.

Management responsibilities

Each pond will be checked twice during the first year, annually for the following four years and then every three years thereafter, to assess whether management measures are required. The surveyor will check for scrub overshading, the presence of invasive or pernicious plant species, excessive accumulation of organic debris, excessive algal growth, and for evidence that the water levels are remaining consistent throughout the year.

If trees and scrub start shading large areas of the ponds, vegetation will be thinned to allow sunlight to return; and aquatic vegetation will be managed as needed to ensure around 50% open water is maintained. Any thinning of vegetation will be undertaken in winter.

If algae need controlling, it may be necessary to plant more scrub along the edges to increase shading or introduce oxygenating plants to the water. Nutrient levels in the water can also be reduced by removing organic debris, such as fallen leaves or branches from the surface (October to February, inclusive); and adding more oxygenating plants. Reducing nutrient levels in the water will make it more difficult for algae to persist.

Any pernicious plant species found within or around the pond will be removed manually, and no chemical herbicides will be applied. If plant species listed by DEFRA as invasive (UK Government, 2020) are found, the advice of suitably qualified ecologist would need to be sought.

To further the ecological value of the ponds, additional logs, rocks, and aquatic plants can be placed in and around the pond for the benefit of wildlife.

Nest boxes and refugia

Hibernacula and log piles

Five hibernacula built from natural materials will be installed at the base of hedgerows, within woodland or adjacent to ponds or scrapes. In the absence of suitable materials (see BMP), assembling log piles would serve as a suitable alternative. Hibernacula (or log piles) will be installed in the following locations on site:

- Within the Eastern corner of Field 1.
- Next to the scrape in Field 4.
- Near to one of the ponds in Fields 6 and 7.
- Close to the new hedgerow along the eastern boundary of Field 7.
- Along the eastern boundary of Field 8.

See BMP for details of hibernacula and log pile establishment methods (Wychwood Biodiversity, 2022b).

Long term objectives

A minimum of five hibernacula or log piles will remain functional protective features for wildlife throughout the lifetime of the installation. Applying additional materials from time to time may be required to secure this objective.

With correct assembly and maintenance, hibernacula and log piles will serve as safe and secure features for small mammals, reptiles, amphibians, and invertebrates to hibernate or retreat during the winter or harsh conditions. Hibernacula and log piles will also provide suitable foraging habitat for small animals during the active seasons, and basking areas for reptiles on sunny days.

Management responsibilities

Minimal management is required for these features, however applying additional material may be required once the initial materials have decayed, eroded or the features have collapsed. This can be undertaken year-round, taking care when applying the materials to not disturb any hibernating or sheltering animals.

Bird boxes

Four long-lasting bird boxes will be installed on suitable mature trees throughout the site. Specific bird box models are required for installation at Forest Gate to accommodate a range of different species. Schwegler boxes from www.gardenature.co.uk are recommended (as detailed below) but alternative comparable boxes could be used.

- 1x open fronted box for small perching birds (Schwegler Nest Box 2H)
- 1x vertical box for treecreepers (Schwegler Treecreeper Box 2B)
- 1x kestrel box (Kestrel Nest Box 2F)
- 1x barn owl box (NHBS Eco Barn Owl Nest Box)

See BMP for details of bird box installation prescriptions (Wychwood Biodiversity, 2022b).

Long term objectives

Four bird boxes (of the specified models) will remain clean and secure throughout the lifetime of the installation.

When correctly maintained, bird boxes will provide safe and secure nesting sites to supplement the natural features present within the local area. Bird boxes can help support existing bird populations while the larger scale habitat enhancements are developing on site.

Management responsibilities

Bird boxes will require occasional cleaning and maintenance from time to time, which will be undertaken between October and February inclusive. If a bird box has deteriorated beyond repair, it will be replaced like for like at the next available opportunity.

Bat boxes

Four long-lasting bat boxes will be installed on sturdy mature trees at field boundaries. A range of bat boxes are recommended for Forest Gate, to accommodate the range of bat species that use the site.

Woodstone and Schwegler boxes from www.gardenature.co.uk are recommended (as detailed below) but alternative comparable boxes could be used.

- 1 x "Large Multi Chamber Woodstone Bat Box"
- 1 x Schwegler "2FN Special Bat Box"
- 1 x Schwegler "Large Colony Bat Box 1FS"
- 1 x Schwegler "Bat Colony Box 2FS"

See BMP for details of bat box installation prescriptions (Wychwood Biodiversity, 2022b).

Long term objectives

Four bat boxes (of the specified models) will remain clean and secure throughout the lifetime of the installation.

When correctly maintained, the bat boxes will serve as safe and secure roosting and nesting sites to supplement the natural features present within the local area. Bat boxes will also provide valuable support for existing bat populations while the larger-scale habitat enhancements are developing on site.

Management responsibilities

Bat boxes will require occasional cleaning and maintenance from time to time outside the season of use (depending on bat box type); if a bat box has deteriorated beyond repair, it will be replaced like for like at the next available opportunity. Such works must be undertaken by a licensed bat worker (Bat Conservation Trust, 2023).

Please note - once installed, a bat box can only be opened, moved, or disturbed by a person holding the correct licence issued by Natural England (Natural England & DEFRA, 2014).

Solitary bee and insect hotels

Twelve solitary bee hotels will be positioned near wetland, scrub, ponds, and hibernation features, to provide refuge habitats for bees and other invertebrates. Several different sized hotel models are recommended to accommodate a range of insect species; some will be placed on the ground and others will be hung on fence posts or trees. See below for a recommended combination of models to install at Forest Gate:

- 4x Wildlife World - Solitary Bee Hive
- 4x ArkWildlife - Sting Tall Bug Hotel
- 2x Nurturing Nature - Award Winning Bumblebee Nest Box
- 2x Nurturing Nature – Award Winning Solitary Bee Observation Nest Box

In addition to the commercially supplied solitary bee hotels, at least two full-sized "bug hotels" will be assembled by stacking a minimum of five pallets and inserting a range of materials, i.e., bamboo canes, bricks and tiles, old flower stems, pine and fir cones and stones.

Long term objectives

Fourteen solitary bee hotels and two large bug hotels will serve as breeding and hibernation sites for bees and other invertebrates throughout the lifetime of the solar farm. Replacing features or applying additional materials from time to time will be required to secure this objective.

When correctly maintained, the bee and bug hotels will provide a safe place for invertebrates to shelter, hibernate and reproduce; thus, encouraging their populations for the benefit of plant communities, which require pollination; and to provide food for insectivorous animals that use the site.

Management responsibilities

Ideally, solitary bee hotel entrance holes will be cleaned once per year between October and February inclusive, leaving any holes in use. Every five years, all twelve solitary bee hotels will be removed and replaced like for like.

The material within larger pallet 'bug hotels' will be replaced once they have significantly decayed. The entire structure will require replacing like for like once it has begun to deteriorate.

Beehives

Beehives will be installed at suitable locations on site, each supporting a honeybee colony to ensure ongoing agricultural production. Ideally, the hives would be constructed from sustainably sourced logs, such as those available from Bee Kind Hives (https://beekindhives.uk/the-log-hive/). The appropriate number of beehives for installation at Forest Gate will be determined by the local beekeepers responsible for maintenance.

Long term objectives

With appropriate maintenance, the beehives installed on site will provide a clean and secure accommodation for honeybee colonies, allowing for the production and collection of honey. The ongoing presence of honeybee colonies on site will benefit the plant communities by delivering a reliable source of pollinators annually.

Management responsibilities

Beehives will be maintained by experienced local beekeepers throughout the year. Such persons will tend to the colonies, clean, and maintain the hives, and harvest honey.

Figure 2. LEMP MAP



Maintenance schedule

The management schedule is presented in two tables. Table 1. indicates the optimal months that each management activity should take place, and Table 2. specifies the years and regularity in which these activities should take place over the lifespan of the solar farm.

Table 1. Optimal months for undertaking habitat management activities.

Broad habitat type	Habitat features	Management activity	Time of year											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grassland	Diverse grassland	Cutting												
		Grazing												
	Tussock margins	Cutting												
	Species-rich grassland	Cutting												
Woody habitats	New hedgerows	Guard and stake removal												
		Light trimming new hedgerows												
		Shrub replacement												
	Existing and new hedgerows (once established)	Cutting												
	Scrub	Weeding and mulching												
		Guard and stake removal												
	Woodland	Weeding and mulching												
		Tree replacement												
		Guard and stake removal												
Wetland habitats	Scrape and ponds	Mowing marginal vegetation												
		Thinning shrub and trees with cutting												
		Adding oxygenating plants												
		Clearing organic debris												
Nest boxes and refugia	Hibernacula and log piles	Adding materials												
	Bird boxes	Box maintainance												
	Bat boxes	Box maintainance (summer roosts only)												
	Solitary bee and insect hotels	Cleaning (holes not in use only)												

Table 2. Habitat management schedule over the lifetime of the solar farm.

Broad habitat type	Habitat features	Management activity	Regularity	Lifetime of the solar farm (years)
				1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Grassland habitats	Diverse grassland	Cutting	Once in July	
		Cutting	Once in August	
		Grazing	Year round	
	Tussock margins	Cutting on rotation	Once in winter or spring	
	Species rich grassland	Cutting	Once in winter	
Woody habitats	New hedgerows	Weeding and mulching	When weed growth identified	
		Guard and stake removal (when required)	When shrub has established	
		Light trimming new hedgerows	Once in winter	
		Shrub replacement	When dead or dying shrub needs replacing	
	Existing and new hedgerows (once established)	Cutting	One length and side per year in winter	
		Shrub replacement	When dead or dying shrub needs replacing	
	Scrub	Weeding and mulching	When weed growth identified	
		Guard and stake removal (when required)	Once shrub has established	
	Woodland	Weeding and mulching	When weed growth identified	
		Tree replacement	When dead or dying tree needs replacing	
		Guard and stake removal	When tree has established	
Wetland habitats	Scrape and ponds	Mowing marginal vegetation	If marginal vegetation becomes overgrown	Undertake at any stage when deemed necessary
		Thinning shrub and trees with cutting	If more than 50% of water is shaded	
		Adding oxygenating plants	If algae requires controlling	
		Clearing organic debris	If algae requires controlling	
Nest boxes and refugia	Hibernacula and log piles	Adding materials	When structure is degraded	
	Bird boxes	Box maintenance	When boxes is unclean or deteriorated	
		Box replacement	When deteriorated beyond repair	
	Bat boxes	Box maintenance (summer roosts only)	When boxes is unclean or deteriorated	
		Box replacement	When deteriorated beyond repair	
	Solitary bee and insect hotels	Cleaning (holes not in use only)	Once per year in winter	
		Box replacement	n/a	

Optimal	
Possible but suboptimal	
Not advised	

Monitoring

The process of establishing new habitats and the enhancement of existing habitats will take some time, and it is not possible to forecast the precise rate of change and the subsequent ecological response. For this reason, an ongoing biodiversity monitoring programme for new and existing habitats will be required.

All new and existing habitats will be monitored as part of the biodiversity surveys. Monitoring in the first five years will oversee the establishing new habitats, with the aim to assess the progress of these habitats against clear targets, which if not met, will result in adaptive management actions. Intervention should be undertaken if further work is needed to remedy an issue. These issues may include failure of habitat establishment or the presence of invasive animal and plant species, such as Japanese Knotweed.

This section provides a summary of the monitoring plan for each habitat grouping, drawing from the monitoring report (Wychwood Biodiversity 2023a), and details the remedial measures required to address issues with the developing habitats, should they arise.

Grassland habitats

Monitoring the progress of new grassland and wetland habitats would typically be incorporated in the biodiversity monitoring surveys, undertaken by an experienced ecologist twice during the first year, and then annually for the following four years. Issues observed and recommendations for management alterations would be fed back to the developer and included in the monitoring reports.

Key indicators and remedial measures

- The ecologist will inspect newly created grassland habitats and will assess whether areas require supplementary seeding or green hay, and whether management requires adjustments to better encourage its establishment. The ecologist will also assess whether the cutting regime is suitable, depending on the growth vigour and the species that have established. The cutting regime will be adjusted as required.
- Where the grassland is grazed by livestock, the ecologist will assess whether the stock density is appropriate for the area. Stock densities should be increased if there is a rise in the amount of uneaten grass, vigorous unpalatable grasses, and a reduction in low growing flora. During wetter periods, the density of livestock may require reducing, to limit the amount of ground exposed through treading. Exposed ground and sward break-up can lead to the colonisation of unwanted and aggressive weed species.
- The ecologist will also assess the grassland for excessive weed growth. It is common for annual weeds to appear in the grassland habitats during the first 2-3 years of growth; largely due to the high nutrient content in the soil left over from previous years of arable farming. To allow the nutrient content in the soil to revert to a semi-natural state, these annual weeds can be overlooked. Perennial weeds such as creeping thistle will be treated if they become a widespread problem; however, with appropriate grassland management these species should disappear over time. If plant species listed by DEFRA as invasive (UK Government, 2020) are found, the advice of suitably qualified ecologist would need to be sought.

Woody habitats

A tree specialist would be responsible for assessing the health and progress of woody habitats such as new hedgerows, scrub, and tree standards in years 2 and 4 after construction; and an ecologist would inspect the hedgerows at least every 3 years to ensure they remain in 'good' condition. Issues observed and recommendations for management alterations would be fed back to the asset manager by the specialist.

Key indicators and remedial measures

- The tree specialist will assess the condition of trees with a visual inspection, looking for signs of disease, pests, decay, structural issues. Dead, dying, or diseased trees can usually be left standing, though may need to be removed and replaced to prevent disease, pests, or fungus from spreading to other trees. Structurally hazardous trees may also need to be removed or cut back, to avoid human injury or damage to site infrastructure. Newly planted trees are susceptible to movement in high winds, resulting in the breakage of the new fragile root systems. If there is evidence of this, installing additional tree support systems will help to reinforce structural stability.
- The tree specialist will also assess the condition of hedgerow and scrub shrubs. Dead or dying shrubs or hedgerows should always be replaced. If shrubs are replaced, the ground must first be assessed for soil quality and drainage efficiency, as these factors may underpin why the shrubs are failing to survive. If the soil and drainage is deemed inappropriate for that species of shrub, an alternative more tolerant species may be used as a replacement.
- All trees and shrubs will be checked for excessive herbivore browsing. Excessive browsing from deer can kill shrubs, particularly young whips before they are fully established. If existing tree guards are deemed insufficient at protecting the young shrubs, temporary deer fencing may be required around the area in question, to allow the shrubs to fully establish and tolerate natural browsing from herbivores.

Wetland habitats

Monitoring the condition of the wetland habitats on site will be undertaken by an ecologist and typically incorporated in the biodiversity monitoring surveys. The surveys would take place twice during the first year and annually for the following four years, and every three years thereafter. Issues observed and recommendations for management alterations would be fed back to the asset manager and included in the monitoring reports.

Key indicators and remedial measures

- The ecologist will check for overshading from marginal vegetation. It is important to avoid excessive shading over ponds, particularly on the southern shoreline. If trees and scrub start shading large areas of the ponds, vegetation will be thinned to allow sunlight to return; and aquatic vegetation will be managed as needed to ensure around 50% open water is maintained. Low level livestock grazing can be implemented to thin vegetation, if possible, though annual mowing once a year may be required during the winter months.

- The ecologist will also check for any pernicious plant species present within or around the pond. These will be removed manually, and no chemical herbicides will be applied. If plant species listed by DEFRA as invasive (UK Government, 2020) are found, the advice of suitably qualified ecologist would need to be sought.
- The ecologist will assess the quality of the water, noting high levels of algae. Nitrate run off from adjacent fields can result in an accelerated growth of algae and weeds, which can swamp the water body; ultimately starving it of oxygen. Pond weed may need to be removed and discarded elsewhere. Ideally a minimum of 50% of clear water should be present at all times of the year. If algae need controlling, it may be necessary to plant more scrub along the edges to increase shading or introduce oxygenating plants to the water. Nutrient levels in the water can also be reduced by removing organic debris, such as fallen leaves or branches from the surface; and adding oxygenating plants. Reducing nutrient levels in the water will make it more difficult for algae to persist.

Legal and funding mechanisms

The LEMP and its associated commitments are secured by Condition 8 attached to the planning permission. Consequently, if the current development option or subsequent site lease is transferred to another developer or operator, this would include all the obligations associated with the management of the land, including the commitments within the LEMP.

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