



LOW FARM, FLOCKTON

Ecological Design Strategy

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Client: Boom Developments.

Ref: eg211271

3 July 2023

REVISION HISTORY

Document history and status

Rev.	Date	Purpose/ Status	File Ref	Author	Check	Review
01	08/06/23	For client comment	eg211271	SAR	MD	MD

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ABBREVIATIONS

BAP	Biodiversity Action Plan
EclA	Ecological Impact Assessment
EDS	Ecological Design Strategy
LWS	Local Wildlife Site
SAC	Special Area of Conservation
SSSI	Site of Special Scientific Interest

1. INTRODUCTION

- 1.1. Engain has been instructed by Boom Developments. to prepare an Ecological Design Strategy (EDS) for the construction of a solar farm at Low Farm, Flockton, West Yorkshire (hereafter referred to as the 'site') (application reference: 2021/62/93644/E).
- 1.2. The purpose of this document is to enable the discharge of planning permission Condition 21, which states:

'Prior to development commencing, an Ecological Design Strategy (EDS) to ensure that a biodiversity net gain is achieved post-development shall be submitted to, and agreed in writing by, the Local Planning Authority. The EDS shall provide a minimum increase of 97.5% in habitat units on site and 21.5% in hedgerow units in accordance with the details outlined within the Biodiversity Metric 3.0 dated 13/06/2022. The EDS shall include the following.

- a) Purpose and conservation objectives for the proposed works;*
- b) Review of site potential and constraints;*
- c) Detailed design(s) and/or working method(s) to achieve stated objectives;*
- d) Extent and location/area of proposed works on appropriate scale maps and plans;*
- e) Details on the establishment of the habitats on the site;*
- f) Type and source of materials to be used where appropriate, e.g., native species of local provenance;*
- g) Timetable for implementation demonstrating that works are aligned with the proposed phasing of development;*
- h) Persons responsible for implementing the works;*
- i) Details of initial aftercare and long-term maintenance;*
- j) Details for monitoring and (where the results from monitoring show that conservation aims and objectives of the EDS are not being met) how contingencies and/or remedial action will be identified, agreed and implemented so that the development still delivers a measurable biodiversity net gain; and*
- k) Details for disposal of any wastes arising from works.*

The EDS shall be implemented in accordance with the approved details and all features shall be retained in that manner thereafter."

Site Description

- 1.3. The site is located on agricultural land north of the village of Flockton, approximately 9.6km to the south-west of the town of Wakefield in West Yorkshire (**Figure 1**). The ordnance survey grid reference for the centre of the site is SE 2407 1600.
- 1.4. The site is approximately 89 hectares (ha) in area, including the area of the proposed grid connection cable corridors linking the solar array to the point of connection at Lady Ings Farm.
- 1.5. The site largely comprises a mix of fields in arable use and improved grassland habitats interspersed by sections of woodland. Refer to **Appendix 1** for the Baseline Habitats Map.

Proposed Development

- 1.6. The proposed development comprises the erection and operation of grid-connected solar photovoltaic farm to supply up to 49.9MW, with ancillary infrastructure and landscaping and biodiversity enhancements.
- 1.7. The development is divided into nine parcels, refer to **Appendix 2** for the Development Landscape Plan.

2. EXISTING ECOLOGICAL CONDITIONS

Ecological Assessments to Date

- 2.1. The site was subject to ecological surveys undertaken by Western Ecology in June 2021, including a preliminary ecological appraisal using the Phase 1 Habitat Survey methodology, a great crested newt assessment, an assessment of trees for roosting bats, and a desk study.
- 2.2. The surveys informed an Ecological Impact Assessment issued by Western Ecology in April 2022 (document reference: WOR 2786.3).

Habitats

- 2.3. Below are the habitats on site, as determined by Western Ecology's Phase 1 Habitat Survey. Refer to **Appendix 1** for the Baseline Habitats Map, informed by the Phase 1 Habitat Survey, updated using recent aerial imagery, and converted to the UK Habitat Classification.

Arable

- 2.4. Winter cereal crops (wheat and barley) comprise the majority of the site. There are margins of rough grasses and ruderals around the crops, associated with boundary features.

Bare ground

- 2.5. Areas of bare soil were present within some of the arable fields.

Ephemeral/short perennial

- 2.6. Ephemeral agricultural weeds were present within some of the arable fields, species included redshank (*Persicaria maculosa*), and scentless mayweed (*Tripleurospermum inodorum*).

Fencing

- 2.7. Wire fencing bounded some of the arable fields, and often had associated margins of rank grasses and ruderals.

Improved grassland

- 2.8. Improved grassland was the second most abundant habitat, planted as temporary leys on land previously used for arable crops. The grassland consisted of a short and open sward dominated by perennial ryegrass, *Lolium perenne*. Other species included Yorkshire fog, *Holcus lanatus*, cock's-foot, *Dactylis glomerata*, red fescue, *Festuca rubra*, white clover, *Trifolium repens*, chickweed, *Stellaria media*, creeping buttercup, *Ranunculus repens*, and broad-leaved dock, *Rumex obtusifolius*.

Native hedgerow

- 2.9. Hedgerows of native shrubs and trees bounded the majority of the fields. The condition of the hedgerows varied significantly, with some being closely managed whilst others featured bushy growth. Mature trees were present in many of the hedgerows, and rough grasses and ruderals covered the margins and ground-layer where gaps were present. Hedge species included hawthorn, *Crataegus monogyna*, elder, *Sambucus nigra*, field maple, *Acer campestre*, and hazel, *Corylus avellana*. The trees were mostly ash, *Fraxinus excelsior*, wych elm, *Ulmus glabra*, lime species, *Tilia sp.*, and oak species, *Quercus sp.*

Scattered trees

- 2.10. Five scattered mature trees were present, within two of the western fields. All five of the trees were oak sp. or common lime, *Tilia x europaea*. Rank grasses grew around the base of the trees.

Semi-natural broadleaved woodland

- 2.11. Semi-natural broadleaved woodland is present interspersed between the western-most fields. The woodland features an open canopy and lacks age diversity, with most of the trees being mature. Tree species included Sycamore, *Acer pseudoplatanus*, beech, *Fagus sylvatica*, ash, horse chestnut, *Aesculus hippocastanum*, wild cherry, *Prunus avium*, common lime, and oak sp. Ground level vegetation included rank grasses and ruderals, including cock's-foot, false oat-grass, *Arrhenatherum elatius*, rough meadow-grass, *Poa trivialis*, common nettle, *Urtica dioica*, hogweed, *Heracleum sphondylium*, cleavers, *Galium aparine*, and bramble, *Rubus fruticosus*.

Stone wall

- 2.12. Stone walls bounded some of the fields, mostly unvegetated but with some associated shrubs and mature trees. Rank grasses and ruderals made up the margins surrounding the walls. Species included false oat-grass, cock's-foot, hogweed, common nettle, bramble, bracken, *Pteridium aquilinum*, and barren brome, *Bromus sterilis*.

Tall ruderal

- 2.13. Tall ruderal vegetation was present in bands at the boundaries of some of the fields. Species included false oat-grass, cock's-foot, common nettle, hogweed, broad-leaved-dock, creeping thistle, *Cirsium arvense*, broad-leaved willowherb, *Epilobium montanum*, rosebay willowherb, *Chamaenerion angustifolium*.

Designated Sites

- 2.14. The site does not lie within or immediately adjacent to any designated nature conservation sites.
- 2.15. There are two statutory designated nature conservation sites within 2km of the site; Denby Grange Colliery Ponds Site of Special Scientific Interest (SSSI), located approximately 2km southeast of the site, and Denby Grange Colliery Ponds Special Area of Conservation (SAC), a Natura 2000 site overlaying the SSSI. The SSSI and SAC are designated for a regionally significant population of great crested newt (*Triturus cristatus*).
- 2.16. There is one non-statutory designated nature conservation site within 2km of the site; Kirklees Wood Local Wildlife Site (LWS), located approximately 1km southeast of the site. The LWS is designated for its species-rich acid woodland.

3. ECOLOGICAL DESIGN STRATEGY

Purpose and Conservation Objectives

- 3.1. The conservation-based management objectives for the site are to manage the site to:
- maximise wildlife benefit by protecting, enhancing, and creating features of significant ecological value; and to
 - implement an on-going management regime capable of delivering this over a rolling the operational life of the development (40 years).
- 3.2. The purpose of these objectives is to deliver a measurable net gain in habitats that will provide benefits for a wide range of wildlife including birds, reptiles, and pollinators, and retain and improve ecological connectivity across the site.

Site Potential

- 3.3. The existing habitats on-site comprise common and widespread habitats of low ecological value, particularly the arable crops and improved grassland. The most ecologically valuable habitats on-site are the broadleaved woodland, hedgerows, and trees.
- 3.4. There is therefore an opportunity to significantly increase the ecological value of the site by replacing the farmland with ecologically valuable habitats. There is also the potential to benefit existing habitats on adjacent land by increasing habitat connectivity – for example by providing stronger ecological connection between Denby Wood and Harry Royd Clough Wood.

Constraints

- 3.5. The hedgerows and trees within the site provide suitable habitat for nesting birds. These potential bird nesting habitats should not be adversely impacted by the development but measures should be taken to ensure their protection during the construction stages. These measures are covered in the CEMP, which includes a breeding bird method statement (document reference: eg211271_CEMP_REV01).

- 3.6. The boundary habitats and woodland provide suitable habitat for reptiles. The woodland should not be adversely impacted by the development and the boundary habitats will be replaced with habitats with superior suitability for reptiles, but measures should be taken to ensure the protection of reptiles during the construction stages. These measures are covered in the CEMP, which includes a reptile method statement (document reference: eg211271_CEMP_REV02).
- 3.7. Japanese knotweed (*Reynoutria japonica*), is located within some of the hedgerows and boundary habitats on-site. Japanese knotweed is an invasive, non-native species and there is potential for the construction of the development to spread the species. A Japanese knotweed management plan produced by Eco Control Solutions (ref: 17670 has been approved by the LPA.

Ecological Design

- 3.8. The ecological design of the site will focus on increasing biodiversity and providing habitat for species listed in the Kirklees Biodiversity Action Plan (BAP):
- 3.9. Tussocky wildflower grassland around field boundaries and species-rich grassland under the solar panels will provide habitat for invertebrates including pollinators, and provide foraging opportunities for birds, bats, and small mammals. Local BAP species that would benefit from this include wall brown butterfly, *Lasiommata megera*, West European hedgehog, *Erinaceus europaeus*, and brown hare, *Lepus europaeus*.
- 3.10. Scrub planting around some of the field boundaries will provide foraging and refugia habitat, particularly for nesting birds included in the local BAP such as common linnet, *Linaria cannabina*, and grasshopper warbler, *Locustella naevia*.
- 3.11. Hedgerow reinforcement and enhancement including new planting will provide commuting, foraging, and refuge habitats for bats, birds, reptiles, mammals, and amphibians. Local BAP species this would benefit include pipistrelle bat species, *Pipistrellus sp.*, brown long-eared bat, *Plecotus auritus*, and house sparrow, *Passer domesticus*.
- 3.12. The habitats within the site will therefore comprise:
- **Other neutral grassland** – other neutral grassland will comprise the majority of the development, including underneath the solar panels and the field margins (where it will be more tussocky).

- **Mixed scrub** – mixed scrub will be created in bands adjacent to some of the field boundaries.
- **Other woodland; broadleaved** – the woodland on-site will be retained and unaffected by the development.
- **Developed land; sealed surface** – the substation will be the only new sealed surface and will be located in the eastern side of the site. The existing highway within the red line boundary will be retained and unaffected.
- **Cereal crops** – a small section of arable land within the red line boundary will be retained.
- **Modified grassland** – small sections of modified grassland adjacent to the highway will be retained.
- **Lines of trees** – all lines of trees will be retained and enhanced where appropriate.
- **Native hedgerows** – all native hedgerows will be retained and enhanced where appropriate. New native hedgerows will be planted along some of the field boundaries.
- **Native hedgerows with trees** – all native hedgerows with trees will be retained and enhanced where appropriate. A new native hedgerow with trees will be planted along the western boundary of the westernmost field.
- **Individual trees** – all individual trees will be retained and enhanced where appropriate.

- 3.13. See **Figure 1** for the Proposed Habitats Maps with the corresponding habitats.
- 3.14. Badger holes will be installed within each parcel's perimeter security fencing to allow badgers through the site. See the Badger Plan for further details (document reference: eg211271 Badger Plan).

Figure 1, "Proposed Habitats Map"



- 3.15. The baseline biodiversity value of the site was determined using the Biodiversity Metric 4.0, developed to provide a standardised methodology for completing Biodiversity Net Gain (BNG) calculations. This process was informed by the findings of the Phase 1 Habitat Survey, the UK Habitat Classification Survey guidelines and condition assessment, and professional judgement.
- 3.16. The Biodiversity Metric 4.0 Calculation Tool was then used to calculate the BNG achievable with the proposed habitats.

- 3.17. The calculations determined that the proposed plan would result in a 105% increase in habitat units, and a 24% increase in hedgerow units. There was no calculation for watercourse units as there are no existing watercourse features.
- 3.18. See **Appendix 3** for the headline results of the BNG calculations, or refer to the full calculations provided separately (document reference: eg211271 Metric 3.0 Calculation REV01).

Establishment Methods

Principals of Establishment

- 3.19. All habitat creation will be established according to horticultural and arboricultural best practice. Natural habitat processes will be incorporated into the establishment methods to aid the successful establishment of robust and ecologically appropriate habitats suited to the local climate, weather, and soil conditions.

Grassland Establishment

- 3.20. Grassland will be established on the former arable fields, and on existing improved grassland. In both cases soil nutrient levels are likely to be higher than in semi-natural grassland habitats, which will favour competitive species over finer grasses and small flowers. The contractor will, where practicable, take steps to ameliorate this in accordance with Natural England Technical Information Note TIN067. This may include:
1. Leaving the arable fields un-cultivated, spraying-off weeds to reduce the seed stock, and removing the growth.
 2. Topping weed growth on the arable fields before seed-set, where spraying off is not practicable.

3.21. Before sowing into the existing grassland fields, the grass will be cropped and removed repeatedly for up to five years to reduce nutrient levels. The success of this will be monitored annually and the timing of sowing agreed with the operator. Once ready, the grass sward will be harrowed to break up the sward before over-seeding with the chosen seed mix.

Establishing Trees and Shrubs

3.22. Trees and shrubs will be planted in an appropriate manner to ensure the highest chance for their survival. This could include following pit planting or slit planting methodologies:

- Pit planting requires the creation of a hole in the ground deep enough for the tree roots. The tree is then placed in the hole, ensuring that all of the roots are below ground level. The hole is then backfilled with soil and firmed up to remove pockets of air.
- Slit planting requires the creation of a slit in the ground deep enough for the tree roots. The slit is then pried open and the tree is placed inside with the root plug approximately 2cm below ground level. Soil is then placed to fill in around the base of the tree.

Materials

3.23. Seed and stock will be procured from suppliers that can offer regionally-sourced materials where available. The contractor will seek to identify sources of wildflower seed mix from local conservation schemes and suppliers where these are available. Where this is not possible (large areas such as this may not be accommodated by locally-sourced materials), national suppliers that provide locally-appropriate seed mixes will be used.

3.24. An example of an appropriate regionally-sourced wildflower seed mix that could be used is the Forest of Flowers Wildflower Seed Mix, a mix of 34 native species sourced from wildflower habitats in Yorkshire and including beneficial meadow species such as yellow rattle, *Rhinanthus minor*.

Timetable of Works

3.25. See **Table 1** below for the full Timetable of Works.

Table 1, "Timetable of Works"

Management Component	Objective	Action	Month/Season	Year					Responsibility
				1	2	3	4	5	
Hedgerow	Enhance and maintain the existing green corridor providing refuge and foraging and commuting habitats for wildlife, including reptiles, bats, birds, and amphibians.	Allow growth up to approximately 2-5m high and 1.5m in width	Winter	✓	✓	✓	✓	✓	Appointed Management Company
		Prune each side of the hedgerow on an alternate basis, every three years	Winter	✓			✓		Appointed Management Company
		Plug any gaps with suitable plant species	When required	✓	✓	✓	✓	✓	Appointed Management Company
Native scrub	To provide opportunities for nesting birds and hibernating reptiles; and Retain species which provide seed,	Provision of stakes and guards	When required	✓	✓	✓	✓	✓	Appointed Management Company
		Replace plant failures within the first 5 years with suitable plant species	When required	✓	✓	✓	✓	✓	Appointed Management Company

	<i>pollen and nectar which are of value to wildlife.</i>	<i>Areas of scrub should be rotationally cut</i>	<i>Every three years Between September and February</i>	✓	✓	✓	✓	✓	<i>Appointed Management Company</i>
<i>Tussocky wildflower grassland in ecological enhancement areas and around field boundaries (outside of the array perimeter fence line)</i>	<i>The creation of species diverse tussocky wildflower grassland via a suitable mowing regime. This habitat will be fenced off from the main grazing area.</i>	<i>Ground preparation:</i> <ul style="list-style-type: none"> <i>Prepare the ground, by creating areas of bare ground</i> <i>In areas of bare ground sow 5 – 10 kg/ha of a wildflower and grass seed mix (at least 20% wildflower)</i> <i>Inclusion of yellow rattle (<i>Rhinanthus minor</i>) in the seed mix will help suppress vigorous grass species growth</i> <i>Fence off to prevent sheep from grazing</i> 	<i>Spring or Autumn</i>	✓					<i>Appointed Management Company</i>
		<i>Cut every 3 years (on a rotational basis)</i>	<i>Spring or Autumn</i>	✓	✓	✓	✓	✓	<i>Appointed Management Company</i>
<i>Wildflower grassland under solar panels</i>	<i>The creation of species diverse grassland via a</i>	<i>Ground preparation:</i> <ul style="list-style-type: none"> <i>Prepare the ground, by creating areas of bare ground</i> 	<i>Spring or Autumn</i>	✓					<i>Appointed Management Company</i>

	<p><i>suitable grazing regime.</i></p> <p><i>It is recommended that the fields are divided up, to allow rotational grazing, i.e. some sheep grazing between October – April inclusive and other sheep grazing August – March inclusive.</i></p> <p><i>The stocking density should remain low-to moderate at approximately 5-6 sheep per hectare.</i></p>	<ul style="list-style-type: none"> <i>In areas of bare ground sow 5 – 10 kg/ha of a wildflower and grass seed mix (at least 20% wildflower)</i> <i>Inclusion of yellow rattle (<i>Rhinanthus minor</i>) in the seed mix will help suppress vigorous grass species growth</i> 								
		<p><i>In the first year:</i></p> <p><i>Allow meadow to establish with no mowing or grazing.</i></p>	<p><i>All year</i></p>	<p>✓</p>						<p><i>Appointed Management Company</i></p>
		<p><i>From second year:</i></p> <p><i>Sheep graze</i></p>	<p><i>October – April</i></p> <p><i>August - March</i></p>		<p>✓</p>	<p>✓</p>	<p>✓</p>	<p>✓</p>		<p><i>Appointed Management Company</i></p>

Persons Responsible

3.26. The **Developer (The Client)** has overall responsibility for any environmental management, ecological enhancement of the site or implementation of works included in the EDS that are scheduled during both the construction works and post-construction period. This section provides a summary of the key roles and responsibilities for implementation of the management plan.

Delivery of the EDS

3.27. The EDS outlines the management recommendations and commitments relevant to the site and existing ecological features following completion of the construction works.

3.28. **The Client** and their **Principal Contractor** will identify the organisations and personnel that have specific responsibilities for the implementation of works included in this management plan which are scheduled during the construction works period. During the operational works period it will be the responsibility of **The Client** to identify the organisations and personnel that have specific responsibilities for implementation of this EDS.

Roles and responsibilities of staff

3.29. **The Client** will appoint an individual to act as a **Biodiversity Champion** (or equivalent) who will oversee the development, implementation, delivery and review of works included in this EDS, which are scheduled during the construction works period. The **Biodiversity Champion** will have the authority to influence site activities and ensure that detrimental impacts on site biodiversity and environmental features are minimised. The **Biodiversity Champion** will also have responsibility for managing the construction of the landscape and planting proposals within any environmental constraints in conjunction with all the necessary management processes.

3.30. The individual must have sufficient authority and time on-site and knowledge of ecology and construction to carry out the role. The **Biodiversity Champion** need not be an ecologist or ecological expert.

- 3.31. During the construction stage **The Client** and/or the **Principal Contractor** will continue to provide the **Biodiversity Champion** with updated versions of the construction programme (should updates occur) to ensure that changes that may affect ecology are not overlooked. The **Principal Contractor** will ensure all additional contractor(s) have been adequately trained and are aware of their responsibilities (where appropriate) for implementation of this management plan, during construction.
- 3.32. A **Suitably Qualified Ecologist (SQE)** will be retained for technical advice during the construction stage.

Commitments and resources

- 3.33. **The Client** is committed, including the funding to achieving ecological enhancement and environmental management of the site and this management plan will help achieve this. This will involve a management company being appointed to carry out the works.

Performance and target setting

- 3.34. Performance during construction and after handover will be monitored to adhere to the format as outlined in **Table 1 (Timetable of Works)**. These tables provide the management actions that are required by key individuals responsible for managing the site at each stage of development.

Performance monitoring

- 3.35. To assess compliance, the construction **Biodiversity Champion** will monitor performance during the construction works period.
- 3.36. The SQE will carry out site visits at key stages including whilst construction works are on-going. A post-construction compliance check will be completed.
- 3.37. Corrective action will be taken if compliance is not achieved.

Record keeping and data management

- 3.38. The **Biodiversity Champion** will document all records of monitoring that occur during the construction works period. The records will be stored securely and made available for review as necessary. These will be maintained to provide a resource for the client and if necessary, to regulatory and statutory authorities to inspect conformity and compliance.

Training

- 3.39. To ensure consistent and acceptable environmental performance during implementation of the EDS, **The Client** will ensure that all staff and sub-contractors are aware of good practice protocols through their **Principal Contractor** and the chosen **Biodiversity Champion**. Relevant information on ecological management will be passed to the work force in briefings or by other suitable means.

Aftercare and Monitoring

- 3.40. The SQE will conduct a pre-commencement inspection for protected species immediately prior to the onset of construction works to ensure the ecological features previously recorded has not changed.
- 3.41. Whilst construction works are on-going, the SQE will undertake site visits if required and confirm that advised measures have been taken to protect biodiversity at the site. A letter report will be prepared suitable for submission to the council to demonstrate compliance.
- 3.42. The site will be monitored annually for the first five years, and the frequency of monitoring thereafter shall be reviewed against the site's condition. Compliance with this document will be assessed during this visit, this will include ensuring that biodiversity enhancement features have been correctly implemented.
- 3.43. The monitoring will be carried out in June or early July of each year, during the peak growing season.
- 3.44. The SQE will produce a compliance report, confirming and demonstrating implementation of this management plan, which will be submitted by the ecologist to the Local Planning Authority.

Disposal of Waste from Habitat Management

- 3.45. Within the first five years arisings from habitat management will be disposed of sensitively to remove nutrients from the habitat and allow for species rich grassland to grow. This could be done by piling on-site in designated areas to reduce the release of nutrients back into the soils whilst creating habitat including for detritivores.

4. APPENDICES

Appendix 1 – Baseline Habitats Map



Appendix 3 – Biodiversity Net Gain Headline Results

FINAL RESULTS					
Total net unit change (Including all on-site & off-site habitat retention, creation & enhancement)	<i>Habitat units</i>	207.87			
	<i>Hedgerow units</i>	4.87			
	<i>Watercourse units</i>	0.00			
Total net % change (Including all on-site & off-site habitat retention, creation & enhancement)	<i>Habitat units</i>	104.96%			
	<i>Hedgerow units</i>	24.17%			
	<i>Watercourse units</i>	0.00%			
Trading rules satisfied?	Yes ✓				
Unit Type	Target	Baseline Units	Units Required	Unit Deficit	
<i>Habitat units</i>	10.00%	198.04	217.85	0.00	Unit requirement met or surpassed ✓
<i>Hedgerow units</i>	10.00%	20.15	22.16	0.00	Unit requirement met or surpassed ✓
<i>Watercourse units</i>	10.00%	0.00	0.00	0.00	Unit requirement met or surpassed ✓

Appendix 4 – Cyclical Mowing Regime





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