



CLEVE HILL SOLAR PARK

UPDATES TO EXISTING DOCUMENTS OUTLINE LANDSCAPE AND BIODIVERSITY MANAGEMENT PLAN

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Revision C

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CLEVE HILL
SOLAR PARK



OUTLINE LANDSCAPE AND BIODIVERSITY MANAGEMENT PLAN

REVISION C

CLEVE HILL SOLAR PARK LTD

AUGUST 2019

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1 INTRODUCTION

1. This Outline Landscape and Biodiversity Management Plan (LBMP) addresses recommendations set out in the Environmental Statement (ES) chapters for Cleve Hill Solar Park (the Development). In particular (but not limited to):
 - Chapter 7: Landscape and Visual Impact Assessment;
 - Chapter 8: Ecology; and
 - Chapter 9: Ornithology.
2. These assessments within the ES have identified mitigation and enhancement measures designed to reduce impacts and/or protect and enhance landscape and biodiversity resources.
3. Landscape and biodiversity mitigation and enhancement measures have been combined in this LBMP as they are closely related; landscape improvements create important habitat for protected and priority species to achieve a net conservation gain, and coordinated large-scale habitat management focused on biodiversity has a net positive effect on the appearance of the landscape.
4. The measures in the LBMP will be agreed prior to the commencement of construction through a requirement of the DCO application, and this will ensure that measures are implemented that deliver at least the equivalent level of mitigation as the measures in this outline LBMP.

1.1 LBMP Structure

5. This LBMP provides detail of how the landscape and habitat management proposals will be successfully implemented, monitored and managed throughout the construction and operational phases of the Development. The following sections are included:
 - Section 2 – Aims and Objectives of the LBMP;
 - Section 3 – Summary of Measures during Construction;
 - Section 4 – Summary of Measures during Operation; and
 - Appendices A to J – Specific Detailed Management Prescriptions.
 - Drawing - Landscape and Biodiversity Masterplan

1.2 Guidance

6. The LBMP has been produced with reference to the following guidance:
 - Institute of Environmental Management and Assessment and Landscape Institute, 2013, Guidelines for Landscape and Visual Impact Assessment, 3rd Edition;
 - National Plant Specification 'Handling and Establishing Landscape Plants'. All plants and planting operations are to comply with the requirements and recommendations of all current relevant British Standard specification including but not limited to:
 - BS 8545. Trees: From Nursery to Independence in the Landscape
 - BS 3936-1:1992. Nursery stock. Specification for trees and shrubs
 - BS 3882:2015 - Specification for topsoil
 - BS 4428:1989. Code of practice for general landscape operations (excluding hard surfaces) (AMD 6784)
 - BS 5837: 2012 Trees in relation to design, demolition and construction. Recommendations
 - BS3998:2010 Recommendations for Tree Work
 - All planting to be carried out during appropriate climatic conditions and where possible in the optimal planting period October through until March. Existing topsoil and/or imported, clean/inert horticultural ameliorants from sustainable sources.
 - The Hedgerow Regulations 1997
 - Local Authority Guidance

- Biodiversity Guidance for Solar Developments¹
- TIN101 Solar Parks: Maximising Environmental Benefits²
- Bumblebee Conservation Trust Website³

2 AIMS AND OBJECTIVES

2.1 Overarching aims

7. The broad aims of the LBMP are:

- Construction Phase:
 - To minimise impacts on existing biodiversity resources; and
 - To ensure that appropriate landscape and biodiversity enhancement measures are implemented effectively.
- Operational Phase:
 - To ensure that proposed mitigation and enhancement measures are properly established during the operational phase; and
 - To ensure that the landscape and biodiversity mitigation and enhancement measures are managed appropriately throughout the operational phase.

2.2 Landscape and Visual

8. The landscape and visual objectives of this LBMP are:

- To screen elements of the Development from key receptor locations, *e.g.*, nearby residential properties;
- To soften 'hard edges' of the Development from the Saxon Shore Way;
- To reflect existing landscape elements and character in areas of the wider Development site which will not be subject to built development; and
- To retain or enhance the amenity of the existing public rights of way within the Development site boundary.

2.3 Ecology

9. The ecological objectives of this LBMP are:

- To minimise impacts on existing habitats and species during construction;
- To extend and enhance the most valuable existing habitats onsite;
- To create new habitats onsite that reflect the natural flora and fauna of the area;
- To make the most of opportunities to improve biodiversity within the Development site and surrounding area.

2.4 Ornithology

10. The ornithological objectives of this LBMP are:

- To protect and minimise impacts on birds within and around the site during construction;
- To secure the continued use of the Development site for a wide range of bird species;
- To mitigate for the loss of existing arable habitats onsite which are used by protected bird species;
- To create a range of new habitats onsite to provide roosting, foraging and nesting resources for birds; and

¹ BRE (2014) *Biodiversity Guidance for Solar Developments*. Eds Parker, G. E. and Greene, L.

² Natural England (2011) *TIN101 Solar Parks: Maximising Environmental Benefits*, Natural England

³ <https://www.bumblebeeconservation.org/>

- To make the most of opportunities to improve biodiversity within the Development site and surrounding area.

3 CONSTRUCTION MEASURES

11. Table 1 summarises the measures that will be undertaken during construction to protect existing landscape and biodiversity resources and the actions that will be required to ensure the measures can be implemented. Construction activities will be controlled by the Construction Environmental Management Plan (CEMP), an outline of which is provided as Technical Appendix A5.4 in the ES. If these measures are updated, they should also be updated in the CEMP.

Table 1: Construction Landscape and Biodiversity Measures

Intervention	Action	Management Prescriptions	Reason or justification
Protection of existing designated habitats adjacent to Site	Follow measures detailed in the Construction Environment Management Plan (CEMP)	Reduce negligible risk of accidental inputs to both the designated sites, field margins and ditch network leading to designated sites by isolation. Follow measures detailed in CEMP including: Use interceptor ditches, bunding, and best practice measures to isolate potential input sources such as oil leaks, dust emissions and other contaminated runoff.	To protect designated sites from contamination and be compliant with legislation and best practice.
Protection of existing habitats onsite	Follow measures detailed in CEMP	Follow measures detailed in CEMP including: Use interceptor ditches, bunding and best practice measures to isolate potential input sources such as oil leaks, dust emissions and other contaminated runoff into terrestrial and aquatic habitats.	To ensure the construction is ecologically sensitive and compliant with legislation and best practice.
Protection of species	General protective measures Follow measures detailed in CEMP	All water control structures will be designed to ensure that they'll be mammal/ eel/elver (all life stages) friendly. Fence under-passes or small openings (of approximately 150 mm diameter) will be installed in the perimeter fence approximately every 50 m to enable badger and other mammals (e.g. hedgehog and brown hare) to retain or improve their current resources. An update survey for protected and notable species will be undertaken by an ecologist before works begin who will advise about constraints. Where required, works will commence under the conditions of a Natural England mitigation licence for protected species, following an agreed method statement. Deep excavations will be filled in at the end of the day or where this is not possible, either securely covered at night to prevent badgers and other animals falling into them or installed with mammal 'ramps' where covering	To ensure the construction is ecologically sensitive and compliant with legislation and best practice.

Intervention	Action	Management Prescriptions	Reason or justification
		is impractical. Heras or similar fencing to be installed within the works perimeter of excavations. All excavations will be checked for the presence of animals before recommencing work. Where pipework is required for drainage and other purposes, these will need to be stored in areas which do not offer ecological value to wildlife and will need to be capped until such time as they are used in the Development. The ECoW will facilitate clear differentiation between any native frog species and the invasive marsh frog.	
	Follow measures detailed in CEMP. Control of Lighting	Night-time lighting during construction (if installed) will be minimised as far as possible and where used will be directed into the works area, away from potential habitats of value to bats and other nocturnal creatures, if compatible with operational Health and Safety procedures. Any lighting required for public safety and security purposes near bat roosts or bat flight lines have the potential to alter the distribution of artificial lighting on site, which may impact on the flight and foraging behaviour of bats present in the area⁴. Light levels during construction (and post construction) should be carefully managed to ensure they do not impact on potential bat foraging/commuting habitat such as hedgerows, waterbodies, ditches and marginal habitats. The following approach based on BCT guidelines⁵ can help when designing the lighting strategy for the site: • Lighting in ecologically sensitive areas within the core study area such as ditch habitats, and towards sensitive habitats outwith the core study area such as: trees and mature habitats, and the adjacent South Bank of the Swale LNR will be avoided; • The siting of lights will avoid locations where lighting could reflect off solar panels and other reflective surfaces; • Lighting will be positioned to minimise the spread of light to, at, or below horizontal and ensure that only the task work area or	To reduce disturbance to bats and other nocturnal animals and to avoid a criminal offence under the Conservation of Habitats and Species Regulations 2017

⁴ Jones, J. (2000) Guidelines on the Impact of Lighting on Bats. English Nature, Peterborough

⁵ BCT (2014) Artificial lighting and wildlife Interim Guidance: Recommendations to help minimise the impact artificial lighting.

Intervention	Action	Management Prescriptions	Reason or justification
		compound (during the construction phase) or security area (operational phase) is lit; - Flat cut-off lanterns or accessories will be used to shield or direct light to where it is required, with the height of lighting columns optimised to ensure light spill is minimised and non-target areas are not lit; - The demarcation of works areas (temporary and permanent) with white lining, good signage and LED cats eyes to reduce lighting requirements in the core study area. Ensure only high-risk areas of the core study area are lit, allowing headlights or torchlight to provide any necessary illumination at other times; - Lights will be limited to such that there are dark periods within the core study area. This will include measures such as the use of adaptive lighting, to reduce lighting intensity from lights, adjustment to the timing of lighting within the core study area, and provision of motion sensitive lighting to suit human health and safety as well as wildlife needs; and - Technical specifications to lighting will include the use of narrow spectrum light sources to lower the range of species affected by lighting, the use of light sources that emit minimal ultra-violet light, with a lighting peak no higher than 550 nm. White and blue wavelengths of the light spectrum will be avoided to reduce insect attraction, and where white light sources are required in order to manage the blue short wave length content they should be of a warm /neutral colour temperature.	
Protection of Invertebrates	Follow measures detailed in CEMP	Reduce dust and other air pollutants that may impact water quality within aquatic habitats and plants and flora in terrestrial habitats within the core study area via dust and emissions from construction vehicles, the building of access roads and the substation. Follow measures detailed in CEMP to achieve this including: Use interceptor ditches, bunding and best practice measures to isolate potential input sources such as oil leaks, dust emissions and other contaminated runoff into terrestrial and aquatic habitats.	To reduce disturbance to invertebrates.
Nesting bird protection	Follow measures detailed in CEMP	The CEMP contains a BBPP which will be followed during construction.	To safeguard nesting birds and avoid legal offences.

Intervention	Action	Management Prescriptions	Reason or justification
	including Breeding Bird Protection Plan (BBPP)		
Great-crested newt (GCN) construction mitigation	All works will be undertaken in adherence to a Natural England European Protected Species (EPS) Mitigation licence as required in habitats supporting GCN	EPS Mitigation licence to be obtained from Natural England post-DCO application, which must be granted prior to any work commencing in areas of habitat supporting GCN. The method statement to be agreed with Natural England under licence will likely include, but not be limited to the following aspects: - The population size recorded within offsite ponds will be determined in accordance with the <i>Great Crested Newt Mitigation guidelines</i>⁶ in the latest season prior to the start of works. - The minimum number of nights trapping will be informed by updated GCN surveys that will record the latest distribution and population size estimates within ponds. However, the minimum trapping days may be longer as trapping will need to occur until all newts are removed from site and traps fail to catch great crested newts over 5 consecutive nights. - All suitable GCN habitats will be trapped out using perimeter and drift fencing. Pitfall traps will be installed adjacent to the inside of the perimeter fence and on both sides of the internal drift fencing. Refugia such as carpet tiles will also be deployed to enhance the capture rate. - Any GCN found will be translocated to a dedicated receptor area the details of which will be agreed with Natural England. - Consequently, trapping will occur until all GCN are removed from within the development areas where this species has the potential to be impacted. The removal of vegetation and a destructive search will be undertaken after a thorough hand search of the area and supervised by a suitably qualified ecologist, with a tool box talk to be given to all contractors by a suitably qualified Ecological Clerk of Works (ECOW) before works proceed.	To reduce the risk of disturbance and harm to GCN and to avoid legal offences under the Conservation of Habitats and Species Regulations 2017.

⁶ English Nature (2001) Great Crested Newt Mitigation Guidelines, English Nature, Peterborough.

Intervention	Action	Management Prescriptions	Reason or justification
Water vole construction mitigation	All works will be undertaken in adherence to either a Natural England <i>Science, Education & Conservation</i> ⁷ or a <i>Class</i> ⁸ licence, where water vole habitat and burrows are likely to be impacted.	Licensing will be agreed with Natural England and granted prior to any works commencing. Licensing will be required in areas of suitable ditch network habitat where water vole burrows are evident. Details of licensing requirements and approach can be found in <i>Appendix H – the Aquatic Habitat Management Plan (AHMP)</i> and detailed in Technical Appendix A5.4 of the Construction Environment Management Plan (CEMP).	To reduce the risk of disturbance and harm to water vole and to avoid legal offences under the Wildlife and Countryside Act 1981.
Reptile construction mitigation	Follow measures detailed in CEMP Follow measures detailed in the Reptile Mitigation Strategy (RMS) as implemented through a method statement.	Any work commencing in areas of suitable field margin habitat where reptiles are evident will need to commence following the Reptile Mitigation Strategy (RMS) set out below. This will be implemented during the construction phase of the Development. The RMS includes the following aspects: - The trapping of reptiles will be completed in suitable weather and temperatures between April and the end of September and prior to construction activity. Beyond this timeframe, reptiles are likely to begin finding sites for hibernating and ecology core study area clearance cannot be undertaken as it would present a significant risk to any reptiles present; - Habitats of value to reptiles that will be removed as part of the substation construction and associated works, and at each of up to 26 ditch crossings will be fenced off with Temporary Reptile Fencing (TRF). This will ensure that any captured reptiles do not re-enter each of the construction zones; - Reptile refugia tins and felts will be placed within the proposed construction zone, to attract reptiles that need to be translocated. The tins and felts will be left within these areas for a minimum of a week and preferably a fortnight to allow reptiles to familiarise themselves with these features;	To reduce the risk of killing and injury of reptiles and to avoid legal offences under the Wildlife and Countryside Act 1981.

⁷ A29 Licence Application Form: Application for a licence to kill, take, disturb or possess wild animals: Science, education and conservation. Natural England

⁸ WML-CL31 Class Licence: Intentional disturbance of water voles and damage/destruction of water vole burrows by means of 'Displacement'. Natural England

Intervention	Action	Management Prescriptions	Reason or justification
		- The Development contains good habitat for supporting a population of reptiles, with only small areas of habitat requiring removal (totalling c. 0.13 ha) and extensive areas of adjacent suitable reptile habitat being retained. Given the small size of habitat to be lost, it is anticipated that this would only affect a 'low' population of reptiles. Current guidance states that a minimum 30 days of trapping (plus five clear days) be undertaken however, the area of habitat loss is incredibly small. On this basis, it is expected that a minimum of sixteen days trapping of reptiles followed by five clear days of trapping (where reptiles have not been observed or caught) within each construction zone will be required, with translocation of any caught reptiles released to adjacent habitat; - On completion of the translocation period, part of the TRF will need to be taken down, with strimming activity taking place towards this opening to allow any remaining reptiles to escape in the unlikely event of their presence. Habitat manipulation using a strimmer and under the supervision of a suitably experienced ecologist will take place in warm weather conditions. This will require a high cut at 100 mm, with strimming activity taking place towards the opening to allow any remaining reptiles to escape. This will be followed by a low cut to ground the following day; and - Once the habitat has been cleared to ground level, and until such time as the construction activity is likely to take place, it will be necessary to ensure that habitats are not allowed to grow back beyond 50 mm to ensure that reptiles are not attracted back into these areas. The implementation of the RMS will need to take place as guided by the ECoW and with consideration to the timings and requirements of other protected species works activities and licencing. This will be considered with respect to water vole and great crested newts. Details on approach can also be seen in Technical Appendix A5.4, Outline Construction Environment Management Plan (CEMP).	

4 OPERATIONAL MEASURES

12. Table 2 outlines the measures that will be undertaken during the operational stage of the Development. The Landscape and Biodiversity Masterplan drawing shows the location of the measures proposed.

Table 2: Summary of Operational Landscape and Biodiversity Measures

Habitat Type	Phase	Management Prescriptions	Aims	Timing
Grazing Marsh Grassland [Appendix A]	Implementation	Grazing marsh to be created under the solar panels and in linear formations adjacent to existing grassland buffer field margins. Ground preparation, seed sowing, management, and monitoring efficacy of each management plan are key components of the management plans. Seed mix to be selected based on appropriate ground conditions, with an emphasis based on ecological enhancement aims. New grassland habitats areas be seeded with a mix will be sown at a rate of 40 kg/ha (4 g/m²). The seed must be surface sown and can be applied by machine or by hand. Once sown, the seed should be lightly pressed into the seedbed by rolling or treading.	To provide a grassland sward that provides greater ecological value than the existing arable land	To be implemented starting with ground preparation at the Pre-construction phase, but with activities throughout the construction and post-construction phases. Section 16 provides indicative timing of pre-construction sowing in each field relative to the construction start date.
	Management	<u>Within the Perimeter Fence and within the array</u> The grassland will be grazed by sheep at a low density (2-3 sheep/ha) to manage the flush of annuals, but grazing will not commence until a sward is established. Grazing within the perimeter fence line of the solar panel fields will take place year-round on a rotational basis and between each solar panel compartment within this period. This avoids overgrazing within individual solar panel fields and allows flowering plants to be present throughout the plant growth season, whilst ensuring that shading of solar panels from plant growth is avoided. <u>Within the perimeter fence and adjacent to the ditches</u> The inter-array grasslands within the perimeter fence will be segregated from the grassland being established within the	To maximise biodiversity opportunities for terrestrial invertebrates, small mammals, ground-nesting birds and other foraging wildlife, and to provide augmented habitats that are sympathetic to the adjacent habitats and designated sites. To maximise habitat suitability for marsh harrier.	Sowing typically in late autumn/early winter. Cutting of grass or grazing from Year 1 onwards to take place after end September in areas outside the perimeter fence. Grazing to take place year-round within the perimeter fence from Year 1, with sensitive habitat areas protected from grazing using temporary stock proof fencing until after the end of September.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		solar arrays by the deployment of temporary stock-proof fencing. This will permit different management regimes in the two different areas. Initially, the tops of the ditch banks may also be fenced off to prevent poaching by livestock, although this should only be implemented in the event that monitoring demonstrates that damage occurs as a result of poaching. <u>Outside the Perimeter Fence</u> Mechanical cutting outside the perimeter fence line of the solar farm will be in line with a low intensity meadow management regime where the sward is cut to 100 mm once per year from the end of September onwards with all arising's collected as hay or silage. This ensures that the seeds are able to fall and flowering has finished providing habitat and feeding over the summer. This also ensures seed is returned to the ground and will add to the natural seed bank each year. The collection of arising's will also ensure that wildflowers within the seed mix will continue to flourish each year. The timing and length of the cut will ensure that impacts to ground nesting birds and other wildlife from these management activities are avoided.		
	Monitoring	Check effectiveness of seed sowing to ensure that seed has been sown correctly. Remedial actions will be communicated to the Operator at the earliest opportunity. Refer to section 16 Monitoring Plan. Ornithological monitoring to take place at the same time to ensure habitat is being utilised as required by target bird species (Marsh Harrier, Golden Plover, Lapwing and Brent Geese).	To determine the efficacy of the management plans and to determine whether the biodiversity objectives have been met. Monitoring results to be fed back to the operator with recommendations on remedial actions taken or required.	Monitoring to be dependent on the efficacy of habitat establishment. Monitoring in Y1, Y2, Y3, Y5, Y10 and Y20 as per, Scottish Natural Heritage. Guidance Note - Monitoring the impact of onshore windfarms on birds (2009).
	Remediation	Where establishment is not occurring as required, corrective action will be taken to alter the seed mix and/or	To ensure all commitments are met.	Throughout construction and operational stages.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		management methodologies to ensure the new approach will establish the desired habitat.		
Lowland Meadow Grassland [Appendix B]	Implementation	Lowland meadow creation to be implemented in blocks to the east and west of the site. Ground preparation, seed sowing, management, and monitoring efficacy are key components of the management plan. Seed mix to be selected based on appropriate ground conditions, with an emphasis based on ecological enhancement aims. New grassland habitats areas be seeded with a mix will be sown at a rate of 40 kg/ha (4 g/m²). The seed must be surface sown and can be applied by machine or by hand. Once sown, the seed should be lightly pressed into the seedbed by rolling or treading.	To provide a grassland sward that provides greater ecological value than the existing arable land.	To be implemented starting with ground preparation at the Pre-construction phase, but with activities throughout the construction and post-construction phases.
	Management	A mechanical cut of grassland habitat within the lowland meadow grassland habitat management fields will be completed twice, which will be in line with a hay meadow management regime. The sward is to be cut to 100 mm in summer (July) and again in September, with all arising's collected as hay or silage. The frequency of the cuts will ensure that the lowland grassland habitat within this area will in time become less fertile, to favour a more diverse wildflower grassland structure. The high cut of 100 mm favours lower growing flowering plants that are competing with the longer grassland sward, but will not be collected during the hay cuts. Low intensity grazing option with timings will be as guided by the HMSG and KWT Land Management Advice Sheet 5 - Choosing livestock for conservation grazing. Ornithological monitoring to take place at the same time to ensure habitat is being utilised as required by target bird species (Marsh Harrier, Golden Plover, Lapwing and Brent Geese).	To maximise biodiversity opportunities for terrestrial invertebrates, ground-nesting birds and other foraging wildlife, and to provide augmented habitats that are sympathetic to the adjacent habitats and designated sites.	Sowing typically in late autumn/early winter. Cutting of grass from Year 1 onwards to take place in July and September. Monitoring to be dependent on the efficacy of habitat establishment. Monitoring in Y1, Y2, Y3 Y5, Y10 and Y20 as per, Scottish Natural Heritage. Guidance Note - Monitoring the impact of onshore windfarms on birds (2009). Same comment: is this the right guidance to reference?

Habitat Type	Phase	Management Prescriptions	Aims	Timing
	Monitoring	Check effectiveness of seed sowing to ensure that seed has been sown correctly. Remedial actions will be communicated to the Operator at the earliest opportunity. Ornithological monitoring to take place at the same time to ensure habitat is being utilised as required by target bird species (Marsh Harrier, Golden Plover, Lapwing and Brent Geese).	To determine the efficacy of the management plans and to determine whether the biodiversity objectives have been met. Monitoring results to be fed back to the operator with recommendations on remedial actions taken or required.	Monitoring to be dependent on the efficacy of habitat establishment. Monitoring in Y1, Y2, Y3 Y5, Y10 and Y20 as per, Scottish Natural Heritage. Guidance Note - Monitoring the impact of onshore windfarms on birds (2009). Same comment
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Hedgerows (with Trees) [Appendix C]	Implementation	3.63 km of native species hedgerows, containing 519 native species trees will be planted within the southern areas of the Development. These will be located within the southern half of the Development and complement the existing network of hedgerows, and trees associated with the local landscape character.	To augment the existing hedgerows and tree belts to further increase the green infrastructure within the Development and local area and to create significant additional habitat. To create low level screening (3-4 m) with new tree planting within hedgerows to provide further screening.	Planting to be undertaken in the planting season between October and March within the first available year/season post construction.
	Management	Any hedgerow plants and trees which are found to be dying, damaged or diseased within the first five years following planting will be replaced with the same species and specification as part of the implementation works. Hedgerows will be mechanically maintained once a year for the first five years allowing the height of the hedge to increase to a maximum height of 4 m during this time. For years six and beyond the hedgerow will be mechanically maintained once every three years to allow habitats to	To ensure that the hedgerows remain dense and healthy throughout the establishment period to provide suitable habitat and to maintain screening.	Hedgerows to be cut between 1st October and 28th February to avoid disturbance to nesting birds.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		establish whilst enabling the hedge to retain its shape and form whilst naturalising. A variable cutting schedule on a 3 year rota will be adopted to provide a range of habitats and a supply of fruit and berries within the hedgerows each year. Visually this will also create a more varied and natural looking landscape.		
	Monitoring	The hedgerow and trees would be monitored each year within the first 5 years	To ensure that the hedgerow is fully established and management and maintenance is undertaken in line with the HMP.	Two visits in year one (spring and summer), followed by yearly visits in late spring up to year 5.
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Shelterbelt Management [Appendix D]	Implementation	1.27 ha of native species trees and shrubs will be planted, predominantly within the southern areas of the Development. These areas of planting will complement the existing and proposed network of hedgerows, trees, shelterbelts and woodlands associated with the local landscape character. Any plants and trees which are found to be dying, damaged or diseased within the first year following planting will be replaced with the same species and specification as part of the implementation works.	To augment the existing hedgerows, trees, shelterbelts and woodlands associated with the local landscape character. To further increase the green infrastructure within the Development and local area and to create significant additional habitat. To create low level screening (4-9m) creating a visual screen and areas of natural vegetation. The species chosen are designed to screen the Development at sensitive locations close to residential receptors whilst retaining distant views to the estuary above the sea wall.	Planting to be undertaken in the planting season between October and March within the first available year/season post construction.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
	Management	Any shrubs/ trees which are found to be dying, damaged or diseased within the first five years following planting will be replaced with the same species and specification as part of the implementation works. Beyond this time the planting will be allowed to naturalise with any gaps filled in to maintain a dense low level screen.	To ensure that the plants form small natural areas of native species shelterbelts which remain dense and healthy with a good understory.	Management to be undertaken between 1st October and 28th February to avoid nesting birds.
	Monitoring	The shelterbelt would be monitored each year within the first 5 years	To ensure that the planting is fully established and management and maintenance is undertaken in line with the SMP ensuring heights are maintained and understory is established.	Two visits in year 1 (spring and summer), followed by yearly visits in late spring up to year 5. If following Year 5, any defects are identified by the site operator then these can subsequently be addressed e.g. reimplementation of the planting methodology for any replacement tree planting for Years 1-5. If any parts of the shelterbelt planting fail during the lifetime of the development then replacement planting will be undertaken as prescribed in Years 1-5.
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Woodland Management [Appendix E]	Implementation	0.72 ha of native species trees will be planted, within the southern area of the Development to the north of Warm House. This new woodland will complement the existing and proposed network of hedgerows, trees, shelterbelts and woodlands associated with the local landscape character. Any plants and trees which are found to be dying, damaged or diseased within the first year following planting will be replaced with the same species and specification as part of the implementation works.	To augment the existing hedgerows, trees, shelterbelts and woodlands associated with the local landscape character. To further increase the green infrastructure within the Development and local area and to create a dense visual screen between the Development and	Planting to be undertaken in the planting season between October and March within the first available year/season post construction.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
			Warm House between 5 m and 25 m high.	
	Management	Any trees which are found to be dying, damaged or diseased within the first five years following planting will be replaced with the same species and specification as part of the implementation works. Beyond this time the planting will be allowed to naturalise with any gaps filled in to maintain a dense woodland screen.	To ensure that the plants form a native species woodland which remains dense and healthy with a good understory.	Management to be undertaken between 1st October and 28th February to avoid nesting birds.
	Monitoring	The woodland would be monitored each year within the first 5 years.	To ensure that the planting is fully established and management and maintenance is undertaken in line with the WMP ensuring a mixed height woodland and enhanced woodland flora is established.	Two visits in year 1 (spring and summer), followed by yearly visits in late spring up to year 5. If following Year 5, any defects are identified by the site operator then these can subsequently be addressed e.g. reimplementation of the planting methodology for any replacement tree planting for Years 1-5. If any parts of the woodland fail during the lifetime of the development then replacement planting will be undertaken as prescribed in Years 1-5.
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Electrical Compound Buffer Planting [Appendix F]	Implementation	1.5 ha of native species trees and shrubs will be planted upon the bund surrounding the site compound. These areas of planting will complement the existing and proposed network of hedgerows, trees, shelterbelts and woodlands associated with the local landscape character. Any plants and trees which are found to be dying, damaged or diseased within the first year following planting will be	To augment the existing hedgerows, trees, shelterbelts and woodlands associated with the local landscape character to further increase the green infrastructure within the Development and local area and	Planting to be undertaken in the planting season between October and March within the first available year/season post construction.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		replaced with the same species and specification as part of the implementation works.	to create significant additional habitat. To create low level screening creating a natural visual screen and areas of natural vegetation. The species chosen is designed to screen infrastructure within the site compound and to naturalize the shape and form of the bund.	
	Management	Any shrubs/ trees which are found to be dying, damaged or diseased within the first five years following planting will be replaced with the same species and specification as part of the implementation works. Beyond this time the planting will be allowed to naturalise with any gaps filled in to maintain a low level screen.	To ensure that the plants form a natural area of native scrubland which remains healthy with a good understory of natural scrub to remain healthy through the establishment period to provide suitable habitat and to maintain screening.	Management to be undertaken between 1st October and 28th February to avoid nesting birds.
	Monitoring	The buffer planting would be monitored each year within the first 5 years	To ensure that the planting is fully established and management and maintenance is undertaken in line with the BPMP.	Two visits in year 1 (spring and summer), followed by yearly visits in late spring up to year 5.
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Scrub [Appendix G]	Implementation	4.3 ha of native species scrub will be planted within the Development site along the northern edge and south eastern corner. These areas of planting will complement the existing scrub planting associated with the local landscape character. Any plants which are found to be dying, damaged or diseased within the first year following planting	To augment the existing scrub associated with the local landscape character to further increase the green infrastructure within the Development and local area and to create additional habitat. To create low level intermittent screening	Planting to be undertaken in the planting season between October and March within the first available year/season post construction.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		will be replaced with the same species and specification as part of the implementation works.	creating a partial visual screen and areas of natural vegetation. The species chosen is designed to naturalize within grassland.	
	Management	Any plants which are found to be dying, damaged or diseased within the first five years following planting will be replaced with the same species and specification as part of the implementation works. Beyond this time the planting will be allowed to naturalise.	To ensure that the plants form a natural area of sparse native scrub which remains healthy through the establishment period to provide suitable habitat.	Management to be undertaken between 1st October and 28th February to avoid nesting birds.
	Monitoring	The scrub planting would be monitored each year within the first 5 years	To ensure that the planting is fully established and management and maintenance is undertaken in line with the SPMP.	Two visits in year 1 (spring and summer), followed by yearly visits in late spring up to year 5.
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Aquatic Habitats [Appendix H]	Implementation	Existing, new and upgraded flow control infrastructure will be used to achieve this aim and there will be an ongoing need to engage with all parties to deliver this. Figure A5.1 of this LBMP shows key existing and proposed flow control structures. Mechanical or chemical treatment of invasive duckweed within areas of the ditch system to encourage improved assemblage of biodiversity to be retained as an option. Creation of a new circa 355 m cut ditch to replace a circa 355 m length of lost ditch and c. 120 m of suitable riparian habitat created, with associated planting to maximize benefits for biodiversity and as a conservation benefit to water voles.	To improve overall water levels (particularly in the AR HMA and FGM HMA) and therefore biodiversity in the ditch system and its value to wildlife, including marsh harrier, eels/elver (all life stages) and water vole. Create separate individually managed hydrological compartments for the development area, AR HMA and FGM HMA.	Mechanical/chemical treatment of duckweed, excavation of new ditch to be planted at the pre-construction phase. The mammal-friendly culverts will be installed during construction. Water control measures and planting of the new reedbed between the solar park and the AR HMA will be implemented during construction. Timing will depend on the construction schedule, Refer to section 16,

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		The inclusion of mammal/eel/elver (all life stages) friendly box culverts that increase the ditch network habitat connectivity for water voles. Creation of additional reedbed habitat (0.5 ha) located between the solar park and AR HMA to provide increased nesting habitat for species such as marsh harrier, bearded tit, reed warbler, sedge warbler and reed bunting whilst also benefitting other invertebrate and bird species. The land adjacent to the areas of additional reedbed creation will also be reprofiled within the site in order to create shallower sloping bankside(s) as opposed to the steep banks currently present. Refer to section 18, Indicative Bank Profiles. The area(s) chosen for this will be dependent on the findings of the 2019 water vole survey ensuring no adverse effect. Maintenance and reprofiling works will be undertaken at the same time to minimise impacts from these activities if undertaken separately.		Grassland Implementation Timing. Ditch reprofiling and reedbed improvements would be undertaken during the construction period. The reprofiling works however will require the watercourses to be divided into groups. Reprofiling across each group will therefore be spread across multiple years so as to avoid significant impact on water vole across a single year.
	Management	To maintain and manage high ditch water levels across the site, new flow control structures, (likely to be drop board style sluices) will be located within drainage ditches at the Site. Figure A5.1 of this LBMP shows key existing and proposed flow control structures. This will create three individually controlled areas of the Development site. Water may be either held back behind structure, or sluice boards used as a top height, above which water may 'overtop' in a controlled fashion to maintain water level at known height. The translocation of macrophyte habitat from a lost ditch to the new c. 355 m cut ditch, in combination with new plug planting and seeding to improve biodiversity and provide suitable habitat for water voles and other wildlife. The mechanical clearance of vigorous invasive macrophyte growth on an annual/bi-annual basis to be retained as an option, and in areas away from water vole habitat and newly created riparian areas.	To maximise the potential for biodiversity gains within the ditch system whilst maintaining the ability to safely operate the site.	New cut habitat activities to be completed during the construction phase, with ongoing management of ditches and water levels during the operational phase of the Development.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
	Monitoring	Monitoring of any Natural England licenced conservation improvements for water voles, to determine efficacy, with corrective action as required. Monitoring of the ditch system and new habitat created areas, with corrective remedial actions communicated to the operator. Monitoring to take place in Y1, Y2, Y3 and Y5, with reference to Natural England water vole licencing requirements as detailed within Appendix H. Water levels will be monitored during site visits and adjustment of water board heights will be undertaken as required. The visiting ecologist will also have responsibility of visual inspection of the boards. Should boards become warped or damaged or the rubber seals degrade, then they will be replaced as required. Ornithological monitoring to take place at the same time to ensure habitat is being utilised as required by target bird species (marsh harrier).	To demonstrate the efficacy of riparian and aquatic management of the ditches on the Site, and to propose corrective remedial action where applicable.	Monitoring to be undertaken in May, and through the operational phase of the Development. Monitoring to be dependent on the efficacy of habitat establishment. Monitoring in Y1, Y2, Y3 Y5, Y10 and Y20 as per, Scottish Natural Heritage. Guidance Note - Monitoring the impact of onshore windfarms on birds (2009). Same comment
	Remediation	Where establishment is not occurring as required corrective action will be taken to alter the seed mix and/or management methodologies to ensure the new approach will establish the desired habitat.	To ensure all commitments are met.	Throughout construction and operational stages.
Pillbox Bat Roost Creation [Appendix I]	Implementation	Pillbox to be converted to be suitable for use by roosting bats. The external features of the pillbox will be modified, through installation of a metal door and blocking up of windows to allow bat access only and ensure that microclimate conditions within the pillbox are optimized. A number of roost features to be installed within the interior walls for hibernating bats but without damaging the pillbox itself e.g. use of Kent Bat Boxes which can be glued to internal walls.	To provide bat roosting opportunities on the site.	Once construction has completed in this locality and ideally prior to the hibernation period (November to February).
	Management	The advice of the local conservation group on management should be followed, if a partnership with a group can be established.	To maximise biodiversity opportunities for bats	Post-construction

Habitat Type	Phase	Management Prescriptions	Aims	Timing
	Monitoring	Annual hibernation roost visits should be undertaken, if a partnership with the local bat group can be established.	To achieve a greater understanding of bat distribution in the local area.	If agreed, hibernation roost visits can take place between November and February in Years 1, 3 and 5.
	Remediation	Where roost establishment does not occur, alternative roost types to be considered to benefit bats.	To ensure all commitments are met.	Throughout construction and operational stages.
Other Measures	Phase	Management Prescriptions	Aims	Timing
Fencing	Implementation	Fence under-passes or small openings (of approximately 150 mm diameter) will be installed in the perimeter fence approximately every 50 m to enable badger and other mammals (e.g. hedgehog and brown hare) to retain or improve their current resources.	To allow continued commuting/foraging routes for wildlife across the development parcels.	Pre-construction
	Management	Inspections to be undertaken during other monitoring site visits and by the site operator to ensure that openings haven't become damaged and therefore are in need of repair.	To allow continued commuting/foraging routes for wildlife across the development parcels.	During construction
	Monitoring	Inspections to be undertaken during other monitoring and by the site operator to ensure that openings are still fully accessible for wildlife and haven't become blocked.	To allow continued commuting/foraging routes for wildlife across the development parcels.	During operation
	Remediation	If damage has occurred or access points are blocked, repair and/or clearing of blockages will occur.	To ensure commuting is possible for wildlife.	Throughout construction and operational stages.
Lighting	Implementation	Any lighting required for public safety and security purposes near bat roosts or bat flight lines have the potential to alter the distribution of artificial lighting on site, which may impact on the flight and foraging behaviour of bats present in the area ⁹ . Light levels during construction (and post	To ensure no adverse effect on nocturnal wildlife such as bats.	During construction

⁹ Jones, J. (2000) Guidelines on the Impact of Lighting on Bats. English Nature, Peterborough

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		construction) should be carefully managed to ensure they do not impact on potential bat foraging/commuting habitat such as hedgerows, waterbodies, ditches and marginal habitats. The following approach based on BCT guidelines¹⁰ can help when designing the lighting strategy for the site: • Lighting in ecologically sensitive areas within the core study area such as ditch habitats, and towards sensitive habitats outwith the core study area such as trees and mature habitats, and the adjacent South Bank of the Swale LNR will be avoided; • The siting of lights will avoid locations where lighting could reflect off solar panels and other reflective surfaces; • Lighting will be positioned to minimise the spread of light to, at, or below horizontal and ensure that only the task work area or compound (during the construction phase) or security area (operational phase) is lit; • Flat cut-off lanterns or accessories will be used to shield or direct light to where it is required, with the height of lighting columns optimised to ensure light spill is minimised and non-target areas are not lit; • The demarcation of works areas (temporary and permanent) with white lining, good signage and LED cats eyes to reduce lighting requirements in the core study area. Ensure only high-risk areas of the core study area are lit, allowing headlights or torchlight to provide any necessary illumination at other times; • Lights will be limited to such that there are dark periods within the core study area. This will include measures such as the use of adaptive lighting, to reduce lighting intensity from lights, adjustment to the timing of lighting within the core study area, and		

¹⁰ BCT (2014) Artificial lighting and wildlife Interim Guidance: Recommendations to help minimise the impact artificial lighting.

Habitat Type	Phase	Management Prescriptions	Aims	Timing
		provision of motion sensitive lighting to suit human health and safety as well as wildlife needs; and Technical specifications to lighting will include the use of narrow spectrum light sources to lower the range of species affected by lighting, the use of light sources that emit minimal ultra-violet light, with a lighting peak no higher than 550 nm. White and blue wavelengths of the light spectrum will be avoided to reduce insect attraction, and where white light sources are required in order to manage the blue short wave length content they should be of a warm /neutral colour temperature.		
	Management	Inspections to be undertaken by the ECoW during construction and at the same time as other monitoring visits during operation to ensure that appropriate locations only are being lit and no areas of sensitivity.	To ensure no adverse effect on nocturnal wildlife such as bats.	During construction and operation
	Monitoring	Inspections to be undertaken during other monitoring visits to ensure that appropriate locations only are being lit and no areas of sensitivity.	To ensure no adverse effect on nocturnal wildlife such as bats.	During operation
	Remediation	If lighting is identified to be facing inappropriate habitats/sensitive receptors then these will be redirected to ensure no adverse effect,	To ensure all commitments are met.	Throughout construction and operational stages.

5 HABITAT MANAGEMENT AREAS

13. Four main areas have been set aside as Habitat Management Areas (HMA) within the Development site as set out in Chapter 5: Development Description of the ES. The specific management of these areas in order to achieve the stated aims is summarised below.

5.1 Arable Reversion Habitat Management Area (AR HMA)

14. The AR HMA management prescriptions are set out in Appendix J.

5.2 Designated Freshwater Grazing Marsh HMA (FGM HMA)

15. The FGM HMA is based on the Grazing Marsh Grassland management prescription (Appendix A) with the additional prescriptions as set out in Table 3.

Table 3: FGM HMA

Phase	Management Prescriptions	Aims	Timing
Implementation	Upgrade, improve and construct water control structures as set out in Figure A5.1 to enable water levels within the FGM HMA to be controlled. Refer to Figure A5.1 in section 19 which identifies locations of existing and proposed key water control measures.		
Management	Facilitate dialogue between neighbouring landowners regarding the management of the SSSI to support any existing SSSI management plans. Likely to involve control of water levels in ditches and of grazing pressure within the SSSI. Any changes to existing management to be agreed with Natural England, Kent Wildlife Trust, Lower Medway IDB and the landowner through the HMSG.	To provide support to the landowner for the ongoing management of the SSSI land to complement the management of the adjacent arable reversion land.	Summer grazing and late summer / autumn cutting if required.
Monitoring	Surveys during years 1, 2, 3, 5, 10 and 20 post establishment. Ornithological monitoring to take place at the same time to ensure habitat is being utilised as required by target bird species (Marsh Harrier, Golden Plover, Lapwing and Brent Geese).	To confirm the effectiveness of any changes to land management to inform ongoing adaptive land management measures.	Monitoring to be dependent on the efficacy of habitat establishment. Monitoring in Y1, Y2, Y3 Y5, Y10 and Y20 as per, Scottish Natural Heritage. Guidance Note - Monitoring the impact of onshore windfarms on birds (2009).

5.3 Lowland Grassland Meadow HMA (LGM HMA)

16. The LGM HMA is based on the Lowland Grassland Meadow management prescription (Appendix B) with no additional management prescriptions.

5.4 Existing Cleve Hill Substation HMA (CHS HMA)

17. The CHS HMA is based on the Lowland Grassland Meadow management prescription (Appendix B) with the limitations as set out in Table 5.

Table 5: CHS HMA

Phase	Management Prescriptions	Aims	Timing
Implementation	Not required – grassland habitat already exists.		

Phase	Management Prescriptions	Aims	Timing
Management	Dependent on consultation with London Array Ltd but likely related to cutting frequency and encouraging floristic diversity.	To provide a different range of biodiversity enhancements relating to ground nesting birds, small mammals, birds of prey, pollinators etc. and to be complementary to the adjacent management and species present in habitats close to the area (e.g., GCN in adjacent ponds).	Cutting of grass to take place in June/July and September.
Monitoring	None proposed		

6 APPENDIX A – GRAZING MARSH GRASSLAND MANAGEMENT PLAN



18. Arable land may be one of the most challenging types of habitat to convert/attempt sward enhancement due to its high soil fertility which promotes dominance by a limited diversity of competitive plant species which limits the establishment and success of less-competitive wildflowers and fine grasses. Consequently, grassland enhancement/ restoration is a complex process requiring monitoring and intervention over several years to ensure success, especially on sites with a long history of agricultural improvement.
19. The prescriptions set out in this Grazing Marsh Grassland Management Plan (GMGMP) are intended to provide a flexible management framework that will be subject to review depending on the outcomes of ongoing monitoring and management. The work outlined below will be undertaken by a suitably qualified contractor with specialist knowledge of grassland management. The ecologist/landscape architect will be responsible for monitoring the success and implementation of measures and for taking appropriate remedial action, if needed. An ecologist will be available during all stages of the Development to undertake scheduled monitoring (specified below) and to provide ad hoc support.
20. The grassland established on site will enhance the character of the wider landscape and will aim to build on the ecological benefits associated with the proximity to the adjacent SSSI. The Public Right of Way will be kept clear and open throughout the duration of the development.

6.1 Aims and Objectives

21. The aim of the GMGMP is to establish a grassland sward with greater ecological value than the existing arable land. It is also designed to be maintainable for the entire duration of the construction and development phases of the Development and therefore the management is separated out into several management prescriptions to ensure the differing areas to be managed are dealt with in the most appropriate and ecologically sound way.
22. In addressing this aim, prescriptions will be defined for the three key phases of the Development:

- Pre-construction: measures required before infrastructure construction begins in order to prepare the ground for grassland establishment.
 - Construction: measures required during and immediately following construction to establish grassland by means of sowing.
 - Operation: monitoring and management measures for the duration of the operational period.
23. The GMGMP follows best practice published by Natural England and specialist seed distributors¹¹. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

6.2 Pre-Construction

6.2.1 Ground Preparation

24. Ground preparation is necessary to establish a clean seed bed into which a grass seed mix can be sown. It is assumed that large-scale, mechanical ground preparation will not be possible once the solar arrays are installed, with the exception of areas outside the perimeter fence.
25. Soil testing may be undertaken, at the discretion of the appointed contractor/ecologist, following ground preparation to determine other preparatory and management requirements.
26. The grassland sowing in each field will be undertaken following the ground preparation at the pre-construction stage and, in advance of any construction activities in a field. Should there be a delay between the sowing of seed at the pre-construction phase and construction phase within a solar panel field, there will be a requirement to either mechanically control sward length of grassland or through stock grazing of 2-3 sheep/ha. This will be required to avoid reptiles and other wildlife becoming attracted into this habitat that may lead to direct conflict and harm to these species from construction activities.

6.3 Construction

6.3.1 Ground Preparation

27. Grassland is anticipated to already have been established at this stage through directly sowing a seed mix into the prepared ground. The following measures will take place as part of, or immediately after, construction.
28. Construction activities have the potential to disturb the seed bed/grassland and so it may be necessary to repeat the pre-construction ground preparation to establish a suitable seed bed. Similarly, if the seedbed lies dormant following construction but before autumn sowing, then further ground preparation may be required.

6.3.2 Timing

29. Autumn (October to December) sowing is preferred because this favours species that germinate in autumn and species that require a period of cold to break their dormancy before they germinate in spring.
30. Section 16 provides recommendations on sowing timing in relation to alternative construction start dates in each field of the Development site. Grass will be sown prior to the commencement of construction in each field hosting solar panels, labelled as 'Proposed Coastal and Floodplain Grazing Marsh Based on Priority Habitat Inventory - under and around

¹¹ Emorsgate Seeds: <http://wildseed.co.uk/home>

31. solar panels' on Figure A5.1 in Section 20.

6.4 Seed Mix

32. The seed mix will be selected based on the results of the soil testing, however, at this stage it is envisaged that Emorsgate EM3 – *Special General Purpose Meadow Mixture*¹² will be suitable as detailed in Table 5.1. The mix is diverse and is suitable for sites where soil conditions vary across a site or where soil and site characteristics have not been established before sowing. Natural recolonization will be utilised in-combination with identified seed mix ensuring necessary and targeted habitat is created.

Table 5.1 Emorsgate EM3 – Special General Purpose Meadow Mixture

%	Scientific name	Common name
Wildflowers		
0.5	<i>Achillea millefolium</i>	Yarrow
2.4	<i>Centaurea nigra</i>	Common Knapweed
1	<i>Centaurea scabiosa</i>	Greater Knapweed
0.6	<i>Daucus carota</i>	Wild Carrot
0.6	<i>Filipendula ulmaria</i>	Meadowsweet
0.8	<i>Galium verum</i>	Lady's Bedstraw
1.5	<i>Knautia arvensis</i>	Field Scabious
0.3	<i>Leontodon hispidus</i>	Rough Hawkbit
1	<i>Leucanthemum vulgare</i>	Oxeye Daisy
1	<i>Lotus corniculatus</i>	Bird's-foot Trefoil
0.1	<i>Origanum vulgare</i>	Wild Marjoram
1	<i>Plantago lanceolata</i>	Ribwort Plantain
0.5	<i>Plantago media</i>	Hoary Plantain
1.8	<i>Poterium sanguisorba</i>	Salad Burnet
0.5	<i>Primula veris</i>	Cowslip
2	<i>Ranunculus acris</i>	Meadow Buttercup
1	<i>Rhinanthus minor</i>	Yellow Rattle
0.6	<i>Rumex acetosa</i>	Common Sorrel
1	<i>Silene dioica</i>	Red Champion
0.2	<i>Silene flos-cuculi</i>	Ragged Robin
1	<i>Silene vulgaris</i>	Bladder Champion
0.1	<i>Trifolium pratense</i>	Wild Red Clover
0.5	<i>Vicia cracca</i>	Tufted Vetch
Grasses		
8	<i>Agrostis capillaris</i>	Common Bent
40	<i>Cynosurus cristatus</i>	Crested Dog's-tail
28	<i>Festuca rubra</i>	Slender-creeping Red-fescue
4	<i>Phleum bertolonii</i>	Smaller Cat's-tail

¹² <http://wildseed.co.uk/mixtures/view/4>

6.5 Sowing

33. The seed mix will be sown at a rate of 40 kg/ha (4 g/m²). The seed must be surface sown and can be applied by machine or by hand. Once sown, the seed should be lightly pressed into the seedbed by rolling or treading.

6.6 Monitoring

34. An ecologist/landscape architect will visit the site before seed is sown to check that ground conditions are suitable, and following seed sowing to check that seed has been sown correctly. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity.

6.7 Operation

35. The following work will be carried out upon completion of all construction works and following the sowing of the grassland seed mix. The activities are relevant for the duration of the operational phase.

6.8 Weed Control

36. A flush of weeds is to be expected in the first season after sowing and these can be managed by a short period of intensive grazing (see below). It is likely that some pernicious weeds will persist following the ground preparation and can be treated by hand pulling or spot treatment with herbicides.

6.9 Grazing

37. For the purposes of this plan it is assumed that grassland within the perimeter fence will be managed by sheep grazing rather than mechanical cutting. Suitable stock grazing densities are in line with best practice for managing lowland grasslands for conservation purposes¹³. Grassland outside the fence will be managed through appropriate mechanical cutting.

6.9.1 Year 1 (within the perimeter fence and within the array)

38. The grassland will be grazed by sheep at a low density (2-3 sheep/ha) to manage the flush of annuals, but grazing will not commence until a sward is established.
39. Grazing within the perimeter fence line of the solar panel fields will take place year round on a rotational basis and between each solar panel field within this period. This avoids overgrazing within individual solar panel fields and allows flowering plants to be present throughout the plant growth season, whilst ensuring that shading of solar panels from plant growth is avoided.
40. Measures to protect grassland habitat that currently supports reptiles, ground nesting birds and foraging bats, such as habitats adjacent to the ditch network will need to be protected from sheep grazing. The protection of areas of this grassland from grazing to allow late flowering plants to set seed in late September, will also ensure that pollinators such as the Shril Carder Bee *Bombus sylvarum* will have available habitat for colonisation, which ensures that land management considers the objectives of local conservation initiatives¹⁴.

6.9.2 Year 1 (within the perimeter fence adjacent to ditches)

41. The inter-array grasslands within the perimeter fence will be segregated from the grassland being established within the solar arrays by the deployment of temporary stock-proof fencing. This will permit different management regimes in the two different areas. Initially, the tops of the ditch banks may also be fenced off to prevent poaching by livestock, although

¹³ BRE (2014) Agricultural Good Practice Guidance for Solar Farms. Ed J Scurlock

¹⁴ Bumblebee Conservation Trust's 'Making a Buzz for the Coast'

this should only be implemented in the event that monitoring demonstrates that damage occurs as a result of poaching. That being said, with the reedbed in this location establishing it is not considered likely that poaching will be a significant risk. This is due to the density at which common reed will establish thereby reducing ease of access for sheep. The KWT Land Management Advice Sheet 5 – Choosing livestock for conservation grazing documents also states that *'sheep have smaller feet than cattle or horses and are therefore less likely to cause poaching'*.

42. As ditch bank vegetation and less restricted growth of reeds develops in the ditches, it should not be necessary to maintain fencing along the ditch banks. The grassland will be grazed extensively by cattle and/or sheep to create a suitable, tussocky sward structure, with supplementary late summer cutting if necessary, to control dominance by undesirable weeds and maintain best practice lowland meadow management. Grazing would be undertaken in accordance with the KWT Land Management Advice Sheet 5 – Choosing livestock for conservation grazing.
43. Improvements to the hydrology of the area will be made through better control of drainage, whereby water levels surrounding/within the development are raised higher than the current baseline - see the Aquatic Habitat Management Plan for further details. Up to 0.5 ha reedbed will also be created between the AR HMA and the solar arrays in fields H and I – further details are provided in the Aquatics Habitat Management Plan.

6.9.3 Year 1 (outside the perimeter fence)

44. Mechanical cutting outside the perimeter fence line of the solar farm will be in line with a low intensity meadow management regime where the sward is cut to 100 mm once per year from the end of September onwards with all arising's collected as hay or silage. This ensures that the seeds are able to fall and flowering has finished providing habitat and feeding over the summer. This also ensures seed is returned to the ground and will add to the natural seed bank each year. The collection of arising's will also ensure that wildflowers within the seed mix will continue to flourish each year.
45. The timing and length of the cut will ensure that impacts to ground nesting birds and other wildlife from these management activities are avoided.
46. Alternatively, a lower intensity grazing regime will be implemented outside the perimeter fence with the same timings and to achieve the same aims.

6.9.4 Years 2 onwards

47. In the second and subsequent years the grassland within the perimeter fence and within the array can be managed in a number of ways which, in association with soil fertility, will determine the character of the grassland.
48. Within the perimeter fence, the best results would be obtained by traditional meadow-pasture management based around a year-round grazing regime, with a similar approach to Year 1 recommended. As the habitats will have started to become more established, the stocking density within the grazed grassland inside the solar panel compartment areas can be increased to c. 4 sheep/ha throughout the year.
49. The grassland within the perimeter fence and adjacent the ditches will be allowed to further establish thick/diverse swards which will continue to support high numbers of rodents/ prey, for marsh harrier. Management will be as per the lowland meadow grassland management plan (Appendix B).
50. The management of grassland outside the perimeter fence line will be undertaken in line with Year 1 and for the duration of the development.

6.10 Monitoring and Remedial Actions

51. A suitably qualified ecologist will visit the site twice annually in spring (May) and Autumn (September) to check the establishment of seed mix and weeds. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species (Marsh Harrier, Golden Plover, Lapwing, Brent Geese, general breeding bird surveys will also be completed).
52. Assuming that the seed mix has established successfully after Y1, an ecologist will visit the site regularly in Years 2, 3, 5 10 and 20 to monitor marsh harrier activity at the site. Marsh harrier use of the inter-array grassland will be monitored each year using a comparable method to the baseline surveys to allow comparison between pre- and post-construction bird-use of the site:
 - Breeding and non-breeding season;
 - Minimum 6 hours flight activity survey per month, totalling a minimum of 36 hours in each of the breeding and non-breeding seasons;
 - Flight activity and flight behaviour of marsh harriers in the site mapped, including AR HMA;
 - Undertake specific breeding marsh harrier survey to locate nest site following best-practice published methodology; if feasible, monitor productivity of any nests found; and
 - Also consider sampling small mammal population.
53. This will assess the success of grassland management and, as necessary, recommend revisions to the GMGMP. Ornithological surveys will be continued across the same years to ensure bird species are benefitting from the habitat being created as required.
54. Marsh harrier use of the inter-array grassland will be monitored each year using a comparable method to the baseline surveys to allow comparison between pre- and post-construction bird-use of the site:
 - Breeding and non-breeding season;
 - Minimum 6 hours flight activity survey per month, totalling a minimum of 36 hours in each of the breeding and non-breeding seasons;
 - Flight activity and flight behaviour of marsh harriers in the site mapped, including AR HMA;
 - Undertake specific breeding marsh harrier survey to locate nest site following best-practice published methodology; if feasible, monitor productivity of any nests found; and
 - Also consider sampling small mammal population.
55. Remedial measures will be implemented if necessary, to achieve the desired sward length and structure – e.g. grazing management, spring/ autumn cutting, herbicide application, spot-treatments.

Marsh harrier triggers:

The grassland is designed to provide foraging resources for marsh harrier.

- Lower than expected use (indicated by lower frequency of flight activity than baseline) by marsh harriers.
- Absence of nesting birds in immediate environs of the site, including within the KWT South Bank of the Swale reserve.

- Also, possibly, lower than expected density of small mammals.

Other monitoring considerations:

- Monitor condition of ditch banks and assess damage by poaching.

Example remedial measures:

- Adapt survey effort to increase understanding of bird use of the site and wider area;
- Inspect sward status and adjust sward management if necessary – considerations include grazing/cutting intensity, water management, herbicide to control weed growth.
- Install fencing to protect ditch banks from damage by poaching if necessary.

7 APPENDIX B – LOWLAND MEADOW GRASSLAND MANAGEMENT PLAN



7.1 Introduction

56. Arable agricultural land may be one of the most challenging types of habitat to convert/attempt sward enhancement due to its high soil fertility which promotes dominance by a limited diversity of competitive plant species which limits the establishment and success of less-competitive wildflowers and fine grasses. Consequently, grassland enhancement/restoration is a complex process requiring monitoring and intervention over several years to ensure success, especially on sites with a long history of agricultural improvement.
57. The prescriptions set out in this Lowland Grassland Management Plan (LGMP) are intended to provide a flexible management framework that will be subject to review depending on the outcomes of ongoing monitoring and management. The work outlined below will be undertaken by a suitably qualified contractor with specialist knowledge of grassland management. The contractor will be responsible for monitoring the success and implementation of measures and for taking appropriate remedial action, if needed. An ecologist will be available during all stages of the Development to undertake scheduled monitoring (specified below) and to provide ad hoc support. The emphasis of the LGMP will be to provide benefits to pollinating invertebrate species, such as bumblebees. It is anticipated that the LGMP seed mix will be the same as that described for grazing marsh habitat management, but with management approach reflecting practical and conservation objectives within this habitat. The prescriptions for the habitat can be found in the following sections.
58. Earthworks onsite (e.g., transformer foundation excavations) may result in a small surplus of material in areas of the Development site. This material will be reused in landscaping and restoration of the Development site during and after construction. If there remains a surplus post construction, small mounds of site won material of up to 3 m in height may be formed and seeded in vacant areas of the Development site (within the perimeter fence) to provide a range of habitats for certain species such as, reptiles, amphibians and invertebrates. Each mound will effectively form hibernacula piles. The exact size of the mounds will be dependent on the quantity of surplus soil however, would potentially be up to 3m x 3m x 1.5m (length x height x width). Six locations lowland meadow grassland habitat have been identified where the soil mounds/hibernacula could be created to benefit the aforementioned species, Figure A5.1.

7.2 Aims and Objectives

59. The aim of the LGMP is to establish a grassland sward with greater ecological value than the existing arable land. In addressing this aim, prescriptions will be defined for the three key phases of the Development:
- Pre-construction: measures required before infrastructure construction begins in order to prepare the ground for grassland establishment.
 - Construction: measures required during and immediately following construction to establish grassland by means of sowing.
 - Operation: monitoring and management measures for the duration of the operational period.
60. The LGMP follows best practice published by Natural England specialist seed distributors¹⁵. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

7.3 Pre-Construction

7.3.1 Ground Preparation

61. Ground preparation is necessary to establish a clean seed bed into which a grass seed mix can be sown. As the lowland grassland habitats will be outside of the footprint of the solar arrays and much of the construction activities, the option for large-scale, mechanical ground preparation is available. Soil testing may be undertaken, at the discretion of the appointed contractor/ecologist, following ground preparation to determine other preparatory and management requirements.
62. Unlike the grazing marsh GMGMP, there will not be a requirement to control grassland sward length prior to construction activities on the Site and ground preparation can take place to create lowland grassland habitat.

7.4 Construction

7.4.1 Ground Preparation

63. Grassland will be established by directly sowing a seed mix into the prepared ground. The following measures will take place prior to, as part of, or immediately after, construction.
64. No Impact is anticipated as located outside the construction area, however, construction activities have the potential to disturb the seed bed and so it may be necessary to repeat the pre-construction ground preparation to establish a suitable seed bed if construction activities encroach on this habitat. Similarly, if the seedbed lies dormant following construction but before autumn sowing, then further ground preparation may be required.

7.4.2 Timing

65. Autumn (October to December) sowing is preferred because this favours species that germinate in autumn and species that require a period of cold to break their dormancy before they germinate in spring. Sowing must take place when conditions are warm and moist, and so winter and drought periods must be avoided.

7.5 Seed Mix

66. The seed mix will be selected based on the results of the soil testing (if undertaken), however, at this stage it is envisaged that the final seed mix will be decided following consultation with the Bumblebee Conservation Trust¹⁶, with a seed mix of local provenance

¹⁵ Emorsgate Seeds: <http://wildseed.co.uk/home>

¹⁶ <https://www.bumblebeeconservation.org/>

suited to damp lowland habitats. An example seed mix such as *Emorsgate EM3 – Special General Purpose Meadow Mixture*¹⁷ may be suitable.

67. The final selected mix will need to be diverse and suitable for sites where soil conditions vary across a site or where soil and site characteristics have not been established before sowing. The list of plant species that can be included within the final seed mix is seen in Table 6.1. Natural recolonization will be utilised in-combination with identified seed mix ensuring necessary and targeted habitat is created.

Table 6.1 Emorsgate EM3 – Special General Purpose Meadow Mixture

%	Scientific name	Common name
Wildflowers		
0.5	<i>Achillea millefolium</i>	Yarrow
2.4	<i>Centaurea nigra</i>	Common Knapweed
1	<i>Centaurea scabiosa</i>	Greater Knapweed
0.6	<i>Daucus carota</i>	Wild Carrot
0.6	<i>Filipendula ulmaria</i>	Meadowsweet
0.8	<i>Galium verum</i>	Lady's Bedstraw
1.5	<i>Knautia arvensis</i>	Field Scabious
0.3	<i>Leontodon hispidus</i>	Rough Hawkbit
1	<i>Leucanthemum vulgare</i>	Oxeye Daisy
1	<i>Lotus corniculatus</i>	Bird's-foot Trefoil
0.1	<i>Origanum vulgare</i>	Wild Marjoram
1	<i>Plantago lanceolata</i>	Ribwort Plantain
0.5	<i>Plantago media</i>	Hoary Plantain
1.8	<i>Poterium sanguisorba</i>	Salad Burnet
0.5	<i>Primula veris</i>	Cowslip
2	<i>Ranunculus acris</i>	Meadow Buttercup
1	<i>Rhinanthus minor</i>	Yellow Rattle
0.6	<i>Rumex acetosa</i>	Common Sorrel
1	<i>Silene dioica</i>	Red Campion
0.2	<i>Silene flos-cuculi</i>	Ragged Robin
1	<i>Silene vulgaris</i>	Bladder Campion
0.1	<i>Trifolium pratense</i>	Wild Red Clover
0.5	<i>Vicia cracca</i>	Tufted Vetch
Grasses		
8	<i>Agrostis capillaris</i>	Common Bent
40	<i>Cynosurus cristatus</i>	Crested Dog's-tail
28	<i>Festuca rubra</i>	Slender-creeping Red-fescue
4	<i>Phleum bertolonii</i>	Smaller Cat's-tail

¹⁷ <http://wildseed.co.uk/mixtures/view/4>

7.6 Sowing

68. The seed mix will be sown at a rate of 40 kg/ha (4 g/m²). The seed must be surface sown and can be applied by machine or by hand. Once sown, the seed should be lightly pressed into the seedbed by rolling or treading.

7.7 Monitoring

69. An ecologist/Landscape Architect will visit the site before seed is sown to check that ground conditions are suitable, and following seed sowing to check that seed has been sown correctly. Remedial actions will be communicated to the Operator at the earliest opportunity.

7.8 Operation

70. The following work will be carried out upon completion of all construction works and following the sowing of the grassland seed mix. The activities are relevant to for the duration of the operational phase.

7.9 Weed Control

71. A flush of weeds is to be expected in the first season after sowing and these can be managed by cutting (see below). It is likely that some pernicious weeds will persist following the ground preparation and can be treated by hand pulling.

7.10 Cutting

72. For the purposes of this plan it is assumed that grassland will be managed by appropriate mechanical cutting, to be managed as a wildflower rich hay meadow. Alternatively, a low intensity grazing regime could be employed in agreement with the HMSG.

7.10.1 Year 1 (Lowland Meadow Grassland Habitat Management Area)

73. A mechanical cut of grassland habitat within the lowland meadow grassland habitat management fields will be completed twice, which will be in line with a hay meadow management regime. The sward is to be cut to 100 mm in summer (July) and again in September, with all arising's collected as hay or silage.
74. The frequency of the cuts will ensure that the lowland grassland habitat within this area will in time become less fertile, to favour a more diverse wildflower grassland structure. The high cut of 100 mm favours lower growing flowering plants that are competing with the longer grassland sward, but will not be collected during the hay cuts.
75. A higher proportion of flowering plants within the lowland grassland sward will provide benefits for invertebrates and other wildlife through the spring and summer months. Any seeds that are returned to the ground will add to the natural seed bank each year. The collection of arising's will also ensure that wildflowers within the seed mix will continue to flourish each year, and not be out competed by vigorous grass species.

7.10.2 Year 1

76. A mechanical cut of grassland habitat will be completed, which will be in line with a low intensity meadow management regime. The sward is to be cut to 100 mm once from September onwards with all arising's collected as hay or silage.
77. The timing of the cut ensures that flowering will be able to take place throughout the peak growth season uninterrupted and that seeds are either available for foraging birds or are able to fall to the ground. The timing of the cut will ensure that lowland grassland habitat is available to foraging bats, birds, invertebrates and other wildlife through the spring and summer months. Any seeds that are returned to the ground will add to the natural seed

bank each year. The collection of arising's will also ensure that wildflowers within the seed mix will continue to flourish each year, and not be out competed by vigorous grass species.

7.10.3 Years 2 onwards

78. In the second and subsequent years the grassland can be managed in a similar way as Year 1 which, in consideration with soil fertility, will determine the character of the grassland. The best results are usually obtained by traditional hay meadow management.
79. The grassland will need to be cut at a similar height and cutting times as to Year 1, with two cuts per year in the lowland Meadow Grassland Habitat management areas, and an annual cut in lowland meadow outside the perimeter fence. On completion of each cut, the arising's will be taken away for use as silage or as hay.
80. As the soil fertility decreases in subsequent years in the lowland meadow habitat within lowland Meadow Grassland Habitat management areas, the frequency of cutting can be reduced to a single summer cut in July annually. Similarly, lowland grassland outside the perimeter fencing can be cut at a reduced frequency of once every two years where soil fertility has reduced. Following habitat monitoring, consultation with an ecologist or agricultural contractor will determine when the cutting frequency can be reduced in subsequent years.
81. With consideration to soil fertility, the management of lowland grassland outside the perimeter fence line and in lowland Meadow Habitat management areas will be undertaken in line with Year 1 and throughout the lifetime of the development.

7.11 Monitoring and Remedial Actions

82. An ecologist will visit the site in spring (May) and summer (July/August) Year 1 to check the establishment of seed mix and weeds. The habitat establishment will ensure enhancement has occurred for invertebrate species who will benefit from the habitat being targeted and created. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species (Marsh Harrier, Golden Plover, Lapwing, Brent Geese, general breeding bird surveys will also be included).
83. Assuming that the seed mix has established successfully after Year 1, an ecologist will visit the site in late-spring (May) in Years 2, 3, 5, 10 and 20 to assess the success of grassland management and, as necessary, recommend revisions to the LGMP. Ornithological surveys will be continued across the same years to ensure bird species are benefitting from the habitat being created as required.

8 APPENDIX C – HEDGEROW (WITH TREES) MANAGEMENT PLAN



8.1 Introduction

84. Hedgerows provide an important habitat within the local area with many networks of hedgerows traversing the landscape and forming an important component of local green infrastructure, providing wildlife corridors and habitat for a variety of species of flora and fauna. Within the Development site there are currently no hedgerows present, some patchy areas of scrub and therefore the introduction of hedgerows at the scale proposed (approximately 3.7km) would significantly increase the habitat diversity on site in line with the surrounding landscape character and provide green linkage between areas of offsite vegetation within the wider landscape context.

8.1.1 Hedge Tree Planting

85. Within the new hedgerows, hedgerow trees will be planted to provide additional habitat and to create a strong vertical presence within the landscape which aims to provide a setting for and to screen views of the Development site. Within the new hedgerows standard trees will be planted at a random spacing of between 5-9 metres (on average 1 tree per 7 m centres) to create informal/natural landscape features. Tree species will be mixed along the hedgerows in random patterns of 1, 3 or 5 trees (of the same species) to reinforce a natural layout of species within the landscape. All species will be native and of local provenance and will reflect those tree species found in hedgerows locally.
86. The prescriptions set out in the Hedgerow Management Plan (HMP) are intended to provide a management framework that will enable hedgerows and hedgerow trees to be planted and established within the first five years post development. The work outlined overleaf will be undertaken by a suitably qualified landscape contractor in line with current British Standards. The contractor will be responsible for implementation and maintenance of the work which would be executed through a JCLI Landscape Works Contract 2017 (JCLI LWC 2017), and a JCLI Landscape Maintenance Works Contract 2017 (JCLI LMWC 2017), under the supervision of a Chartered Landscape Architect to ensure all work is undertaken to the correct standards.

8.2 Aims and Objectives

87. The hedgerows (with trees) should be implemented within the first available planting season post construction to ensure that mitigation measures are completed in a timely manner and their impact is delivered in as shorter timeframe as possible.
88. The aim of the HMP is to establish a dense healthy hedgerow which ties existing areas of green infrastructure together creating a landscape asset which enhances the local green infrastructure whilst creating on site mitigation and screening of the Development site with greater ecological value than the existing arable land and pockets of vegetation. In addressing this aim, prescriptions will be defined for the two key phases of the Development:
 - Construction: measures required during and immediately following construction to establish hedgerows.
 - Operation: monitoring and management measures for the duration of the operational period.
89. The HMP follows best practice published by British Standards Institution¹⁸. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

8.3 Construction

90. Hedgerows and hedgerow trees will be established by planting into the prepared ground. The following measures will take place as part of, or immediately after, construction.

8.4 Ground Preparation

91. Ground preparation is necessary to establish a clean planting bed into which hedgerow plants can be planted. An area 0.5m either side of the centre line of the hedgerow line will be sprayed with herbicide and cultivated to a depth of 450mm prior to planting. Repeated treatments may be necessary to exhaust weeds. Any imported topsoil must be BS 3882:2015 compliant and existing topsoil must be cultivated in accordance with BS 3882:2015. No cultivation should take place in wet/ waterlogged conditions and onsite topsoil is to be used in areas of uneven surfaces to make good levels to create a smooth level surface for hedge planting.

8.5 Timing

92. All planting will be undertaken between November and March of the first planting season following construction of the Development or as soon as practicable thereafter.
93. If planting is undertaken during construction, Hedgerows and trees planted along the route of the existing 11 kV overhead line and the proposed underground route of the line (e.g., northwest of Warm House) will be planted after the undergrounding has been completed.
94. Similarly, hedgerows within the perimeter fence adjacent to fields V and X will be planted after the construction of solar arrays in these fields.

8.6 Species Mix

95. The proposed hedge species mix shown in Table 8.1 overleaf is informed by a survey of existing hedgerows species surrounding the site. The mix includes species that are currently found at the Development site and in the surrounding landscape. The new hedge and hedgerow trees will benefit biodiversity by creating a hedge with nut and fruit bearing species which will provide a food source for birds, small mammals and invertebrates.

¹⁸ British Standards Institution: <https://www.bsigroup.com/en-GB/>

Table 8.1: New Hedge Planting: Plant Species, Mix Percentage, Size and Root

% within mix	Scientific name	Common name	Size (cm)	Root
10	<i>Acer campestre</i>	Field Maple	60-90	BR
5	<i>Carpinus betulus</i>	Hornbeam	60-90	BR
2.5	<i>Cornus sanguinea</i>	Dogwood	60-90	BR
10	<i>Corylus avellana</i>	Hazel	60-90	BR
45	<i>Crataegus monogyna</i>	Hawthorn	60-90	BR
5	<i>Fagus sylvatica</i>	Beech	60-90	BR
2.5	<i>Ilex aquifolium</i>	Holly	30-40	C
15	<i>Prunus spinosa</i>	Blackthorn	60-90	BR
2.5	<i>Rosa canina</i>	Dog Rose	60-90	BR
2.5	<i>Sambucus nigra</i>	Elder	60-90	BR

8.7 Hedgerow Planting

96. Mixed native hedging will comprise of a double staggered row of plants 450mm apart within each row, overall 5 plants per linear metre. Species will be mixed throughout the hedge line in random groups of 3/5. A 500 mm wide trench will be excavated to take plants and topsoil cultivated to 450 mm depth prior to application of fertiliser. All native planting shall be of local provenance. Native hedgerow plants will be protected by spiral shelters and one cane per plant.

8.8 Hedgerow Trees

97. Figure A5.1 of the LBMP shows the location of hedgerows where hedgerow trees will be planted. Trees within hedgerows will be planted as Select Standards with a height of between 3.0-3.5 m, a girth of between 8 and 10 cm and a clear stem of 1.75-2 m. The location of each hedge tree will be marked by a timber post 1.5 m in height so that its location is noticeable to operators of tractor flails during maintenance periods. Select Standard trees to be planted in pits 800x800x450 mm or dimensions of rootball, whichever is greater. Trees will be supported by two round timber stakes (75 mm diameter x 1500 mm long, per tree, and finished at 600mm above ground), with cross bar (400x100x15 mm) and two biodegradable tree ties. A 25kg bag of soil improver and 140g Enmag (or equivalent) slow release fertiliser will be incorporated into the soil of all new tree pits. Trees will be planted centrally within the new hedgerow (along the centre line of the hedge).

Table 8.2: New Hedgerow with Tree Planting: Plant Species, Mix Percentage, Size and Root

% within mix	Scientific name	Common name	Height (cm)	Root
25	<i>Acer campestre</i>	Field Maple	300-350	RB
25	<i>Crataegus monogyna</i>	Hawthorn	300-350	RB
10	<i>Malus sylvestris</i>	Crab Apple	300-350	RB
25	<i>Prunus spinosa</i>	Blackthorn	300-350	RB
15	<i>Quercus robur</i>	Common Oak	300-350	RB

8.9 Operation

98. The following work will be carried out upon completion of hedgerow planting. The activities are relevant to the duration of the operational phase.

8.10 Maintenance Operations - Year 1

99. The hedgerow should be regularly watered in its first summer and weeds should be controlled through the use of biodegradable mulch matting prior to the addition of bark mulch. A 75 mm layer of bark mulch 0.5 m either side of the hedge will be spread along the length of the hedge to suppress weeds and retain soil moisture.
100. Allow for 1 cut per season and only between 1st September and 28th February. Carefully clip and prune the top and sides of the hedge to promote dense growth to ground level and in the desirable parameters that the hedge will eventually attain. Prune the top of the hedge when it has achieved a height of 90 cm. Care should be taken to avoid damage to hedgerow trees during cutting new hedgerow planting.
101. Hedge plant shelters to be checked 4 times in the first year. Shelters which have fallen should be straightened and any damaged or missing shelters should be replaced.
102. Any plants during the first year of establishment which die or are dying should be replaced with 60–90 cm plants of the same species (planted in November).

8.11 Maintenance Operations - Year 2

103. The hedgerow should be watered as required in prolonged periods (1 week) without rainfall. Spot treat any weeds growing at the base of the hedge with Glyphosate during the growing season prior to topping up with 75mm depth bark mulch where applicable to suppress weeds and retain soil moisture.
104. Directly apply fungicide and or insecticide as spot treatment to any plants suffering from fungal infection or insect attack. Care needs to be taken to avoid these chemicals coming into contact with the ground or near aquatic habitats.
105. Allow for 1 cut per year and only between 1st October and 28th February. Carefully clip and prune the top and sides of the hedge to promote dense growth to ground level and in the desirable parameters that the hedge will eventually attain. Prune the top of the hedge when it has achieved a height of 90cm. Care should be taken to avoid damage to hedgerow trees during cutting.
106. It is best to cut in January or February and if this is not feasible, cut as late as possible in autumn. The bird breeding season of 1st March to 30th September should be avoided.
107. Hedge plant shelters to be checked 4 times in the second year. Shelters which have fallen should be straightened and any damaged or missing shelters should be replaced.
108. Any plants during the second year of establishment which die or are dying should be replaced with 60–90cm plants of the same species (planted in November).
109. Water recently replaced plants as necessary to ensure establishment.

8.12 Maintenance Operations - Year 3 and 4

110. Repeat procedures as for Year 2 above.
111. When cutting a hedgerow in rotation, allow the height of the trim to increase a little each time (e.g. 10-20cm). If a hedgerow is cut back at the same height repeatedly, after some years a hard knuckle will start to form.
112. At year 4 the hedge should be dense and clothed in leaves to ground level, no further requirement for spot treating weeds or topping up mulch is necessary. Replace dead or missing plants as necessary to maintain the hedge density.

8.13 Maintenance Operations - Year 5

113. Remove hedge plant shelters and stakes to allow natural establishment of the hedgerows. After year 4 it is optimal to cut on a two or (preferably) a three year cycle, as most tree or

shrub flowers are produced on year old twigs, which annual cutting removes, resulting in no flowers, berries or nuts being produced. Care should be taken to avoid damage to hedgerow trees during cutting.

114. It is best to cut in January or February and if this is not feasible, cut as late as possible in autumn. The peak bird breeding season March to September should always be avoided.
115. Where viable, different wildlife likes different sizes and shapes of hedge, so create a variety, though favouring large, dense, infrequently cut hedges ranging in height of between 3-4m high.

8.14 Maintenance Operations - Years 6 onwards

116. Continue to cut hedges on a two or (preferably) a three year cycle, as most tree or shrub flowers are produced on year old twigs, which annual cutting removes, resulting in no flowers, berries or nuts being produced. Care should be taken to avoid damage to hedgerow trees during cutting.
117. As above wildlife like different sizes and shapes of hedge, so create a variety, though favouring large, dense, infrequently cut hedges ranging in height of between 3-4m high. This can be undertaken by adopting a variable cutting schedule on a 3 year rota to provide a range of habitats and to ensure a supply of fruit and berries is available to birds and wildlife within the hedgerows each year. Visually this will also create a more varied and natural looking landscape.
118. No work which might harm nesting birds or destroy their nests should be undertaken throughout the duration of the Development; therefore hedge cutting should not be undertaken between the main bird nesting period from 1st March to 30th September. A green cover on land within 2 m of the centre of a hedge should be maintained at all times and no cultivation or application of fertilisers or pesticides should be undertaken within 2m of the centre of the hedge. Optimally the management of a margin should be cut in two halves; whereby the closest half to the hedgerow is allowed to grow rough tussocky, by cutting once every few years and the other half should be cut annually, after mid-July. Prevent weed growth of the ground flora margin by excluding fertilisers and allowing the grassland on site to develop up to the hedgerows.

8.15 Monitoring and Remedial Actions

119. A landscape architect will visit the site in spring (May) and summer (July/August) Year 1 to check the establishment of hedgerows and trees. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species specifically, breeding bird surveys.
120. Assuming that the hedgerow has established successfully after Year 1, a landscape Architect will visit the site in late-spring (May) in Years 2, 3, 5, 10 and 20 to assess the success of hedgerow management and, as necessary, recommend revisions to the HMP.

9 APPENDIX D - SHELTERBELT MANAGEMENT PLAN



9.1 Introduction

121. Shelterbelts provide an important habitat within the local area and contribute to the landscape character of the Graveney Fruit Farms linking hedgerows and woodlands as part of the local green infrastructure. The role of the Shelterbelts will be to create structural planting along the southern boundary of the Development site immediately north of the Graveney Fruit Farms Landscape Character Area. This will extend the influence of the character area and provide a relatively low level screen within the landscape. This is particularly prevalent to contribute to screening adjacent to properties at Nagden. The planting will consist of native species of local provenance and will reflect those tree species found in shelterbelts locally. Trees will be maintained to a height of between 5-7 m with the exception of Black Poplar, Alder, Beech and Hornbeam planted at a low density to provide some structure in keeping with the edge of the Graveney Fruit Farm Character Area. The planting will be maintained at a height which screens views of the Development in short and medium distance views whilst retaining some long distance views over the sea wall surrounding the Development site. Trees will be planted to provide habitat and to create a strong vertical presence within the landscape which aims to provide a setting for and to screen views of the Development site.
122. The prescriptions set out in the Shelterbelt Management Plan (SMP) are intended to provide a management framework that will enable shelterbelts to be planted and established within the first five years post development. The work outlined below will be undertaken by a suitably qualified landscape contractor in line with current British Standards. The contractor will be responsible for implementation and maintenance of the work which would be executed through a JCLI Landscape Works Contract 2017 (JCLI LWC 2017), and a JCLI Landscape Maintenance Works Contract 2017 (JCLI LMWC 2017), under the supervision of a Chartered Landscape Architect to ensure all work is undertaken to the correct standards.

9.2 Aims and Objectives

123. The trees and shrubs should be planted within the first available planting season post construction to ensure that mitigation measures are completed in a timely manner and their impact is delivered in as shorter timeframe as possible.
124. The aim of the SMP is to establish a dense healthy Shelterbelt which ties into proposed and existing areas of green infrastructure together creating a landscape asset which enhances the local green infrastructure whilst creating on site mitigation and screening of the Development site with greater ecological value than the baseline. In addressing this aim, prescriptions will be defined for the two key phases of the Development:
- Construction: measures required during and immediately following construction to establish shelterbelts.
 - Operation: monitoring and management measures for the duration of the operational period.
125. The SMP follows best practice published by British Standards Institution¹⁹. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

9.3 Construction

126. Shelterbelts will be established by planting into the areas of land recently sown with wildflower and grass seed. This ensures a ground cover habitat whilst the shelterbelt establishes. The following measures will take place as part of, or immediately after, construction.
127. Heras fencing will be installed in necessary locations within the development footprint to act as an identifiable barrier to construction activities thereby protecting the newly planted trees and hedgerow species.

9.4 Ground Preparation

128. Ground preparation is necessary to establish a clean planting bed into which trees and shrubs can be planted. The extent of the planting area will be sprayed with herbicide and cultivated to a depth of 450mm prior to planting and prior to sowing of wildflower and grass seed in line with section 9.3 above. Repeated treatments may be necessary to exhaust weeds prior to sowing. Any imported topsoil must be BS 3882:2015 compliant and existing topsoil must be cultivated in accordance with BS 3882:2015. No cultivation should take place in wet/ waterlogged conditions and onsite topsoil is to be used in areas of uneven surfaces to make good levels to create a smooth level surface for new planting.

9.5 Timing

129. All planting will be undertaken between November and March of the first planting season following construction of the Development or as soon as practicable thereafter.

9.6 Species Mix

130. The proposed shelterbelt species mix shown in Table 9.1 is informed by a survey of existing vegetation within or surrounding the site. The mix includes species that are currently found at the Development site and in the surrounding landscape. The new shelterbelt trees will benefit biodiversity by creating a dense shelterbelt with nut and fruit bearing species which will provide a food source for birds, small mammals and invertebrates.

¹⁹ British Standards Institution: <https://www.bsigroup.com/en-GB/>

Table 9.1: New Shelterbelt Planting: Plant Species, Mix Percentage, Size and Root

% within mix	Scientific name	Common name	Size (cm)	Form	Root
10	<i>Acer campestre</i>	Field Maple	125-150	Whip	BR
5	<i>Alnus glutinosa</i>	Alder	200-250	Feathered	RB
5	<i>Carpinus betulus</i>	Hornbeam	100-125	Transplant	BR
2.5	<i>Cornus sanguinea</i>	Dogwood	60-90	Transplant	BR
10	<i>Corylus avellana</i>	Hazel	100-125	Transplant	BR
45	<i>Crataegus monogyna</i>	Hawthorn	125-150	Whip	BR
5	<i>Fagus sylvatica</i>	Beech	100-125	Transplant	BR
2.5	<i>Ilex aquifolium</i>	Holly	40-60	3L	C
10	<i>Malus sylvestris</i>	Crab Apple	125-150	Whip	RB
	<i>Populus nigra</i>	Black Poplar	200-250	Feathered	
15	<i>Prunus spinosa</i>	Blackthorn	200-250	Feathered	RB
2.5	<i>Rosa canina</i>	Dog Rose	60-90	Transplant	BR
2.5	<i>Sambucus nigra</i>	Elder	100-125	Transplant	BR

9.7 Shelterbelt Planting

131. New Shelterbelt planting will consist of trees/shrubs planted at 1 m centres to create informal/natural landscape features. Tree/shrub species will be planted in groups of 1, 3, 5 and 7 (of the same species) to reinforce a natural layout of species within the landscape.
132. Trees and shrubs will be planted as Whips, Transplants and Feathered specimens in pits approximately 300x300x400mm or the dimensions of the rootball whichever is greater. Shrubs will be planted directly into the ground without guards to enable them to develop into a bushy and dense understorey. Whips will be protected by spiral shelters supported by a cane. Transplants will be protected by shelterguard with post tie with a single round timber stake 1.2 m x 50 mm fitted in line with manufacturers instructions. Feathered Trees will be supported by one round timber stake (75 mm diameter x 1500mm long, per tree, and finished at 600mm above ground), and a biodegradable tree tie. Soil improver and 140g Enmag (or equivalent) slow release fertiliser will be incorporated into the soil of all new tree pits.

9.8 Operation

133. The following work will be carried out upon completion of shelterbelt planting. The activities are relevant to the duration of the operational phase.

9.9 Maintenance Operations - Year 1

134. The trees/shrubs should be regularly watered in the first summer and weeds should be controlled by the use of biodegradable base collars around each tree/shrub prior to the addition of bark mulch. A 75 mm layer of bark mulch 0.5 m in diameter will be spread around each tree/shrub to suppress weeds and retain soil moisture.
135. Tree shelters and stakes to be checked 4 times in the first year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.
136. Any plants during the first year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).

9.10 Maintenance Operations - Year 2

137. The trees and shrubs should be watered as required in prolonged periods (1 week) without rainfall.
138. Directly apply fungicide and or insecticide as spot treatment to any plants suffering from fungal infection or insect attack. Care needs to be taken to avoid these chemicals coming into contact with the ground or near aquatic habitats.
139. Tree shelters to be checked twice in the second year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.
140. Any plants during the second year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).
141. Water recently replaced plants as necessary to ensure establishment.
142. Top up bark mulch to maintain a depth of 75 mm, 0.5 m in diameter around each tree/shrub as required to suppress weeds and retain soil moisture.

9.11 Maintenance Operations - Year 3 and 4

143. Repeat procedures as for Year 2 above.
144. Clip and prune the top and sides of the shrubs (10 cm) to promote dense growth to ground level and in the desirable parameters that the shrub will eventually attain.
145. It is best to cut in January or February and if this is not feasible, cut as late as possible in autumn. The peak bird breeding season March to September should always be avoided.
146. At year 4 the shelterbelt should be forming a dense low level landscape feature with some height achieved from the larger trees (Black Poplar and Alder) and understorey shrubs should be clothed in leaves to ground level, no further requirement for spot treating or topping up mulch is necessary. Replace dead or missing plants as necessary to maintain the planting density.

9.12 Maintenance Operations - Year 5

147. In line with the objectives of the shelterbelts the overall height should be maintained to between 5-7 m with the exception of Black Poplar, Alder, Beech and Hornbeam. Due to the species and density of planting proposed the mature heights of plants will be relatively low and therefore maintenance should be minimal at this time. Black Poplar and Alder will be relatively sparse in the mix creating some filtering of views and these trees should be left to mature throughout the Development. Beech and Hornbeam will also be left to mature; however, these species are slower growing and will gain height over a longer period.
148. Remove any tree/shrub shelters and stakes to allow natural establishment of the shelterbelt.

9.13 Maintenance Operations - Years 6 onwards

149. In line with the objectives of the shelterbelts the overall height should be between 5-7 m with the exception of Black Poplar, Alder, Beech and Hornbeam. To ensure a natural shape to the shelterbelt tree maintenance should be undertaken on a four year cycle whereby a maximum of 25% of the shelterbelt is maintained in any one year with heights of trees (with the exception of those four species above) reduced to between 5-7 m where necessary. This will encourage a better habitat on site and will also create a natural landscape feature over time. All pruning work should be undertaken in line with BS3998:2010. At years 15-20 the Black Poplar should be assessed for the ability to pollard in line with the local landscape character of the Graveney Fruit Belt. This should be undertaken in line with an assessment of the wider landscape management offsite (adjacent) at the time to ensure a consistent approach. Hazel trees within the shelterbelt should be coppiced at year 6 with coppicing repeated on a 6-12 year cycle to create an enhanced habitat and landscape feature.

150. No work which might harm nesting birds or destroy their nests should be undertaken throughout the duration of the Development; therefore pruning/cutting should not be undertaken between the main nesting period from 1st March to 30th September.

9.14 Monitoring and Remedial Actions

151. A landscape Architect will visit the site in spring (May) and summer (July/August) Y1 to check the establishment of trees and shrubs. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species specifically, general breeding bird surveys.
152. Assuming that the plants have established successfully after Y1, a landscape Architect will visit the site in late-spring (May) in years 2, 3, 5, 10 and 20 to assess the success of the shelterbelt and, as necessary, recommend revisions to the SMP.

10 APPENDIX E – WOODLAND MANAGEMENT PLAN



10.1 Introduction

153. Woodland planting provides an important habitat within the local area and contributes to the landscape character of the Graveney Fruit Farms linking hedgerows, shelterbelts and woodlands as part of the local green infrastructure. The role of the proposed woodland planting will be to create a visual screen along a section of the southern boundary of the Development site immediately adjacent to Warm House and north of the Graveney Fruit Farms Landscape Character Area. This will extend the influence of the landscape character area and provide a dense visual screen between Warm House and the Development.
154. The planting will consist of native species of local provenance and will reflect those tree species found in woodlands locally. Trees will be allowed to naturalise over time achieving a height which screens views of the Development from Warm House. Trees will be planted to provide habitat and screening creating a strong visual presence to residents at Warm House. The woodland is approximately 45m wide and 230m long to ensure the screen is effective all year round.
155. The prescriptions set out in the Woodland Management Plan (WMP) are intended to provide a management framework that will enable the woodland to be planted and established within the first five years post development. The work outlined below will be undertaken by a suitably qualified landscape contractor in line with current British Standards. The contractor will be responsible for implementation and maintenance of the work which would be executed through a JCLI Landscape Works Contract 2017 (JCLI LWC 2017), and a JCLI Landscape Maintenance Works Contract 2017 (JCLI LMWC 2017), under the supervision of a Chartered Landscape Architect to ensure all work is undertaken to the correct standards.

10.2 Aims and Objectives

156. The trees should be planted within the first available planting season post construction to ensure that mitigation measures are completed in a timely manner and their impact is delivered in as shorter timeframe as possible.

157. The aim of the WMP is to establish a dense healthy Woodland which ties into proposed and existing areas of green infrastructure together creating a landscape asset which enhances the local green infrastructure whilst creating on site mitigation and screening of the Development site with greater ecological value than the baseline. In addressing this aim, prescriptions will be defined for the two key phases of the Development:

- Construction: measures required during and immediately following construction to establish the woodland.
- Operation: monitoring and management measures for the duration of the operational period.

158. The WMP follows best practice published by British Standards Institution²⁰. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

10.3 Construction

159. Woodlands will be established by planting into the areas of land recently sown with wildflower and grass seed. This ensures a ground cover habitat whilst the woodland establishes. The following measures will take place as part of, or immediately after, construction.

160. Heras fencing will be installed to act as an identifiable barrier to construction activities thereby protecting the newly planted trees and hedgerow species.

10.4 Ground Preparation

161. Ground preparation is necessary to establish a clean planting bed into which trees can be planted. The extent of the planting area will be sprayed with herbicide and cultivated to a depth of 450mm prior to planting and prior to sowing of wildflower and grass seed in line with section 9.3 above. Repeated treatments may be necessary to exhaust weeds prior to sowing. Any imported topsoil must be BS 3882:2015 compliant and existing topsoil must be cultivated in accordance with BS 3882:2015. No cultivation should take place in wet/waterlogged conditions and onsite topsoil is to be used in areas of uneven surfaces to make good levels to create a smooth level surface for new planting.

10.5 Timing

162. All planting will be undertaken between November and March of the first planting season following construction of the Development or as soon as practicable thereafter.

10.6 Species Mix

163. The proposed woodland species mix shown in Table 10.1 overleaf is informed by a survey of existing vegetation within or surrounding the site. The mix includes species that are currently found at the Development site and in the surrounding landscape. The new woodland trees will benefit biodiversity by creating a dense woodland with nut and fruit bearing species which will provide a food source for birds, small mammals and invertebrates.

²⁰ British Standards Institution: <https://www.bsigroup.com/en-GB/>

Table 10.1: New Woodland Planting: Plant Species, Mix Percentage, Size and Root

% within mix	Scientific name	Common name	Size (cm)	Form	Root
10	<i>Acer campestre</i>	Field Maple	125-150	Whip	BR
20	<i>Alnus glutinosa</i>	Alder	200-250	Feathered	RB
2.5	<i>Betula pendula</i>	Silver Birch	100-125	Transplant	BR
10	<i>Corylus avellana</i>	Hazel	100-125	Transplant	BR
5	<i>Crataegus monogyna</i>	Hawthorn	125-150	Transplant	BR
10	<i>Ilex aquifolium</i>	Holly	40-60	3L	C
5	<i>Populus nigra</i>	Black Poplar	200-250	Feathered	RB
10	<i>Quercus robur</i>	English Oak	125-150	Transplant	RB
10	<i>Quercus patrea</i>	Sessile Oak	125-150	Transplant	RB
15	<i>Salix caprea</i>	Goat Willow	60-90	Transplant	BR
2.5	<i>Sambucus nigra</i>	Elder	100-125	Transplant	BR

10.7 Woodland Planting

164. New Woodland planting will consist of trees planted at 1 m centres to create informal/natural landscape features. Tree species will be planted in groups of 1, 3, 5 and 7 (of the same species) to reinforce a natural layout of species within the landscape.

165. Trees will be planted as Whips, Transplants and Feathered specimens in pits approximately 300x300x400mm or the dimensions of the rootball whichever is greater. Whips will be protected by spiral shelters supported by a cane. Transplants will be protected by shelterguard with post tie with a single round timber stake 1.2 m x 50 mm fitted in line with manufactures instructions. Feathered Trees will be supported by one round timber stake (75 mm diameter x 1500mm long, per tree, and finished at 600mm above ground), and a biodegradable tree tie. Soil improver and 140g Enmag (or equivalent) slow release fertiliser will be incorporated into the soil of all new tree pits.

10.8 Operation

166. The following work will be carried out upon completion of woodland planting. The activities are relevant to the duration of the operational phase. Residential input can be considered and discussed within the HMSG if there is a desire to change the habitat type.

10.9 Maintenance Operations - Year 1

167. The trees should be regularly watered in the first summer and weeds should be controlled by the use of biodegradable base collars around each tree/shrub during the growing season prior to the addition of bark mulch. A 75 mm layer of bark mulch 0.5 m in diameter will be spread around each tree to suppress weeds and retain soil moisture.

168. Tree shelters and stakes to be checked 4 times in the first year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.

169. Any plants during the first year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).

10.10 Maintenance Operations - Year 2

170. The trees should be watered as required in prolonged periods (1 week) without rainfall.

171. Directly apply fungicide and or insecticide as spot treatment to any plants suffering from fungal infection or insect attack. Care needs to be taken to avoid these chemicals coming into contact with the ground or near aquatic habitats.
172. Tree shelters to be checked twice in the second year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.
173. Any plants during the second year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).
174. Water recently replaced plants as necessary to ensure establishment.
175. Top up bark mulch to maintain a depth of 75 mm, 0.5 m in diameter around each tree as required to suppress weeds and retain soil moisture

10.11 Maintenance Operations - Year 3 and 4

176. Repeat procedures as for Year 2 above.
177. At year 4 the woodland should be forming a dense landscape feature with height achieved from the larger fast growing trees (Black Poplar, Goat Willow, Birch and Alder) and a good understorey establishing to ground level (Field Maple, Hazel, Holly and Elder), no further requirement for spot treating or topping up mulch is necessary. Replace dead or missing plants as necessary to maintain the planting density.

10.12 Maintenance Operations - Year 5

178. In line with the objectives of the woodland a natural form should be establishing and a slight closing of the canopy will be forming at year 5. At this stage any tree/shrub shelters and stakes should be removed and recycled, to allow natural establishment of the trees.
179. At year 5 it is proposed to further establish the woodland by introducing a more diverse woodland flora through the addition of a further wildflower and grass seed mix as follows:
180. The seed mix will be Emorsgate EW1 – *Woodland Mixture*²¹ will be suitable as detailed in Table 10.2.

Table 10.2 Emorsgate EW1 – Woodland Mixture

%	Scientific name	Common name
Wildflowers		
3	<i>Alliaria petiolata</i>	Garlic Mustard
1	<i>Allium ursinum</i>	Ramsons
1.6	<i>Betonica officinalis</i> - <i>(Stachys officinalis)</i>	Betony
1	<i>Digitalis purpurea</i>	Foxglove
2	<i>Filipendula ulmaria</i>	Meadowsweet
1	<i>Galium album</i> - <i>(Galium mollugo)</i>	Hedge Bedstraw
3	<i>Geum urbanum</i>	Wood Avens
2.6	<i>Hyacinthoides non-scripta</i>	Bluebell
0.4	<i>Hypericum hirsutum</i>	Hairy St John's-wort
0.2	<i>Primula vulgaris</i>	Primrose
1	<i>Prunella vulgaris</i>	Selfheal

²¹ <http://wildseed.co.uk/mixtures/view/11>

2	<i>Silene dioica</i>	Red Campion
0.2	<i>Silene flos-cuculi</i> - (<i>Lychnis flos-cuculi</i>)	Ragged Robin
1	<i>Teucrium scorodonia</i>	Wood Sage
Grasses		
10	<i>Agrostis capillaris</i>	Common Bent (w)
2	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass (w)
7	<i>Brachypodium sylvaticum</i>	False Brome (w)
28	<i>Cynosurus cristatus</i>	Crested Dogstail
1	<i>Deschampsia cespitosa</i>	Tufted Hair-grass (w)
20	<i>Festuca rubra</i>	Slender-creeping Red-fescue
12	<i>Poa nemoralis</i>	Wood Meadow-grass

10.13 Sowing

181. The seed mix will be sown at a rate of 40 kg/ha (4 g/m²). The seed must be surface sown into the existing surface sward following light scarification/cultivation to disturb soil, particularly at canopy edges away from tree roots, and seed then applied by hand. Once sown, the seed should be lightly pressed into the seedbed by treading. Once sown the seed should be left to naturalise with any pernicious weeds removed by hand and removed from site.

10.14 Maintenance Operations - Years 6 onwards

182. In line with the objectives of the woodland minimal maintenance should be undertaken to encourage a natural woodland form. This will encourage a better habitat on site and will also create a natural landscape feature over time. Hazel trees within the shelterbelt should be coppiced at year 6 with coppicing repeated on a 6-12 year cycle to create an enhanced habitat and landscape feature. Coppiced hazel can be either used by the contractor, or retained on site, cut into 2m lengths and stacked in piles approximately 500 mm high to create brush and log pile shelters to benefit wildlife.

183. No work that might harm nesting birds, disturb, or destroy their nests should be undertaken throughout the duration of the Development; therefore coppicing should not be undertaken between the main nesting period from 1st March to 30th September.

10.15 Monitoring and Remedial Actions

184. A landscape Architect will visit the site in spring (May) and summer (July/August) Y1 to check the establishment of trees. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species specifically, breeding bird surveys.

185. Assuming that the plants have established successfully after Y1, a landscape Architect will visit the site in late-spring (May) in years 2, 3, 5, 10 and 20 to assess the success of the woodland and, as necessary, recommend revisions to the WMP. If following Year 5, any defects are identified by the site operator these can subsequently be addressed e.g. reimplementation of the planting methodology for any replacement tree planting for Years 1-5. If any parts of the woodland fail during the lifetime of the development then replacement planting will be undertaken as prescribed in Years 1-5.

11 APPENDIX F – (ELECTRICAL COMPOUND) BUFFER PLANTING MANAGEMENT PLAN



11.1 Introduction

186. Buffer planting provides a large area of habitat creation within the local area and would be planted on the bund surrounding the Site Compound. The role of the Buffer Planting will be to create screen planting and naturalisation of the bund surrounding the site compound within the eastern section of the Development site. The planting will consist of native species of local provenance and will reflect those tree species found in hedgerows and natural groups locally. Trees will be planted at a low density to provide a natural landscape feature which reduces the uniform shape of the bund and provides low level screening to plant within the site compound.

187. The prescriptions set out in the Buffer Planting Management Plan (BPMP) are intended to provide a management framework that will enable the buffer planting to naturalise effectively and retain a low level landscape feature within the Development site. The work outlined below will be undertaken by a suitably qualified landscape contractor in line with current British Standards. The contractor will be responsible for implementation and maintenance of the work which would be executed through a JCLI Landscape Works Contract 2017 (JCLI LWC 2017), and a JCLI Landscape Maintenance Works Contract 2017 (JCLI LMWC 2017), under the supervision of a Chartered Landscape Architect to ensure all work is undertaken to the correct standards.

11.2 Aims and Objectives

188. The trees should be planted within the first available planting season post construction to ensure that mitigation measures are completed in a timely manner and their impact is delivered in as short a timeframe as possible.

189. The aim of the BPMP is to establish a healthy area of natural planting which when viewed from the Saxon Shore Way appear as naturalising areas of vegetation which screen the

majority of the site compound and partly screen the existing substation whilst creating greater ecological value than the baseline. In addressing this aim, prescriptions will be defined for the two key phases of the Development:

- Construction: measures required during and immediately following construction to establish buffer planting.
- Operation: monitoring and management measures for the duration of the operational period.

190. The BPMP follows best practice published by British Standards Institution²². Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

11.3 Construction

191. Buffer planting will be established by planting into the newly formed bund which has been recently sown with wildflower and grass seed. This ensures a ground cover habitat and soil stabilisation whilst the buffer planting establishes. The following measures will take place as part of, or immediately after, construction.

11.4 Ground Preparation

192. Ground preparation is necessary to establish a clean planting bed into which tree and shrubs can be planted. The extent of the planting area will be sprayed with herbicide (prior to seeding). Repeated treatments may be necessary to exhaust weeds (prior to seeding). Any imported topsoil must be BS 3882:2015 compliant. Given the trees and shrubs will be planted into the bund no further preparation will be required.

11.5 Timing

193. All planting will be undertaken between November and March of the first planting season following construction of the Development or as soon as practicable thereafter.

11.6 Species Mix

194. The proposed buffer planting species mix shown in Table 11.1 is informed by a survey of existing vegetation within or surrounding the site. The mix includes species that are currently found at the Development site and in the surrounding landscape. The buffer planting mix will benefit biodiversity by creating shelter and habitat with nut and fruit bearing species which will provide a food source for birds, small mammals and invertebrates.

Table 11.1: Buffer Planting: Plant Species, Mix Percentage, Size and Root

% within mix	Scientific name	Common name	Size (cm)	Root
5	<i>Acer campestre</i>	Field Maple	60-90	BR
5	<i>Corylus avellana</i>	Hazel	60-90	BR
70	<i>Crataegus monogyna</i>	Hawthorn	60-90	BR
15	<i>Prunus spinosa</i>	Blackthorn	60-90	BR
2.5	<i>Rosa canina</i>	Dog Rose	60-90	BR
2.5	<i>Rubus fruticosus agg.</i>	Bramble	60-90	BR

11.7 Buffer Planting

195. Buffer planting will consist of trees/shrubs planted at 2m centres to create informal/natural landscape features. Tree/shrub species will be planted in groups of 1, 3 and 5 (of the same species) to reinforce a natural layout of species within the landscape.

²² British Standards Institution: <https://www.bsigroup.com/en-GB/>

196. Trees and shrubs will be planted in pits approximately 400x400x400mm or the dimensions of the rootball whichever is greater. Shrubs will be planted directly into the ground/bund (assuming a minimum of 450mm of topsoil is available within the bund capping layer) and will be protected by spiral shelters (with the exception of bramble) supported by a cane. Soil improver and 140g Enmag (or equivalent) slow release fertiliser will be incorporated into the soil of all new planting pits.
197. Areas of grassland can be established within the bund area that is based on the Lowland Grassland Meadow management prescription (Appendix B).

11.8 Operation

198. The following work will be carried out upon completion of buffer planting. The activities are relevant to the duration of the operational phase.

11.9 Maintenance Operations - Year 1

199. The trees/shrubs should be regularly watered in the first summer (3 days of no rain due to the sloped site). Weeds should be controlled by the use of biodegradable base collars around each tree/shrub prior to adding 75 mm depth of bark mulch will ensure weeds are suppressed and soil moisture is retained.
200. Tree shelters and canes to be checked 4 times in the first year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.
201. Any plants during the first year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).

11.10 Maintenance Operations - Year 2

202. The trees and shrubs should be watered as required in prolonged periods (5 days) without rainfall. The bark mulch should be topped up to 75mm depth where applicable to ensure weeds are suppressed and soil moisture is retained.
203. Directly apply fungicide and or insecticide as spot treatment to any plants suffering from fungal infection or insect attack. Care needs to be taken to avoid these chemicals coming into contact with the ground or near aquatic habitats.
204. Tree shelters to be checked twice in the second year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.
205. Any plants during the second year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).
206. Water recently replaced plants as necessary to ensure establishment.

11.11 Maintenance Operations - Year 3 and 4

207. Repeat procedures as for Year 2 above.
208. At year 4 the buffer planting should be forming a natural low level landscape feature with shrubs clothed in leaves to ground level, no further requirement for spot treating or topping up mulch is necessary after year 4.
209. Remove any tree/shrub shelters and stakes to allow natural establishment of the planting.

11.12 Maintenance Operations - Year 5

210. Due to the species and density of planting proposed the mature heights of plants will be relatively low and due to the requirement to create a natural planting area maintenance should be minimal. At this point the planting should be left to fully naturalise in shape and

form adapting to the exposed conditions of the site. Any maintenance of planted trees/shrubs will be determined as a result of monitoring recommendations as per the below.

11.13 Maintenance Operations - Years 6 onwards

211. In line with the objectives of the buffer planting maintenance should be limited to the replacement of any dead, dying or diseased plants. Should plants begin to lean due to wind no action would be required unless the plants fall or are uprooted. If this occurs the fallen plants should be retained on site for low level habitat and a replacement specimen planted in its place based on the original specification and maintained in line with years 1-5. Any maintenance of planted trees/shrubs will be determined as a result of monitoring recommendations as per the below.

11.14 Monitoring and Remedial Actions

212. A landscape Architect will visit the site in spring (May) and summer (July/August) Y1 to check the establishment of trees and shrubs. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species specifically, breeding bird surveys.
213. Assuming that the plants have established successfully after Y1, a landscape Architect will visit the site in late-spring (May) in years 2, 3 5, 10 and 20 to assess the success of the buffer planting and, as necessary, recommend revisions to the BPMP.

12 APPENDIX G - SCRUB PLANTING MANAGEMENT PLAN



12.1 Introduction

214. Scrub planting provides a site wide opportunity to enrich existing and proposed grassland and watercourses. The naturalising vegetation found adjacent to the sea wall creates a simple habitat and adds to the landscape character in this area. The role of the Scrub Planting will be to create visual interest in the landscape and reinforce landscape character found to the east and west of the Development site at Oare and Graveney Marshes; together with further naturalisation of the site. The planting will consist of native species of local provenance and will reflect those tree species found in hedgerows and naturalising locally. Scrub is also already present within sections of the Development as shown by Plate 1 - Photograph taken on 31 May 2019 on the Saxon Shore Way at approximate National Grid Reference TR 024 637.

Plate 1 Natural Low-Density Scrub Development Onsite



215. The prescriptions set out in the Scrub Planting Management Plan (SPMP) are intended to provide a management framework that will enable the scrub planting to establish effectively with minimal maintenance, whilst encouraging the future naturalisation of scrubland within areas of grassland. The work outlined below will be undertaken by a suitably qualified landscape contractor in line with current British Standards. The contractor will be responsible for implementation and maintenance of the work which would be executed through a JCLI Landscape Works Contract 2017 (JCLI LWC 2017), and a JCLI Landscape Maintenance Works Contract 2017 (JCLI LMWC 2017), under the supervision of a Chartered Landscape Architect to ensure all work is undertaken to the correct standards.

12.2 Aims and Objectives

216. The trees should be planted within the first available planting season post construction to ensure that mitigation measures are completed in a timely manner and their impact is delivered in as short a timeframe as possible.

217. The aim of the SPMP is to establish a healthy area of natural planting which when viewed from the Saxon Shore Way appears as naturalising areas of vegetation which add to the character of the Development site within the wider landscape context, whilst creating greater ecological value than the baseline. In addressing this aim, prescriptions will be defined for the two key phases of the Development:

- Construction: measures required during and immediately following construction to establish scrub planting.
- Operation: monitoring and management measures for the duration of the operational period.

218. The SPMP follows best practice published by British Standards Institution²³. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

12.3 Construction

219. Scrub planting will be established by planting into areas recently sown with wildflower and grass seed. This ensures a ground cover habitat and soil stabilisation whilst the planting establishes. The following measures will take place as part of, or immediately after, construction.

12.4 Ground Preparation

220. Given the natural and limited nature of the planting proposed, no ground preparation would be undertaken other than that prescribed in the GMGMP.

12.5 Timing

221. All planting will be undertaken between November and March of the first planting season following construction of the Development or as soon as practicable thereafter.

12.6 Species Mix

222. The proposed scrub species mix shown in Table 12.1 is informed by a survey of existing vegetation within or surrounding the site. The mix includes species that are currently found at the Development site and in the surrounding landscape. The scrub planting mix will benefit biodiversity by creating shelter within areas of open grassland and habitat with fruit bearing species which will provide a food source for birds, small mammals and invertebrates.

²³ British Standards Institution: <https://www.bsigroup.com/en-GB/>

Table 12.1: Scrub Planting: Plant Species, Mix Percentage, Size and Root

% within mix	Scientific name	Common name	Size (cm)	Root
85	<i>Crataegus monogyna</i>	Hawthorn	60-90	BR
10	<i>Prunus spinosa</i>	Blackthorn	60-90	BR
5	<i>Rubus fruticosus</i>	Bramble	60-90	BR

12.7 Scrub Planting

223. Scrub planting will consist of trees/shrubs planted randomly along the site boundaries at a density of 50 plants per hectare to create informal/natural landscape features. Planting would increase to 100 plants per hectare along the southern and western boundaries towards Nagden and Sandbanks Road.
224. Tree/shrub species will be planted as individual specimens at random spacing's mimicking existing planting on site to create a naturalising element within the landscape.
225. Trees and shrubs will be planted in pits approximately 300x300x400mm or the dimensions of the rootball whichever is greater. Shrubs will be planted directly into the ground and will be marked by a stake 50mmx1.2m driven 600mm into the ground. Soil improver and 140g Enmag (or equivalent) slow release fertiliser will be incorporated into the soil of all new planting pits.

12.8 Operation

226. The following work will be carried out upon completion of scrub planting. The activities are relevant to duration of the operational phase. The Public Right of Way will be kept clear and open throughout the duration of the development.

12.9 Maintenance Operations - Year 1

227. The trees/shrubs should be regularly watered in the first summer (1 week of no rain due to the sloped site) and weeds should be controlled by the use of biodegradable base collars around each tree/shrub during the growing season prior to the addition of bark mulch. A 75 mm layer of bark mulch 0.5 m in diameter will be spread around each tree/shrub to suppress weeds and retain soil moisture.
228. Plant stakes to be checked 4 times in the first year. Stakes which have fallen or are not straight should be straightened and any damaged or missing stakes should be replaced.
229. Any plants during the first year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).

12.10 Maintenance Operations - Year 2

230. The trees and shrubs should be watered as required in prolonged periods (1 week) without rainfall. No further requirement for spot treating weeds or topping up mulch is necessary as the plants are to be encouraged to naturalise following initial establishment at year 1.
231. Directly apply fungicide and or insecticide as spot treatment to any plants suffering from fungal infection or insect attack. Care needs to be taken to avoid these chemicals coming into contact with the ground or near aquatic habitats.
232. Tree stakes to be checked twice in the second year. Shelters which have fallen or are not straight should be straightened and any damaged or missing shelters should be replaced.
233. Any plants during the second year of establishment which die or are dying should be replaced with plants of the same size and species (planted in November).
234. Water recently replaced plants as necessary to ensure establishment.

235. Top up bark mulch to maintain a depth of 75 mm, 0.5 m in diameter around each tree/shrub as required to suppress weeds and retain soil moisture.

12.11 Maintenance Operations - Year 3 and 4

236. Repeat procedures as for Year 2 above.
237. At year 4 the scrub planting should be forming natural low level landscape features with shrubs clothed in leaves, no further requirement for spot treating or topping up mulch is necessary at year 4.

12.12 Maintenance Operations - Year 5

238. Due to the species and density of planting proposed the mature heights of plants will be relatively low and due to the requirement to create natural planting area maintenance should be minimal. At this point the planting should be left to fully naturalise in shape and form adapting to the exposed conditions of the site.
239. Remove timber stakes as shrubs/trees should be noticeable within the landscape.

12.13 Maintenance Operations - Years 6 onwards

240. In line with the objectives of the scrub planting, maintenance will not be required after year 6 unless the trees/shrubs begin to encroach across the Saxon Shore Way. Any plants which fail following establishment should be allowed to die back and left insitu as habitat. It is desirable to retain any naturalising native scrub vegetation on site and whilst maintenance is not required, the retention of such naturalising vegetation should be considered as part of the grassland maintenance.

12.14 Monitoring and Remedial Actions

241. A Landscape Architect will visit the site in spring (May) and summer (July/August) Y1 to check the establishment of trees and shrubs. Remedial actions will be communicated to the Operator at the earliest opportunity. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species specifically, breeding bird surveys.
242. Assuming that the plants have established successfully after Y1, a Landscape Architect will visit the site in late-spring (May) in years 2, 3, 5, 10 and 20 to assess the success of the scrub planting and, as necessary, recommend revisions to the SPMP.

13 APPENDIX H – AQUATIC HABITATS MANAGEMENT PLAN



13.1 Introduction

243. The existing ditches cross the site between arable fields, which are subject to fertiliser application. It is expected that these ditches receive some enrichment from these terrestrial habitats, which is likely to lead to typical eutrophic conditions that would normally be experienced in lowland habitats. The eutrophic conditions within the ditches provides a fertile environment, which promotes dominance by a limited diversity of competitive macrophyte species. Many macrophyte species that dominate eutrophic waters, are also naturally invasive. It is understood that many of the ditches on the site are already managed by the Internal Drainage Board (IDB), where any dominating macrophytes that choke the ditch systems and alter the drainage capacity/efficiency of the ditch system and neighbouring land are removed through management. It is expected that through land use change from agricultural practice to a solar park, (complete with a suite of enhancement measures) will naturally reduce the input of enrichment to the ditch system.
244. However, any attempt to enhance the flora within these habitats before there are any changes to enrichment levels, is likely to limit the establishment and success of less-competitive planted or seeded macrophytes.
245. Consequently, ditch enhancement/ restoration is a complex process requiring monitoring and intervention over several years to ensure success, especially on sites with a long history of agricultural improvement. Small areas of the ditch network will also be subject to disturbance and change during the construction phase at the electrical substation, spine road, access track and 11kV cable crossing points that may impact on water vole habitat found throughout the site. Water voles are a very mobile species, and can enter or leave suitable habitat on a regular basis throughout the active season. They are a protected species, which require a licence from Natural England should their burrows or habitat be disturbed or subject to change, or should there be a risk of killing or injuring of the animal itself.
246. The prescriptions set out in the Aquatic Habitats Management Plan (AHMP) are intended to provide a flexible management framework that will be subject to review depending on the

outcomes of ongoing monitoring and management. The work outlined below will be undertaken by a suitably qualified contractor with specialist knowledge of aquatic habitat creation and management. The contractor will be responsible for monitoring the success and implementation of measures and for taking appropriate remedial action, if needed. An ecologist will be available during all stages of the Development to undertake scheduled monitoring (specified below) and to provide ad hoc support, and to fulfil the requirements of Natural England's water vole licencing requirements.

13.2 Aims and Objectives

247. The aim of the AHMP is to establish a ditch system with greater ecological value than what is currently extant. In addressing this aim, prescriptions will be defined for the three key phases of the Development:

- Pre-construction: measures required before infrastructure construction begins in order to prepare the ditch systems by the removal of invasive or vigorous macrophyte growth.
- Construction: measures required during and immediately following construction to establish new aquatic habitats (where required).
- Operation: monitoring and management measures for the duration of the operational period.

248. The AHMP follows best practice published by Natural England²⁴ and the Wildlife Trusts²⁵, specialist seed distributors²⁶, and others²⁷. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

249. There will also be creation of a new 0.5 ha reedbed located between the solar park and AR HMA within an existing ditch. The reedbed will comprise common reed (*Phragmites australis*) and Branched Bur-reed (*Sparganium erectum*). The aim of this habitat will be to create additional habitat for invertebrates and birds such as, reed warbler and Cetti's Warbler. Other bird species will also benefit from the creation of this reedbed habitat.

13.3 Pre-Construction

250. The following work will be carried out before the construction of site infrastructure begins.

13.3.1 Water Vole Licencing

13.3.1.1 Approach

251. The trapping and displacement of water voles needs to be carried out under licence from Natural England. In England and Wales there is no provision for licencing the Development or other construction activities under the Wildlife and Countryside Act 1981 (as amended). Such works will need to be carried out under licence, which requires the applicant to demonstrate a conservation benefit for water voles. The conservation benefit will be achieved by delivering a net gain in the amount of habitat available to the water vole population on the Site, or by improving the quality of the habitat.

252. It is expected that the quality of habitats for water voles (and other species) will be improved across the extent of the Site, following the prescriptions provided within this appendix. Similarly, the extent of drainage ditch lost under the footprint of the substation, will be replaced by c355 m of diverted drainage ditch link, which ensures no net loss in the quantity of this habitat. The provision of enhanced riparian habitat quality within this new drainage

²⁴ Natural England Research Report NERR067

²⁵ Wetland Restoration Manual – Wildlife Trusts

²⁶ <https://wildseed.co.uk/mixtures>

²⁷ www.pondconservation.org.uk

ditch section provides a marked qualitative improvement over the replaced ditches existing riparian habitat. This approach can be viewed as likely to comply with the requirements of a Science, Education & Conservation licence, providing demonstrable conservation benefit for water voles with appropriate habitat enhancements in place.

253. The exact requirements of the Natural England licence will be detailed in the conditions of the relevant licence, which will include, but not be limited to the prescriptions in the following sections.
254. Any licenced water vole activities will need to have consideration to the presence of other protected species such as, reptiles and nesting birds.
255. Any water vole works will also need to have consideration to the Construction Environmental Management Plan (CEMP), the details of which are referenced within Technical Appendix A5.4 of the ES.

13.3.1.2 Displacement Licencing

256. It has already been identified that the proposed 'spine' road and access tracks within the Site will need to be developed following the requirements of a Natural England licence for the displacement of water voles. Water voles are restricted to discrete parts of the field drain network that contain open water consistently throughout the year and suitable foraging and burrowing conditions for them. The construction of drain crossings in these areas risks disturbing and directly harming water voles, which would constitute a legal offence under the Wildlife and Countryside Act 1981 (as amended).
257. As such, mitigation and required enhancements are proposed within the following sections to reduce the likelihood of harm from Development activities and to demonstrate how net conservation benefits can be achieved for water voles.
258. For activities that involve the impact to < 50 m sections of ditch where water voles are present and that meet other qualifying criteria, it is possible that works can continue under the conditions detailed within a Natural England Water Vole *Class*²⁸ Licence. This will take place under the supervision of a suitably trained and experienced ecologist who is pre-registered to use the *Class* licence. Working on this basis, works can progress and allow the legal displacement of water voles in the affected areas, so that drain crossings can be constructed with minimal risk of disturbance or harm to water vole.

13.3.1.3 Trapping and Translocation Licencing

259. Whilst no water voles have been found within a c 355 m section of ditch within the footprint of the proposed substation, they are a mobile species that means there is the potential they could move into this section from neighbouring and connected ditch sections. If water vole are present within this ditch section there will be the requirement to obtain a *Science, Education & Conservation*²⁹ licence from Natural England for the additional approach of trapping and translocation of water vole.

13.3.1.4 Letters of No Impediment (LoNI)

260. Letters of no impediment have been sought and received from Natural England (July 2019) for undertaking works activities that have the potential to impact protected species specifically, water voles and great crested newt.

²⁸ Class Licence: Intentional disturbance of water voles and damage/destruction of water vole burrows by means of displacement (to facilitate development activities). (WML-CL31 – Class Licence) Natural England.

²⁹ Licence Application Form: Application for a licence to kill, take, disturb or possess wild animals for science, education or conservation (A29 – Science, Education or Conservation) Natural England.

13.3.2 Displacement activities

261. Displacement activities will follow that required within the Class licence conditions only in areas of the Development where water vole burrows and/or field signs are present. Displacement activities will not be required in the absence of water vole activity and burrows. However, displacement activities are likely to be required within the footprint of the proposed 'spine' road, where access crossings are to be constructed, and in known water vole habitat. The main activities for water vole displacement requires a vegetation and destructive search approach, with the details of this approach seen in Section 13.4.1.
262. Full details of these activities will be included within the Natural England *Class* licence for displacement and following established water vole mitigation guidance²⁵.

13.3.3 Trapping and related activities

263. Dependent on the presence of water voles in the ditch section within the footprint of the substation, and subject to the requirement of a Natural England licence for the trapping of water voles, the pre-construction activities will need to include, but not be limited to the following:
- *Creation of new ditch habitat:* To provide high quality established habitat into which water vole can be released following completion of the trapping and temporary captivity of water vole as described below. This will need establishing prior to any of the following stages commencing.
 - *Fencing of the ditch section:* To ensure that water voles do not re-enter the area of ditch system to be lost during initial trapping and during construction works, it will be necessary to install a water vole fence across the ditch section for the duration of the phased works programme. It will also be necessary to fence off the created habitat to ensure that no water voles begin using it before the reintroduction has been completed;
 - *Trapping of water voles:* During the active season, water voles are to be trapped in standard water vole traps baited with carrot or apple feed. This needs to be set the previous late afternoon and checked the following morning, re-set and checked again in the afternoon, before being set again overnight. The water vole trap needs to have a nesting area for the overnight welfare of water voles;
 - *Temporary water vole captivity:* Any water voles that are trapped, will need to be processed, with sex, weight and breeding state identified before being health checked and micro-chipped. They will then need to be kept within temporary and separate storage cages/release pens, within a suitable overnight structure. Bedding and food will need to be replaced daily to ensure the welfare of the water voles is fully considered;
 - The exact details of these activities will be included within the Natural England *Science, Education and Conservation* licence (should it be required for trapping) and following established water vole mitigation guidance³⁰.

13.3.4 Habitat Preparation

264. It is expected that the removal of pesticide and fertiliser inputs to land through the cessation of agricultural activities will lead to the decline of the invasive least duckweed from within the ditch network, by allowing other less vigorous macrophytes that may be more sensitive to pesticide applications opportunities to grow. However, should this not occur naturally, the option to remove invasive least duckweed either mechanically or through glyphosate application should be available.

³⁰ Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) *The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series)*. The Mammal Society, London

265. This latter activity will need to take into account the implications for water vole populations on site, and will need to be applied by a suitably experienced operative where feasible. Permission will need to be granted from the Environment Agency (EA) or Internal Drainage Board (IDB) before a programme of works starts.
266. During construction there will also be creation of a new 0.5 ha reedbed located between the solar park and AR HMA within an existing ditch. The reedbed will comprise common reed and branched bur-reed. Re-profiling of the existing ditch will also be undertaken to create a more gradual sloping bankside as opposed to the current steep sided banks which are present. Refer to section 18, indicative ditch reprofiling. This re-profiling will be informed by the 2019 water vole surveys currently being completed. The banksides once reprofiled will be top soiled and left bare of vegetation allowing target reed species to be planted along the watercourse/bank sides. Common reed will also be transplanted from existing ditches where present and, only where water voles are not present. The combination of planting and transplanting will ensure quick establishment of the created reedbed.
267. With the reedbed in this location establishing it is not considered likely that poaching will be a significant risk to the ditch network. This is due to the density at which common reed will establish thereby reducing ease of access for sheep. The above referenced document also states that *'sheep have smaller feet than cattle or horses and are therefore less likely to cause poaching'*.

13.4 Pre-Construction

13.4.1 Trapping and Translocation – Activities

268. If the trapping of water voles is required within the ditch section that will be lost under the footprint of the new substation, it will be necessary to include the following activities at the pre-construction through to post-construction phases.

13.4.2 New Ditch Cut and Existing Ditch Destroyed

269. A new ditch will be cut around the perimeter boundary of the substation footprint. This ditch will need to be appropriately planted with all planting fully established before any works are undertaken to the existing ditch to be lost. In this way the habitat will immediately be available for release of the trapped water vole following their temporary captivity.
270. To accommodate water voles and help establish a population within the new ditch section, it is proposed that artificial water vole burrows made of plastic drainage pipe are installed in clusters throughout the circa 355 m length of new cut ditch. These will be focussed around areas chosen for the release pens as this is where the water vole will focus their initial burrowing activity. Whilst the habitat creation is being undertaken exclusion fencing will also be installed around the perimeter of the new ditch to ensure that no water vole move into the new ditch prior to the water vole reintroduction should it be required. The new ditch will therefore remain viable for use for the reintroduced water vole upon completion of the trapping and temporary captivity.
271. As soon as all the water vole have been removed from the existing ditch network it will be destructively searched and destroyed under full ecological supervision, as per the requirements of this licence type. In this way there will be no risk of water vole re-entering this ditch network.

13.4.3 Monitoring

272. An ecologist will visit the site during the habitat establishment and before water vole translocation to ensure that the new ditch conditions are suitable, and following habitat checks to ensure that it has successfully established. Remedial actions will be communicated

to the Operator and Natural England (if any risk to licence specifics) at the earliest opportunity if this does not look to be the case.

13.5 Construction

13.5.1 Water Vole habitat Creation - Background

273. Approximately c 355 m of new high quality ditch habitat will be created to mitigate for losses of aquatic ditch and riparian habitat within the substation footprint and will take place as part of construction. If water voles are confirmed present, this creation will be pre-construction as detailed in section 13.4. The new ditch will be cut along the northern perimeter of the substation footprint, to include riparian habitats that represent a qualitative improvement over the removed ditch and that will provide net conservation gains for water voles and other wildlife.

274. New 'spine' road crossings will be completed across the ditch system, which will consist of five ditch crossings that will link through the Development. This will involve the loss of c 235 m of riparian habitat suitable for water voles and other wildlife. However, the aquatic components of the ditch network will be maintained with no net loss. This will be achieved by the inclusion of mammal friendly open box culverts at each crossing where either a new culvert is being constructed or replacement culverts are proposed. This will therefore not lead to the fragmentation of the ditch network, with open aquatic connectivity maintained as a minimum, with likely enhancement possible.

275. Where water voles are present, these activities will need to take place following the requirements of the work schedule and method statement detailed within a NE water vole *Science, Education & Conservation* licence and/or following the conditions within a NE water vole *Class* licence. Elements of this will be required pre-construction.

13.5.1 Displacement of Water Voles – Vegetation Clearance and Destructive Search Activities

276. In accordance with the licence conditions stipulated within the Natural England *Class* licence, the following section details the methodology for vegetation clearance and destructive searches proposed for the Development leading up to the construction phase. The approach used to displace water voles at ditch crossings within the footprint of the proposed 'spine' road and access track crossings where construction activities will affect known water vole populations is as follows:

- Before vegetation cutting takes place, the locations of known water vole burrows must be identified. This requires that the vicinity of site works needs to be surveyed by a suitably competent person to check for evidence of occupied water vole burrows. Areas where burrows are located will be identified on the ground with a cane;
- The removal of vegetation including marginal vegetation must take place and be completed during the period 15th February to 15th April, inclusive. Displacement should only take place in suitable weather conditions (i.e. no snow / ice, mild conditions, over 5 °C and where this is no flooding) and when there is sufficient forage available to support the displaced water voles and following relevant guidance³¹;
- Cutting of vegetation must be limited to a continuous length of bank not exceeding 50 metres, and where there is suitable water vole habitat in adjoining lengths of bank or in other immediately adjacent areas, which are unaffected by the works. There must be a gap of at least 500 metres in length between cuts on the same bank;
- Vegetation cutting can take place concurrently on both banks of the same watercourse, not exceeding 50 metres in length on each bank, where this is required for the development works, or to increase the likelihood of water voles being

³¹ Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook for Development and Other Construction Activities. Eds. Fiona Mathews and Paul Chanin.

- displaced. The unaffected habitat must be sufficient in terms of both quantity and quality to accommodate the displaced animals and those outside the footprint of the works;
- Removal of vegetation including marginal vegetation must only take place where a cut has already been made between 15th February and 15th April and where it is necessary to maintain a previously cut area. Any re-growth must be removed and maintained as short as possible, through cutting or herbicide use, at a height no greater than 10 cm (4 inches) above ground level.
 - All vegetation on the bank face within the working area must be cut, along with an appropriate 'buffer' around it. The area in which vegetation cutting or water draw down/removal is undertaken should include the entire working area plus an appropriate buffer area around it (either side of the working area, and back from the bank top). The buffer should comprise at least an additional three metres either side of the working area and on the bank top (at least three metres back from the bank), where suitable habitat for water voles is present. Any emergent aquatic vegetation located along the water margin should also be cut;
 - Cut vegetation, weed cuttings and arising's need to be raked off from the cut area, and must not be deposited or burned on the bank where there are retained water vole refuge areas or be left where they will prevent access to water vole burrows; and
 - Where water draw-down/removal is to be used in parallel with vegetation cutting, this must be limited to no more than 50 m, and between 15th February and 15th April.
 - Following vegetation removal, the cut area must be left intact, for a minimum period of five consecutive days and a maximum period of ten consecutive days before a destructive search is carried out.
 - Prior to undertaking the destructive search, the cut area must be surveyed for evidence of the continued presence of water voles. Monitoring can include the use of an endoscope where necessary. Where this survey records no evidence that the burrows in the cut area are still occupied by water voles, each burrow affected must be carefully excavated and searched, and destroyed once the search is completed. This will minimise the risk that any water voles remaining in burrows will be harmed. Where monitoring does find fresh signs of water vole activity, the monitoring period may need to be extended and vegetation cutting or draw down/removal repeated. If there are still signs that water voles are present, a destructive search by hand should be carried out and water voles allowed to escape or captured temporarily. Captured water voles must be kept in an appropriate animal container with suitable bedding material and food provided²⁹, for release at an adjacent refuge area on the same day;
 - A destructive search is not required, if it is judged that it is neither safe nor technically feasible to do so (e.g. due to engineering constraints such as destabilisation of the bank that would occur as a result of the destructive search, presence of a road or other permanent structure, or no safe access from which to undertake a destructive search). Justification for not undertaking a destructive search or modifying the methodology to account for any of the above constraints must be provided by the class licenced registered ecologist in their annual report; and
 - Any water voles found during excavation of burrows must either be allowed to escape to an adjacent refuge area or be captured and kept in a suitable animal container, with suitable bedding material and food provided²⁹, for release at an adjacent refuge area on the same day.
 - All works will be overseen by a licenced ecologist or their accredited agent and therefore, will be able to differentiate between any native frog species and the invasive marsh frog.

13.5.2 Timing

277. The timings of any habitat removal or installation will need to avoid impacting water voles and take place outside of the most sensitive season for water voles, which is stipulated

within the Natural England *Class* licence as 15th February to 15th April for water vole displacement. If dedicated trapping is required this can be undertaken between March and April or potentially, August to September but only under full licence from Natural England.

278. The timing for the removal and translocation of water voles will be determined following agreement with Natural England and as stipulated within the applicable licence type.

13.6 Riparian Plant Mix

279. Planting needs to be incorporated into the new length of ditch. This will help in the establishment of a new thick macrophyte sward, which will provide both habitat cover and food source for water voles. Plug planting should focus on a higher proportion of branched bur reed *Sparganium erectum*, sedges *Carex sp.* and reed sweet grass *Glyceria maxima*, as these species are important in establishing a lush thick macrophyte growth suitable for foraging and sheltering water voles. Additional seeding of the new ditch cut, with seeds of local provenance can also be applied to assist the development of this new habitat.

280. Careful additional planting to the margins of the new cut ditch provide an attractive backdrop to this habitat, and can enhance the habitat for wildlife. This can attract a greater diversity of aquatic and terrestrial invertebrates that are likely to be fed upon by a variety of bat species and other wildlife found in riparian habitats.

281. Marginal plants such as purple loosestrife *Lythrum salicaria*, spearwort *Ranunculus flammula*, yellow flag iris *Iris Pseudacorus*, and meadowsweet *Filipendula ulmaria* can be planted to the boundary margins of the new ditch, which provides interest to pollinators.

282. Emergent plants such as water forget-me-not *Myosotis scorpioides* and water mint *Mentha aquatica* will provide a route for dragonflies and damselflies to emerge into adults, providing habitat for a greater diversity of invertebrate species.

283. Exotic plant species, in particular: New Zealand pygmyweed *Crassula helmsii*, parrot's-feather *Myriophyllum aquaticum*, water fern *Azolla filiculoides*, water hyacinth *Eichhornia crassipes*, Canadian pondweed *Elodea canadensis*, Nuttall's pondweed *Elodea nuttallii*, and water primrose *Ludwigia peploides* must not be added to the new ditch. These species are alien invasive plants.

284. Native aquatic plant species that can also become invasive include: reedmace *Typha latifolia* and *T. angustifolia*, common reed *Phragmites australis*, white water lily *Nymphaea alba*, yellow water lily *Nuphar lutea*, and fringed water lily *Nymphoides peltata*. These species also need to be avoided in any planting plan for the water vole habitat.

Emergent plants (Options)

Branched Bur-reed	<i>Sparganium erectum</i>
Amphibious Bistort	<i>Persicaria amphibium</i>
Reed sweet-grass	<i>Glyceria maxima</i>
Arrowhead	<i>Sagittaria aquatilis</i>
Water Crowfoot	<i>Ranunculus aquatilis</i>
Water mint	<i>Mentha aquatica</i>
Flowering Rush	<i>Butomus umbellatus</i>
Water Plantain	<i>Alisma plantago-aquatica</i>
Water Forget-me-not	<i>Myosotis Scorpiodes</i>
Stinking Iris	<i>Iris foetidissima</i>
Marsh Cinquefoil	<i>Potentilla palustris</i>
Yellow flag Iris	<i>Iris Pseudacorus</i>

Margin Wildflowers (Options)

Sneezewort	<i>Achillea ptarmica</i>
Wild Angelica	<i>Angelica sylvestris</i>
Marsh Marigold	<i>Caltha palustris</i>
Hemp Agrimony	<i>Eupatorium cannabinum</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Water Avens	<i>Geum rivale</i>
Yellow Iris	<i>Iris pseudacorus</i>
Gypsywort	<i>Lycopus europaeus</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Meadow Buttercup	<i>Ranunculus acris</i>
Water Figwort	<i>Scrophularia auriculata</i>

13.6.1 New Reedbed Creation - Background

285. The new reedbed creation will be undertaken via reprofiling of the existing ditch (where no adverse effect on water vole) to create more gradual sloping banksides. Common reed will be transplanted from existing ditches on site where water voles have been confirmed absent. Transplanting will therefore supplement the planting to be undertaken i.e. through coir rolls. Supplementary planting will also comprise branched bur-reed thereby creating additional habitat for a variety of bird species.
286. With the reedbed in this location establishing it is not considered likely that poaching will be a significant risk to the ditch network. This is due to the density at which common reed will establish thereby reducing ease of access for sheep. The above referenced document also states that '*sheep have smaller feet than cattle or horses and are therefore less likely to cause poaching*'.

13.6.2 Water Control Structures - Background

287. Section 10.3.10 of Chapter 10 - Hydrology, Hydrogeology, Flood Risk and Ground Conditions of the ES [APP-040] identified that several manmade concrete flow controls were observed within the Hydrology Core Study Area. Discussions with the Lower Medway IDB and the Habitat Management Steering Group (HMSG) have indicated that these flow control structures are currently used to regulate water levels within the ditches within and surrounding the Development.
288. In order to promote suitable conditions for AR, water levels within the drainage ditch network surrounding the site will be managed utilising existing flow control measures and through the introduction of new structures, such as drop boards sluices, as outlined within RSPBs 'Water management structures for conservation - Technical case study series'³².
289. Existing flow control infrastructure will be used to achieve this aim and there will be an ongoing need to engage with all parties to deliver this. Figure A5.1 of this LBMP shows key existing and proposed flow control structures. All structures will be designed to ensure that they are mammal/ eel/elver (all life stages) friendly.
290. To maintain and manage high ditch water levels across the site, new flow control structures, (likely to be drop board style sluices) will be located within drainage ditches at the Site. Figure A5.1 of this LBMP shows key existing and proposed flow control structures.

³² http://ww2.rspb.org.uk/Images/Water_management_structures_tcm9-214636.pdf

291. Water may be either held back behind the structure, or sluice boards used as a top height, above which water may 'overtop' in a controlled fashion to maintain the water level at known height. An example of the implementation of drop board sluices for arable reversion is provided as Technical case study No. 5: Berney Marshes, Norfolk of RSPBs 'Water management structures for conservation - Technical case study series'.

13.7 Operation

292. The following work will be carried out upon completion of all construction works and following the sowing of the grassland seed mix. The activities are relevant for the duration of the operational phase.

13.8 Weed Control

293. A flush of weeds is to be expected in the first season after planting of new riparian habitat. It is likely that some pernicious weeds will persist following the ground preparation and can be treated by hand pulling.
294. It is thought that the removal of pesticide and fertiliser inputs to land through the cessation of agricultural activities will lead to the decline of the invasive least duckweed *Lemna minuta* from within the ditch network, by allowing other less vigorous macrophytes that may be more sensitive to pesticide applications opportunities to grow. However, should this not occur naturally, the option to remove this invasive species either mechanically or through glyphosate application should remain. No invasive species will be present in the newly created ditch therefore removing any risk of ongoing maintenance in this ditch section. Monitoring checks will be undertaken of this should invasive species be found in the site (e.g. from bird movements) and if required, appropriate maintenance will be identified and undertaken.
295. This latter activity will need to take into account the implications for water vole populations on site, and will need to be administered by suitably qualified personnel with an appropriate National Proficiency Testing Certificate (NPTC) certificate of competence. Permission will need to be granted from the Environment Agency (EA) or Internal Drainage Board (IDB) before a programme of works starts.

13.9 Management

296. For the purposes of this plan it is assumed that aquatic macrophyte habitats will be managed on an annual basis at a suitable time of the year (as per Paragraph 13.5.2) that does not/limits impact to wildlife.

13.9.1 Year 1

297. Removal of vigorous and crowding perennial growth in the riparian zone of the ditches, actions on identifying the presence of any invasive species, followed by remedial actions.
298. This management activity will exclude areas where water voles will be released under licence, or where new habitats have been created for them. No management will be undertaken of the created water vole ditch habitat as establishment will have already been ensured before water vole trapping/release occurred. Monitoring will be undertaken to ensure habitat continues to provide appropriate conditions for water vole.

13.9.2 Years 2 onwards

299. No management will be undertaken of the created water vole ditch habitat as establishment will have already been ensured before water vole trapping/release occurred. Monitoring will be undertaken to ensure habitat continues to provide appropriate conditions for water vole and remediated if necessary.

300. Common reed are fast growing species in the right conditions so habitat creation following initial planting/transplanting is anticipated to quickly establish with little management required. Establishment of the reedbed is considered to be led by ensuring the water levels are maintained at appropriate levels throughout the lifetime of the development.

13.10 Monitoring and Remedial Actions

301. As part of any Natural England Licencing requirements, there will be a requirement to monitor the efficacy of the licenced water vole works. i.e. to demonstrate that a net conservation benefit has been achieved. This involves looking for field signs, and to determine if artificial burrows are being used, along with the catch and release of water voles within the newly created ditch cut, if full trapping was required. Monitoring will be undertaken through field sign surveys in Years 1-3 following temporary captivity if required.
302. An ecologist will visit the site in spring (May) and summer (July/August) Y1 to check the establishment of the new ditch habitats, record establishment of the new reedbed and invertebrate assemblage and observe the presence of other wildlife. Any remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity.
303. Assuming that the riparian habitats have established successfully after Y1, an ecologist will also visit the site in late-spring (May) in years 2, 3, 5, 10 and 20 to assess the success of aquatic and riparian habitat management and, as necessary, recommend revisions to the AHMP in line with any Natural England water vole licencing requirements. Monitoring will also comprise ornithological surveys to ensure habitat is being utilised as required by target bird species particularly, nesting marsh harrier.
304. Water levels will also be monitored by the visiting ecologist and adjustment of board heights will be undertaken as required. The visiting ecologist will also have responsibility of visual inspection of the boards. Should boards become warped or damaged or the rubber seals degrade, then they will be replaced as required therefore ensuring long term appropriateness.

14 APPENDIX I – PILLBOX BAT ROOST CREATION



14.1 Introduction

305. The Site is open and largely unlit by security lighting, providing dark corridors and areas within the Site to benefit all species of foraging and commuting bat, including those likely to be more sensitive to lighting. Previous surveys of the Site found that the ditch systems, and grassland habitats adjacent to these aquatic habitats were important for a variety of foraging bats, and also to bats commuting into it from the wider landscape. Bat species frequently recorded within the Site include: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), noctule (*Nyctalus noctula*) and serotine bat (*Eptesicus serotinus*). Other bats using the Site include: Daubenton's bat (*Myotis daubentonii*), Leisler's bat (*Nyctalus leisleri*), brown long-eared bat (*Plecotus auritus*) and Nathusius' pipistrelle (*Pipistrellus nathusii*). This represented a diverse assemblage of different bat species utilising the Site. It is thought that some of these bats are found roosting close to the Site, although no roosting provision is available to bats within the Site.
306. An intact Second World War era pillbox emplacement is found on the Site, which was identified as having the potential to be converted for roosting bats. Hibernation sites are characterised by thick walls that buffer their interior spaces from fluctuating ambient winter temperature and humidity. Man-made sites include a wide range of built structures that have fallen into disuse, such as various military structures that includes pillboxes such as the one found on the Site. If accessible to humans, structures such as these are often disturbed and this can preclude their use by bats. The installation of grilled entrance gates, metal doors, and partially bricking up access holes to control access and limit disturbance, as well as other enhancements to improve their performance as hibernacula, are important activities to improve local bat conservation. The presence of a pillbox structure within the boundary of the Site, will exclude the regular disturbance from humans. The pillbox is located close to bat foraging habitat along the south of the Site and is adjacent to a damp ditch. These factors maximise the potential of this structure to attract and maintain roosting bats on Site.

The creation of a bat roost within the pillbox therefore provides a unique opportunity to enhance the Site for roosting bats.

14.2 Aims and Objectives

307. The aim of the Pillbox Bat Roost Creation is to convert a Second World War pillbox to enable the provision of artificial bat roosts within the Site, which will provide an ecological enhancement and feature that is not currently available within the Site. In addressing this aim, prescriptions will be defined for the construction phase of the Development once all construction activities in this locality are complete:

- Measures required to modify the structure in order to prepare the pillbox to make it a suitable design for encouraging roosting bats.
- Prepare the external areas of the pillbox, so that it maximises the potential of the pillbox to provide a variety of environmental conditions for different types of bat roost.
- Preparation of the internal areas of the pillbox, so that different types of roosting provision is incorporated within the pillbox structure to attract different species of bat.
- Exploring whether there is an opportunity to partner with a local wildlife group, such as Kent Bat Group, with a view to monitoring how bats use this enhancement feature, and expanding the understanding of how roosting bats use this feature and near landscape.

308. The pillbox enhancement follows guidance provided by the Bat Conservation Trust³³ and found in the Bat Workers Manual³⁴. The timing for this individual activity is provided in the text and should be integrated into the Development programme when this is established.

14.3 Pillbox preparation

309. The general aim of the design is to stabilise air temperature and moisture content, making the pillbox cool and damp, ideal conditions for bats.

14.4 External works

310. To complete the external conversion works on the pillbox, the following external works activities should be completed;

- Filling hole gaps in the pillbox, so they are temporarily blocked leaving openings only big enough for bat species, but not for detritus to enter;
- A metal lockable door to be fitted to secure the pillbox from human disturbance; and
- Ivy, which is favoured by foraging bats is currently growing across the pillbox. This will provide cover for bats and attract more prey insects. Future management may be needed should the ivy growth become too substantial across the pillbox. This feature acts as insulation to prevent rapid warming of the pillbox by the sun in summer.

14.5 Internal works

311. To ensure that suitable conditions for roosting bats and a variety of different roosting opportunities are available within the pillbox for different bat species, the following prescriptions are recommended to be installed on the interior wall of the pillbox:

- Roofing tiles glued (so as not to damage the structure) to and supported by wooden batons are recommended to provide crevice features for small numbers of crevice dwelling bats;
- Lay damp leaves and detritus on the floor of the pillbox to help raise humidity within the pillbox;

³³ Bat Conservation Trust

³⁴ A.J. Mitchell-Jones and A. McLeish (ed.) (2004) *Bat Workers' Manual*. JNCC, Peterborough

- The installation of 'Kent Bat Boxes' affixed directly to supporting batons, with the design as specified by the Kent Wildlife Trust³⁵; and
- The installation of a Schwegler 1FW hibernation box³⁶ (or similar) to the interior wall of the pillbox, to provide an internal bat roost space suitable for hibernating bats.

312. The inclusion of these different types of bat roosting feature will provide crevice and cavity features that are favoured by a number of different bat species. Ensuring that the features are installed within the pillbox structure on different walls, where there are subtle microclimate changes, will encourage individual bats to seek optimum areas within the structure to roost.

14.6 Timing

313. It is recommended that works on converting the pillbox take place once all solar related construction activities are completed in this locality thereby limiting any disturbance on the pillbox from construction activities.

14.7 Monitoring

314. Opportunities to explore a partnership with a local conservation group, such as the Kent Bat Group should be explored to look at the monitoring of this structure for bats during the operational period of the solar park. If a partnership can be established with a local conservation group, hibernation survey visits could be arranged annually between November to February. This provides an opportunity to help understand the local conservation status and behaviour of bats within this area of Kent.

14.8 Licencing Requirements

315. Once bats have inhabited the prescribed bat roost features within the pillbox, they may only be disturbed by licenced bat workers.

³⁵ www.kentbatgroup.org.uk

³⁶ <https://www.nhbs.com/1fw-bat-hibernation-box>

15 APPENDIX J – ARABLE REVERSION HABITAT MANAGEMENT AREA MANAGEMENT PLAN



15.1 Introduction

317. Due to the proximity of the Development to The Swale SPA/SSSI/Ramsar Wetland Site, it was recognised at an early stage in the evolution of the project that there was potential for effects from the Development on this European site.
318. The Swale is a wetland of international importance, comprising intertidal mudflats, shell beaches, saltmarshes and extensive grazing marshes. It provides habitats for important assemblages of wintering waterfowl and also supports notable breeding bird populations.
319. A Report to Inform an Appropriate Assessment (RIAA) accompanies the Application (DCO Document Reference APP-0.26) that identified potential effects of the Development on avian fauna. One of these effects was the loss of habitats outside the European Site that is functionally linked to the European site because it provides important foraging resources for some of the wintering waterbird qualifying interests, dark-bellied brent goose, lapwing, and golden plover.
320. To mitigate for impacts of loss of foraging resources on these species, an Arable Reversion Habitat Management Area (AR HMA) will be developed in an extensive area of c. 56 ha to the east of the Development, with the aim of providing alternative foraging resources.
321. The management of the mitigation grassland will be focussed on provision of optimal foraging conditions for dark-bellied brent goose. This will involve grazing and/or cutting during the summer (and as necessary during the course of the winter) and application of organic fertiliser (e.g. farmyard manure) to provide a nutritious short sward favoured by foraging brent geese, lapwing and golden plover. The manure will be sourced from ivermectin free cattle (where possible) to avoid adverse effect on invertebrates.
322. Measures will also be included to increase the water levels around the AR HMA and in doing so, enhance the habitat present for target bird species. The specifics of the water control measures are detailed in Appendix H.

323. The grassland will be established in advance of the first winter before construction is due to commence. Refer to section 16, Grassland Implementation Timing. The following sections set out the proposals for how the land will be managed throughout the construction and operational phases, and how this will be implemented following the completion of construction.

15.2 Aims and Objectives

324. The aim of the AR HMA is to establish a grassland sward to provide foraging resources for overwintering dark bellied brent geese, golden plover and lapwing. In addressing this aim, prescriptions will be defined for the three key phases of the Development:

- Pre-construction: measures required before infrastructure construction begins in order to prepare the ground for grassland establishment or treatment. Measures required to establish grassland by means of sowing.
- Construction: measures required to maintain the created habitat.
- Operation: monitoring and management measures for the duration of the operational period.

325. The AR HMA management plan follows consultation advice from Natural England and through the Habitat Management Steering Group. Timings for individual activities are provided in the text and should be integrated into the Development construction and operation programmes when these are developed.

326. Monitoring and triggers for any remedial actions have been discussed with the Habitat Management Steering Group. Within discussions it was agreed that there are too many permutations to set out specific triggers at the outset. This LBMP document has therefore been updated to include the mechanism by which monitoring results can be reviewed by the HMSG, with subsequent discussions held by the HMSG to determine whether or not remedial actions are necessary based on the results of the monitoring in combination with analysis of WeBS counts for The Swale.

327. Primary considerations will include the development of the target grassland sward structure in the management areas, the consistent absence of key species from the management areas and evidence of decline in populations within The Swale.

15.3 Pre-Construction

15.3.1 Ground Preparation

328. Ground preparation will be required in the AR HMA to establish a clean seed bed into which a grass seed mix can be sown following the cessation of arable agricultural activities. As the AR HMA will be outside of the footprint of the solar arrays and much of the construction activities, the option for large-scale, mechanical ground preparation is available outside of the breeding bird season and is ideally timed to occur in early autumn when birds have finished nesting but before the arrival of the wintering water birds. This can include the mechanical harrowing of arable fields in September and prior to sowing.

329. Soil testing may be undertaken, at the discretion of the appointed contractor/ecologist, following ground preparation to determine other preparatory and management requirements, (e.g. need to add fertiliser or other applications).

330. It is not envisaged that there will be a requirement to control grassland sward length whilst the new grassland becomes established; however, this will need to be monitored to ensure it does not grow above 100 mm in height prior to winter.

331. The inter-array grassland will be implemented prior to construction, the exact timing of its implementation being dependent on the timescales of application consent, discharge of

conditions and commencement of construction. Establishment of the grassland is as set out in this document.

15.4 Construction

15.4.1 Water Control Measures

332. Water control measures will be established to increase the water levels around the AR HMA and in doing so, enhance the habitat present for target bird species. The specifics of the proposed water control measures are detailed in Appendix H.

15.4.2 Weed Control

333. A flush of weeds is to be expected in the first season after sowing and these can be managed by a short period of intensive grazing (see section 15.11). It is likely that some pernicious weeds will persist following the ground preparation and can be treated e.g., by hand pulling or spot treatment by selective herbicide.

15.4.3 Timing

334. Autumn (September/October) sowing is preferred because this favours grassland species that germinate in autumn and will provide young nutritious grass shoots through the winter for geese. The timing avoids the breeding bird season to prevent any disturbance to ground-nesting birds and allows establishment of the grassland prior to the arrival of the wintering species. Sowing is most effective when conditions are warm and moist, which is a further reason to avoid winter and drought periods.

335. The application of fertiliser within the AR HMA can be undertaken in mid/late October to increase fertility and encourage vigorous growth and quantity of plant species favoured for foraging by overwintering dark bellied brent geese. It will also attract invertebrates for the golden plover and lapwing³⁷. Refer to section 16, Grassland Implementation Timing.

336. It may also be of benefit to apply organic (manure) fertiliser in autumn, as this can provide suitable conditions for soil surface invertebrates on which lapwing and golden plover feed. The manure will be sourced (where possible) from ivermectin free cattle to avoid adverse effect on invertebrates.

15.5 Seed Mix

337. The seed mix will be selected based on the results of the soil testing (if undertaken) and to be applied within existing arable field areas within the AR HMA; however, at this stage it is envisaged that the final seed mix will be decided based on the foraging requirements of overwintering dark-bellied brent geese, with a seed mix to be sourced from an agricultural wholesaler.

338. The final selected mix will need to be simple and suitable for sites where soil conditions vary across a site or where soil and site characteristics have not been established before sowing. The list of plant species that need to be included within the final seed mix is seen below:

Table 7.1 AR HMA Grassland Mix

Scientific name	Common name
Wildflowers	
<i>Trifolium repens</i>	White Clover
<i>Trifolium pratense</i>	Red Clover
Grasses	

³⁷ Rowcliffe-Mitchell (1996) The Conservation Management of Brent Geese In The UK

<i>Agrostis capillaris</i>	Common Bent
<i>Lolium perenne</i>	Rye Grass
<i>Festuca rubra</i>	Red fescue
<i>Cynosurus cristatus</i>	Crested Dog Tail

15.6 Sowing

339. The seed mix will be sown at a rate of 40 kg/ha (4 g/m²). The seed must be surface sown and can be applied by machine. Once sown, the seed should be lightly pressed into the seedbed by rolling.

15.7 Sward Management

340. A mechanical cut of grassland habitat will be completed twice per year, which will be in line with a hay meadow management regime. The sward is to be cut to 50 mm in summer (July) and again in September, with all arising's collected as hay or silage.

341. In the second and subsequent years the grassland can be managed in a similar way as Year 1. The grassland will need to be cut at a similar height and cutting times as to Year 1, with two cuts per year. On completion of each cut, the arising's will be taken away for use as silage or as hay.

15.8 Monitoring

342. An ecologist/Landscape Architect will visit the site before seed is sown to check that ground conditions are suitable, and following seed sowing to check that seed has been sown correctly. Remedial actions will be communicated to the Operator and relevant consultees at the earliest opportunity.

15.9 Operation

343. The following work will be carried out upon completion of all construction works and following the sowing of the seed mix. The activities are relevant for the duration of the operational phase.

15.10 Farmyard Manure

344. The application of fertiliser within the AR HMA can be undertaken in mid/late October to increase fertility and encourage vigorous growth and quantity of plant species favoured for foraging by overwintering dark bellied brent geese. It will also attract invertebrates for the golden plover and lapwing³⁸. Refer to section 16, Grassland Implementation Timing. Application of the fertiliser will be excluded from within 10m of the drainage ditches, in line with DEFRA best practice guidance.

345. It may also be of benefit to apply organic (manure) fertiliser in autumn, as this can provide suitable conditions for soil surface invertebrates on which lapwing and golden plover feed. The manure will be sourced (where possible) from ivermectin free cattle to avoid adverse effect on invertebrates.

15.11 Grazing

346. For the purposes of this plan it is identified that grassland within the AR HMA will be managed by cattle/sheep grazing or by mechanical cutting. Suitable stock grazing densities are in line

³⁸ Rowcliffe-Mitchell (1996) The Conservation Management of Brent Geese In The UK

with best practice for managing grasslands for conservation purposes³⁹. The grazing will be overseen by an appropriately experienced grazier to ensure this is undertaken appropriately.

15.11.1 *The first year after the grassland is established*

347. The grassland will be grazed by cattle/sheep at a low density (2-3 sheep/ha (or up to 1 head of cattle per ha⁴⁰) to manage the flush of annuals, but grazing will not commence until a grassland sward is sufficiently established within AR HMA.
348. Grazing within the AR HMA will take place during the summer months (April to September). This favours the development and quantity of clovers and availability of stolons during autumn and winter, which would otherwise be outcompeted by higher sward species. Clover stolons are a particularly favoured foraging plant source for geese.
349. The summer grazing intensity will need to be sufficient that a sward length of less than 100 mm is established prior to the autumn arrival of the geese, or that an early autumn cut is implemented to achieve this. This is required to ensure that the habitats are attractive to foraging geese.

15.11.2 *Years 2 onwards*

350. The management of grassland within the AR HMA will be undertaken in line with Year 1 and throughout the operational phase, with annual monitoring to inform any management adjustments that are required.
351. In the second and subsequent years the grassland will need to be managed such that soil fertility is maintained, and the grassland plant structure supports species favoured by foraging overwintering geese.
352. Within the AR HMA, the best results are likely to be obtained by traditional meadow-pasture management to be focussed on a summer grazing regime, with a similar approach to Year 1 recommended.
353. As the habitats will have started to become more established, the stocking density within these AR HMA habitat compartment areas can be increased to c. 4 sheep/ha (or approximately 1 head of cattle) throughout the summer months.
354. Overwintering bird species such as dark-bellied brent geese, lapwing and golden plover prefer habitats with a sward height of no greater than 100 mm, the stocking density will need to be reviewed and adjusted to ensure sufficient grazing takes place during summer months, such that sward height in winter is below this figure, or an early autumn cut can be introduced to create the favourable sward height prior to arrival of the wintering birds.

15.12 Monitoring and Remedial Actions

355. Monitoring within the AR HMA will comprise two elements:
- The monitoring of habitat development to inform management requirements; and
 - The monitoring of breeding or wintering bird species, to determine management success or the requirement for corrective management prescriptions.
356. During the implementation of the AR HMA, the establishment will be monitored by the ECoW who will ensure that the necessary habitat is in place prior at the start of the winter season (September).
357. An ecologist will visit the site in spring (May) and late summer (August) Year 1 to check the establishment of seed mix, sward height, grassland species composition and weeds. Remedial actions will be communicated to the Operator and relevant consultees at the

³⁹ BRE (2014) Agricultural Good Practice Guidance for Solar Farms. Ed J Scurlock

⁴⁰ Kent Wildlife Trust Land Management Advice Sheet 5 - Choosing livestock for conservation grazing

earliest opportunity, where there are requirements for management adjustments within the AR HMA.

358. Assuming that the seed mix has established successfully after Year 1, an ecologist will visit the site in late-spring (May) and early autumn (September) in Years 2, 3, 5, 10 and 20 – a critical period for grassland establishment – to assess the success of grassland management and, as necessary, recommend revisions to the AR HMA plan.

359. Wintering bird surveys will take place between September and March in Years 1, 2, 3, 5, 10 and 20. After this period, the monitoring schedule will be reviewed. The results of winter bird monitoring will be submitted to the HMSG on an annual basis to allow review of the efficacy of the implemented measures and adaptive management should it be necessary to modify the management prescriptions of the AR HMA.

360. Remedial measures will be implemented if necessary, to achieve the desired sward length, structure and resource availability – e.g. grazing management, spring/ autumn cutting, herbicide application, spot-treatments, analysis of ivermectin content of organic fertiliser.

Monitoring considerations:

- Monitor condition of ditch banks and assess damage by poaching.

Example remedial measures:

- Adapt survey effort to increase understanding of bird use of the site and wider area;
- Inspect sward status and adjust sward management if necessary – considerations include grazing/cutting intensity, water management, herbicide to control weed growth.
- Install fencing to protect ditch banks from damage by poaching if necessary.

16 GRASSLAND IMPLEMENTATION TIMING

Arable Reversion Habitat Management Area Implementation

Quarter 2 Year 1 (Y1)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Quarter 3 Year 1 (Y1)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Quarter 4 Year 1 (Y1)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Quarter 1 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Quarter 2 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Quarter 3 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Quarter 4 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
AR HMA Implementation								

Grazing Marsh Grassland Implementation

Quarter 2 Year 1 (Y1)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

Quarter 3 Year 1 (Y1)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

Quarter 4 Year 1 (Y1)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

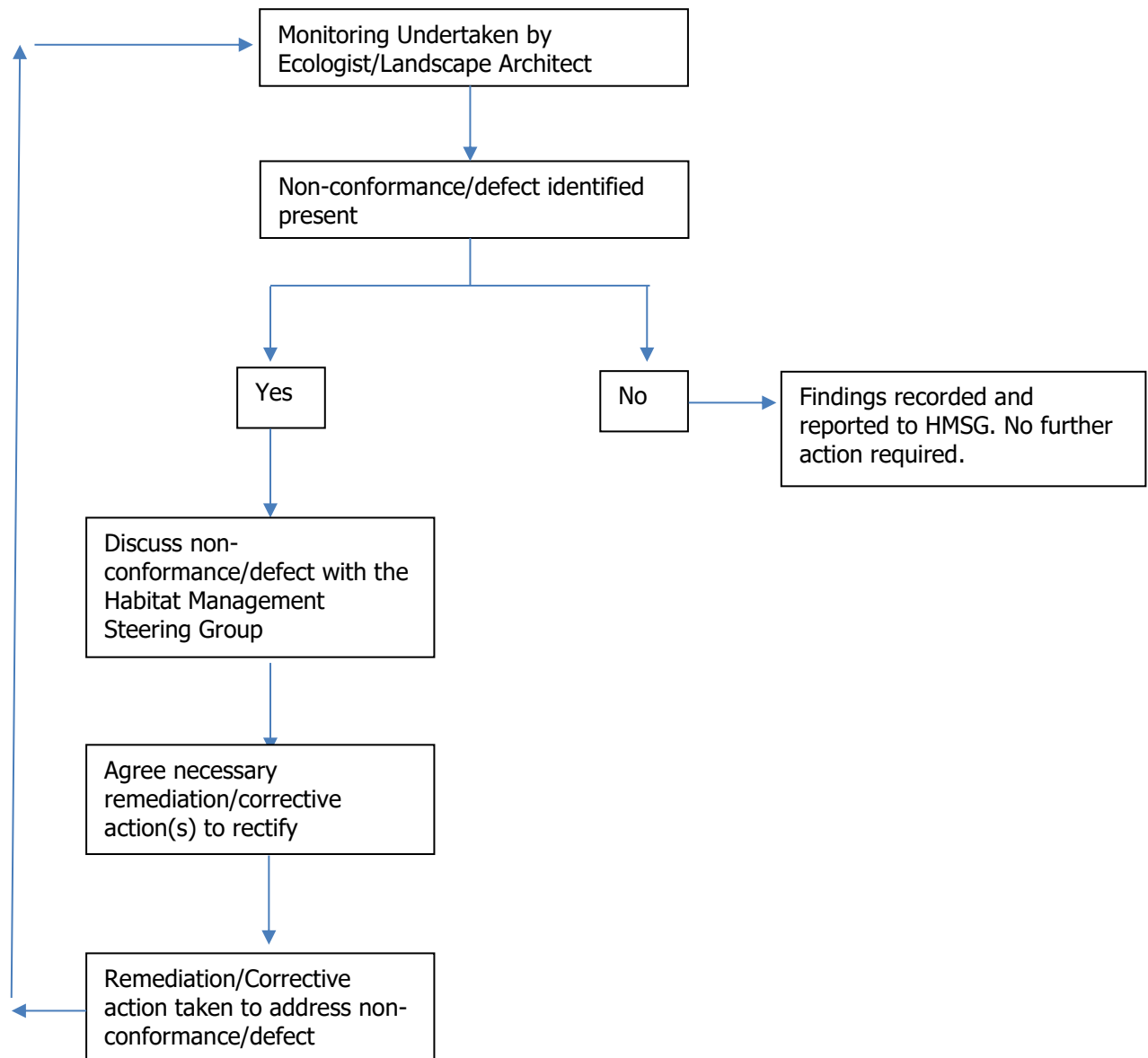
Quarter 1 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

Quarter 2 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

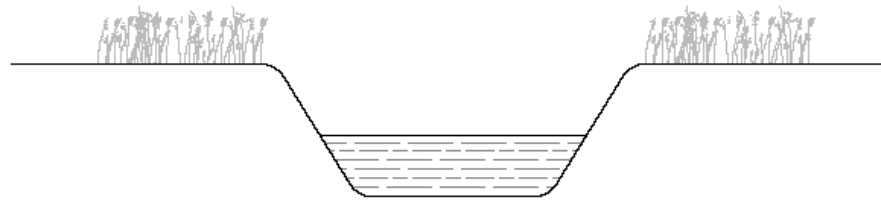
Quarter 3 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

Quarter 4 Year 2 (Y2)	Y1				Y2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Start Date								
Grassland Implementation (in fields to be built)								

17 MONITORING / MITIGATION / REMEDiation ROUTE MAP



18 INDICATIVE DITCH REPROFILING CROSS SECTIONS

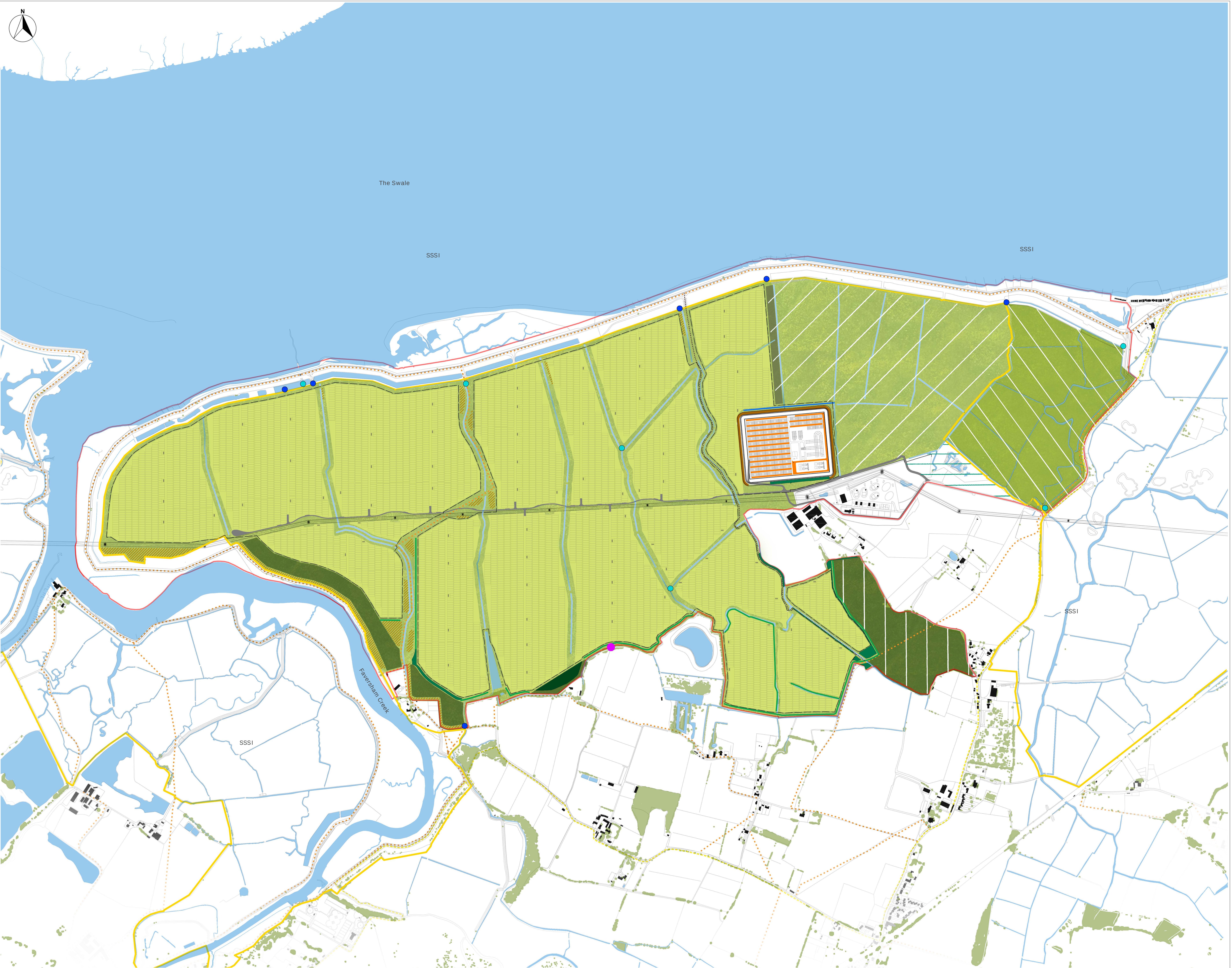
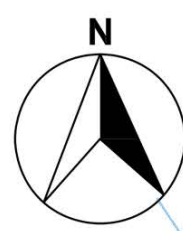


EXISTING INDICATIVE STEEP DITCH PROFILE



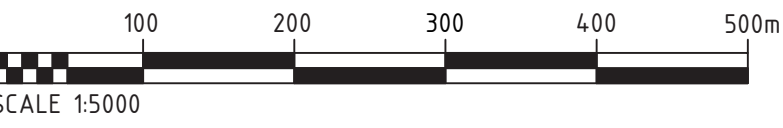
PROPOSED INDICATIVE GRADUAL SLOPING DITCH PROFILE

19 DRAWING – LANDSCAPE AND BIODIVERSITY MASTERPLAN



KEY

- Site Boundary
- Existing Pylons and Overhead Cables
- Existing Vegetation
- Existing Built Form
- Existing Hydrological Features
- Existing Public Rights of Way
- Existing National Cycle Route
- Proposed Permissive Footpath
- Proposed Bat Roost
- SSSI
- Proposed Perimeter Fence
- Proposed Site Compound
- Proposed New Ditch
- Proposed Native Species Hedging
- Proposed Native Species Shelterbelt
- Proposed Native Woodland
- Proposed Native Species Buffer Planting
- Proposed Establishment of Low Density Native Species Scrub to Link to Existing Areas Around Site
- Proposed Coastal and Floodplain Grazing Marsh Based on Priority Habitat Inventory - under and around solar panels
- Proposed Coastal and Floodplain Grazing Marsh Based on Priority Habitat Inventory
- Proposed Lowland Meadow Based on Priority Habitat Inventory
- Areable reversion Habitat Management Area
- Fresh Water Grazing Marsh Habitat Management Area
- Lowland Grassland Meadow Habitat Management Area
- Cleve Hill Substation Habitat Management Area
- Area of Proposed Reedbed Creation
- Key Existing Water Flow Control Structures (x6)
- Key Proposed Water Flow Control Structures (x6)



Scale 1:5,000 @ A0

Produced By: BM

Checked By: MT

Ref: 2238-DR-LAN-103

Date: 09/11/2018

Outline Landscape Biodiversity
Management Plan
Figure A5.1

Cleve Hill Solar Park
LBMP