

**Byers Gill Solar
EN010139**

6.4.2.14 Environmental Statement Appendix 2.14 Outline Landscape and Ecology Management Plan

Planning Act 2008

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and
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1. Introduction

1.1. Purpose of Document

- 1.1.1. This document provides the outline Landscape and Ecology Management Plan (OLEMP) for the construction, operation and decommissioning of Byers Gill Solar (the Proposed Development). It includes the provision for the successful establishment and future management of biodiversity and landscaping works. In doing so, it proposes measures to mitigate the effects of the Proposed Development, enhance biodiversity and secure compliance with relevant planning policies.
- 1.1.2. An Environmental Impact Assessment (EIA) has been undertaken for the Proposed Development and an Environmental Statement (ES) (Volume 6 of the DCO application) has been prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). In accordance with the requirements of the EIA Regulations, the ES contains the assessment of the likely significant effects on the environment that may be caused during construction, operation and decommissioning of the Proposed Development and describes proposed mitigation measures (Document Reference 6.2).
- 1.1.3. RWE (the Applicant) has prepared this OLEMP, drawing from requirements outlined in the ES, as part of an Application for a Development Consent Order (DCO) for the construction, operation and decommissioning of the Proposed Development. It demonstrates the mitigation measures to be secured via the production of a detailed LEMP, based on the OLEMP, when they will be implemented, as well as setting out the monitoring and recording activities to ensure that these measures are carried out.
- 1.1.4. The LEMP, produced in accordance with this OLEMP, will guide the Principal Contractor (PC) in relation to the management of the landscape and ecological features within the Proposed Development. The production of the LEMP is secured by Requirement 12 of the draft DCO (Document Reference 3.1).
- 1.1.5. It is highlighted that the Proposed Development has been designed to respond to its local context. The Design Approach Document (Document Reference 7.2) provides a summary of the approach taken towards design and the requirements the Proposed Development will comply with.
- 1.1.6. A suite of management plans exists to support the delivery of the Proposed Development through construction, operation and decommissioning. This OLEMP should be read in conjunction with the suite of management plans as outlined in Table 1-1.

Table 1-1 Suite of management plans

Management Plan	Purpose	Stage	Document reference
Outline Construction Environmental Management Plan (CEMP)	Sets out how negative environmental impacts will be minimised during construction.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 2.6 (Document Reference 6.4.2.6)
Outline Construction Traffic Management Plan (CTMP)	Sets out how construction traffic and staff vehicles will be managed during construction.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 2.8 (Document Reference 6.4.2.8)
Outline Pollution and Spillage Response Plan	Sets out methods to manage pollution and spillage incidents on site during construction.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 2.9 (Document Reference 6.4.2.10)
Outline Materials Management Plan (MMP)	Sets out how excavated materials that will be generated in the course of constructing the Proposed Development will be re-used in a manner that is compatible with the Waste Framework Directive and associated regulations.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 2.10 (Document Reference 6.4.2.10)
Outline Site Waste Management Plan (SWMP)	Sets out how the Proposed Development will manage resources efficiently, and measures to prevent and minimise waste.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 2.11 (Document Reference 6.4.2.11)
Outline Soil Resources Management Plan (SRMP)	Sets out the overall approach to managing soil resources affected by the Proposed Development.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 2.12 (Document Reference 6.4.2.12)
Archaeological Management Strategy	Sets out the management of archaeological remains, both known and currently unknown, during construction.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 8.5 (Document Reference 6.4.8.5)
Outline Battery Fire Safety Management Plan	Sets out the key measures to minimising the chances of a battery fire event and fire spread in the event of a fire. Sets out the proposed operational response to a fire event.	<ul style="list-style-type: none"> ▪ Operation 	ES Appendix 2.13 (Document Reference 6.4.2.13)
Outline Landscape and Ecological Management Plan (LEMP)	Sets out the management of the landscape and ecological features of the Proposed Development.	<ul style="list-style-type: none"> ▪ Construction ▪ Operation ▪ Decommissioning 	ES Appendix 2.14 (Document Reference 6.4.2.14)
Outline Public Rights of Way (PRoW) Management Plan	Sets out how PRoWs would be managed to ensure they remain safe to use, and disruption to users of the PRoW is minimised.	<ul style="list-style-type: none"> ▪ Construction ▪ Operation ▪ Decommissioning 	ES Appendix 2.15 (Document Reference 6.4.2.15)

Management Plan	Purpose	Stage	Document reference
Arboricultural Impact Assessment (AIA)	Sets out the protection measures to be implemented during the construction phase, including activity supervision by a suitably qualified arboriculturist where appropriate.	<ul style="list-style-type: none"> ▪ Construction 	ES Appendix 7.5 (Document Reference 6.4.7.5)
Outline Decommissioning Environmental Management Plan (DEMP)	Sets out how negative environmental impacts will be minimised decommissioning.	<ul style="list-style-type: none"> ▪ Decommissioning 	ES Appendix 2.7 (Document Reference 6.4.2.7)

1.2. Stakeholder Engagement

- 1.2.1. A summary of engagement to date is included in the Consultation Report (Document Reference 5.1).
- 1.2.2. Of note to this OLEMP, there has been engagement with Darlington Borough Council Rights of Way Officers regarding the proposed re-routing of PRow and proposals for permissive paths. These proposals have generally been welcomed as a means of providing accessible alternatives where existing routes are often poorly used due to accessibility, condition or waymarking. In addition, the proposed widths of paths and their relationship to proposed planting and fencing has also been discussed and agreed to.

1.3. Structure of the OLEMP

- 1.3.1. The OLEMP is structured as follows:
- **Chapter 1: Project introduction:** this section sets out an introduction to the Proposed Development
 - **Chapter 2: Proposed Development:** this section sets out a description of the Proposed Development, including its ecological and landscape context within the Order Limits.
 - **Chapter 3: Design approach and objectives:** this section provides an overview of the design approach and objectives applied to the Proposed Development and informing this document.
 - **Chapter 4: Roles and responsibilities:** this section sets out the roles and responsibilities for implementation of the LEMP.
 - **Chapter 5: Landscape management:** this section sets out detailed management prescriptions designed to enhance and manage the landscape elements within the Proposed Development.
 - **Chapter 6: Ecology management:** this section outlines strategies for managing and conserving the ecological aspects of the Order Limits, with a particular emphasis on protecting and enhancing biodiversity.

- **Chapter 7: Maintenance:** this section provides guidance on ongoing maintenance activities required to sustain the landscape and ecological features.
- **Chapter 8: Monitoring works:** this section describes the monitoring works required to ensure satisfactory establishment of the proposed landscape and ecology enhancements.
- **Appendix 9: Management and maintenance schedule:** this provides a detailed schedule of when and how often specific management and maintenance tasks should be carried out to ensure proper implementation of the LEMP.
- **Appendix 10: Additional sites within Order Limits prescription:** this provides supplementary information about sites within the Order Limits that may require specialized prescriptions or attention.

2. The Proposed Development

2.1. Proposed Development Location

- 2.1.1. The majority of the Proposed Development, including the panel areas, substation and on-site BESS are located within the administrative area of Darlington Borough Council. The eastern part of the cable routes crosses into the administrative area of Stockton-on-Tees Council. The northern extent of the planning boundary (the 'Order Limits') borders Durham County Council's administrative area.
- 2.1.2. The Order Limits and surroundings are comprised of agricultural fields, interspersed with individual trees, hedgerows, farm access tracks, woodlands and local farm holdings. There are several local villages located within close proximity to the Proposed Development, including Brafferton, Newton Ketton, Great Stainton, Bishopton and Old Stillington.
- 2.1.3. The Order Limits for the Proposed Development are shown in ES Figure 1.1 Site Location Plan (Document Reference 6.3.1.1).

2.2. Landscape Context

- 2.2.1. The Proposed Development and its Order Limits is located entirely within National Character Area (NCA) 23: Tees Lowlands. The NCA is described generally as '*a broad, open plain dominated by the meandering lower reaches of the River Tees and its tributaries, with wide views to distant hills.*'. The Proposed Development sits west of the '*large conurbation around the Lower Tees and Teesmouth*' with the south and west of NCA 23 described as '*largely agricultural in character.*'
- 2.2.2. The location in which the Proposed Development is sited within NCA 23 is described as 'agricultural land' which is 'intensively farmed, with large fields and sparse woodland, and a settlement pattern influenced both by the river and by past agricultural practices.'
- 2.2.3. Statements of Environmental Opportunity (SEO) identified for NCA 23 include:
- "SEO 2: Incorporate semi-natural habitats within the farmed environment, and use innovative farming techniques in order to improve the value of food provision alongside biodiversity, flood water storage capacity, and the ability of the landscape to adapt to the impacts of climate change.
 - SEO 3: Ensure that there is a well-connected network of high-quality green infrastructure throughout the Tees Lowlands which will enable people to understand and enjoy the natural environment, as well as providing a range of other benefits including biodiversity enhancement, food provision and flood risk mitigation."
- 2.2.4. Specific Landscape Opportunities identified for the NCA include:
- "*Maintaining and enhancing networks of semi-natural habitat within the farmed environment such as species-rich meadows, uncultivated field margins, hedgerows and ponds.*"

- *Increasing the number of hedgerow trees, actively managing hedgerows using techniques such as coppicing and ‘gapping up’, and improving the connectivity of field boundaries.*
- Improving access provision along green corridors both within and between urban areas, linking existing corridors such as those along the river channels and disused railway lines, and creating new routes in order to form a strategic green infrastructure network.”

2.2.5. Details of more local landscape character assessments are provided in the ES Chapter 7 Landscape and Visual. In summary, local landscapes are described as enclosed farmland under a mix of arable and pastoral cultivation, with hedgerow boundaries which are often gappy and interspersed with occasional trees. Other characteristics include woodland, broad verges and becks which may provide connections between habitats. Management Objectives are therefore intended to build on the existing landscape character and environmental opportunities wherever possible.

2.3. Ecological context

- 2.3.1. The Preliminary Ecological Appraisal (PEA) of the Order Limits was completed by RSK Biocensus in 2022 and 2023. Further details can be found in ES Appendix 6.1 Preliminary Ecological Appraisal Report (Document Reference 6.4.6.1). This section provides a summary of the ecological baseline within the Order Limits.
- 2.3.2. The majority of the Proposed Development is comprised of arable fields and modified grassland which are delineated by hedgerows, though some are also marked by fences, ditches, watercourses and lines of trees.
- 2.3.3. The vast majority of the habitats across the Order Limits were species-poor and had little intrinsic botanical value. All of the habitats were also common and widespread in the surrounding landscape. However, most of the hedgerows, ponds, areas of woodland and watercourses (particularly Byers’ Gill and Bishopton Beck) qualify as local BAP priority habitats and/or habitats of principal importance.
- 2.3.4. The only invasive species identified within the Order Limits was Himalayan Balsam (*Impatiens glandulifera*).
- 2.3.5. Common Valerian (*Valeriana officinalis*) was found along a tributary along High House Lane (track) in Brafferton which is listed as near-threatened, likely due to a loss of suitable habitat. The tributary in this area (and this species) is not expected to be impacted by the Proposed Development.
- 2.3.6. The open field habitat within and adjacent to the Order Limits were considered important for ground-nesting bird species such as curlew (*Numenius arquata*), lapwing (*Vanellus vanellus*) and skylark (*Alauda arvensis*). Design iterations have meant that fields identified with nesting curlew and lapwing have largely been avoided by the Order Limits. Hedgerows and other field boundaries supported a diverse assemblage of other nesting bird species.

- 2.3.7. Hedgerows were identified as commuting, foraging and roosting habitat for a number of bat species with a number of mature trees along hedgerows recorded as potential bat roost trees. Woodland and hedgerows within the Order Limits also recorded a number of badger setts.
- 2.3.8. Watercourses across the Order Limits included minor tributaries to the River Skerne near Brafferton, and nearby ditches and tributaries to Byers Gill and Little Stainton Beck. These watercourses had limited suitability for Water Vole (*Arvicola terrestris*) and otter (*Lutra lutra*).
- 2.3.9. Chapter 5 (Landscape Management) sets out the Management Objectives which build on an understanding the site landscape and ecology. In particular the landscape design proposals within this OLEMP and as illustrated in the Environmental Masterplan (Document Reference 2.5) seek to protect and enhance the valued landscape and ecology present throughout the site, as well as providing new opportunities for wildlife to thrive.
- 2.3.10. The Proposed Development extents are split into six sites as detailed in ES Chapter 2 The Proposed Development (Document Reference 6.2.2). These six panel areas are presented in the Environmental Masterplan (Document Reference 2.5).

3. Design approach and objectives

3.1. Design Approach Document

3.1.1. The Proposed Development has been designed to avoid or minimise impacts on the landscape and biodiversity, in accordance with the design approach and design principles set out in the Design Approach Document (Document Reference 7.2). The Design Approach Document (Document Reference 7.2) describes the rationale behind the iterative design process that has resulted in the design of the Proposed Development. In particular, the document describes how the Proposed Development responds to its local landscape setting, ecology and recreational usage. The following sections provide a brief overview of the factors considered within the design process.

3.2. Design objectives

Design Objective 1 – Protect and enhance existing features characteristic of the local landscape character within the Order Limits

3.2.1. The landscape contains numerous hedgerows and some large hedgerow trees, albeit hedgerows often contain gaps and have sometimes been replaced with fences. The vast majority of hedgerows and hedgerow trees will be retained with removals generally limited to short sections of hedge where access or cable laying is required. Where possible and practical, construction access and cabling will use existing field entrances and horizontal directional drilling (HDD) will install the cables under hedgerows. Proposed management will include relaxation of current flailing practises to enable improved growth with the objective of enhancing landscape structure and biodiversity value in accordance with landscape character and ecological guidance. This will ensure:

- i. Protection and enhancement of the existing field structure and characteristic field pattern;
- ii. Protection and enhancement of habitat for nesting and or foraging birds, bats, badgers and reptiles; and
- iii. Protection of existing green infrastructure (GI)/ habitat corridors.

Design Objective 2: Develop a strong GI network and improve habitat connectivity within the Order Limits

3.2.2. Existing field boundaries will be improved by way of new hedgerow and hedgerow tree planting to gap up, infill and replant field boundaries where they have been lost to intensive farming practices whilst field margins will be seeded with a variety of native grassland and wildflora mixes. These measures will be designed to meet the aspirations of Darlington Borough Council's Green Infrastructure Strategy and relevant landscape character studies in terms of:

- i. Enhancement of the existing field structure characteristic of the local landscape and mitigation of views of solar PV panels as illustrated by the illustrative cross-sections provided within the DAD (Document Reference 7.2);
- ii. Enhancement of GI including incorporating the Proposed Green Corridors within the Order Limits referenced in the Darlington GI Strategy [1]. This will include the planting of new hedgerows, hedgerow trees and tree belts and species rich grassland margins and meadow areas. As a result of the proximity of these Green Corridors, planting will be used to enhance their function by improving connectivity and species diversification with future potential to link to existing valued natural habitats in the surrounding environment;
- iii. Enhanced screening of solar PV panels, on-site Battery Energy Storage Systems (BESS) and associated infrastructure from Public Rights of Way (PRoW), local roads and properties by means of new and enhanced hedgerows and hedgerow corridors, hedgerow trees, woodland and scrub planting;
- iv. Improvements to water courses by way of promoting improved infiltration and filtering of runoff due to new planting and riparian buffers together with a reduction in nitrogen levels with no fertiliser application during operation; and
- v. New species rich grassland and wildflora areas will replace a number of fields/partial fields currently involved in intensive farming activity and managed as traditional hay meadows to reduce fertility and improve species diversification.

Design Objective 3: Enhance the PRoW network

3.2.3. Current usage of the 14 PRoW within the Order limits varies considerably; those in the vicinity of Bishopton and Great and Little Stainton are noted of particularly low usage in the Darlington Rights of Way Improvement Plan (RoWIP) [2] in spite of some improvements to waymarking, whilst those closer to Brafferton appear to be better used. Proposals to enhance and, as far as possible, mitigate potential adverse effects for users of the PRoW network within the Order Limits are as follows:

- i. Encourage greater usage of the network with a number of paths to be rerouted from the middle of fields to run through field margins in accordance with the RoWIP;
- ii. Accessibility and experience of users to be improved by inclusion of biodiverse field margins, to provide attractive year-round routes that are well waymarked and use suitable boundary furniture as required;
- iii. Enhancement of the existing hedgerow network and provision of new hedgerows, hedgerow trees and biodiverse margins to mitigate views of where users pass close to panel areas.
- iv. Routes will retain a minimum 3m width footpath space to enable ease of passing along routes. A further minimum 11m will be provided either side of routes to

panels areas to allow space for hedgerow planting and native grassland/wildflora buffers.

- v. Proposed habitat improvement will ensure that these routes will form a key element of the GI network across the Order Limits;
- vi. In certain instances, some views of solar PV panels will not be screened at closer/ intermediate distances to enable longer distance views to be retained, such as to the east of Hauxley Farm;
- vii. Interpretation boards will be used at key locations throughout the network to provide information of wildlife and the contribution of the Proposed Development to meeting Net Zero targets;
- viii. A PRow assessment has been undertaken and provided in ES Chapter 9 Land Use and Socioeconomics (Document Reference 6.2.9).

3.2.4. Typical cross sections of proposed screening for the PRows are presented in the DAD (Document Reference 7.2).

Design Objective 4: Protect and enhance the biodiversity of the Order Limits

3.2.5. The biodiversity of the Order Limits will be protected and enhanced with delivery of an overall biodiversity net gain, anticipated to be approximately 88% for habitat units and 108% of hedgerow habitats. as a result of the Proposed Development, as reported in ES Appendix 6.6 Biodiversity Net Gain Report (Document Reference 6.4.6.6). The proposed improvements to existing and creation of new habitats is informed by Darlington Borough Council landscape and ecological management guidelines and policies and will include:

- i. Establishment of a low maintenance grassland beneath solar PV panel and legume rich herbal ley/wildflora mixes to margins and between solar PV panel rows. To be managed with a late summer / autumn hay cut to benefit invertebrate, bird and mammal wildlife across the Proposed Development;
- ii. Establishment of native species rich wildflora meadow, tussock and wild bird grassland outside of the secure PV panel areas with one third of the area in total sown to each treatment to provide a range of habitat and food source for local wildlife including skylark, which would be managed by a late summer cut;
- iii. Eight land parcels currently used for intensive agriculture across the Order Limits to be used for biodiversity enhancement with species rich wildflora meadow grassland for ground nesting birds and foraging habitat and to mitigate the potential avoidance of Panel Areas by bats. To be managed with no grazing during the bird nesting season, considered to be between mid-February and August inclusive, with a late summer hay cut (late August to September) after young birds have fledged followed by grazing if required. The two large fields to the north of

Bishopton will be maintained with low maintenance grass rich sward to ensure continued availability of open ground for ground nesting birds such as lapwing and curlew;

- iv. Establishment of a network of new and enhanced native species rich hedgerows with hedgerow trees to provide increased screening/habitats and additional and enhanced commuting, foraging and roosting habitat for bats as appropriate across the Order limits; and
- v. Establishment of new native woodland/tree and scrub planting to provide habitat for invertebrates, birds and mammals.

3.2.6. Additional habitat features such as insect hotels/habitat piles and hibernaculum will be created using natural materials such as logs, turf and grass strimmings to improve shelter and hibernating opportunities.

Design Objective 5: Enhance public amenity provision

3.2.7. The Proposed Development will provide a number of interpretation boards at appropriate locations to provide information to local people regarding the natural environment and the benefits of renewable energy. This will include information on different species and habitats present within the Order Limits and the contribution of solar energy and the scheme in particular in helping to achieve the regional net zero targets. New way-marking will be provided at appropriate locations to enable ease of navigation of the existing and proposed footpaths and new furniture provided to enable access where required.

3.2.8. The provision for two public amenity and recreational sites to the northeast and west of Bishopton and a secure outdoor classroom connected to Bishopton Primary School are provided for in the Environmental Masterplans (Document Reference 2.5). Proposals for these areas are included as follows:

- i. The area to the northeast of Bishopton would connect with the existing informal recreation area to the north of the primary school. Proposals include an orchard and 'arboretum' together with opportunities for increased invertebrate and bird wildlife with a mosaic of native grasses and wildflora;
- ii. The area to the west of Bishopton is intended to provide an informal recreation space with provision of benches and tables. The fields to the south of this area were used as a landing strip during World War I and there is potential to introduce sculpture and/or interpretation of this historic aspect of the landscape into the scheme. Similarly, interpretation could be provided for the Castle Hill Motte and Bailey situated to the south of Bishopton; and
- iii. The outdoor classroom connected to Bishopton Primary School would be developed in conjunction with the school's needs. Appendix 2 provides

information regarding forest schools and sensory gardens that could form part of such a scheme which are intended to be a useful learning resource.

- 3.2.9. These sites will enhance the existing green space and provide important sites for the public and school children to connect to the natural environment within close proximity to residential areas.

Design Objective 6: Protect and enhance protected species

- 3.2.10. As well as developing a broader GI strategy, the Proposed Development will seek to enhance opportunities for protected species within the Order Limits as follows:
- i. A total of 10 barn owl boxes will be installed on retained trees, in locations determined by an ecologist at the time of installation;
 - ii. Security fencing around the Panel Areas will be permeable to allow badgers and other small mammals, such as hares access into Panel Areas;
 - iii. Enhancement of the existing trees on site assessed to have low roosting potential will be achieved through the use of c. 50 bat boxes on existing trees;
 - iv. Hibernaculum to be created for great crested newts;
 - v. Habitat piles to be created for reptiles; and
 - vi. Bug hotels to be created for insects.

4. Roles and responsibilities

4.1. Introduction

- 4.1.1. The Applicant has ultimate responsibility as the undertaker of the Proposed Development to ensure that the measures secured in the DCO are implemented and maintained. However, the Applicant may seek to appoint contractors to deliver and/or maintain the Proposed Development and they will also be responsible for ensuring compliance with the DCO.

4.2. Roles and responsibilities

- 4.2.1. The following roles are identified as relevant to the measures in this document. Additional roles relevant to the wider construction and decommissioning of the Proposed Development are identified in the Outline Construction Environmental Management Plan (CEMP) (Document Reference 6.4.2.6) and the Outline Decommissioning Environmental Management Plan (DEMP) (Document Reference 6.4.2.7) respectively.

The Applicant

- 4.2.2. The Applicant would be responsible for the following:
- adherence to UK and other relevant legislation and guidelines;
 - supplying data as appropriate to the appointed contractor and relevant stakeholders;
 - provision of sufficient supervision of implementation and reinstatement;
 - ensure monitoring of the ecological and landscape restoration works is undertaken and that the LEMP is reviewed and updated as appropriate;
 - liaise with the relevant stakeholders regarding the results of the monitoring and the success of the reinstatement effort; and
 - ensure the habitat creation and enhancement outlined is delivered and managed for 40 years duration in compliance with the DCO.

Appointed Principal Contractor

- 4.2.3. The appointed Principal Contractor (PC) would be responsible for the following:
- adhere to the requirements of the LEMP;
 - adhere to UK and other relevant legislation and guidelines;
 - appoint suitably qualified ecology and landscape professionals to deliver the LEMP and produce an appropriately updated LEMP if and when required;
 - provide all relevant information to the Applicant and their representatives;
 - provide a detailed programme for the Proposed Development;
 - diligently execute the works in accordance with approved drawings and specifications; and
 - ensure the habitat creation and enhancement outlined is delivered and managed for 40 years duration in compliance with the DCO.

Environmental and Ecological Clerk of Works

4.2.4. The appointed Environmental Clerk of Works, and Ecological Clerk of Works, with support from a landscape architect where required, would be responsible for the following:

- provide assistance to the appointed contractor, ensuring adherence to UK and other relevant legislation and guidelines;
- ensure that monitoring is undertaken and fully documented and reported until the completion of the Proposed Development; and
- review and make recommendations regarding appropriate changes to the maintenance, management and monitoring programme within the LEMP and produce an updated LEMP as appropriate.

5. Landscape Management

5.1. Overview

- 5.1.1. This section sets out Management Objectives and details the required works and measures to help ensure those Management Objectives can be achieved.
- 5.1.2. A programme for the 5-year aftercare period following completion of the soft landscape works is detailed in the Management and Maintenance Schedule (see Appendix 1).
- 5.1.3. All planting failures during the 5-year period following completion of the Proposed Development shall be replaced to the original specification, or where appropriate, at a size to match adjacent planting. Replacement planting is to be carried out by the PC in the soonest available planting season.
- 5.1.4. Habitat enhancement and habitat creation measures will need to be managed for a period of 40 years, which is the operational life of the Proposed Development as defined in requirement 5 of the draft DCO (Document Reference 3.1). This exceeds the minimum management period of 30 years to meet BNG requirements.

5.2. General Management

- 5.2.1. The tasks set out below will be undertaken across the Order Limits throughout the operational life of the Proposed Development or as required. A Management and Maintenance Schedule is provided in Appendix 1 which outlines when management and maintenance operations will be undertaken.

Fencing

- 5.2.2. All security fencing to panel areas to be regularly checked to ensure it is safe and fit for purpose and ensure no deer or other large mammals have become trapped and badger access points remain operational.
- 5.2.3. Fence to be of a height suitable to exclude deer from solar panel area, with suitable mesh size to prevent deer being harmed or becoming trapped. In addition, fencing will have gates or similar at intervals to allow badgers and brown hare access to forage under panels.

Lighting

- 5.2.4. Lighting required for maintenance works during operation will not be a permanent fixture. Lighting will conform to best practice guidelines with respect to minimising light spill into adjacent habitats and prevent disturbance to bats and other species during operation. Lighting will be minimised to that required for safe site operations. Where lighting is required, it will be directed toward the middle of the working area and will utilise directional fittings to minimise outward light spill and glare, preferably at an angle greater than 20 degrees from the horizontal).

Public Rights of Way

- 5.2.5. During operation of the Proposed Development, all PRoW within the Order Limits will be maintained to allow unimpeded passage, unless where maintenance requires otherwise temporarily. Any temporary closures or diversions to allow for maintenance activities will be subject to agreement with the LPA.

Litter and Vandalism

- 5.2.6. Litter picking will be undertaken as part of regular maintenance visits within the Order Limits. Similarly, damage to signage, interpretation boards, seating and field boundary furniture will also be identified at such visits and replacements implemented as soon as practically possible.

Watercourses and ponds

- 5.2.7. Water courses and ponds will be managed to enhance biodiversity and water quality and maintain flows. Grasslands will be diversified and managed to promote biodiversity and improve filtration of runoff. Native scrub and woody vegetation will be left to colonise naturally but monitored such that if it encroaches or shades more than 70% of watercourse then rotational coppicing will be used to maintain its cover to no more than 70%.

Pollution control

- 5.2.8. Vehicular access to the Proposed Development would be limited to maintenance activities. Equipment will be provided to contain and clean up any spills of fuel or lubricants as required. Regular inspection of the access tracks would occur to ensure no unacceptable erosion is taking place, with appropriate practicable remedial action taken, should erosion be noted. No vehicle cleaning or refuelling would take place within the site and drip trays would be placed underneath any stationary maintenance vehicles.

Pre-construction and Construction

- 5.2.9. The following pre-construction and construction principles will be followed:
- All new planting should be sourced from a reputable UK based provider, who are able to demonstrate provenance of planting (locally sourced where available) and adhere to all relevant biohazard controls including Landscape Institute Technical Note 1/15 Pests and Disease Threats.
 - All new planting must be certified disease and pest free from the chosen supplier(s). Planting to be undertaken in suitable planting conditions. All new tree planting will be undertaken in accordance with the BS8545:2014 'Trees: from Nursery to Independence in the Landscape'.
 - Where vegetation removal/pruning is required for access and/or visibility splays, the works should be limited to that amount required to achieve the appropriate access / visibility required. Pruning of vegetation will be preferred over removal wherever possible.

- Existing vegetation will be managed to maximise biodiversity and the screening of the solar PV panels and site infrastructure. Where feasible, current flailing practises will be relaxed at the point of consent to enable growth of hedgerow prior to construction. Similarly, reinforcement of defunct and gappy hedgerows and the planting of new hedgerows and hedgerow trees will be undertaken within the earliest feasible timescales taking into account needs of construction traffic.
- Any ground where planting or seeding is proposed that has been used by construction vehicles will require decompaction prior to planting or seeding.
- Wildflower seed should be species native to the UK, species appropriate to the location and from a reputable supplier.
- The Proposed Development has taken into account the utilities present within the Order Limits. Planting and seeding within these areas will be undertaken in accordance with National Grid guidance (Development near overhead lines, 2008) and will consist of hedgerow and lower growing shrub species maintained to ensure statutory safety clearances. Planting above underground utilities and cables will ensure that seeding and hedgerow planting will be undertaken with suitable species that will not be a risk to buried services due to root damage or soil shrinkage.

Enabling works

- 5.2.10. It is anticipated that the removal of 7 trees and a combined hedgerow length of 158m will be required during the construction phase. Where possible and practical, construction access and cabling will use existing field entrances and horizontal directional drilling (HDD) will install the cables under hedgerows.
- 5.2.11. Additional minor works to trees such as lateral pruning or crown lifting may be undertaken where required prior to construction to avoid damage to trees by construction activities. If this is required these works will be undertaken by a qualified arborist with checks for roosting bats before works commence if a tree has been identified as having bat roost potential.
- 5.2.12. Tree protection fencing will be erected before any construction works begin. Tree protection fencing will be in accordance with the principles set out within 'BS5837: Trees in relation to design, demolition and construction'. Protection fencing may be erected and dismantled in phases as construction progresses.

5.3. Native Woodland

Management Objective

- 5.3.1. Parcels of native woodland planting are proposed across the Order Limits to screen views of the Proposed Development.

- 5.3.2. Where woodland planting occurs south of a solar PV panel area, 100% woodland edge shrubs may be planted, providing screening to immediately adjacent properties without creating shading over time.
- 5.3.3. It is recommended that woodland and woodland edge blocks of planting are protected by deer fencing for at least the first 5 years to aid successful establishment and prevent browsing. Fencing will be managed as outlined earlier in this section.

Management Operations

- 5.3.4. The proposed tree stock will include a mix of bare root transplants (80-100cm, 1+2 transplants) together with standard and extra heavy standard woodland trees in locations where initial impact of the planting is required. Bare root stock to be planted at 2m centres with standard/extra heavy standard trees interspersed at 5m centres to create a varied canopy structure.
- 5.3.5. The initial planting and any re-stocking operations will be carried out between November and early March, avoiding periods of frost, extreme cold and waterlogged conditions. All tree planting is to be in accordance with BS8545:2014. Plants should be inspected on delivery.
- 5.3.6. The whips will be notch planted with the open notch heeled-in or, or pit planted in the case of standard and extra heavy standard plants. The tree pit sides should not have compacted, glazed or smeared sides from digging. Sides of a planting pit that have been smeared or smoothed during excavation should be scarified. Tree pits should have a radius of at least 75mm greater than that of the root system. During excavation of the tree pit, the soil should be placed to one side separating topsoil and subsoil as far as possible. The root flare of the newly planted plant should be clearly visible at the soil surface, and it should not be buried by excess soil. The root ball or stem-root transition should be level with the existing host soil. All backfill applied should, as far as practicable, replicated the horizons within the original soil profile. Topsoil should not be used below the depth of the original topsoil layer. The final layer of backfilling should not be consolidated but should be of a sufficient depth to allow for settlement.
- 5.3.7. Heavy standard and extra heavy standard trees are to be secured using a double stake and tree ties.
- 5.3.8. The irrigation of newly planted standard and extra heavy standard trees may be required in drought conditions. Water should only be applied if the soil moisture values indicate that it would be appropriate to do so. However, watering requirements are subject to change and any deviation from the above will be agreed between the management company and the local authority.
- 5.3.9. All plants will be protected with a biodegradable guard and secured with a cane, regular monitoring and adjusting of guards as required. The height of the shrub guard would be sufficient to protect against grazing deer if deer fencing is not used and guards are to be removed during year 5 (if necessary). As well as protecting the plants from browsing

deer or rabbits, the tree guards will facilitate spot-treatment with herbicide to control the annual growth of weeds.

- 5.3.10. In the initial years after planting, trees and shrubs will need to be checked for damage or disease and to ensure they are firmed in, stakes are secure and not rubbing, and tree shelters should be adjusted to ensure they are secured and protecting the tree to ground level. Where damage has occurred, necessary pruning, adjustments or replacements should be carried out.
- 5.3.11. In year 5, following guard removal (if necessary), thinning of Woodland and Woodland Edge Mix (up to a maximum of 30% of total tree cover) will be implemented to maintain the health, vigour and appearance of trees. All works to be carried out by an Arboricultural Association approved Contractor in accordance BS3998: 2010 Tree Work.

Species

Native woodland trees

- 40% *Quercus robur* – (Pedunculate Oak)
- 10% *Fagus sylvatica* – (Beech)
- 10% *Sorbus aucuparia* – (Rowan)
- 5% *Salix fragilis* – (Crack Willow)
- 25% *Acer campestre* – (Field Maple)
- 10% *Ulmus glabra* – (Wych Elm)

Native woodland edge shrubs

- 5% *Salix cinerea* – (Grey Willow)
- 35% *Crataegus monogyna* – (Hawthorn)
- 8% *Prunus spinosa* – (Blackthorn)
- 15% *Corylus avellana* – (Hazel)
- 15% *Malus sylvestris* – (Crab Apple)
- 15% *Viburnum opulus* – (Guelder Rose)
- 5% *Ilex aquifolium* – (Holly)
- 2% *Rosa canina* – (Dog Rose).

- 5.3.12. Long-term management, will include the following:
- check for trees affected by disease, removal and replacement of diseased trees;
 - prevent the encroachment of trees into areas designed to be clear for maintenance access;
 - prevent the encroachment of trees into areas designed to be clear for use as ecological strips;
 - thinning regime to increase light levels by opening the canopy and improve the vertical structure of woodland areas. Thinning to be carried out selectively to encourage the success of long-life tree species such as oak and beech. Thinning is recommended to be carried out every 5 years; and

- hazel and other shrub species respond well to coppicing. Coppicing should be carried out in groups, so regrowth is not prevented by dense shading. Trees suitable for coppicing can be subject to, commencing at year 7, a 7-year rotation from September to February. This will be beneficial to plant health, an array of wildlife and maintains a varied woodland structure. Trees could be coppiced again at year 14 and then every 7 years.

5.4. Individual and Hedgerow Trees

Management Objective

- 5.4.1. Buffer and hedgerow trees are proposed predominantly to the north of solar PV panel areas to prevent shadow casting. These trees will help to screen views of the Proposed Development over the 40-year operational period of the solar farm, becoming permanent features in the landscape.
- 5.4.2. Where buffer trees are proposed to exist intact hedgerows that do not require supplementary planting or gapping up, trees are to be placed adjacent to the hedge, on the edge of the ecological strip, ensuring no damage to root zone of existing hedgerow shrubs. It is recommended that planting is protected by deer fencing for at least the first 5 years to aid successful establishment and prevent browsing.

Management Operations

- 5.4.3. The proposed tree stock will include standard and extra heavy standard trees in locations planted at between 10-20m centres along the hedgerow to create a varied and irregular hedgerow tree structure.
- 5.4.4. Planting and maintenance of trees to be as per woodland trees above.
- 5.4.5. Pruning/remedial tree surgery and crown lifting will be implemented to maintain the health, vigour and appearance of individual trees across site. All works to be carried out by an Arboricultural Association approved Contractor in accordance BS3998: 2010 Tree Work.

Species

- 35% *Acer campestre* – (Field Maple)
- 10% *Crataegus monogyna* – (Hawthorn)
- 15% *Corylus avellana* – (Hazel)
- 5% *Malus sylvestris* – (Crab Apple)
- 10% *Salix cinerea* – (Grey Willow)
- 25% *Sorbus aucuparia* – (Rowan)

5.5. Native Hedgerow

Management Objective

- 5.5.1. To maximise biodiversity and help create wildlife corridors that connect the Order Limits with hedgerows and treelines within the wider landscape. Existing hedgerows are to be retained and enhanced through additional underplanting by infilling gaps to improve species diversity.
- 5.5.2. All proposed hedgerows are to satisfy Defra (2007) definition of 'species-rich' and consist of at least four woody species per 30m of hedgerow.
- 5.5.3. Hedgerows should be managed with the intention of generally reaching 2-2.5 in height and 2-3m width.

Management Operations

- 5.5.4. The proposed hedgerow stock will be bare root with the exception of holly which will be container grown. The initial planting and any re-stocking operations will be carried out between November and early March, avoiding periods of frost, extreme cold and waterlogged conditions. Plants should be inspected on delivery.
- 5.5.5. All shrubs will conform to either the 'British Standard 3936-1:1992 Nursery Stock Part 1: Specification for Trees and Shrubs' (BS3936) or the 'National Plant Specification' (NPS) produced by the Horticultural Trades Association and be 60-80cm bare root transplants or equivalent cell grown stock.
- 5.5.6. The proposed hedgerow species will be planted at 300mm centres in a double staggered row with five plants per linear metre. Natural planting will be achieved by planting the same species randomly in groups of 5, 7 and 9, whilst benefitting foraging wildlife and pollinators. The plants will be notch planted with the open notch heeled-in or, pit planted in the case of containerised species.
- 5.5.7. All plants will be protected with a biodegradable guard and secured with a cane with regular monitoring and adjusting of guards as required. Guards are to be removed during year 5 (if necessary).
- 5.5.8. The planting area is to be kept weed free using a broad-spectrum systemic herbicide if necessary. Alternatively, the hedgerow gaps will be planted through a weed suppressant geotextile or mulching to control weeds and reduce moisture loss.
- 5.5.9. An initial prune will be undertaken within the first two years of growth to encourage dense bushy growth. Thereafter hedges will be subject to a 3-year rotational cut of the top or either side with one side only being cut on rotation. Rotational cutting of hedges ensures an annual resource of flowers and berries for wildlife and pollinators.
- 5.5.10. Hedges are to be maintained at generally 2-2.5 in height and 2-3m in width.

- 5.5.11. If underplanting an existing defunct hedgerow, the hedge may need to be coppiced in sections to allow the new plants to become established. This work must be carried out by an experienced contractor. Works to be carried out over a 2-year period with 50% of hedge coppiced each year to ensure resource of flowers and berries for wildlife and pollinators whilst newly planted hedgerows are establishing:

Species

- 50% *Crataegus monogyna* – (Hawthorn)
- 8% *Prunus spinosa* – (Blackthorn)
- 15% *Corylus avellana* – (Hazel)
- 10% *Viburnum opulus* – (Guelder rose)
- 5% *Ligustrum vulgare* (Wild privet)
- 5% *Ilex aquifolium* – (Holly)
- 5% *Rosa canina* – (Dog rose)
- 2% *Lonicera periclymenum* – (Honeysuckle)

5.6. Native Scrub

Management Objective

- 5.6.1. To create a scrub mosaic to maximise biodiversity and help create wildlife linkage within the Order Limits and to provide increased screening of solar PV panels from residential properties and PRow. Scrub species are to be planted into the same low maintenance grass rich sward as used as an establishment crop.
- 5.6.2. Scrub should be managed with the intention of generally reaching 70% coverage with remaining area retained as grassland.

Management Operations

- 5.6.3. The proposed stock will consist of bare root stock (80-100cm, 1+2 transplants) to be planted at 1.5m centres.
- 5.6.4. The initial planting and any re-stocking operations will be carried out between November and early March, avoiding periods of frost, extreme cold and waterlogged conditions. All tree planting is to be in accordance with BS8545:2014. Plants should be inspected on delivery.
- 5.6.5. The whips will be notch planted with the open notch heeled-in or, pit planted in the case of containerised species. Natural planting will be achieved by planting the same species randomly in groups of 3, 5 and 7.
- 5.6.6. All plants will be protected with a biodegradable guard and secured with a cane with regular monitoring and adjusting of guards as required. Guards to be removed during year 5 (if necessary).

Species

- 20% *Crataegus monogyna* – (Hawthorn)
- 10% *Prunus spinosa* – (Blackthorn)
- 20% *Corylus avellana* – (Hazel)
- 20% *Viburnum opulus* – (Guelder Rose)
- 10% *Salix cinerea* – (Grey Willow)
- 4% *Ilex aquifolium* – (Holly)
- 6% *Rosa canina* – (Dog Rose)
- 10% *Lonicera periclymenum* – (Honeysuckle)

5.7. Low Maintenance Grass Rich Sward

Management Objective

- 5.7.1. The mix has been selected as a grass rich sward to be sown across the Order Limits. It will be sown without the use of fertilizer and cropped regularly over a two-year period to help lower nutrients in the soils, ahead of overseeding of mixes that require reduced soil fertility for flowering species to succeed.
- 5.7.2. The selected mix is a combination of low growing grasses that produce a short, open flower-friendly sward, which will help protect the ground during construction works, allowing for natural recolonisation of wildflower and grassland species found in the local area. The mix will reduce bare ground which will also help reduce establishment of annual weeds.
- 5.7.3. Different grass and wildflower species will naturally establish throughout the grassland areas as the ground conditions, exposure and shade cover fluctuates. The grassland will be managed to prevent natural succession, providing diverse grassland habitats for wildlife.
- 5.7.4. This low maintenance seed mix may also be used under areas of woodland and woodland edge planting as well as all new hedgerows. This will reduce bare ground, preventing the establishment of annual and perennial weeds.
- 5.7.5. The grassland will be retained for the 40-year duration of the Proposed Development beneath the solar PV panels and to the two large fields to the northeast of Bishopton to be retained for nesting bird species. Elsewhere, and following the two years of cut and removal of arisings, the grass-rich sward will be oversown with the following treatments.
- 5.7.6. The area of each field within the security fence (excluding underneath PV panels) will be over sown with either a:
- wildflower mix; or
 - legume rich herbal ley.

- 5.7.7. Each field will be sown with only one mix, either wildflower or legume, and the total for all fields will equate to an approximately 50:50 split.
- 5.7.8. The mix for the ecological strip outside of the security fence will be over sown with either a:
- wildflower mix; or
 - tussock grass mix; or
 - wild bird seed mix.
- 5.7.9. Each field will be sown with only one mix, either wildflower, tussock or wild bird, and the total for all fields will equate to an approximately 33:33:33 split.
- 5.7.10. The biodiversity enhanced fields will be over sown with a wildflower mix:

Management Operations

- 5.7.11. Ground preparation is essential for the successful establishment of all proposed grasslands. Existing vegetation associated with the arable land and arable field margins should be fully removed prior to any seeding to minimise impacts from undesired species. Cultivation along the bases of existing vegetation should take care to not dig too deep to avoid impact on roots and advice should be sought from the arboriculture consultant where required.
- 5.7.12. Ground will require rotavating prior to sowing seed. Where weed growth is prevalent, repeated cultivation can be used to exhaust weed plants. Final cultivation with harrow and roller to produce a fairly fine, firm surface suitable for seeding.
- 5.7.13. Seeding preferably in the autumn (August- September) or spring (March-April) when there is sufficient warmth and moisture at a rate of 2-4g/sq.m.
- 5.7.14. In the first two years of management, regular mowing and removal of arisings will be required to reduce a flush of annual weeds and encourage sown species to establish. This management will take into consideration the nesting period for birds, which is considered to be between mid-February and August inclusive. If mowing cannot avoid this time period and there is a risk that nesting birds could be present, then a nesting bird check must be completed before mowing. Grassland will be cut to a minimum of 40-60mm. Cut and collection of arisings in the first two years will reduce nutrient content in soil, allowing for wildflowers and sown mixes to establish more successfully in subsequent years.
- 5.7.15. It is noted that vegetation will be maintained under the drip line of all solar PV modules to reduce erosion and ensure greenfield drainage is maintained. If livestock is to be used to maintain sward length, stock will be rotated, and vegetation shall be maintained at all times. No feeding or livestock tending will take place within the watercourse buffer zones.

Species

5.7.16. Recommended species for grass-rich sward include:

100% Grasses

- 10% *Agrostis capillaris* - (Common Bent)
- 35% *Cynosurus cristatus* – (Crested Dogstail)
- 30% *Festuca rubra* – (Red Fescue)
- 20% *Poa pratensis* – (Smooth-Stalked Meadow Grass)
- 5% *Phleum bertolonii* – (Smaller Cat’s Tail)

5.8. Legume Rich Mix

Management Objective

- 5.8.1. A legume seed mix is proposed to be sown within the security fence including between but not beneath solar PV panels. The mix will be over sown on the established grass-rich sward to produce a vigorous sward with abundant legumes and herbs, which will provide habitat and food for invertebrates, including crop pollinators, and improve soil structure and water infiltration.
- 5.8.2. After establishing in the first year following over sowing, a mixture of legumes, herbs and wildflowers will be growing and flowering throughout the spring, summer and early autumn. The sward will be left to rest for at least 5 weeks between 1 May and 31 July, so that the majority of flowers are open and available for pollinators.

Management Operations

- 5.8.3. Scarify the existing grass-rich sward and sow shallowly into and pay careful attention to slugs and other pests. Sow from March until August during warm moist conditions; sowing legumes and herbs after August may not allow good enough establishment before the winter. Cultivate and sow to suppliers’ recommendations and ensure good seed to soil contact by rolling.
- 5.8.4. Following sowing cut or graze the herbal ley late each summer (September onwards) with no cutting or grazing between 1 May and 31 July, so that the majority of flowers are open and available for pollinators.

Species

- 5.8.5. Only source legume rich mixtures which comply with the Countryside Stewardship GS4.
- 5.8.6. For a full list of appropriate species to sow (and species to avoid) refer to the following government website: <https://www.gov.uk/countryside-stewardship-grants/legume-and-herb-rich-swards-gs4>

- 5.8.7. If grazing is not considered an option for management, select a mix that does not contain chicory. Chicory becomes woody towards late summer, is difficult to dry and can cause damage to bale wrapping material.

5.9. Wildflower Mix

Management Objective

- 5.9.1. The wildflower mix is proposed to be sown within the security fence including between but not beneath solar PV panels, outside the security fence to the ecological strip and within the majority of the biodiversity enhanced fields (excluding those to the northeast of Bishopton).
- 5.9.2. The mix will be over sown on the established grass-rich sward which will be scarified to enable soil contact of seed. Wildflowers will be selected to tolerate still relatively high nutrient soil conditions of formerly improved agricultural land. Proposed wildflowers will grow tall within sward or scramble up grass stems (for example meadow vetchling). The mix should be sown with 100% wildflower content to allow wildflowers to establish and not be outcompeted by established grasses.

Management Operations

- 5.9.3. Sow from March until early September during warm moist conditions; late autumn sowings should be avoided. Cultivate and sow at a rate of 2-4g/sq.m with two equal sowings at right angles to each other where possible ensuring good seed to soil contact by rolling.
- 5.9.4. The first year following sowing of wildflower mix can also be mown regularly to reduce presence of annual weeds, starting in July and then monthly in August, September and October.
- 5.9.5. Management can move to a more traditional hay cut in late summer early autumn to allow wildflower seeds to drop ahead of the following growing season.

Species

- 5.9.6. Recommended species include:

100% Wildflowers

- 6% *Achillea millefolium* – (Yarrow)
- 10% *Centaurea nigra* – (Black Knapweed)
- 8% *Lathyrus pratensis* – (Meadow Vetchling)
- 8% *Leucanthemum vulgare* – (Oxeye Daisy)
- 5% *Lotus corniculatus* – (Common Birdsfoot Trefoil)
- 4% *Lychnis flos-cuculi* – (Ragged Robin)
- 10% *Plantago lanceolata* – (Ribwort Plantain)

- 10% *Ranunculus acris* – (Meadow Buttercup)
- 5% *Rhinanthus minor* – (Yellow Rattle)
- 10% *Rumex acetosa* – (Common Sorrel)
- 7% *Sanguisorba minor* – (Salad Burnet)
- 7% *Silene dioica* – (Red Campion)
- 6% *Trifolium pratense* – (Red Clover)
- 4% *Vicia cracca* – (Tufted Vetch)

5.10. Tussock Grass Mix

Management Objective

- 5.10.1. A tussock grass seed mix is proposed for the ecological strip between new hedgerows or field boundary vegetation and security fence, outside of the PV panel areas.
- 5.10.2. Once established, this grassland type can form a good habitat for insects, small mammals, birds, amphibians and reptiles, providing nesting sites during spring, food during summer and autumn, and shelter during winter.
- 5.10.3. Maintaining areas of tussocky grassland and tall herbs through rotational cutting (one third every three years) will help to encourage small mammal populations and overwintering invertebrates. The small mammals provide suitable foraging habitat for Barn Owls, a schedule 1 bird species.
- 5.10.4. Ant mounds are often a major component of this type of habitat if left undisturbed which can help to attract Green Woodpeckers.

Management Operations

- 5.10.5. Established grassland to be scarified to provide suitable soil contact for seed. Seed to be sown in the autumn or spring when sufficient warmth and moisture at 3-5g/sq.m and ensure good seed to soil contact by rolling.
- 5.10.6. Tussock grassland once established requires little or no maintenance. Field margins may be cut two or three times in the first year for annual weed control but, once established, are cut only to prevent the encroachment of woody and suckering weeds on rotation one third every three years.
- 5.10.7. Unwanted perennial weeds (docks, thistles) may need control by occasional spot treatment with herbicide. To control scrub and bramble development, tussocky areas may need cutting every 2-3 years, between October and February. For wildlife this cutting is best done on a rotational basis so that no more than half the area is cut in any one year leaving part as an undisturbed refuge.

Species

5.10.8. Recommended species include:

100% Grasses

- 20% *Cynosurus cristatus* – (Crested Dogstail)
- 20% *Dactylis glomerata* – (Cocksfoot)
- 5% *Deschampsia cespitosa* – (Tufted Hair-grass (w))
- 30% *Festuca rubra* – (Red Fescue)
- 12% *Schedonorus arundinaceus* (*Festuca arundinacea*) – (Tall Fescue (w))
- 1.50% *Holcus lanatus* – (Yorkshire Fog)
- 10% *Schedonorus pratensis* – (Meadow Fescue)
- 1.50% *Briza media* – (Quaking-grass)

5.11. Wild Bird Seed Mix

Management Objective

- 5.11.1. A wild bird seed mix is proposed for the ecological strip outside of the PV panel areas. Wild bird seed mix provides important food resources (small seeds) for farmland birds, especially in autumn and winter. The flowering plants will benefit insects including bumblebees, solitary bees, butterflies and hoverflies.
- 5.11.2. During the spring or summer, the seed mix, containing at least 6 small seed-bearing crops (not maize), will be established. For 2-year mixes, during the second spring biennial plants, such as kale, will show continued growth and development.
- 5.11.3. Plants will flower throughout the summer and set seed by autumn which will provide the much-needed supply of small seeds throughout the winter, until at least mid-February.

Management Operations

- 5.11.4. Establish the plot between 1 March and 15 June, but ideally between mid-March and early June during warm and moist conditions which will help any brassicas establish quickly to protect against flea beetle damage. Create a fine and firm seedbed with seed sown at a depth between 1.5 cm and 2.5 cm.
- 5.11.5. Establish by sowing a seed mix which contains at least 6 seed bearing crops. Seed mixes may contain a maximum of 3 of the following cereal crops - barley, oats, rye, triticale and wheat.
- 5.11.6. Re-establish one-year mixes annually and two-year mixes every other year, to maintain seed production. Re-sow winter bird plots that fail to establish. Keep winter bird food plots until 15 February each year.

- 5.11.7. To minimise the build-up of diseases, pests and weeds over time consider alternating between sowing cereal and brassica-based mixes on non-rotational plots every few years.

Species

- 5.11.8. Only source wild bird mixtures which comply with Countryside Stewardship AB9 with mixes for one and two-year schemes. For full list of appropriate species to sow (and species to avoid) refer to the following government website:
<https://www.gov.uk/countryside-stewardship-grants/winter-bird-food-ab9>.

5.12. Habitat Enhancement Areas

- 5.12.1. The habitat enhancement areas will be sown with the low maintenance grass rich sward as described above. It will be sown without the use of fertilizer and cropped regularly over a two-year period to help lower nutrients in the soils, ahead of overseeding of mixes that require reduced soil fertility for flowering species to succeed.
- 5.12.2. The grassland will be retained for the 40-year duration of the Proposed Development to the two large fields to the northeast of Bishopton specifically for ground nesting bird species. Different grass and wildflower species will naturally establish throughout the grassland areas as the ground conditions, exposure and shade cover fluctuates.
- 5.12.3. Elsewhere, and following the two years of cut and removal of arisings, the grass-rich sward within the habitat enhancement areas will be oversown with the wildflower mix as described above.

6. Ecology Management

6.1. Overview

- 6.1.1. This section will detail the required works to help ensure the design objectives set out in Section 3 can be achieved through ecology management.
- 6.1.2. An ecologist will complete a pre-construction survey in advance of works to reconfirm the ecological baseline conditions to identify any new ecological risk or changes to existing known constraints. The walkover will be completed sufficiently in advance of the works to allow for the completion of any additional seasonal surveys (e.g., surveys in support of protected species licences).
- 6.1.3. An ecological clerk of works to be appointed during the construction phase of the Proposed Development. The ecological clerk of works will advise on protecting valued biodiversity features and provide practical, site-specific and proportionate advice on how to achieve compliance with environmental legislation.
- 6.1.4. A Species Protection Plan (SPP) is to be implemented during the construction and decommissioning phases of the Proposed Development. The SPP will be a live document subject to review and updating and will assist site personnel in the protection of species during construction and decommissioning, under the guidance of a project ecologist.
- 6.1.5. No protected species licences are currently required, although the need for such (e.g. badger and bats) prior to construction, will be informed by pre-construction surveys.
- 6.1.6. Himalayan balsam was recorded within the study area along the course of the Bishopton beck, which borders the Order Limits. This species is listed on the Invasive Alien Species (Enforcement and Permitting) Order 2019, it would therefore be an offence to aid its spread into the wild.
- 6.1.7. If Himalayan balsam is recorded within the Order Limits, then a management plan should be created with the aim of removing this species from the Order Limits. Himalayan balsam should be removed by either hand pulling and where this is not practical by mechanical means. If this species is along watercourses, then chemical treatment should be avoided.

6.2. Birds

- 6.2.1. Enhancements for bird species will include strengthening the hedgerow habitats within the Order Limits by the relaxation of current flailing practises to enable improved growth, reinforcement of defunct hedgerows and the planting of new hedgerows with native species.
- 6.2.2. Specific biodiversity enhancements areas have been set aside to benefit ground nesting birds by ensuring continued availability of open ground without panels and providing

shelter and food resources. These areas will be sown as a wildflower meadow and managed by taking a single haycut in late August to September after ground nesting birds have fledged. The wild seed bird mix in the field margins will provide a cover crop habitat for game birds and food source for over-wintering farmland birds such as tree sparrows (*Passer montanus*).

- 6.2.3. A total of 10 barn owl boxes will be installed on retained trees, in locations determined by an ecologist/ ecological clerk of works at the time of installation.
- 6.2.4. Whenever practicable, to avoid impacts on breeding birds, clearance of vegetation of potential value to nesting birds (i.e. to facilitate access) will be completed outside of the bird-breeding season (considered to be between mid-February and August inclusive). However, should it not be possible to avoid this season, vegetation will be inspected/surveyed by an ecologist/ ecological clerk of works immediately before clearance (i.e., within 24 hours of clearance works). An active nest will be given an appropriate disturbance buffer for that species with work only allowed to take place within this buffer once the ecologist/ ecological clerk of works has confirmed any young have fully fledged and left the nest.
- 6.2.5. Any deceased bird species found on site as part of maintenance activity will be reported for review by an ecologist to establish whether there is any link to bird strike.

6.3. Badger

- 6.3.1. Numerous badger setts and other signs of activity were observed within and adjacent to the Order Limits. The woodland, hedgerows, field margins, and scrub present suitable habitats for foraging and commuting badger.
- 6.3.2. For mobile species such as badger, pre-construction surveys will be required to check the status of the setts identified and to locate any new active setts that would need to be protected.
- 6.3.3. It is anticipated that sett closure will not be required, with any setts recorded to be protected from direct impacts by maintaining a suitable standoff distance measured via professional judgement from existing setts, and micro-siting equipment or fencing if required.
- 6.3.4. Any exposed trenches or holes are to be covered up when contractors are off site (i.e. at nighttime) or a slope provided to allow any trapped badgers a safe exit.
- 6.3.5. Security fencing used around the panel areas will be permeable to badgers with badger access points placed in the fencing at strategic locations to allow badgers and other small mammals, such as hares access into panel areas. The number of badger access points will be determined after preconstruction surveys. A suitable qualified ecologist knowledgeable in badger ecology will determine the number and location of badger access points. These badger access points should be in place the same day the fencing is installed and remain up until the point of fence removal at the end of decommissioning.

- 6.3.6. Regular checks of fencing will occur to ensure badger access points remain operational.

6.4. Bats

- 6.4.1. The habitat suitability for bats varies across the Order Limits ranging from areas with low suitability with defunct hedgerows and scattered trees, to higher value habitats with potential roost features in mature trees and foraging opportunities along woodland edges, streams, and intact hedgerows. A great number of trees were assessed as having roost potential, many with features including knot holes, butt rot, and ivy planting.
- 6.4.2. Buildings within the Order Limits were not fully assessed as these were deemed unlikely to be affected by the proposed works.
- 6.4.3. The strengthening of the existing hedgerows through the planting of native trees will increase connectivity to surrounding woodland, providing enhanced foraging and commuting habitat for bats as this will improve linear commuting routes. Habitat enhancement around panels and margins and the areas set aside for ground nesting birds will also improve foraging opportunities for bats.
- 6.4.4. Maintenance of 8m buffers (3m from hedgerows to security fencing and 5m from security fencing to Solar Cells) between Solar PV modules and hedges to retain foraging and commuting corridors for bats.
- 6.4.5. Any tree to be felled will be subject to a pre-construction check to determine its current bat roost potential and if found to have potential to support roosting bats will be subject to suitable surveys, as described in good practice survey guidelines.
- 6.4.6. Where possible, hedgerows, tree lines, ditches and trees including the tree RPA are to be protected during construction and decommissioning through the use of suitable buffers and fencing. For further information on tree buffers, see ES Appendix 7.5 Arboricultural Impact Assessment (Document reference 6.4.7.5).
- 6.4.7. Lighting will conform to best practice guidelines with respect to minimising light spill into adjacent habitats and prevent disturbance to bats and other species during construction and operation. Lighting will be minimised to that required for safe site operations. Where lighting is required, it will be directed toward the middle of the working area and will utilise directional fittings to minimise outward light spill and glare, preferably at an angle greater than 20 degrees from the horizontal.
- 6.4.8. Enhancement of the existing trees on site assessed to have low roosting potential will be achieved through this use of c. 50 bat boxes. The bat boxes will be located on trees that are to be retained within the proposed works.
- 6.4.9. The bat boxes will be preferentially situated in locations and positions that provide immediate and good quality foraging and commuting pathways for bat species such as along hedgerows, streams, or woodland edges, to increase the potential for bat box occupancy.

6.5. Great Crested Newts

- 6.5.1. The habitats present within the Order Limits recorded a number of ponds suitable for great crested newts (*Triturus cristatus*) (GCN). These ponds will be retained by the Proposed Development and will be protected with a buffer to prevent accidental damage from construction activities. In addition, an application to the GCN District Licensing Scheme will be undertaken to ensure legislative compliance with regards GCN.
- 6.5.2. Some fragmented areas of rough grassland and hedgerow bases may provide suitable habitat for shelter and foraging for GCN, but these are limited in their extent. These habitats will be enhanced with the relaxation of flailing practices along hedgerows and the planting of wildflower, tussock grass and wild bird seed mix along field margins. Additional habitat will be created through biodiversity enhancement areas and the planting of new hedgerows.
- 6.5.3. The native species-rich grassland and wildflower meadows along field margins and within the biodiversity enhancement areas, will be a significant enhancement to GCN, improving foraging, commuting and shelter opportunities, as well as improving connectivity throughout the Proposed Development
- 6.5.4. Habitat piles are to be constructed throughout the Proposed Development around ponds and in suitable areas, identified as suitable amphibian habitat using natural materials such as logs, turf and grass strimmings. These will provide refuge and hibernation opportunities for amphibian species. Exact locations will be determined by a suitably experienced ecologist. In addition to benefitting GCN, the log piles will provide suitable shelter and overwintering sites for invertebrates.
- 6.5.5. Should ground clearance of habitat suitable for amphibian be required then this should be undertaken at the right time of year to avoid the hibernation period of amphibians - i.e. avoid the period: October to March. The Ecological Clerk of Works would supervise works and relocate any reptiles/amphibians found.

6.6. Reptiles

- 6.6.1. The existing agricultural land offers limited prospects for reptiles. However, within this landscape, there are some established habitats including field margins, scrub areas, hedgerows, and pockets of woodland that offer opportunities (basking and shelter) for reptiles. The majority of suitable habitat will be avoided and retained throughout the Proposed Development.
- 6.6.2. As suitable reptile habitat is mostly limited to narrow linear features within the Order Limits, the conversion of land to low maintenance species rich grassland under panel areas with native species-rich grassland and wildflower meadows along field margins will present a significant habitat enhancement for reptiles. In addition, suitable reptile habitat will be created through biodiversity enhancement areas and the planting of new hedgerows.

- 6.6.3. The creation of habitat piles using natural materials such as logs, turf and grass strimmings, will also improve shelter and hibernating opportunities for reptiles within the local area.
- 6.6.4. Should ground clearance of habitat suitable for reptiles be required then this should be undertaken at the right time of year to avoid the hibernation period of reptiles - i.e. avoid the period: October to March. The Ecological Clerk of Works would supervise works and relocate any reptiles/amphibians found.
- 6.6.5. Any removal of reptile hibernacula (not anticipated) should be done in the summer months (April to September).

6.7. Brown Hare

- 6.7.1. Habitats within the Order Limits were considered suitable to support brown hare. The conversion of land to low maintenance species rich grassland under panel areas with native species-rich grassland and wildflower meadows along field margins will provide foraging and sheltering habitat for this species, therefore enhancing the Order Limits for brown hare, which favours a mosaic of grassed, woodland edge and hedgerows.
- 6.7.2. Badger access points within the security fence will also be permeable to brown hare to maintain connectivity for brown hare across the Proposed Development allowing continued foraging within panel areas.

6.8. Invertebrates

- 6.8.1. The Order Limits provides limited opportunity for invertebrates due to its largely intensive agricultural habitats. The planting of shrub, tussocky and wildflower grassland and sowing of flower-rich grassland and herbal lays will improve opportunities and support a diverse range of invertebrate species, including pollinators.
- 6.8.2. Insect hotel and/or habitat piles will be installed strategically along field margins and within the biodiversity enhancement areas, to further attract invertebrates to the area and provide enhanced sheltering opportunities.
- 6.8.3. Insect hotels can be ready-made or created from natural material such as moss, brash and logs. These will be positioned adjacent to existing woodland and treelines.
- 6.8.4. Where possible wood from windblow, fallen trees or management operations, will be left on-site in suitable locations to provide deadwood habitats for invertebrates.

6.9. Deer

- 6.9.1. Both red deer (*Cervus elaphus*) and muntjac (*Muntiacus reevesi*) have been observed within the Order Limits. Deer are likely to make use of the hedgerows within the Order Limits as a commuting corridor. The proposed fencing design will encompass solar PV Panel Areas, maintaining a deliberate separation between the fencing and the

adjacent hedgerows to promote unencumbered deer movement within the Order Limits.

7. Maintenance

7.1. Overview

- 7.1.1. Maintenance operations are defined as regular activities required, such as grass cutting and weeding. The maintenance operations required to ensure satisfactory establishment of enhancement and mitigation planting is achieved, is summarised in the maintenance programme detailed in Appendix 1 for the 5-year (and beyond) aftercare period following completion of the soft landscape works. The management will be revisited after the end of the initial five-year aftercare period and then at 10-year intervals ensuring it is still fit for purpose and ensuring the BNG commitments are delivered for the 40-year operational life of the Proposed Development.

8. Monitoring Works

8.1. Landscape and Ecology Monitoring

- 8.1.1. A post-construction monitoring programme will be formalised and agreed as part of the application and included within the LEMP. This will include validating the BNG to check an anticipated biodiversity net gain of approximately 88% for habitat units and 108% of hedgerow habitats is achieved (using metric 4.0), in line with the Environmental Masterplans (Document Reference 2.5). Walkover surveys of the Order Limits will be undertaken between April and June in years 2, 4, 6, 10 and every 5 years post-construction until year 40. The surveys will involve an inspection of the hedgerows, field margins, tree planting and biodiversity enhancement areas to ensure that they are being managed accordingly.
- 8.1.2. Post construction monitoring for birds, badgers and bats will be undertaken in years 1, 3, 5 and 10 post-construction. These surveys may include the use of bat static detectors. The results of this post-construction monitoring will feed into the management plan.

8.2. General monitoring of planting

- 8.2.1. To ensure reasonable establishment of the newly planted areas within the Order Limits, the areas should be assessed biannually and be maintained for a 5-year period following the completion of the proposed works.
- 8.2.2. Any areas of newly seeded wildflower meadow, hedgerows, or individual trees found to be damaged, diseased, or dying within the initial 5-year period will be replaced with like for like planting within the next suitable planting period.
- 8.2.3. Any existing planting within the Order Limits that is relied upon for mitigation purposes will be replaced where found to be damaged, diseased or dying within the initial 5-year period, where required.
- 8.2.4. The replacement with like for like planting may be revised if the species of concern are regarded as unsuccessful or commercially unavailable. If such an instance does occur, the species will be replaced with more successful (consultation with a suitably qualified ecologist may be required to determine a suitable replacement species) or readily available species.

Compliance Assessment Monitoring

- 8.2.5. This section identifies the compliance assessment monitoring required for the soft landscaping.

Habitat creation and enhancement

- 8.2.6. The habitat creation and enhancement measures outlined above will be monitored regularly to ensure that they meet or are considered to be progressing towards the

habitat condition outlined in the BNG assessment. This is likely to involve undertaking a habitat condition assessment and scoring the habitat creation and enhancement at regular intervals during the 40-year operational life of the Proposed Development.

Habitat Enhancement Areas (HEA) Monitoring

- 8.2.7. As above the HEA will be monitored during the operational phase to ensure that they meet or are considered to be progressing towards the habitat condition outlined in the BNG assessment. Areas set aside for ground nesting birds will be monitored by repeating the breeding bird survey at set intervals (year 1, year 3 and year 5) to assess if ground nesting birds have used the areas set aside.

8.3. Ecology Monitoring and Inspections

Bat box inspection

- 8.3.1. To monitor the efficacy of the bat box installations, it is proposed that bat boxes are monitored during late spring or summer by a bat licenced ecologist annually within the first five years of the Proposed Development to confirm use.
- 8.3.2. If during these monitoring visits there is no evidence of use by roosting bats, then it is recommended that the location and position of the boxes be re-evaluated, with alternative locations considered.

Bird box inspection

- 8.3.3. To monitor the efficacy of the bird box installations, it is proposed that bird boxes are monitored during late spring or summer by a suitably experienced ecologist or ornithologist annually within the first five years of the Proposed Development to confirm use.
- 8.3.4. Should the bird boxes not have evidence of use by nesting birds after this time, it is recommended that the location of the bird boxes be re-evaluated, and alternative locations be considered.
- 8.3.5. To monitor the efficacy of the areas set aside for ground nesting birds regular monitoring during the operational period will occur.

Badger access point inspection

- 8.3.6. To monitor the efficacy of the badger access points in the security fencing, regular checks will take place to ensure they remain operational.
- 8.3.7. The security fencing itself will also be subject to regular checks to ensure no deer or other large mammals have become trapped.

Appendix 1 - Management and Maintenance Schedule

- A.1.1.1 This section will provide a programme of work in table form that identifies maintenance operations, their frequency and time of year in order to successfully manage the landscape/ecology requirements of the Proposed Development.

Management Prescription	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5+	Every 5 years	Every 10 years
Enabling / Pre-Commencement								
Trees / Vegetation								
Pruning of vegetation for construction in accordance with Arboricultural Impact Assessment (AIA)	X							
Erection of tree protection fencing around Construction Exclusion Zone (CEZ) in accordance with AIA	X							
Construction using Special Technical Measures in accordance with AIA	X							
Operational Maintenance								
All Planting Areas								
Removal and replacement of diseased or dying plants, as necessary in the dormant season, size to match adjacent planting		X	X	X	X	X		
Treat pests and diseases including removal of dead, diseased and dying wood, remove from site		X	X	X	X	X	X	X
Check, adjust and replace stake and tie (remove in year 5 if necessary)		X	X	X	X	X		
Water plants as required in prolonged dry weather		X	X	X	X	X		
Check plant material is firmly planted and firmed in where required		X	X	X	X	X		
Weed control by herbicidal treatment, if necessary, April to October		X	X	X	X	X		
Existing Trees								
Annual visual inspection of trees in relation to PRoW and Proposed Development		X	X	X	X	X		

Management Prescription	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5+	Every 5 years	Every 10 years
Annual visual inspection for dead, dying or diseased wood in accordance with BS3998:2010		X	X	X	X	X		
Pruning as required by a suitably qualified arborist outside of the bird nesting season, preferably in the dormant season		X	X	X	X	X		
Existing Hedgerows								
Relaxation of management to allow hedgerows to grow out. Rotational cutting to cut one third of hedgerows per year.	X	X	X	X	X	X		
Grass cut of margins to prevent encroachment of woody plants into ecological strips	X	X	X	X	X	X		
Laying or coppicing of defunct hedge over two years to be carried out by an experienced contractor	X	X						
New Hedgerows (including infill)								
Planting to gap up existing hedgerows in dormant season	X							
Planting new hedgerows for screening in dormant season	X							
Annual inspection and formative pruning to promote bushy growth (cut in late winter in accordance with BS 3998: 2010)		X	X					
One third cut of top or either side to 2-2.5m. Avoid hedgerow trees				X	X	X		
Woodland and Woodland Edge planting								
Planting of all tree stock in dormant season	X							
Pruning/remedial surgery as required (cut in late winter in accordance with BS 3998: 2010)		X	X	X	X	X		
Tree thinning (up to a maximum of 30% of total tree cover at one time)						X		X

Management Prescription	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5+	Every 5 years	Every 10 years
Crown lifting (as necessary in late winter in accordance with BS 3998: 2010)						X		X
Tree condition survey to be carried out by a suitably qualified arborist								X
Low Maintenance Species Rich Grassland								
Creation of grassland, soil inversion if suitable to reduce soil fertility, sow mix in either autumn or spring	X							
Regular cut and immediate removal of arisings throughout year to reduce soil fertility and reduce annual weed growth		X	X					
Over sow (excluding areas underneath solar panels) with various seed mixes that will establish better following lowered nutrient content in soil				X				
Hay cut alongside new mixture maintenance to grass mix underneath panels in late summer (late August - September)				X	X	X		
Herbicidal spot treatment of perennial weeds where necessary in summer before weeds set seed and disperse.		X	X	X	X	X		
Legume Rich Mix								
Create at least 50% bare ground and sow mix in spring. Preferably broadcast seeds and roll in immediately. One cut 4-6 weeks following sowing to encourage tillering			X					
Hay cut, collection of arising 3-7 days later in late summer (late August - September)			X	X	X	X		
Herbicidal spot treatment of perennial weeds where necessary in summer before weeds set seed and disperse.			X	X	X	X		

Management Prescription	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5+	Every 5 years	Every 10 years
Wildflower Mix								
Creation of grassland, soil inversion if suitable, sow mix in either autumn or spring			X					
Grassland cut and immediate removal of arisings as necessary between September and March			X	X	X			
Hay cut, collection of arising 3-7 days later in late summer (late August to September)			X	X	X			
Herbicidal spot treatment of perennial weeds where necessary in summer before weeds set seed and disperse.			X	X	X	X		
Tussock Grass Mix								
Creation of grassland, soil inversion if suitable to reduce soil fertility, sow mix in either autumn or spring			X					
Rotational cut every 2 to 3 years between October and February, cutting no more than 50% in one year				X	X	X		
Herbicidal spot treatment of perennial weeds where necessary in summer before weeds set seed and disperse.			X	X	X	X		
Wild Bird Seed Mix								
Creation of grassland in biodiversity enhancement areas (BEA), soil inversion if suitable to reduce soil fertility, sow mix in spring	X							
Creation of grassland in the ecological strip, sow mix in spring		X						
Cut the following year late February to March		X BEA	X	X	X	X		
Re-establish seed mix following cut March to April		X BEA	X	X	X	X		

Management Prescription	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5+	Every 5 years	Every 10 years
Herbicidal spot treatment of perennial weeds where necessary in summer before weeds set seed and disperse.		X	X	X	X	X		
General Management Monitoring and Review								
Review of LEMP and amendments to management and maintenance if required							X	

Appendix 2 - Additional Sites within Order Limits

School Sensory Garden

A.2.1.1 A sensory garden will be created within the Bishopton Redmarshall Primary School grounds with the purpose of providing a unique outdoor space which will not only stimulate the five senses (sight, taste, smell, sounds and touch) but will also create an external space to encourage further curriculum-based activities. Plants will be carefully selected for their colour, scent and textural qualities with the added potential to attract and support local wildlife and add to the biodiversity to the site.

A.2.1.2 Below are some suggestions for plant species which can be used to stimulate each individual sense as well as being beneficial to wildlife:

Sight

A.2.1.3 Plants are selected for their bright and bold colours that will visually draw children towards them as well as attracting birds and insects for pollination and seed dispersal too.

- Sunflowers – (*Helianthus annuus*); a tall growing plant with bright, bold colour and a large flower head. It is quick growing and a good one for children to grow from seed.
- Love-in-a-mist – (*Nigella damascena*); good for a sunny position with bright blue flowers.
- Chameleon plant – (*Houttuynia cordata* 'Chameleon'); grown for its three-toned foliage and it smells of lemon too.
- Swiss chard 'Bright Lights' – (*Beta vulgaris*); an edible plant similar to spinach, grown for its bright red coloured stems and vibrant foliage.
- Heuchera cultivars; these are available in many vibrant colours and shades from lime green to red and dark purple. They can be planted in shade, and some retain their leaves during the winter months.

Taste

A.2.1.4 A mixed selection of herbs, fruits and vegetables will provide a good range of taste experiences from sweet to sour. Some of which could be used by the school for curriculum-based cooking activities. Below are some recommendations:

- Spearmint – (*Mentha spicata*); a vigorous growing herb, best grown in pots or other containers as it will spread and take over a planting bed. Other mint plants can be used such as Chocolate Mint which children will love.
- Rosemary – (*Rosmarinus officinalis*); a large woody shrub with highly fragrant leaves especially when brushed past or rubbed between fingers. Good for bees.
- Chives – (*Allium schoenoprasum*); in addition to the edible foliage, this plant also produces pink, mauve or purple flowers which the bees also love.

- Nasturtium – (*Tropaeolum majus*); every part of this plant is edible, and the flowers range from orange, red to yellow.
- Wild strawberry – (*Fragaria vesca*); this plant loves partial sun and damp conditions and produces small, sweet, delicious fruit.
- Pot marigold – (*Calendula officinalis*); orange flowers which can be added to a salad, with aromatic, dark green leaves.
- Sweet basil – (*Ocimum basilicum*); staple Italian cooking herb that could be grown in the classroom and then transplanted outdoors.
- Vegetables. A range of vegetables could be used in the sensory garden such as peas, carrots, radishes, broad beans and lettuces. Again, could be started in the classroom and transferred outdoors as part of a curriculum-based activity.

Smell

A.2.1.5 The aromas given off by plants not only stimulate the sense of smell but also attract insect to the flowers for pollination and some of the stronger scented leaves also deter insects from eating them.

- Curry plant – (*Helichrysum italicum*); curry smelling leaves which give off a spicy aroma.
- Lavender – (*Lavandula angustifolia*); relaxing, fresh aroma with tiny purple flowers.
- Chocolate cosmos – (*Cosmos atrosanguineus*); maroon flowers give off a chocolate/vanilla scent - a big hit with the kids!
- Stocks - these sweetly scented summer flowers are very traditional and come in a variety of pink, white & red shades.
- Lemon scented geranium – (*Pelargonium crispum*); crinkly leaves that smell of lemon when rubbed.
- Wild Thyme or Creeping thyme – (*Thymus vulgaris* or *thymus serpyllum*) – low growing thyme varieties with aromatic leaves when crushed and, that can withstand some trampling under foot.

Sound

A.2.1.6 Plants listed below are mainly ornamental grasses chosen for their gentle rustling qualities when caught in a light breeze, but they also offer height and structure to the planting scheme.

- Greater quaking grass – (*Briza maxima*); a grass that rustles in the wind with nodding, papery lantern-like flower heads.
- *Miscanthus oligostachyus* 'Nanus Variegatus' - bamboo-like foliage and tufted fronds.
- Sweetcorn – (*Zea mays*); an annual vegetable with good rustling leaves and also a good one for children to grow from seed.
- Fountain grass – (*Pennisetum alopecuroides*); long, evergreen grass, with bristly spikelets. A good tactile plant too.

Touch

A.2.1.7 A selection of plants below has been chosen for their softer tactile leaves to best suited a school environment. If spikier plants are required, then there are plenty to choose from, but this will ultimately be decided by the school.

- Lamb's ears – (*Stachys byzantina*); a favourite with children for its silvery downy leaves which resemble the ears of a lamb.
- Silver sage – (*Salvia argentea*); large, silvery-white leaves covered in cotton wool like down.
- Jerusalem sage – (*Phlomis fruticosa*); soft, downy leaves and stems with yellow flowers.

Forest School/Outdoor Classroom

A.2.1.8 The key principles of a Forest School are that the learning activities should take place in a naturally wooded environment (where possible) with an embedded appreciation of the natural world. Most Forest School sessions will take place outdoors in a natural setting ideally with some trees and plants that can be utilised for their natural materials for learning activities such as climbing, building dens, carving wood and making fires.

A.2.1.9 If the Forest School is either being started from scratch or an existing area is looking to be enhanced then, the following tree and shrub species could be considered.

Planting and Plant Species - Pioneer and Sacrificial Plants

A.2.1.10 These plants are quick growing and will be planted to form the green infrastructure which will allow other longer-term trees to successfully establish at the same time or in a few years later. As they grow and establish, some will be selected for removal (thinning out) to allow space for the more robust plants to expand and establish more successfully also allowing space for a layered woodland structure to develop. Most trees proposed are native varieties with some non-native species selected for their unique characteristics or suited to specific site conditions:

Large to medium trees

- *Alnus cordata* - Italian alder
- *Alnus glutinosa* – Native alder
- *Betula pendula* – Native Silver birch
- *Salix caprea* – Pussy willow
- *Sorbus aucuparia* – Native Rowan
- *Sorbus aria* – Native Whitebeam
- *Pinus sylvestris* – Native Scots pine

Useful small trees, shrubs and bushes

- Hazel, *Corylus avellana*: essential shrub / tree for Forest School as it is fast growing (grows up to 4m height), is a multi-stem which can be coppiced, producing excellent materials for den making, walking sticks, firewood, weaving and other art and craft making activities. All parts of this plant are user friendly, including the large soft leaves which make great toilet paper. Is a valuable food source for wildlife as it produces hazel nuts in autumn and catkins in the spring.
- Buddleija species: a hardy butterfly bush, very fast to establish producing an abundance of flower spikes (albeit usually in the summer holidays) which dry on the tree and make great fire lighting material throughout the year. Useful for of kindling sticks which season quickly. This plant will self-seed and should be grubbed up where not needed.
- Willow species: small varieties and coppiced willows yield masses of good firewood. Needs seasoning for 6-9 months and burns very well. Stems can also be used for den making and for other arts and crafting activities.
- Cotoneaster franchettii: a recommended shrub for a variety of reasons including its dense, multi-stem and arching form, growing to a height of approx. 3m.
- This plant is an evergreen cotoneaster, providing good shelter for birds and other wildlife. It will provide winter interest within a deciduous woodland setting. Masses of flowers are produced in June providing food for bees and other pollinators. The long-lasting berries (can last for 4 months when they turn a darker red) are loved by songbirds and it highly tolerant of environmental pollution.
- Elder, *Sambucus nigra*: a plant favoured for a high yield of consistently great flowers for tea and making cordial where the large flowers can be dried and stored. The stems or twigs can be hollowed to make whistles. Very wildlife friendly and loved by all birds and bugs for the summer flowers and late summer berries.

Habitat Creation within the Forest School Woodland

A.2.1.11 There are many ways of creating formal and informal habitats on site. However, this will very much depend on the requirements of the school and the space available to accommodate each item. Below are some suggestions of various habitats that could be considered as part of the Forest School environment and that could be incorporated into curriculum-based learning activities:

- Pond and wetland area – a wildlife pond or dipping pond is generally viewed as excellent habitat to have on any site. A well-constructed pond provides a haven for a variety of wildlife including amphibians, reptiles and insects as well as providing valuable drinking water for birds and mammals during the warmer summer months. However, consideration must be given to the safety of children where they have access to an open water body. A simple fence and gate or more permanent cover might be needed depending on the final size of the pond design and how the area is managed by the school.
- Bog Garden - If a traditional pond is not an option, then a bog garden might be a good wetland alternative, although an aspect of open water is still a requirement

albeit much shallower than a wildlife pond. Here, a variety of different plants and mosses could establish and thrive, intern attracting insects and other aquatic species.

- Log Piles – a simple log stack is a haven for all manner of insect and invertebrates and is a simple and cost-effective way to clear any felled trees on site so long as the wood is free from disease. Care should be taken as the wood decays over time if children are allowed to climb on it.
- Bird and bat boxes - These are very simple items that can be purchased and installed either in trees or, on buildings. A range of different bird box sizes and designs will attract different species from blue tits to swallows. Bat boxes can be attached to either trees or to the school building and advice should be sought from a qualified ecologist to identify the best locations on site.

Publicly Accessible Orchard and Ecological Area

- A.2.1.12 A traditional orchard is orchard is proposed north of Bishopton Redmarshall Primary School's sensory garden and forest school.
- A.2.1.13 A traditional orchard is likely to contain a mosaic of habitats important to wildlife and provide food shelter and breeding sites for many different species. This is likely to contain elements of woodland, pasture, meadow grassland, ideally bordered by hedgerows and sometimes contain small areas of scrub. Each individual habitat has value in its own right however, combined together within a traditional orchard setting creates a wildlife haven with a diverse range of plants and a mosaic of habitats that support a range of species on site.
- A.2.1.14 The area to the north of the Bishopton Redmarshall Primary School could be considered along the lines of creating a traditional orchard with a similar mosaic of habitats suited to the site and the space available. This area will be accessible to the public and will need to be kept relatively open both visually and physically to ensure it works as a safe space for users.
- A.2.1.15 Therefore, some of the habitats that make up a traditional woodland as describe above such as woodland and scrub and some of the traditional management methods may need to be amended and adapted to suit this site and its users.
- A.2.1.16 Some of the habitats and suggested planting types and plant species are listed below for consideration:

Fruiting Trees

- A.2.1.17 Apple and pear trees are the best of the orchard trees for humans and for wildlife. However, these combined with a variety of other fruiting trees such as cherries, greengages, quinces and plums will create a more interesting orchard mix for the local community, bringing back some of the forgotten varieties too, offering a good range of fruits to eat and to cook with. Varieteis to consider include:

- Bramley Apple – *Malus domestica* 'Bramley's Seedling' (cooking apple)
- Cox Orange Pipin – *Malus domestica* 'Cox Orange Pipin' (eating apple)
- Egremont Russet – *Malus domestica* 'Egremont Russet' (eating apple)
- Adams Pearmain – *Malus domestica* 'Adams Pearmain' (eating apple)
- Pear 'Onwards' – (dessert pear)
- Pear 'Beth' – (eating pear)
- Damson 'Westmoreland' – (cooking damson)
- Plum 'Victoria' – (cooking plum)
- Quince 'Gamboa' – (cooking quince)
- Greengauge 'Count Althann's Gauge' – (dessert gauge)

A.2.1.18 Note: Some consultation / research may be needed to see if any heritage varieties are known locally and could be included in the orchard mix.

A.2.1.19 A well-managed established orchard has a mixture of tree ages. Young trees allow plenty of light to reach the grassland and older trees provide shelter and food further adding to the diversity of habitat available for nature. To achieve a varied range of sizes the following rootstock sizes could be considered when planted:

- Rootstock M106 More traditionally orchard size, making 12-14' and the same across. More tolerant of poorish soils.
- Rootstock M26 Is a good compromise between the genuinely dwarfing trees and the larger more vigorous. Growing 10' or so with the same spread.

Grassland

A.2.1.20 The grassland in many traditional orchards was largely left undisturbed as the ground would not have been ploughed due to risk of damage to the tree roots. As a result, the soil structure and the complex subterranean ecosystems including the fungal hyphae networks remained intact creating an ideal environment for plants such as the native orchid to germinate and establish.

A.2.1.21 A similar approach could be adopted in the new Community Orchard depending on the ground conditions on site (to be confirmed). An initial sowing of the low maintenance grass rich sward would result in an open structure that allows wildflowers and other plants to naturally colonise in the early establishment years with a phased management and maintenance regime including some early establishment cutting and tidying leading to the ground left undisturbed creating a haven for wildflowers and wildlife to flourish.

Hedgerow

A.2.1.22 Hedgerow will form some of the orchard boundaries using a variety of species selected for their wildlife beneficial properties alongside their edible fruits and nuts for both wildlife and humans to forage. The edible hedgerow species could include:

- Hawthorn (*Crataegus monogyna*)

- Hazel (*Corylus avellana*)
- Blackthorn / Sloe (*Prunus spinosa*)
- Crab apple (*Malus sylvestris*)
- Dog rose (*Rosa canina*)
- Blackberry (*Rubus fruticosus*)
- Elder flower (*Sambucus nigra*)
- Wild pear (*Pyrus communis*)

Habitat Creation

A.2.1.23 Within the orchard, opportunities for providing additional wildlife habits can be proposed by installing simple items such as a hibernaculum, log piles for insects and invertebrates, nesting boxes in trees or standalone boxes on tall wooden poles for birds, shallow wetland scrapes and hedgehog shelters nestled in secluded areas. All these habitats will attract and support local wildlife and increase the bio-diversity across the site.

Amenity/Recreation Area

- A.2.1.24 This proposed amenity space, to the west of Bishopton, is sited next to the large solar farm field in the south where it abuts the site along its western and southern edge.
- A.2.1.25 This space is intended as a safe space with an open parkland character used for recreational activities such as walking the dog, informal kick abouts, picnics and perhaps larger local social gatherings or events if space allows.
- A.2.1.26 The parkland will be formed using a combination of individual specimen tree planting together with smaller groups for tree planting to maintain clear views below the canopy line.

Some parkland tree suggestions below:

Large Specimen Trees:

- English oak – (*Quercus robur*)
- Beech - (*Fagus sylvatica*)
- Elm – (*Ulmus glabra*)

Grassland

A.2.1.27 Grassland will largely be the same amenity grass sowing of low maintenance grass rich sward with an open structure that allows wildflowers and other plants to naturally colonise but will withstand mowing to maintain a neat sward where required with areas left unmown for wildflowers and long grasses to flourish, benefiting wildlife year-round with simple mown paths running throughout to create a network of routes and for

informal play. Larger mown areas can be cut into the grass for picnic areas and gathering spots.

Furniture and Signage

Seating

- A.2.1.28 As mentioned above, this area will provide an attractive setting for a picnic and as such, picnic benches will be provided throughout the park. These should be made from a high quality (ideally FSC hardwood) timber, some with extended ends to accommodate wheelchair users.
- A.2.1.29 Other seating within the park could include a selection of formal and informal timber parkland benches, ranging from bench seats with back and arm rest to large tree trunks with flat tops for sitting on.

Natural Play

- A.2.1.30 Some elements of play could be introduced in the parkland in the form of natural play using items such as rounded boulders to climb on, timber stepping logs and balancing beams, vertical poles to weave in and out of and carved wooden animal sculptures to climb on. Some low earth mounds could also be considered for children to run up and roll down.

Sculpture/Interpretation

- A.2.1.31 This area is located on a site with some historical reference to a WWI airstrip and reference to this could be represented as a sculpture and/or interpretation for interest to visitors. Similarly, interpretation could be provided for the motte and bailey castle located further to the east, to the south of Bishopton. Interpretation of Bishopton Conservation Area will be developed at detailed design in order to provide an enhancement for users of the PRow network in the Conservation Area. This interpretation would be developed in conjunction with the relevant stakeholders, local community and the relevant local planning authority.

References

- [1] Darlington Borough Council, "Darlington's Green Infrastructure Strategy 2013 - 2026," [Online]. Available: <https://microsites.darlington.gov.uk/local-plan/document-library/darlingtons-green-infrastructure-strategy/>.
- [2] Darlington Borough Council, "Darlington Rights of Way Improvement Plan," [Online]. Available: <https://www.darlington.gov.uk/transport-and-streets/rights-of-way/rights-of-way-improvement-plan/>.