Lostrigg Solar
Draft Design Approach Document

March 2025

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1 Introduction

1.1 Purpose of this document

1.1.1 This draft Design Approach Document (DAD) has been prepared to support the statutory consultation process for Lostrigg Solar (the Proposed Development) and assist interested parties understand the preparation and evolution of the design case from project inception to this stage.

1.1.2 The draft DAD sets out the brief, relevant policy and guidance used, our approach to design, our vision, our design evolution and design principles and the beneficial outcomes of the Proposed Development. As well as the Proposed Development's current design parameters and how the post consent design will evolve and be managed. It has been underpinned by the requirements for good design set out in the relevant National Policy Statements (NPS), the National Infrastructure Commission's (NIC) four principles of good design and other relevant policy and guidance as set out in Chapter 4.

1.1.3 The draft DAD will be updated following the statutory consultation and will be submitted to support the Development Consent Order (DCO) Application, it will become a certified document through the DCO should it be granted consent.

1.1.4 By becoming a certified document, it places a duty on RWE Renewables UK Solar and Storage Ltd (the Applicant), the future contractor and the relevant stakeholders to ensure that the detailed design and associated infrastructure is delivered in accordance with the principles and parameters outlined within Chapters 5 and 7 and subsequently secured by this document.

1.1.5 The parameters within Table 6-1 will be secured by Requirement in the DCO when this is drafted and submitted alongside the final application.

Interaction with other statutory consultation documents

1.1.6 The Applicant has prepared this document with the intended purpose of it to be read alongside and supplemented by other statutory consultation documents, namely the Preliminary Environmental Impact Report (PEIR), PEIR Figure 1.2 Layout of Proposed Development (Plate 4-5), PEIR Figure 2.4 Outline Environmental Masterplan (Plate 4-3), PEIR Appendix C-5 Outline Landscape and Ecology Management Plan (outline LEMP) and the Phase One Non-statutory Consultation Summary Report.

1.2 The brief

1.2.1 The Applicant has appointed Ove Arup and Partners (Arup) to lead the design process for the Proposed Development. Arup is a global collective of designers, advisors and experts dedicated to sustainable development. The Arup team are supported by Counter Context, Dalcour Maclaren, Treeworks and Wardell Armstrong, who are providing consultation, lands and environmental advisory support, respectively. Burges Salmon are providing legal advice.

1.2.2 The multi-disciplinary design team has followed an iterative environmental led design approach, ensuring that the opportunities and constraints within and surrounding the draft Order Limits have been considered. The design of the Proposed Development aims to avoid environmental impacts where possible, ensure local communities can continue to enjoy the surrounding landscape and natural environment and integrate the Proposed Development into its setting from the outset.

1.2.3 The Environmental Impact Assessment (EIA) process (PEIR at this stage) has fed into this environmental led design approach by assessing the potential effects of the Proposed Development and helping to determine design principles whilst identifying opportunities for mitigation and enhancement / gain. The PEIR considers the following environmental topics and is informed by a suite of site surveys and desk-based assessments:

- Agricultural land and soils;
- Biodiversity;
- Climate change;
- Cultural heritage and archaeology;
- Landscape and visual;
- Noise and vibration;
- Socio-economics; and
- Water resources and flood risk.

2 Approach to good design

2.1 Policy and guidance

Advice on Good Design

2.1.1 The Department for Levelling Up, Housing and Communities Nationally Significant Infrastructure Projects: Advice on Good Design (DLUHC Advice on Good Design) [1] sets out that "good design is crucial for achieving excellent functionality, sustainability, positive place-making and resilience in NSIPs." It further states that "Given the scale and impact of NSIP developments, achieving well-design project outcomes addressing sustainability and climate change is essential."

2.1.2 The NPS set out the criteria for achieving good design in projects, aligning functionality with sustainability principles and balancing environmental, economic, and social factors. In deciding a DCO application to which a NPS has effect, the Secretary of State must have regard to any relevant NPS, any local impact report, and any other matters considered important or relevant to the decision, pursuant to the Planning Act 2008.

2.1.3 This chapter provides a summary of the good design and planning policy documents and guidance considered relevant and important to the good design of the Proposed Development and how the requirements of these have been met.

National Infrastructure Strategy

2.1.4 The National Infrastructure Strategy (NIS) [2] is the government's long-term plan to transform the country's infrastructure to boost economic growth, support green recovery, and level up regional disparities. The NIS outlines the UK government's long-term vision to modernise the country's infrastructure, foster economic growth, and meet the challenges of climate change. It is a central component of efforts to "level up" regional inequalities and achieve net zero emissions by 2050. Solar energy, as a key renewable resource, plays a crucial role in decarbonising electricity production.

2.1.5 As set out in the then Prime Minister's Ten Point Plan for a Green Industrial Revolution, infrastructure investment is fundamental to delivering net zero emissions by 2050.

2.1.6 The NIS recognises solar energy as a critical component in the transition to a green economy, aligning with broader decarbonisation goals. Its success hinges on effective policy implementation, technological innovation, and collaboration between public and private sectors.

2.1.7 The NIC encourages private sector investment in renewable energy, including solar, through policy support, incentives, and funding mechanisms and places a large emphasis on community solar schemes to ensure local areas benefit from renewable energy, outlining strategies to support rural and underserved regions in adopting solar energy to address energy inequalities.

The NIC's Four Principles of Good Design

2.1.8 The NIC published Design Principles for National Infrastructure in 2020 [3], developing four principles to guide the planning and delivery of major projects. The four principles are: climate, people, places, and value.

2.1.9 The 'climate' principle refers to mitigating greenhouse gas emissions and adapting to climate change. Opportunities to do this may be beyond the site boundary of a project and should be sought during design and construction to enable decarbonisation and the mitigation and offsetting of residual emissions. Good design should also incorporate flexibility so that projects are adaptable and resilient to climate change.

2.1.10 Infrastructure should reflect what society wants and share benefits widely (the 'people' principle). This refers to designing to a human scale, being easy to navigate and improve the quality of life of those who interact with it.

2.1.11 Infrastructure should give 'places' a sense of identity and improve our environment. Projects should make a positive contribution to local landscapes and ecology, and respect and enhance local culture and character.

2.1.12 To provide 'value', infrastructure projects should achieve multiple benefits and solve problems well. Opportunities to secure economic, environmental and social benefits should be identified and pursued, as well as solving multiple problems with one solution and seeking to add value beyond the site boundary and purpose of the infrastructure.

Overarching NPS for Energy (EN-1)

2.1.13 NPS EN-1 [4] sets a number of requirements regarding good design. NPS EN-1 was designated in January 2024, as an update to the previous suite of energy NPSs designated in 2011. How the Proposed Development responds to NPS EN-1's requirements are set out in the draft Policy Compliance Document available at this statutory consultation stage.

2.1.14 Section 4.7 of NPS EN-1 establishes the need for "good design" in energy infrastructure, identifying in paragraphs 4.7.1-4 that implementing good design can achieve specific criteria.

2.1.15 At 4.1.7, NPS EN-1 defines the 'mitigation hierarchy' as measures to "avoid, reduce, mitigate or compensate for any adverse impacts", and clarifies at 4.3.8 that references to 'impacts' within the NPS should be taken to mean 'likely significant impacts'. Section 4.2.11 indicates that the mitigation hierarchy must be applied to projects and that residual impacts should only be those which "cannot be avoided, reduced or mitigated"

2.1.16 Applicants are encouraged to embed good design within a project from the outset, with paragraph 4.7.5 referring to the use of "design principles" to be established to guide the project from conception to operation. Paragraph 4.7.7 requires that applicants demonstrate in their DCO application how the design process was conducted and evolved, and why a favoured choice was selected where different designs were considered.

2.1.17 Paragraphs 4.7.6 and 4.7.10-12 of NPS EN-1 recognise the role of functionality and operational requirements in designing new energy infrastructure. However, the benefits of ensuring both functionality and aesthetics are highlighted with regard to

ensuring a proposal is sensitive to its location, contributes to the quality of an area where possible and remains durable and adaptable.

NPS for Renewable Energy Infrastructure (EN-3) and NPS for Electricity Networks Infrastructure (EN-5)

2.1.18 NPS EN-3 [5] and NPS EN-5 [6] set out technology-specific policy, relating to solar infrastructure and electricity networks infrastructure respectively. They make reference to the overarching principles of good design as set out in NPS EN-1, with the concept underpinning the approach outlined in many policy topics across the NPS suite. How the Proposed Development responds to NPS EN-3 and NPS EN-5's requirements are addressed in the draft Policy Compliance Document.

2.1.19 NPS EN-3 identifies in section 2.3 that a number of factors may influence site selection and design, recognising that most renewable energy resources can only be developed where that resource exists and is economically feasible. Paragraphs 2.10.19-26 identifies how irradiance, topography and grid connection are key factors for solar farm siting and commercial viability, noting the need to consider cumulative effects where there may be other energy generating stations in proximity.

2.1.20 NPS EN-5 paragraph 2.2.7 notes that it is not necessarily always the case that the cable route should be the most direct, as there will be other factors including engineering and environmental aspects. Paragraph 2.2.1-6 states that siting is not always within the control of the applicant and is determined by the location of new generating stations and system capacity, but that applicants do have control over the routing and site selection. Locational constraints do not exempt candidates from balancing sites election or good design considerations. Paragraphs 2.2.8-9 state that the flexibility of locating substations should allow the applicant to consider local characteristics and screening and other mitigation options.

Nationally Significant Infrastructure Projects: Advice on Good Design

2.1.21 The Government's guidance on Nationally Significant Infrastructure Projects: Advice on Good Design emphasises the importance of integrating functionality, sustainability, and aesthetics in major infrastructure developments. Published on 23rd October 2024 by the Planning Inspectorate (PINS), this non-statutory advice complements existing legislation and NPS under the Planning Act 2008.

2.1.22 The guidance serves as a resource for applicants and stakeholders involved in Nationally Significant Infrastructure Projects (NSIPs). Applicants are advised to consider factors such as context, functionality, sustainability, build quality, and aesthetics in their design approach.

2.1.23 The guidance underscores the duty of the Secretary of State to promote sustainable development, climate change mitigation and adaptation, and good design in preparing NPSs. Good design is deemed crucial for achieving functionality, sustainability, positive place-making, and resilience in NSIPs.

2.1.24 Applicants are encouraged to align their projects with the criteria set out in the NPSs. The guidance highlights the importance of explaining design decisions, including how EIA and stakeholder engagement have informed the design process. The integration of EIA into the design process is emphasised, ensuring that environmental considerations are central to project development.

2.1.25 The document advises on establishing clear design principles and parameters to guide the development process, ensuring consistency and quality in design outcomes.

National Design Guide

2.1.26 The National Design Guide [7] published by the UK Government, outlines the characteristics of well-designed places to demonstrate what good design means in practice. It forms part of the government's planning practice guidance and should be read alongside the separate guidance on design processes and tools. The guide emphasises ten key characteristics that contribute to the creation of well-designed places. These characteristics are intended to guide local authorities, developers, and communities in creating high-quality, enduring places that meet the needs of current and future generations. The guide also aligns with the National Model Design Code, which provides detailed guidance on the production of design codes, guides, and policies to promote successful design.

Local policies and good design guidance

2.1.27 As detailed in the draft Policy Compliance Document, the Allerdale Local Plan Policies [8] DM10, DM12 and DM14, which are strategic policies of the plan, make reference to the need for good design in new development. Policies DM10 and DM12 set out that this is required to create attractive and desirable places, as well as reduce carbon emissions and increase resilience of development to the effects of climate change. Policy DM14 refers to the ability of good design to reduce or avoid effects on heritage assets and their settings.

2.2 Applying 'good design'

2.2.1 An appraisal of how the Proposed Development is in compliance with relevant planning policy relating to good design is provided in the draft Policy Compliance Document available at this statutory consultation stage and will be expanded upon in the Planning Statement which will be submitted in support of the DCO application.

2.2.2 The remainder of this document demonstrates how the Proposed Development has taken into account the guidance and criteria of good design. It sets out the local context in which the Proposed Development is situated and outlines the design response to that context in seeking to mitigate adverse impacts and integrate good design principles. Recognising the constraints presented by some infrastructure, it also identifies how technical considerations have in some instances limited design choices.

2.2.3 The design process has incorporated a practical hierarchy of mitigation with the purpose of identifying how potential impacts can be avoided or reduced if at all possible. The first option would be to avoid the impacts at source, which would involve removing the feature or re-siting it to an area where it would have no or reduced effects. In some instances, it is not possible to avoid impacts altogether and the potential to reduce impacts has been explored.

2.2.4 It is acknowledged that not all impacts will be able to be avoided, and in some cases even reduced. The proposals have therefore also considered mitigation to offset adverse effects on the environment, such as providing additional community benefits to compensate for the potential loss of access or visual amenity.

2.2.5 Mitigation measures proposed to prevent, reduce or offset likely adverse effects have been identified and developed as part of the iterative design process. The primary mitigation measures have been embedded into the project design and are referred to within the design principles as embedded mitigation. Where avoidance of an impact through embedded mitigation is not possible, or is only partly effective, further 'essential mitigation' is considered. Further definition of mitigation measures will be provided in the ES.

2.2.6 To secure the delivery of good design, a set of design principles for the Proposed Development have been created and outlined in Table 4-4 and should development consent be granted, Table 6-1 of this draft DAD includes a list of design parameters which respond to these principles and underpin the delivery of good design for the Proposed Development. The design parameters will be retained in the future detailed design and will be secured as a Requirement of the DCO should consent be granted.

2.3 Design approach

2.3.1 This section explains the iterative, environment-led design process that the Applicant has applied to develop and achieve good design from the outset.

Environment-led design

2.3.2 Environment-led design is a design process in which consideration of the natural and cultural environment is given due weight and priority from the outset. The design is led by someone from an environment focused discipline as part of a team of environmental and engineering disciplines. The design is informed by an holistic understanding of the receiving environment and its context. The focus of environment led design is on delivering a legacy of positive outcomes for nature and the local community.

2.3.3 Achieving good design which works with the landscape and delivers valuable green infrastructure needs a joined up, collaborative approach, where all planning and design elements of the project are integrated. This requires a common vision and purpose and a culture of openness to new ideas and perspectives.

2.3.4 Environment-led design is the process by which sustainable development is delivered, which will stand the test of time. Our approach is front-loaded, bringing the right people and information together early in a project to set the right trajectory and aspirations.

2.3.5 The approach is multi-faceted and has been formulated to address the criteria for good design for energy projects set out in NPS EN-1 and the advice published by the PINS, NIC and institutions including the Landscape Institute and Institute of Civil Engineers (ICE).

2.3.6 The environment-led design approach employed on this project delivers the following:

- **Advocacy**: we champion good design which delivers positive environmental and social outcomes from the outset, minimising risk and maximising opportunity early in the project and driving for best value;

- **Design leadership**: we lead and facilitate collaboration within the project team and consider the feedback received from stakeholders and the local community. We challenge each other to elevate our solutions, ensuring excellence at every stage;
- **Setting the design vision:** (Section 4.2 below) to articulate the ambitions of the project through the design vision statement, which addresses risks and opportunities for environmental enhancement and social value;
- **Outcome-led**: we define a clear set of environmental and social outcomes (see Section 4.6 below) that are embedded in project delivery alongside economic outcomes and core project drivers;
- **Defining design principles**: our solutions are delivered through project level design principles, which provide clear boundaries within which teams develop the design;
- **Nature as a stakeholder**: we treat nature as an active participant in the design process, respecting its role in shaping our environment and supporting our lives;
- **Regenerative design**: we harness the power of nature to restore and regenerate the environment through our projects; and
- **Stewardship**: good design fails on poor management. We resolve the future stewardship of land early to ensure the outcomes of projects are delivered in the long-term. Further information is provided in the PEIR Appendix C-5 outline LEMP provided with the statutory consultation material.

2.3.7 Plate 2-1 shows the structure of the design team and the key steps that have been taken to develop the design up to statutory consultation. It also shows the steps that are proposed to further refine the design in response to feedback and the documents that will be presented with the DCO application. Finally, it addresses the process that is proposed to develop the detailed design, post-DCO consent.

Design champion

2.3.8 PINS advocates for design leadership supported by an engaged design champion to ensure design governance is secured and the design principles drive a structured design process and hierarchy of design control. The role of Design Champion is supported by the NIS and NPS EN-1 and PINS Advice on Good Design.

2.3.9 The Institution of Civil Engineers defines the role of Design Champion as being "accountable for delivering coherent good design that drives value across the project" and "responsible for constantly querying the design to ensure that the design principles are delivered in practice and that the outcomes meet the needs of users" [9].

2.3.10 The Applicant has appointed an RWE Lead DCO Development Project Manager as Design Champion for the Proposed Development. The role of the Design Champion is defined as follows:

- Involved in setting up appropriate governance structures so that good design is incentivised;
- Responsible for creating an environment that allows good design to flourish;
- Ensuring that the NIC design principles are used as a jumping-off point for the development of project-specific design principles;

- Overseeing the development of the design vision and the brief and ensure that the design principles are used as a tool for testing feasibility;
- Guiding and championing an iterative design process to test the best way of achieving the design principles;
- Ensuring that design reviews are taking place and that the outcomes of reviews are implemented;
- Ensuring that the design principles are not lost during the procurement process and that the right designers are procured at the right time;
- As the project progress through construction, they will be responsible for ensuring that the design principles are not undermined; and
- ensuring that lessons learned are shared and acted upon.

Environmental design lead

2.3.11 The environment-led design lead for the Proposed Development is an Associate Landscape Architect at Arup. Their responsibilities are as follows:

- Develop the design approach.
- Chair design workshops.
- Coordinate the input of environmental and other relevant disciplines.
- Attend stakeholder and public consultation meetings.
- Ensure that feedback is considered in refining the design.
- Oversee the preparation of design deliverables, including the Environmental Masterplan and Design Approach Document.

Project team

2.3.12 The wider project team's structure is illustrated in Plate 2-1. It comprises project managers, designers, environmental, planning, legal, lands and communications specialists representing the Applicant, who collaborate on the design of the Proposed Development.

Plate 2-1 ***Project team***

3 Site context

3.1 Understanding the place

3.1.1 The total area within the draft Order Limits is approximately 417ha and shown in Plate 3-1 PEIR Figure 1.1 draft Order Limits. The entirety of the Proposed Development is within the administrative area of Cumberland Council.

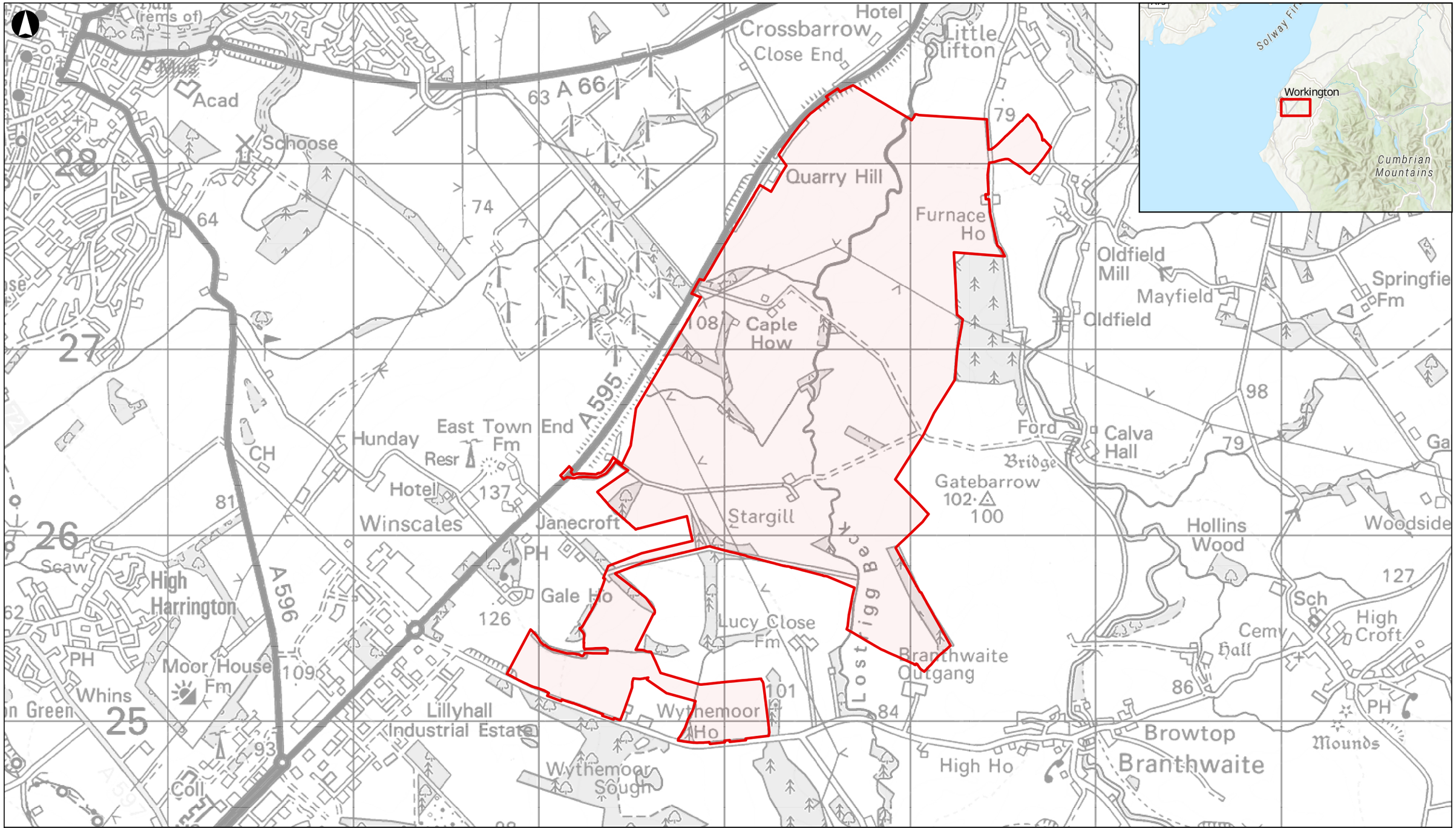
3.1.2 Within the wider context, the draft Order Limits is located within the open countryside between the town of Workington, which lies approximately 2km to the west, and the Lake District National Park (LDNP), approximately 4.8km to the east. Locally, it is contained by Winscales Road (A595) to the west, a local road between Lillyhall Business Park and the village of Branthwaite to the south and the valley of the River Marron between Branthwaite and Little Clifton.

3.1.3 The draft Order Limits comprises an undulating topography with Lostrigg Beck running through its centre, creating a deep meandering valley to the south of Little Clifton.

3.1.4 The land use within the draft Order Limits is predominantly agricultural, containing rough grazing including on areas of moorland, with some arable farming in places. Best and most versatile (BMV) agricultural land is absent across the Panel Areas and the land is Subgrade 3b and below.

3.1.5 The character of the landscape is described in detail in PEIR Chapter 9 Landscape and Visual. This is summarised as follows. The overall character of the draft Order Limits and immediate surroundings is one of low undulating ridges and valleys, regular shaped medium to large pastures bound by hedges, interspersed with occasional native broadleaf woodlands, tree clumps and plantations. It is a moderately busy working agricultural landscape which feels exposed on ridges and more settled intimate and enclosed in valleys. There are scattered farms hamlets and villages throughout, but the edges of Workington and Lillyhall business park, to the west and southwest respectively, have a more urban fringe feel to the landscape. Approximately 4km to the south and east the landscape changes becoming a more exposed, upland and wild character around Dean Moor and on the western edge of the LDNP.

Plate 3-1 PEIR Figure 1.1 draft Order Limits



Legend

draft Order Limits

Metres

0 250 500 1,000

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	04/03/2025	JEP	JM	NQ	DB

Client

RWE

Project Name

Lostrigg Solar

Drawing Title

Figure 1.1 Draft Order Limits

Scale at A3

1:20,000

Role

PEIR

Suitability

Issued

Project Number

300884-00

Rev

P01

Drawing Number

LSF-PEIR01-00001

Plate 3-2 Looking east to the distant LDNP fells from the cycle route along the A595 adjacent to Quarry Hill

Plate 3-3 Looking west to the Draft Order Limits rising up the distant ridge from Springfield

Plate 3-4 Looking northwest over the lowland West Cumbria Coastal Plain from the trig point on Knock Murton in the west edge of the LDNP

3.1.7 A small number of dispersed residential properties are present within and adjacent to the draft Order Limits. There are bands of woodland along watercourses, woodland blocks, woodland shelterbelts, and hedges along historic field boundaries. The draft Order Limits are crossed by five Public Rights of Way (PRoW), which form part of a fragmented network of routes throughout the local landscape.

3.1.8 There are several existing pole-mounted and two pylon-mounted overhead lines running across the draft Order Limits. There are prominent wind turbines to the south and west of the draft Order Limits. This electricity infrastructure detracts from the rural character of the local landscape.

3.1.9 There are a number of statutory environmental designations, and other features adjacent to the draft Order Limits as outlined on Plate 3-5 PEIR Figure 2.5 Key Environmental Designations.

3.1.10 The majority of the draft Order Limits are located within Flood Zone 1, an area with a low probability of flooding from rivers and the sea. Some small areas of the draft Order Limits around the Lostrigg Beck are within Flood Zones 2 and 3.

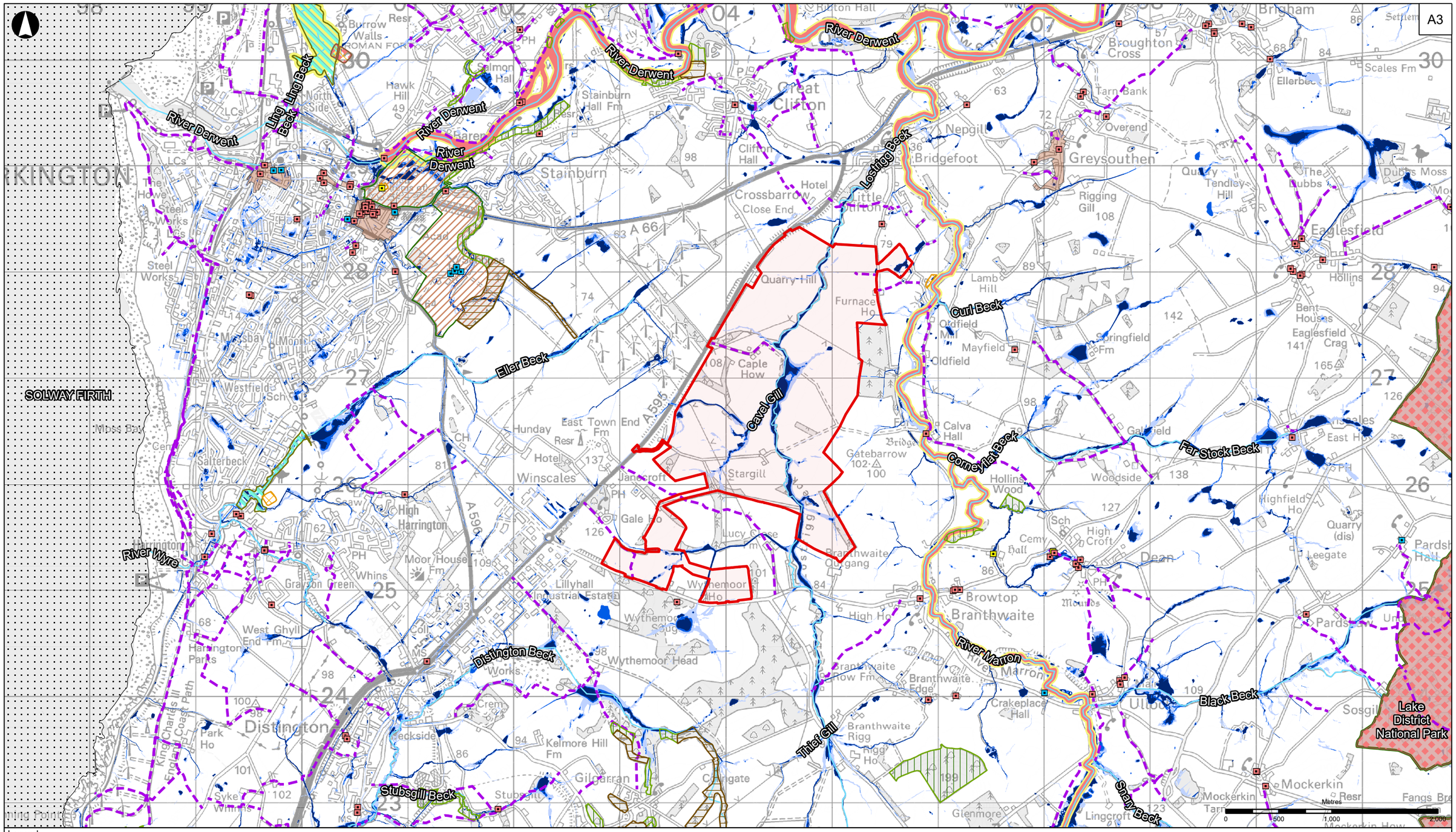
3.1.11 A suite of environmental site surveys and desk-based assessments have been undertaken within and around the draft Order Limits to support the PEIR. These are listed below and have identified a range of environmental features and constraints as described:

- Agricultural Land Classification (ALC) – ALC surveys were undertaken between April and May 2024 and results have demonstrated that none of the land within the draft Order Limits is BMV land. The results and findings of these surveys are found in PEIR Appendix A-4 Agricultural Land Classification Report and shown in PEIR Chapter 5 Agricultural Lands and Soils on PEIR Figures:
    - Figure 5.1: Provisional Agricultural Land Classification
    - Figure 5.2: Soil Associations
    - Figure 5.3: Agricultural land classification survey – Panel Areas
- Arboriculture – a tree survey of the Panel Areas was undertaken in May 2024 and of the cable route corridors in January 2025 and found that the site contains 8no. Category A trees and woodlands, 66no. Category B trees, groups, hedges and woodlands, 280no. Category C trees, groups, hedges and woodlands and 14no. trees and groups. One of the Category B trees is at an veteran life stage, no ancient trees were observed. The results and findings of these surveys are shown in PEIR Appendix A-13 Arboricultural Impact Assessment.
- Archaeology – geophysical surveys were undertaken between April and June 2024 and results have demonstrated that no settlement activity was identified, however, the report notes that the magnetic susceptibility of the soils across the site varies, meaning that some archaeological features in areas of low magnetic background, may only produce very weak responses. Targeted trial trenching is proposed for Spring 2025. The results and findings of these surveys are found in PEIR Appendix A-15 Geophysical Survey Report and shown in PEIR Chapter 8 Cultural Heritage and Archaeology on PEIR Figures:
    - Figure 8.1: Designated Heritage Assets

    - Figure 8.2: Non-designated Heritage Assets
- Coal mining legacy – a Coal Mining Risk Assessment (CMRA) was undertaken in November 2024 and found that the site contains 199no. untreated mine entries (192no. shafts & 7no. adits) within, or within 50m distance of the draft Order Limits and areas of historic open cast mines in the central and southern parts of the draft Order Limits. The CMRA is found in PEIR Appendix B-2 Coal Mining Risk Assessment.
- Ecology – a suite of ecological surveys have been undertaken since March 2024 and/or are ongoing within the draft Order Limits. Notably the surveys have found that the draft Order Limits contains areas of purple moor grass and rush pasture priority habitat and potential for badgers, bats, breeding and wintering birds, otter and water vole, amphibians including GCN, reptiles, fish, invertebrates, white clawed crayfish, invasive non-native species and other protected species including red squirrel, polecat and brown hair. The results and findings of these surveys are found in PEIR Appendix A-5 – A-12: Survey Reports and shown in PEIR Chapter 6 Biodiversity on PEIR Figures:
    - Figure 6.1: Site location Plan
    - Figure 6.2: Statutory designated sites
    - Figure 6.3: Non-statutory designated site
    - Figure 6.4: Waterbody location plan
    - Figure 6.5: Provisional habitat plan
    - Figure 6.6: Provisional priority habitat map
    - Figure 6.7: Invasive species location plan
- Hydrology – a hydrological site walkover was undertaken in September 2024 to identify the nature and sensitivity of water receptors within the draft Order Limits. The results and findings of these surveys are found in PEIR Chapter 12 Water resources and flood risk on PEIR Figure:
    - Figure 12.1: Surface water features
- Landscape – a series of landscape and visual surveys has been undertaken. April 2023, initial site and wider landscape walkover for familiarisation and preliminary viewpoint photography. April 2024, Scoping survey for Landscape characterisation and viewpoint photography. November 2024 winter viewpoint photography including Wainwright peaks within the LDNP. The results and findings of these surveys are shown in PEIR, particularly Chapter 9 Landscape and Visual on PEIR Figures:
    - Figure 2.4: Outline Environmental Masterplan
    - Figure 9.1: Site location, study area and search area
    - Figure 9.2: Topography and hydrology
    - Figure 9.3: Landcover and vegetation patterns
    - Figure 9.4: Tranquillity Baseline
    - Figure 9.5: Landscape designations

    - Figure 9.6: Landscape receptors
    - Figure 9.7: Visual receptors and Zone of Theoretical Visibility
    - Figure 9.8: Viewpoint photographs and visualisations
- Noise – a noise survey was undertaken in June 2024 and the results of this found 17no. residential receptors within 500m of the draft Order Limits. The results and findings of these surveys are found in PEIR Appendix A-21: Noise Monitoring Data and shown in PEIR Chapter 10 Noise and Vibration on PEIR Figures:
    - Figure 10.1: Sensitive receptor plan
    - Figure 10.2: Noise monitoring location plan
    - Figure 10.3: Solar panel construction noise buffer plan
    - Figure 10.4: Cable construction route noise buffer
    - Figure 10.5: Operational noise contours

Plate 3-5 PEIR Figure 2.5 Statutory environmental designations



Legend

- draft Order Limits
- Listed Buildings (Grade)
  - I
  - II*
  - II
- Scheduled Monuments
- Conservation Areas
- World Heritage Sites
- PRoW
- Ancient & Semi-Natural Woodland
- Ancient Replanted Woodland
- Watercourses
- National Parks
- Local Nature Reserves (LNR)
- Registered Parks and Gardens
- Special Protection Areas (SPA)
- Special Areas Of Conservation (SAC)
- Sites Of Special Scientific Interest (SSSI)
- Extent of Flooding from Surface Water
  - High
  - Medium
  - Low

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	04/03/2025	JEP	JM	NQ	DB

Client

RWE

Project Name

Lostrigg Solar

Drawing Title

Figure 2.5 Key Environmental Designations

Scale at A3

1:35,000

Role

PEIR

Suitability

Issued

Project Number

300884-00

Rev

P01

Drawing Number

LSF-PIER02-00005

4 The design vision and development

4.1 Proposed Development

4.1.1 The Proposed Development consists of a renewable energy scheme, covering an area of approximately 417ha, and comprising solar photovoltaic (PV) panels, on-site Battery Energy Storage Systems (BESS), associated infrastructure, biodiversity mitigation and enhancement, as well as underground cabling, located between the villages of Little Clifton and Branthwaite to the north-east of Lillyhall Industrial Estate in Cumbria, east of Cumbria, north-west England.

4.1.2 The Proposed Development comprises three Panel Areas – the Northern Panel Area, Central Panel Area and Southern Panel Area. Panel Areas are defined as an area within the draft Order Limits that contain a group of PV panels and hybrid packs (comprising BESS and power conversion units).

4.1.3 The Proposed Development will include 33kV underground cabling between the Panel Areas and the on-site substation, as well as 132kV underground cabling between the on-site substation and the point of connection (PoC) into the existing distribution network.

4.1.4 A range of supporting infrastructure is required for the Proposed Development, comprising hybrid packs containing BESS; power conversion units including inverters, converters and transformers; storage containers to hold this equipment; customer switchgear and security measures such as fencing, CCTV and lighting.

4.1.5 The design of the Proposed Development also includes environmental mitigation and enhancement measures to avoid or reduce adverse impacts on the surrounding environment and nearby communities.

4.1.6 A full description of the Proposed Development and a detailed description of the design and environmental mitigation is provided in PEIR Chapter 2 The Proposed Development. A detailed description of the technical infrastructure components of the Proposed Development is also provided in Section 4.5 of this document.

4.2 Design vision

4.2.1 The design vision for the Proposed Development has been developed in agreement with the Applicant and the design team. It sets a balance between the functional requirements of the Proposed Development and the Applicant's aspirations to create a sustainable and well-designed solar farm that gives back to the receiving environment and communities. The Proposed Development aims to fit into the local landscape and respect its setting, especially in light of the proximity to the highly valued LDNP and World Heritage Site.

4.2.2 In addition to the Panel Areas, on-site substation, underground cabling, PoC and other supporting infrastructure, the Proposed Development will host a series of wider

mitigation and enhancement measures, ensuring that the putting the local landscape, ecology, environment and communities are considered throughout the design process.

4.2.3 Our vision statement is as follows:

> *"We want to create a solar farm to safely and reliably produce clean and affordable energy for an equivalent of 45,000 homes and businesses that contributes to the UK's net zero carbon target and acute need for energy security. In achieving this we will minimise environmental impacts, respect and enhance the local landscape, provide social value benefits for the local community, and create and connect habitats for bi-odiversity."*

4.3 Design evolution

4.3.1 The following section sets out the design evolution for the Proposed Development to this stage.

Site selection

4.3.2 The location of the Proposed Development has been selected through a staged process to ensure that a site could be identified which would be suitable for solar energy generation and feasible to deliver, whilst avoiding and minimising the potential for harm to the environment and communities.

4.3.3 The key stages for site selection were:

- Stage 1: Identifying the search corridor.
- Stage 2: Consideration of environmental and planning constraints.
- Stage 3: Land availability by agreement.
- Stage 4: Initial identification of the Proposed Development layout.

4.3.4 An overview of the activities undertaken at each stage are provided below, the stages are described in more detail in Section 3.5 of PEIR Chapter 3 Alternatives and Design Iteration.

Stage 1: Identifying the search corridor

4.3.5 In order to focus the site selection process, an initial search corridor had to be defined. The Applicant identified optimal locations for solar farms of a nationally significant scale based on two key factors: the irradiance and yield; and the availability of grid connection capacity.

4.3.6 Having established the agreed grid connection Cumbrian Ring line for the Proposed Development, a search corridor of 6km was applied around grid connection points. This enabled the site selection process to progress onto Stage 2.

Stage 2: Consideration of environmental and planning constraints

4.3.7 A constraints mapping exercise was then undertaken in order to assess potential locations for siting the Proposed Development within the search corridor. This was undertaken using Geographic Information Systems (GIS) software and the analysis reviewed a wide range of planning and environmental constraints within the search corridor.

4.3.8 The Draft Order Limits were selected based on the following findings:

Table 4-1 Summary of Stage 2 output reflected in land assembly

Stage 2 Constraint	Relationship to Order Limits
Brown field land register	No suitable previously developed land within search corridor
Agricultural Land Classification	None of land in the draft Order Limits is best and most versatile (BMV) land (Grades 1, 2 or 3a). At the time of site selection, it was known that all areas proposed were Grades 3 or 4 and surveys have subsequently confirmed that the Panel Areas consist of Grade 5, 4 and Subgrade 3b.
Ecological designations	There are no ecologically designated sites within the draft Order Limits.
Flood zones	The majority of the draft Order Limits are in Flood Zone 1. Some small areas of panels, parts of an existing and proposed access tracks and parts of a cable route located around within the Central Panel Area around the Lostrigg Beck are located within Flood Zones 2 and 3. No critical infrastructure (hybrid packs, on-site substation, customer switchgear) is proposed within Flood Zones 2 and 3. For justification on why it has not been possible to wholly locate the Proposed Development outside Flood Zone 2 and 3 please refer to PEIR Appendix 22 draft Flood Risk Assessment.
Cultural heritage	There are no Conservation Areas, Scheduled Ancient Monuments, Listed Buildings or other statutory heritage designations within the draft Order Limits.
Landscape designations	There are no landscape designations within the draft Order Limits.
PRoW	There are five PRoW within the draft Order Limits, three of which are dead ends.

Stage 3: Land assembly

4.3.9 Alongside analysis of environmental and planning constraints, the Applicant began engagement with landowners in the area of search to receive expressions of interest in solar development. From the outset, the Applicant has sought to deliver the Proposed Development via voluntary landowner agreement. The Applicant approached landowners with a sufficient area of land for Panel Areas, mitigation and enhancement to enter into an option agreement. This was successfully achieved, enabling the potential Panel Areas of the Proposed Development to be defined under Stage 4 of the site selection process.

Stage 4: Initial identification of the Proposed Development layout

4.3.10 In spring 2023 an initial Landscape and Visual Appraisal (LVA) was undertaken by the Applicant to identify risks and areas of higher and lower susceptibility to the proposed change to inform refinement of the location of the Panel Areas.

4.3.11 A Zone of Theoretical Visibility (ZTV) study was undertaken to appraise the potential visibility of the Proposed Development. Fieldwork was then carried out to verify the findings of the desk study and ZTV. Then an extensive review of the study area was then undertaken to identify landscape and visual receptors with the potential to be affected by the development within the draft Order Limits.

4.3.12 The output from the LVA was a RAG (Red Amber Green) analysis applied to land parcels across the draft Order Limits to identify parcels of land most and least suitable for development as Panel Areas. This initial spatial design step was used to identify the three distinct Panel Areas for development within the draft Order Limits.

DCO process

4.3.13 Once the site selection process had concluded, the full multi-disciplinary design team was appointed by the Applicant, the Project Inception and DCO process commenced.

Design iteration: inception to EIA Scoping

4.3.14 At the start of the DCO process environmental surveys to gather baseline data and initial environmental assessment work commenced in March 2024. The aim of these surveys and assessments was to enable the project team to analyse the baseline of the draft Order Limits, to understand the key constraints and opportunities to inform the design evolution of the Proposed Development.

Opportunities and constraints

4.3.15 Table 4-2 sets out the key environmental opportunities and constraints identified following early survey and analysis work undertaken by the multidisciplinary design team.

Table 4-2 Addressing opportunities and constraints

Aspect	Constraint	Opportunity
Site selection/ layout	Sensitive environmental areas within the draft Order Limits	Analyse environmental sensitivity within the draft Order Limits and seek to avoid developing on more sensitive areas. Reserve undeveloped land within the draft Order Limits for mitigation and compensation measures to deliver environmental gain.
Landscape	Existing hedgerow field boundaries	Existing hedgerow field boundaries to be retained and enhanced to reinforce character of local landscape and improve habitat connectivity.
Landscape	Historic field patterns	New hedgerow planting along historic boundaries to reinforce historic landscape character, connect habitats and break up and reduce the size of Panel Areas in views.
Landscape	Existing PRoW and recreational network	Retain and avoid further fragmentation of the existing resource. Create new Permissive Path to connect existing fragmented PRoW network (a Permissive Path is a route which the public can use because a landowner has made a route across their land available to the public (i.e. permitted the public to access otherwise private land). It is not nor should not become a PRoW)
Landscape	Designated landscapes, including the LDNP	Avoid undue impact on the visual setting of designated landscapes and assets including the LDNP. Reinforce existing field pattern within the draft Order Limits through restoring Historic field boundaries to integrate the Proposed development into views

Aspect	Constraint	Opportunity
Landscape	Existing wooded valley and the Lostrigg Beck	Protect and retain the wooded valley and Lostrigg Beck, working with local landowners to improve the riparian woodland habitat along the Lostrigg Beck with new habitat features Design landscape and habitat mitigation measures to link into and connect up existing green and blue infrastructure network
Visual	Views from nearby residential properties	Minimise impacts through the provision of reasonable development-free set backs from residential receptors and provide woodland and hedgerow screening to mitigate impacts
Flooding	Flood Zones 2 and 3	Seek to avoid the placement of critical infrastructure within Flood Zones 2 and 3. New meadow and wildflower seeding and management under the panels to the vegetation cover, slowing down storm water runoff to help reduce flooding on the Lostrigg Beck downstream of the draft Order Limits
Biodiversity	Valued habitats within the draft Order Limits	Minimise impacts on habitats through good design. Provide Biodiversity Net Gain (BNG) and additional valued habitats through enhancement and creation of new habitats within the draft Order Limits

4.3.16 The design of the Proposed Development has aimed to avoid and minimise environmental impacts and to integrate the Proposed Development into the wider landscape. This led to the early definition and application of an initial set of design principles and embedded mitigation measures to guide the Proposed Development. Further details of the design principles are set out in Section 4.4. and Table 4-4.

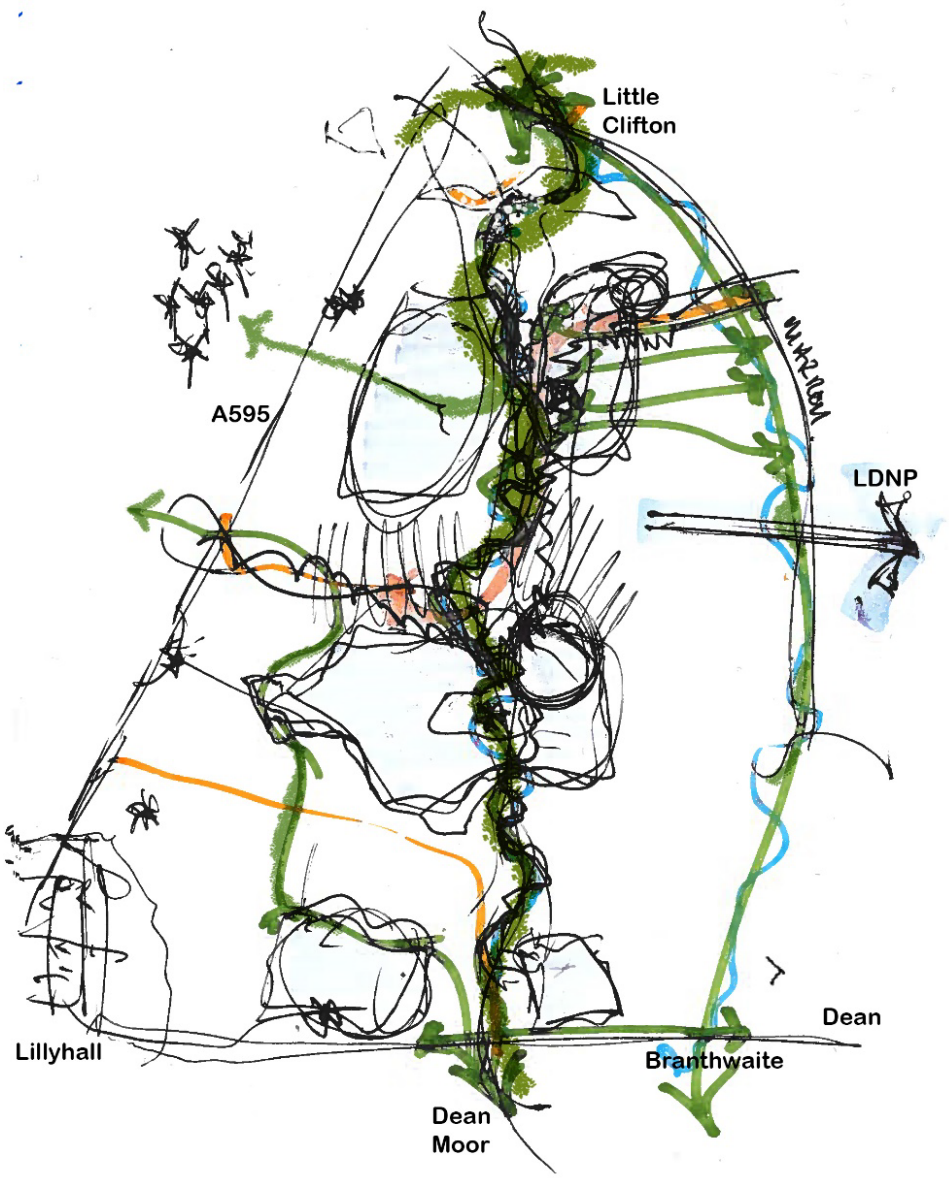


Plate 4-1 Lostrigg illustrative GI and connectivity sketch

4.3.17 The sketch in Plate 4-1 illustrates some of the key green infrastructure and connectivity drivers identified early on for the design to achieve. Namely:

- Protect retain and enhance existing green infrastructure, particularly along watercourses, and design new features to connect it up and link to the wider network
- Protect retain and enhance existing valuable natural assets and provide new habitats to support environmental net gain
- Manage and retain key views east to and from the Lake District National Park
- Respect and involve the local communities and provide real social value through community benefits
- Retaining and enhancing the circulation network including PRoWs, cycle route and connect them with proposed Permissive Path links.

Design iteration: EIA Scoping to PEIR

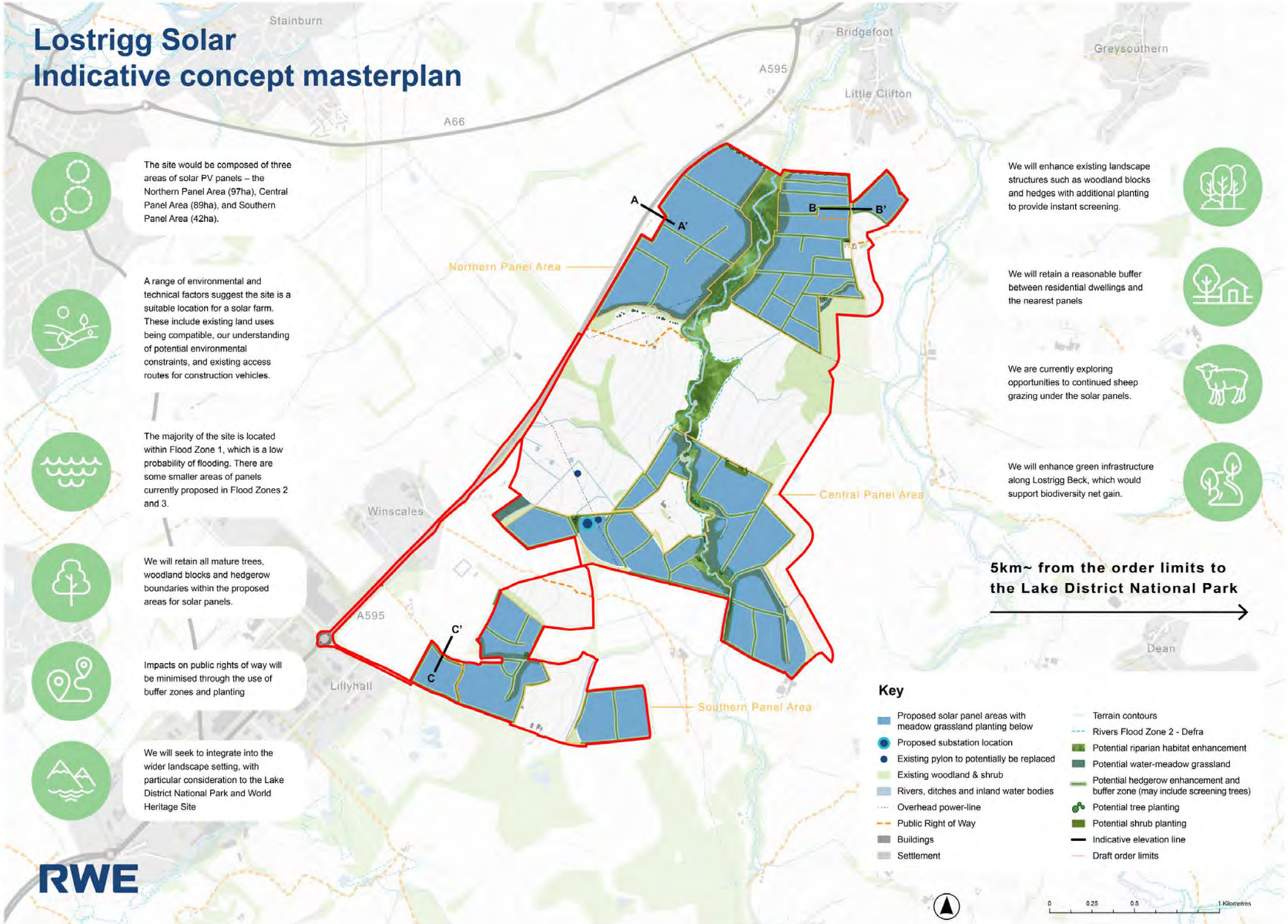
Stage 1

4.3.18 Following the submission of EIA Scoping in June 2024, the Applicant undertook a three-stage iterative design process comprising specialist design workshops.

4.3.19 In the first stage, the Applicant and design team held a workshop where Plate 4-2 EIA Scoping Report Figure 2.4 Indicative Concept Masterplan was developed and used to engage the public and stakeholders through non-statutory consultation in September – October 2024. During this stage feedback on the Indicative Concept Masterplan was sought from key stakeholders and members of the public through the non-statutory consultation process.

Plate 4-2 EIA Scoping Report Figure 2.4 Indicative Concept Masterplan

A3



Legend
See figure

Rev	Date	By	Chkd	Appd	Authd
P01	09/04/2024	JEP	BD	NQ	DB

Client

RWE

Project Name
Lostrigg Solar

Drawing Title
Figure 2.4 Indicative concept masterplan Sheet 1 of 2

Scale at A3

Role
Scoping Report

Suitability
Issued

Project Number
300884-00

Rev
P01

Drawing Number
LSF-SR02-00004

Stage 2

4.3.20 In the second stage, the feedback in the EIA Scoping Opinion combined with that from the non-statutory consultation and the results of ongoing surveys and baseline assessments was used to inform an interim design fix for PEIR assessments purposes and later a statutory consultation design fix.

4.3.21 As part of this, a specific two stage Ecological Cable Route Study was undertaken to identify potential easements within the 'cable routes area of search' identified between the Panel Areas and on-site substation. The aim of the ecological study was to avoid easements running through the most ecologically sensitive areas of the draft Order Limits or within identified buffer zones identified within the design principles / embedded mitigation measures. To determine this, initially a desk based review of known ecological constraints was undertaken and then a RAG rating prepared, which was used to inform options and areas for a Phase 1 ecological walkover for cable route options. The results of the desk based assessment and Phase 1 survey were then analysed to determine the least ecologically sensitive parts of the search area and shared with the Applicant to define the cable routes and progress landowner agreements for the identified easements.

4.3.22 A second workshop was then held with the Applicant and design team to present the environmental design. This environmental design was informed by the outcomes of the earlier multi-disciplinary design workshop, as well as the suggestions and feedback from the engagement activities (both through non-statutory consultation and direct engagement with statutory consultees) and ongoing surveys and baseline assessments. The design workshops reviewed potential changes to the design and considered whether the proposals will be feasible in terms of deliverability (cost and likely landowner agreement).

4.3.23 As a result of this design iteration process, a revised layout and Plate 4-4 PEIR Figure 2.4 Outline Environmental Masterplan of the Proposed Development was produced.

4.3.24 A summary of the key design changes that were made at this stage are listed below. The numbers for each item below are located for reference on Plate 4-4 Outline Environmental Masterplan– Key design changes following non-statutory consultation. For a full overview of how comments have been responded to please refer to the Non-statutory Consultation Summary Report:

1) Following the completion of the CMRA which identified coal mining shafts and their associated zones of potential instability, solar panels and associated infrastructure were omitted from three fields in the Northern Panel Area. The northeastern most of these fields was also omitted in response to comments from the local community regarding the prevalence of surface water flooding and the amenity value of the field.
2) Following the completion of the preliminary BNG calculations the fields referred to in 1 above have been retained within the draft Order Limits for areas of potential biodiversity mitigation and enhancement.
3) Further land for potential biodiversity mitigation and enhancement area is necessary to compensate for habitat loss and to contribute towards BNG. Discussions with the landowners are ongoing in order to satisfy the requirements for replacement habitat on land within the Draft Order Limits, between the Northern and Central Parcels

4) The location of the main access track and 33kV cable route to the western extent of the Northern Panel has been refined to avoid coal mining shafts and their associated zones of potential instability.
5) The location of a number of hybrid packs has been refined to avoid coal mining shafts and their associated zones of potential instability.
6) The layout of the on-site substation has been reviewed to ensure that none of the proposed critical equipment will cross the head wall of the former open cast mine.
7) In response to the Ecological Cable Route Study and discussions with landowners the 'cable routes area of search' has been removed and the 33kV underground cable routes between the Panel Areas have been identified.
8) The A595 on-road 33kV cable route option has also been removed in response to consultation feedback, the Ecological Cable Route Study and discussions with landowners.
9) In response to engagement with a resident at Quarry Hill, during the Non-statutory consultation event at Little Clifton on Saturday 28th September 2024, the nearest panels and fence in the northwestern Panel Area were set back 100m from residential properties to preserve their easterly view of the Lakeland fells, similar to the view shown in Plate *3*-2.
10) In response to feedback from several parties at the September non-statutory consultation events regarding the poor quality and fragmented nature of the local PRoW network, the Applicant is exploring the opportunity to introduce a new Permissive Path to link up existing PRoW and enhance the network to local walkers
11) Through collaborative engagement with the adjacent Dean Moor Solar Farm NSIP (ref EN010155), it was agreed that landscape mitigation will be added to each development to alleviate cumulative in combination effects on the landscape and views. The existing hedgerow along the north edge of Branthwaite Road is proposed to be reinforced with gap infill planting of hedgerow species and trees, and brought into enhanced management to reduce intervisibility of the two projects.
12) In response to feedback received from the non-statutory consultation process and through the environmental-led design process the design of the solar panels has been refined and determined as fixed with the tracker option removed.
13) Further opportunities for hedgerow planting have been identified along historic field boundaries, which will help to break up Panel Areas, and ensure the development is integrated into its landscape setting. Proposed hedgerows will connect with existing vegetation to enhance the connectivity of green infrastructure.
14) Opportunities have been identified for erecting barn own, bird and bat boxes, subject to landowner agreement.

4.3.25 Section 3.5 of this document also provides details of the design rationale for each of the technical infrastructure components within the Proposed Development.

Plate 4-3 PEIR Figure 2.4 Outline Environmental Masterplan

A0

Little Clifton
Clifton Green
Punderland
Lostrigg Beck
A595
Quarry Hill
Northern Panel Area
Furnace House
River Marron
Capel How
Oldfield
Fairview
Winscales
Stargill Farm
Calva Hall
Central Panel Area
Cumberland Lodge
Gale House
Lillyhall
Lucy Close Farm
Lostrigg Beck
Branthwaite Outgang
Southern Panel Area
Wythemoor House
Proposed Dean Moor Solar Farm
Branthwaite

Key

Draft Order Limits

Existing

- Public Rights of Way
- Rivers, ditches & inland water bodies
- Woodland, trees & shrub
- High voltage overhead lines
- Electricity pylon

Existing to be managed/enhanced

- Hedgerow to be removed and replaced
- Hedgerow and trees to be protected, retained and managed
- Hedgerow to be protected, retained and reinforced with gap infill planting

Proposed

- Solar panels
- Hybrid packs
- Substation
- Customer switchgear
- Underground electrical cable route
- Point of connection (PoC)
- Construction/operational access point
- Emergency access point
- Access tracks
- Access gate
- Deer fence with badger gates
- Minor vegetation management or removal works to create access
- Mixed native woodland planting
- Mixed native hedgerow planting
- Tree planting
- Wetland meadow habitat creation area
- Species rich grassland beneath solar panels
- Wildflower to enhance field margins to tussocky species-rich neutral or acid lowland grassland
- Potential bird & bat boxes in existing habitat along Lostrigg Beck, subject to landowner agreement
- Potential pole mounted barn owl box, subject to landowner agreement
- Permissive path

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Rev	Date	By	Chkd	Appd
01	06/02/25	SL	NQ	BO

Project Name
Lostrigg Solar

Drawing Title
Figure 2.4 Outline Environmental Masterplan

Client
RWE

Scale at A0
1:5000

Role
PEIR

Suitability
Issued

Project Number
30088400

Rev
01

Drawing Name
LSF-PEIR-EMP-01

Plate 4-4 Outline Environmental Masterplan – Key design changes follow-ing non-statutory consultation

13 Reinstated hedgerows along historic field boundaries for habitat connectivity and integration into the landscape.

14

9 Panels offset from residents to preserve views of LDNP.

1 2 Omission of panels due to flood risk, amenity value, and mine shafts. Area to be enhanced for BNG.

Northern Panel Area

5 Location of hybrid packs refined to avoid mine shafts.

14

1 2 Omission of panels due to mine shafts. Area to be enhanced for BNG.

4 Access track and cable route refined to avoid mine shafts.

10 Opportunities to connect PRoW with proposed Permissive Path.

14 Opportunities identified for erecting barn owl, bird and bat boxes, subject to landowner agreement.

14

3 Potential areas for biodiversity enhancement.

14

8 Cable route option within highway removed from draft Order Limits following Ecological Cable Route Study and consultation.

7 Ecological Cable Route Study and consultation has informed the underground cable routes.

7

6 Substation layout refined to avoid headwall of former open cast mine.

12 Panels determined as fixed, removing tracker option and determining a maximum (worst case) height of 3.5m.

Central Panel Area

7

7

14

Southern Panel Area

11 Landscape mitigation to alleviate cumulative effects with Dean Moor Solar Farm.

Proposed Dean Moor Solar Farm

Outline Environmental Masterplan

Key design changes following Non-Statutory Consultation

Metres
0 40 80 160

4.4 Design principles

4.4.1 As outlined within the design evolution section above during the first stage of the design evolution an initial set of design principles and embedded mitigation measures to guide the Proposed Development where established.

4.4.2 These principles were considered within the context of the NIC design principles and have been reviewed and developed throughout the DCO process to this stage.

NIC Design Principles for National Infrastructure

4.4.3 The Applicant has reviewed the NIC's four high-level design principles for national infrastructure and has considered these in developing project level design principles for the Proposed Development.

4.4.4 A high level overview of how the project responds to the NIC's design principles is presented in Table 4-3.

4.4.5 The project level design principles are set out within Table 4-4 and where applicable will be secured through design parameters as a Requirement of the DCO.

Table 4-3 Addressing the NIC Design Principles for National Infrastructure

NIC Design principles	How the design of the Proposed Development responds to the NIC design principles
 Climate Mitigate greenhouse gas emissions and adapt to climate change	The primary purpose of the Proposed Development is to provide up to 100mw of clean energy to mitigate greenhouse gas emissions. The Proposed Development will make a contribution towards achieving net zero greenhouse gas emissions by 2050 or sooner. Residual emissions from construction and operation will be offset by the production of low carbon renewable energy The Proposed Development will assist in adapting the landscape to a changing climate by increasing the area of biodiverse native meadow grassland and suitable moorland and wetland habitat. The resilience of new and existing habitats will be enhanced by increasing the range of species and plant provenance.
 People Reflect what society wants and share benefits widely	The Applicant has engaged positively and openly with the local community from an early stage in the DCO process, undertaking non-statutory consultation in the autumn of 2024 following the publication of the Scoping Report in June 2024. The Proposed Development is designed to provide clean energy and will share the benefits widely to power the equivalent of approximately 45,000 homes via the National Grid. The majority of the Proposed Development will occupy private farmland, which currently has no public access beyond existing PRoW. The design embeds setbacks, substantial areas of new habitat and over 1.3km of Permissive Path to substantially improve access to the countryside in proximity to local communities and to join up fragmented parts of the PRoW network. The project will support local initiatives through a £1.6 million community benefit fund which will take the form of annual payments spread across the 40-year operational period.

NIC Design principles	How the design of the Proposed Development responds to the NIC design principles
	The project will support local jobs during construction operation and decommissioning and will instigate outreach educational partnerships.
 Places Provide a sense of identity and improve our environment	The Applicant has considered the layout of the Proposed Development carefully to maximise integration with the local landscape. This includes setting it back from existing settlement edges, breaking up larger areas of development to retain broad sweeps of open countryside between and integrating substantial areas of new habitat. The existing landscape framework of woodland and hedgerows within the draft Order Limits will be retained and enhanced, respecting and enhancing local character and ecology by improving the condition and quality of existing landscape and habitat features. In larger areas of panels the Proposed Development will be subdivided into smaller field parcels by replating lost historic field boundaries. This will help mitigate visual and landscape effects but will also help reinforce the historic character of the landscape. The Proposed Development will deliver at least 10% BNG on site.
 Value Achieve multiple benefits and solve problems well	The environment-led design approach has considered opportunities to deliver beneficial outcomes that extend beyond the boundaries of the Proposed Development from the outset. This has included a review of strategic environmental and social value opportunities outlined in published documents and identified as projects or priorities by stakeholders and the local community. In addition to BNG, the design seeks to deliver wider environmental net gain, by maximising the range of ecosystem services that the natural capital created by the Proposed Development will provide. This includes providing enhanced habitat connectivity and public access to nature.

Project level design principles

4.4.6 This section sets out the project level design principles for the Proposed Development and explains how these have been developed in the context of the NIC Design Principles for National Infrastructure set out above.

> "The NIC guidance states that project level design principles should directly address the project's requirements, benefits and outcomes.

- "Design principles should form a key part of project governance, driving design decisions from the project outset.
- Developing design principles is an iterative, ongoing process. But once consent is achieved, they should become fixed, outlining how schemes will achieve their outcomes.
- Principles should align all parties around agreed, shared outcomes, facilitating timely, effective delivery."

4.4.7 The design of the Proposed Development has emerged as part of an iterative environmental-led design process which has identified a number of project level design principles. These principles have been formulated with the input of the Applicant, engineering, environmental and planning teams and in response to stakeholder engagement and community consultation. They have also been informed

by the site context, technical infrastructure components and the findings of surveys and environmental assessments.

4.4.8 Collectively the design principles determine how the Proposed Development will meet the criteria of 'good design' as set out in NPS EN-1.

4.4.9 Throughout this design process, changes have been made to the design principles and implemented into the design of the Proposed Development, as set out in the design evolution above, to avoid or reduce adverse environmental effects and to help the Proposed Development integrate into the wider landscape and habitat network.

4.4.10 The principles as set out in Table 4-4 are split into a number of topic areas which respond to site's context and the NIC's four principles for good design set out in Table 3-3.

4.4.11 Table 4-4 also identifies how each principle will be secured as follows:

- Design principle – an overarching design commitment made from the outset of the project
- Embedded mitigation – a site-specific design commitment based on the site conditions
- Management measure – a site-specific management measure based on the site conditions

4.4.12 Where applicable the relevant design parameter related to each principle is also specified and for a full list of design parameters for the Proposed Development please refer to Table *6*-1. The future detailed design of the Proposed Development must accord with the identified design parameters.

4.4.13 Plate 4-3 PEIR Figure 2.4 Outline Environmental Masterplan prepared for statutory consultation incorporates all relevant principles to create a coordinated design for the Proposed Development.

Table 4-4 Proposed Development design principles

No	Principle	Topic	Secured	NIC Principle	Design Parameter
1	Panel Areas will be targeted towards lower quality agricultural land	Agriculture	Design principle	Places	All Panel Areas are located on lower quality land Grade 5, 4 and Subgrade 3b
2	Opportunities for continued sheep grazing under the solar panels are being explored	Agriculture	Design principle	Value	The opportunity for low intensity sheep grazing will be explored under the panels
3	Where possible, underground cables will be installed using a cable plough or trenching. These are considered the most efficient and least impactful methods of cable installation, causing minimal disruption to the ground by cutting, installing and back-filling in one operation	Agriculture	Design principle	Places	A cable plough will be used for off-road routes. If this is not possible, other methods such as conventional open cut trenching or horizontal direction drilling (HDD) will be used HDD will be used where cables cross existing watercourses, unless there is an existing watercourse crossing or the watercourse is dry and then a cable plough or conventional open cut trenching will be used
4	If below ground archaeology constraints arise through further site investigation the mounting structure of solar panels will utilise options such as ballast slabs, anchor, or block which sit on the ground surface	Archaeology	Embedded mitigation	Places	The mounting structures will be fixed to the ground by galvanized steel poles which are typically driven into the ground to a depth of approximately 1m. This will avoid interaction with the water table. Where targeted trial trenching identifies the need for archaeological protection, an alternative mounting structure will be proposed, in the form of ballast slabs which sit on the surface rather than penetrating the ground.
5	Wherever possible, existing trees, woodland blocks and hedgerow boundaries within the proposed areas for solar panels and critical infrastructure will be retained. The creation of small gaps in hedgerows and the loss of a small number of trees may be required for construction access and cable runs	Biodiversity	Design principle	Places	Appropriate buffers for retained trees will be maintained between solar panels and critical infrastructure, in line with the Tree Protection Plan available in PEIR Appendix C-13 Arboricultural Impact Assessment by establishing a construction exclusion zone around their Root Protection Areas (RPA). An 8m buffer will be maintained between solar panels and external hedges to retain foraging and commuting corridors for bats. This will be 3m from hedgerows to security fencing and 5m from security fencing to solar panels
6	15m buffer from panels to ancient and veteran trees	Biodiversity	Embedded mitigation	Places	There are no ancient trees or woodlands within the draft Order Limits. One veteran tree has identified but

No	Principle	Topic	Secured	NIC Principle	Design Parameter
					lies outside the area of development. No veteran trees will be removed or encroached upon to facilitate the Proposed Development.
7	15m buffer from panels to woodland	Biodiversity	Embedded mitigation	Places	Appropriate buffers for retained trees will be maintained between solar panels and critical infrastructure, in line with the Tree Protection Plan available in PEIR Appendix C-13 Arboricultural Impact Assessment
8	The construction compounds will be located on lower quality biodiversity habitat	Biodiversity	Management measure	Places	Ecological surveys conducted and the temporary construction compounds to be located on low biodiversity habitat
9	Buffers for all other trees (non-ancient / veteran) and hedgerows to be determined by RPA, but at least 5m buffer for trees with potential for bats, and a minimum 8m buffer between solar panels and external hedgerows (reduced to 5m from panels for internal hedges)	Biodiversity	Embedded mitigation	Places	Appropriate buffers for retained trees will be maintained between solar panels and critical infrastructure, in line with the Tree Protection Plan available in PEIR Appendix C-13 Arboricultural Impact Assessment. Ecological surveys conducted and an 8m buffer will be maintained between solar panels and external hedges to retain foraging and commuting corridors for bats. This will be 3m from hedgerows to security fencing and 5m from security fencing to solar panels. Appropriate buffers will be maintained between solar panels and trees with potential bat roost features, in line with British Standard BS 5837 by establishing a construction exclusion zone around their RPA.
10	Minimum 16m offset from all infrastructure (including fencing) from bank top of all riparian boundaries and watercourses	Biodiversity	Embedded mitigation	Places	A 16m buffer will be maintained between solar panels and riparian boundaries and watercourses, comprising of 14m buffer from the perimeter of the watercourse and 2m infrastructure offset from the fencing
11	30m buffer from badger sett locations	Biodiversity	Embedded mitigation	Places	Badger surveys conducted and 30m buffer applied to known sett locations
12	Fencing to be designed to let small mammals pass through (excluding that around the on-site substation)	Biodiversity	Design principle	Places	The majority of the fencing will be deer fencing. The fence will be designed in such a way to allow small animals to pass through
13	Any access tracks, cable routing and fencing will be located to pass through existing gates and gaps in hedgerows where feasible	Biodiversity	Embedded mitigation	Places	Access tracks, cables and fencing will be located in existing gaps in hedgerows where feasible

No	Principle	Topic	Secured	NIC Principle	Design Parameter
14	Existing hedgerows in poor condition will be reinforced with planting / management where feasible	Biodiversity	Embedded mitigation	Places	Tree and hedgerow planting will be located as shown on PEIR Figure 2.4 Outline Environmental Masterplan
15	Additional planting and/or enhancement of existing habitats will seek to use native species that are climate resilient	Biodiversity	Design principle	Places	Commitment made in PEIR Chapter 6 Biodiversity, Chapter 9 Landscape and Visual and PEIR Appendix C-5 outline LEMP
16	Removal and/or avoidance of invasive species.	Biodiversity	Management measure	Places	PEIR Appendix C-1 outline CEMP aligns with principle
17	Planting of native trees and shrubs of local provenance which naturally occur within the local area. To include berry, pollen and nectar producing species.	Biodiversity	Embedded mitigation	Places	Commitment made in PEIR Chapter 6 Biodiversity, Chapter 9 Landscape and Visual and PEIR Appendix C-5 outline LEMP
18	Creation of habitats which are ecologically linked across site and into the wider area.	Biodiversity	Design principle	Places	Commitment made in PEIR 6 Biodiversity, Chapter 9 Landscape and Visual and PEIR Appendix C-5 outline LEMP
19	All establishment and management of habitats to be detailed in outline Landscape Ecological Management Plan (LEMP)	Biodiversity	Management measure	Places	PEIR Appendix C-5 outline LEMP aligns with principle
20	Construction and Environmental Management Plans will be required to manage pollutant run off into priority habitats and watercourses, as well as protection for protected habitats/species.	Biodiversity	Management measure	Places	PEIR Appendix C-1 outline CEMP aligns with principle
21	A minimum 10% BNG will be achieved	Biodiversity	Design principle	Places	Commitment made in PEIR Figure 2.4 Outline Environmental Masterplan and to be documented in BNG Report submitted in support of the DCO application
22	An appropriate buffer will be maintained between properties and construction areas	Construction impact	Management measure	People	Construction compounds to be located away from residential properties
23	An appropriate buffer will be maintained between properties and construction areas to minimise construction dust	Construction impact	Management measure	Places	PEIR Appendix C-1 outline CEMP aligns with principle
25	All Non-Road Mobile Machinery (NRMM) of 36kW to 560 kW used onsite in construction, maintenance and decommissioning shall meet or exceed the latest emission standards in Regulation (EU) 2016/1628	Construction impact	Management measure	Climate	Commitment made in PEIR Chapter 7 Climate Change
26	Sustainable drainage solutions (SUDs) will be provided at source, ensuring that surface water run-off is managed consistently with existing site conditions	Drainage	Embedded mitigation	Climate	SUDs to align with principle
27	Access tracks will be permeable using gravel to allow water to filtrate through and maintain greenfield runoff rates	Drainage	Design principle	Places	The access tracks will be permeable to allow water to filtrate through and maintain greenfield runoff rates.

No	Principle	Topic	Secured	NIC Principle	Design Parameter
28	Minimise number of river crossings and design to convey flood flows and demonstrate no increase in blockage risks	Drainage	Embedded mitigation	Places	HDD will be used where cables cross existing watercourses, unless there is an existing watercourse crossing or the watercourse is dry and then a cable plough or conventional open cut trenching will be used Existing access watercourse crossings will be used wherever possible for access tracks
29	Consultation and engagement with the local community and key stakeholders will be undertaken throughout the design process, development and operation of the Proposed Development	Engagement	Design Principle	People	Consultation and engagement undertaken to date is set out in the Non-statutory Consultation Summary Report. Consultation to be undertaken going forward is set out in the Programme Document
30	The placement of BESS and other critical infrastructure will avoid historic mine entries and compressible ground	Ground conditions	Embedded mitigation	Places	The location of the solar panels, hybrid packs and electrical cables have been designed to respond to known former mining constraints / workings and avoid the location of all mine shafts and associated zones of potential instability The layout of the on-site substation has been designed to respond to known former mining constraints / workings and avoid the location of the head wall of the open cast mine
31	The Proposed Development will be integrated into the wider landscape setting, with particular consideration to the Lake District National Park and World Heritage Site	Landscape and visual	Design principle	Places	A LVA was undertaken at the outset of the project to identify the most appropriate fields for Panel Areas within the draft Order Limits Proposed tree and hedgerow planting is located as shown on the PEIR Figure 2.4 Outline Environmental Masterplan
32	Existing landscape structures, such as woodland blocks and hedges will be enhanced with additional planting to provide instant screening	Landscape and visual	Design principle	Places	Where required tree and hedgerow planting is located as shown on the PEIR Figure 2.4 Outline Environmental Masterplan
33	A buffer between residential dwellings and the nearest panels will be maintained	Landscape and visual	Design principle	People	A minimum 50m buffer between residential dwellings and the nearest solar panels has been applied to mitigate potential effects on residential visual amenity where possible.

No	Principle	Topic	Secured	NIC Principle	Design Parameter
34	The new / replacement pylons will be replaced like for like and will be no taller than existing	Landscape and visual	Design principle	Places	Should replacement 132kV pylons be required, the design of the pylons will match the existing and will likely be installed by the DNO.
35	Opportunities for advanced planting will be explored to provide early establishment and maximise visual screening	Landscape and visual	Embedded mitigation	Places	Options still being discussed
36	Large areas of panels will be avoided where feasible, broken up by hedgerow planting along historic field boundaries to maximise landscape integration	Landscape and visual	Embedded mitigation	Places	Tree and hedgerow planting will be located as shown on the PEIR Figure 2.4 Outline Environmental Masterplan
37	No significant lighting proposed. For security, maintenance and emergencies, demand responsive motion controlled lights only, using passive infra-red (PIR) technology, designed and installed in a manner which minimises light spill impacts	Lighting	Design principle	Places	During operation, the Proposed Development will not be manned or permanently lit. The lighting at the hybrid packs will be PIR motion-controlled lighting for emergencies and the on-site substation will have manual lighting. This will be low level lighting, shrouded and designed and installed to face downward to eliminate the risk of light spill impacts. This level of lighting will be minimal, infrequent and transitory.
38	Any sources of operational noise (i.e. inverters) will be located as far as reasonably possible from existing sensitive receptors	Noise	Embedded mitigation	People	Noise generating equipment, the hybrid packs will be located as far as reasonably possible from existing sensitive receptors, and at a minimum of 300m from those sensitive receptors where possible
39	Where noise levels are predicted to exceed assessment criteria / be located within the identified buffer zones, mitigation in the form of local re-siting to be adopted	Noise	Embedded mitigation	People	Commitment considered in PEIR Chapter 10 Noise and vibration
40	Acoustic barriers / compounds and/or manufacturers noise reducing kit / lower noise emitting infrastructure to be implemented if noise exceeds assessment criteria	Noise	Embedded mitigation	People	PEIR Chapter 10 Noise and vibration does not identify the need for any acoustic barriers or noise reducing kit within the Proposed Development
41	Impacts on PRoW will be minimised through the use of buffer zones and planting	PRoW	Embedded mitigation	People	All existing PRoW within the draft Order Limits as identified on the PEIR Figure 2.4 Outline Environmental Masterplan will have a minimum 5m buffer zone applied either side of any PRoW to deer fencing or any other proposed vertical element, including hedgerows.
42	Routing for construction and operation vehicles will avoid routing through local villages	Transport	Management measure	Places	PEIR Appendix C-1 outline CEMP aligns with principle

4.5 Technical infrastructure components

4.5.1 As part of the design evolution for the Proposed Development, a number of design decisions have been made for the technical infrastructure components of the Proposed Development.

4.5.2 Where applicable the design rationale for the location, scale and technology for each component is set in this section. However, the section does not provide a design rationale for all technical infrastructure components, as some of these have been constrained by safety requirements, manufacturing capabilities or industry standards.

4.5.3 Therefore, the design rationale for some components has been determined partly through the requirements of good design, the site-specific context and associated design principles as set out above but this has not been possible for all components across the draft Order Limits.

Ground mounted solar photovoltaic generating station

4.5.4 The ground mounted solar PV generating station comprises solar panels fitted to mounting structures. Solar panels generate electrical power by converting sunlight into direct current (DC) electricity. Individual solar panels contain several PV cells wired and encapsulated by tempered glass. Solar panels are sealed for weatherproofing and held together by a metal frame in a mountable unit.

Location

4.5.5 The solar panels will be located within the Panel Areas across the draft Order Limits. The draft Order Limits contain a number of environmental constraints which have driven the design rationale in relation to the layout of the solar panels. In response to these constraints the following offsets and buffers have been applied:

- An 8m buffer between solar panels and existing external hedges to retain foraging and commuting corridors for bats. This will be 3m from hedgerows to security fencing and 5m from security fencing to solar panels.
- The layout of the Panel Areas has been designed to respond to known former mining constraints / workings.
- A 16m buffer between solar panels and riparian boundaries and watercourses, comprising of 14m buffer from the perimeter of the watercourse and 2m infrastructure offset from the fencing.
- Appropriate buffers between solar panels and trees with potential bat roost features, in line with British Standard BS 5837 by establishing a construction exclusion zone around their RPA.
- A minimum 50 buffer between residential dwellings and the nearest solar panels has been applied to mitigate potential effects on residential visual amenity.

4.5.6 The application of these offsets and buffers has been carried forward into the design parameters set out in Table 6-1 and these have been applied to mitigate the impact of the solar panels on sensitive receptors.

4.5.7 Of particular note, following the close of non-statutory consultation a CMRA has been undertaken for the draft Order Limits and this has resulted in the removal of three

solar panel fields in the Northern Panel Area where a number of coal mining shafts and their associated zones of potential instability were identified.

Scale

4.5.8 Individual PV cells are typically 2m by 1m in width and depth. However, as solar panels are rapidly developing due to innovation in technology and processing techniques for the PV cells, the dimensions of the solar panels available at the time of construction may vary. A number of solar panels are fixed to a frame to form the rows of solar panels.

4.5.9 The solar panels arranged in rows are designed to be 3m high on flat ground however minor undulations or mitigation requirements may mean that rows need to be slightly higher and therefore the maximum height parameter for the rows is set at 3.5m which represents the worst-case scenario in terms of identifying the potential environmental effects.

4.5.10 Please refer to PEIR Figure 2.6 Typical fixed solar panel.

Technology

4.5.11 At the non-statutory consultation and EIA Scoping stage, the option for both fixed and tracking solar panels was presented. However, following the non-statutory consultation and through the environmental-led design process, the design of the solar panels has been refined and determined as fixed.

4.5.12 The Applicant has determined that a fixed solar panel system will be most appropriate for the of the Proposed Development responding the locational specific context and the following design parameters have been applied to reflect this:

- The solar panels will be fixed;
- The solar panels will include rows aligned in east-west rows;
- The solar panels will be positioned on the mounting structures at an angle of between 10 and 30 degrees from horizontal;
- The solar panels will slope towards the south;
- The rows of solar panels will be a minimum of 4m and maximum of 12m apart (pitch); and
- The minimum height of the lowest part of the solar panels (i.e. not including the mounting structure) will be 0.8m. Solar panels will be raised sufficiently above the 1.0% AEP flood level and not impede overland flow routes.

4.5.13 The mounting structure for the solar panels is typically fixed to the ground by galvanised steel poles which are driven into the ground to a depth of circa 1m. However, there may be a need to propose an alternative mounting structure, in the form of ballast slabs which sit on the surface rather than penetrating the ground, where the mounting structures are located within a mine shaft or its associated zone of instability. Ballast slabs may also be required in some parts of the draft Order Limits, in response to geophysical and planned targeted trial trenching. The need for this will be determined prior to the submission of the DCO application.

Hybrid packs

4.5.14 A range of equipment is required to support the solar panels to convert the electrical power generated, manage this power and export power onto the electricity distribution network. The electrical output from the solar panels will be exported by low voltage cabling to hybrid packs including shipping container style storage units which will contain power conversion units including an inverters and transformer and DC-DC converters and BESS. The function of each of these elements are as follows:

- Inverters convert the DC generated by the solar panels into AC that can be exported to the electricity distribution network;
- Transformers monitor, increase and control the voltage of the electricity produced before it reaches the on-site substation. The transformers will be located adjacent to the inverters; and
- BESS will provide battery energy storage systems to allow the energy from the solar panels to be stored then released when required and will comprise containerised battery storage systems, DC-DC converter boxes and ancillary equipment.

Location

4.5.15 The power conversion units and BESS will be arranged together across the Proposed Development in hybrid packs located within the Panel Areas. The location of these hybrid packs within the Panel Areas has been determined by a number of key principles including locating noise generating equipment, including BESS, invertors, transformers and as far as reasonably possible from existing sensitive receptors, and at a minimum of 300m from those sensitive receptors where possible. As well as co-locating the hybrid packs within the centre of Panel Areas, amongst the solar panels to reduce their visual impact.

4.5.16 Additionally, a number of the hybrid pack locations across the Panel Areas has been refined to respond to the coal mining legacy within the draft Order Limits and avoid coal mining shafts and their associated zones of potential instability.

Scale

4.5.17 At this stage of design, it is anticipated that there will be up to 27no. hybrid packs located across the draft Order Limits.

4.5.18 The hybrid packs will be up to 3.5m in height, up to 22m in length and up to 13m width.

4.5.19 The maximum height of the hybrid packs will match that of the maximum height of the solar panels.

4.5.20 The foundations for the for the inverters, transformers and BESS within the hybrid packs will be a concrete slab, placed on compacted gravel and underlaid by a membrane. The remainder of the hybrid pack surface between the electrical equipment will comprise compacted gravel underlaid by a membrane.

4.5.21 Please refer to PEIR Figure 2.7 Typical hybrid pack.

Technology

4.5.22 The containers will be finished in a light grey, white, dark green or similar.

BESS

4.5.23 The design and specification of the proposed BESS is subject to a number of key standards, guidelines and principles which have been established as part of the wider solar industry and associated development requirements. A detailed assessment of the safety management and mitigation measures can be found in PEIR Appendix C-4 outline Battery Fire Safety Management Plan. A summary of the design and associated embedded mitigation is provided below.

4.5.24 The BESS is likely to consist of lithium-ion batteries and will allow energy to be stored within the Proposed Development to ensure that there is an equal distribution of electricity across the National Grid, providing a balance in services where surplus electricity is produced. BESS will be included as part of the hybrid packs, which also include auxiliary transformers and power conversion system units including invertors, transformers required to control the BESS.

4.5.25 The BESS will require associated heating, ventilation and cooling (HVAC) systems to ensure efficiency of the batteries and these systems will be integrated within the individual containers.

4.5.26 The key parameters for the hybrid packs have been proposed to limit environmental effects (in accordance with NPS EN-1 and the ability of good design to mitigate adverse effects), including visual and landscape effects on residential receptors, roads and rights of way and hydrology and flood risk across the Order Limits.

4.5.27 However, have also sought to retain a level of flexibility so that technological advances can be considered. This flexibility, and associated parameters are detailed in Table 6-1.

Customer switchgear

4.5.28 Standalone customer switchgear are required to control, protect and isolate electrical currents and equipment. Switchgears allow parts of the solar panels to be de-energised safely, allowing for routine maintenance or faults to be identified and work undertaken.

Location

4.5.29 Two customer switchgear will be required within the Northern and Southern Panel Areas. Due to the scale of the Central Panel Area a customer switchgear is not considered necessary as this Panel Area will feed directly into the on-site substation.

Scale

4.5.30 At this stage of design, it is anticipated that there will be up to 4no. customer switchgear located across the draft Order Limits.

4.5.31 The customer switchgear will be up to 3m in height, up to 12.5m in length and up to 2.5m in width.

4.5.32 The foundations for the customer switchgear will be a concrete slab, placed on compacted gravel and underlaid by a membrane.

4.5.33 Please refer to PEIR Figure 2.8 Typical customer switchgear.

Technology

4.5.34 The customer switchgear will be finished in a grey.

33kV underground cabling

4.5.35 33kV underground cables are required to connect the solar panels and the hybrid packs within the Panel Areas to the proposed on-site substation.

Location

4.5.36 The 33kV cabling will use off-road routes between the Panel Areas and the proposed on-site substation within the Central Panel Area.

4.5.37 The layout of the electrical cabling has been determined by two main factors, off-road routing and ecological constraints.

4.5.38 As a starting principle for determining cable routes, the Applicant's first preference was to avoid impacts to local communities that may be derived from utilising routes along existing roads, such as disruption to local access during the works. Avoiding routes along existing roads also has engineering and cost benefits. In comparison, it is considered that the potential for environmental impacts from using off-road routes is low considering the limited area of land required and the short-term nature of construction, with any agricultural land affected able to be returned to agriculture post construction. Therefore, it is the Applicant's preference to avoid on-road cable routes where feasible.

4.5.39 At the non-statutory consultation stage, the Applicant's preference for using off-road routes was expressed however at that time a 'cable routes area of search' was identified within the draft Order Limits which included an on-road route along the A595 in the south-west of the draft Order Limits.

4.5.40 In developing the Proposed Development design ahead of statutory consultation, the Applicant has sought to identify options for the cable routes through greenfield land. As part of this, the Applicant has engaged with landowners and undertaken a three-stage ecological cable route study to identify potential easements within the 'cable routes area of search'.

4.5.41 The aim of the ecological study was to avoid easements running through the most ecologically sensitive areas of the draft Order Limits or within buffer zones identified by applying the design principles / embedded mitigation measures. To determine this, initially a desk based review of known ecological constraints was undertaken and then a RAG rating prepared, which was used to inform options and areas for a Phase 1 ecological walkover for cable route options. The results of the desk based assessment and Phase 1 survey were then analysed to determine the least ecologically sensitive parts of the search area and shared with the Applicant to define the cable routes and progress landowner agreements for the identified easements.

4.5.42 As a result of this ecological study and discussions with the landowners off-road routes for the 33kV routes have been determined and are identified on

4.5.43 Plate 4-5 PEIR Figure 1.2 Layout of Proposed Development.

Scale

4.5.44 A cable plough will be used for the installation of the 33kV electrical cabling. If this is not possible, other methods such as conventional open cut trenching or HDD will be used. HDD will be used where cables cross existing watercourses, due to

environmental constraints and to respond to comments received from the Environment Agency (EA), unless the watercourse is dry and then a cable plough or conventional open cut trenching will be used.

4.5.45 The maximum dimension of the 33kV cable trench will be 1.2m wide by 1.5m deep. The construction working width will be 10m.

On-site substation

4.5.46 An on-site substation is required for the Proposed Development to connect the Panel Areas to the electricity distribution network. The on-site substation will house electrical equipment like 132kV harmonic filter compound, communications mast and substation buildings.

4.5.47 The purpose of this on-site substation is to convert low voltages from electricity generation to high voltages, or vice versa, using power transformers.

Location

4.5.48 The on-site substation will be located within the Central Panel Area as close as possible to the PoC to connect the Proposed Development to the existing Electricity North West (ENW) network which runs through the draft Order Limits.

4.5.49 Whilst the location of the on-site substation has been determined by the PoC the layout has been reviewed following the close of non-statutory consultation and the production of the CMRA to ensure that none of the proposed critical equipment will cross the head wall of the former open cast mine in this part of the draft Order Limits.

Scale

4.5.50 The on-site substation compound will be up to 90m in length and will be up to 70m in width. The parking and turning area will be up to 70m in length and 30m in length.

4.5.51 The electrical equipment itself will have a maximum height of 8m and the communications tower will have a maximum height of 15m. The palisade fencing will have a maximum height of 2.4m.

4.5.52 The foundations for the substation buildings will be a concrete slab. The remainder of the substation compound surface will be hardstanding.

4.5.53 Please refer to PEIR Figure 2.9 Typical substation.

Technology

4.5.54 The substation will contain power conversion system units, control building housing, monitoring and control systems,132kV harmonic filter compound, electrical cables, communications mast, deluge system and associated boundary treatments.

4.5.55 The design and specification of the proposed substation is subject to a number of key standards, guidelines and principals which have been established as part of the wider solar industry and associated development requirements.

132kV underground cabling

4.5.56 132kV underground cables are required to connect the on-site substation to the PoC.

Location

4.5.57 The 132kV cabling will use an off-road route between the on-site substation and the PoC expected to be approximately 30m in length.

Scale

4.5.58 A cable plough will be used for the installation of the 132kV electrical cabling. If this is not possible, other methods such as conventional open cut trenching or HDD will be used.

4.5.59 The maximum dimension of the 132kV cable trench will be 2.0m wide by 1.6m deep. The construction working width will be 30m.

Point of connection

4.5.60 Two existing or replacement on-site 132kV pylons and will be required for the Proposed Development to connect to the existing ENW network which runs through the draft Order Limits.

4.5.61 In addition to the two pylons, up to two PoC masts may also be required to facilitate the connection between the 132kV underground cabling and the two existing or replacement pylons.

4.5.62 The pylons and if required PoC masts will provide the PoC for the Proposed Development to connect it to the wider Cumbrian Ring circuit and the ENW electricity distribution network.

Location

4.5.63 The PoC will be located immediately north east and east of the proposed on-site substation to the west of the Central Panel Area as identified on Plate 4-5 PEIR Figure 1.2 Layout of Proposed Development. Should replacement pylons be required these will be located up to 50m from the existing pylons and should PoC masts be required these will be located 25m from the pylons.

Scale

4.5.64 Should replacement 132kV pylons be required the design of the pylons will match the existing and the height of the pylons will match the existing or be lower.

4.5.65 Should PoC masts be required the masts will be a slim monopole design and the height of the mast will be lower in height than the existing or replacement pylons.

4.5.66 Please refer to PEIR Figure 2.10 Typical pylon and PoC mast.

Technology

4.5.67 The ability to use the two existing pylons or replace these with two new pylons and the requirements for associated PoC masts will be determined by the DNO.

4.5.68 The parameters therefore allow for up to two replacement pylons and two PoC masts to retain a level of flexibility but also to ensure that the worst-case scenario is assessed.

Fencing

4.5.69 Safety and security perimeter fencing.

Location

4.5.70 The perimeter fencing will be installed on the boundaries of the Panel Areas.

4.5.71 The fencing will be located a minimum of 8m from riparian boundaries and watercourses, 5m from existing PRoW and 3m from external boundary hedgerows.

4.5.72 The fencing will be located in existing gaps in hedgerows wherever feasible.

4.5.73 Additionally, the fencing will be installed in such a way that small animals and mammals such as badgers and hares will be able to navigate between and through the Panel Areas, and to allow the movement of large mammals such as deer through the landscape along the retained hedgerow margins between the fencing and the highway.

Scale

4.5.74 The fencing will be deer fencing, with a maximum height of 2m.

4.5.75 The maximum height of the proposed fencing has been determined so that the proposed planting can adequately screen the perimeter fencing, reducing the visual impact of this element of the Proposed Development.

4.5.76 Please refer to PEIR Figure 2.11 Typical fencing.

CCTV

4.5.77 Infra-red security detection CCTV cameras will be mounted on poles.

Location

4.5.78 CCTV columns will be placed within the perimeter fencing between the fencing and the solar panels.

Scale

4.5.79 The poles will have a maximum height of 3m.

4.5.80 Please refer to PEIR Figure 2.12 Typical CCTV pole.

Technology

4.5.81 The CCTV will comprise pole mounted, infra-red security detection cameras. It is anticipated that these cameras will have motion detection technology for recording and will be pointed directly within the draft Order Limits and away from any land outside of the draft Order Limits.

4.5.82 The CCTV cameras will be no taller than the solar panels and included within the solar panel fields. They will not have markedly different effects on views and character to those of the other elements (panels, inverters, storage) of similar height within the panel areas.

Lighting

4.5.83 During operation, the Proposed Development will not be manned or permanently lit but low level lighting, shrouded and designed and installed to face downward to eliminate the risk of light spill impacts. This level of lighting will be minimal, infrequent and transitory.

Location

4.5.84 The lighting will be at the on-site substation and hybrid packs for emergencies.

Scale

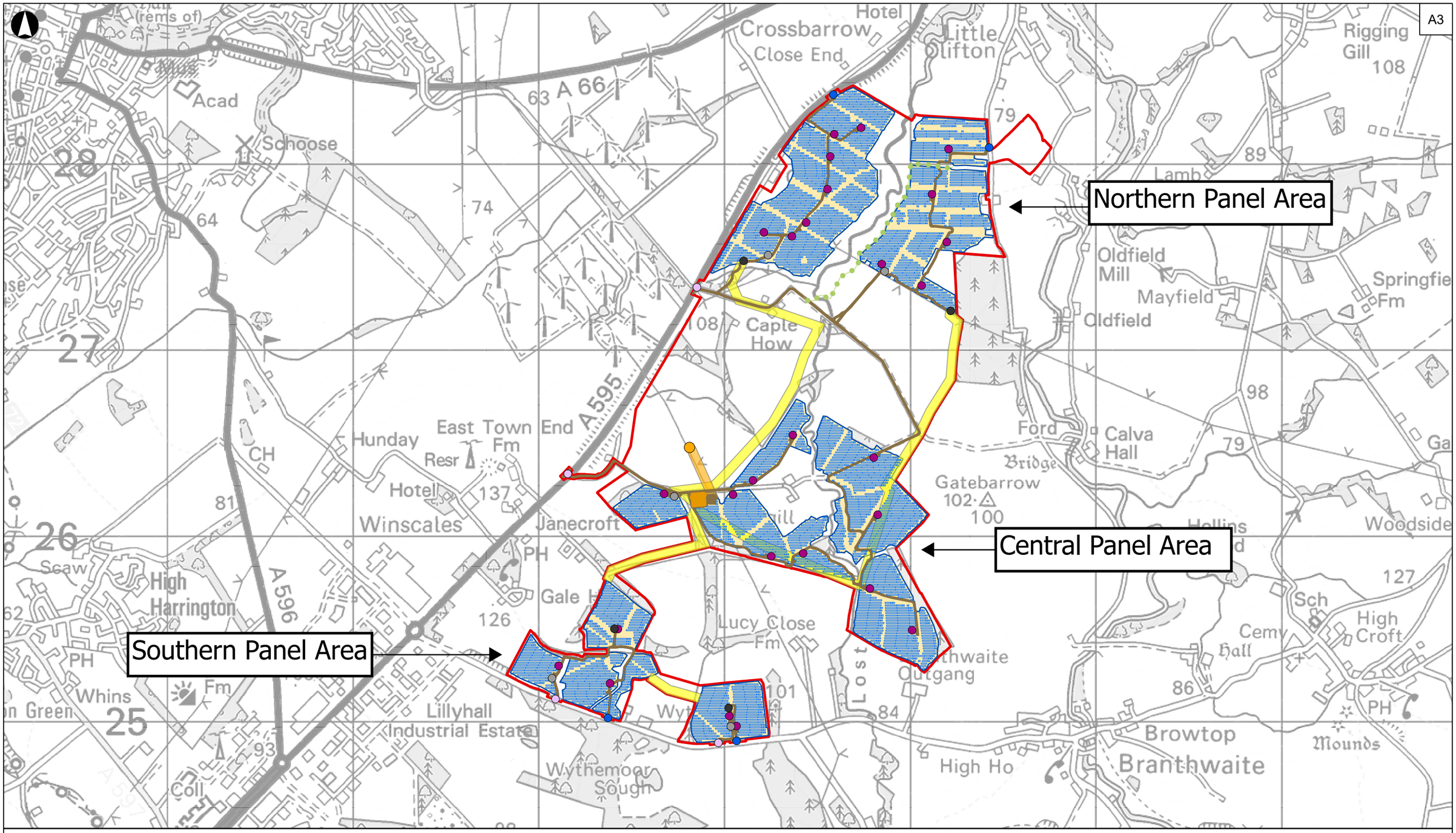
4.5.85 The lighting will have a maximum height of 10m.

Technology

4.5.86 The lighting will be manually controlled at the on-site substation and PIR motion-controlled lighting at the hybrid packs will be required for emergencies.

4.5.87 The lighting will not be continuous.

Plate 4-5 PEIR Figure 1.2 Layout of Proposed Development



Legend

- draft Order Limits
- Panel Areas
- 132kV Cable Route
- 33kV Cable Route
- Substation
- Point of connection to existing network
- Fenceline
- Solar PV modules
- Hybrid Packs
- Customer Switchgear
- Storage Container
- Access Tracks
- Construction / Operational Access Point
- Emergency Access Point
- Permissive Paths

Coordinate System: British National Grid

Rev	Date	By	Chkd	Appd	Authd
P01	04/03/2025	JEP	JM	NQ	DB

Client

RWE

Project Name

Lostrigg Solar

Drawing Title

Figure 1.2 Layout of Proposed Development

Scale at A3

1:20,000

Role

PEIR

Suitability

Issued

Project Number

300884-00

Rev

P01

Drawing Number

LSF-PEIR01-00002

4.6 Beneficial design outcomes

4.6.1 In addition to generating enough renewable power for the equivalent of up to 45,000 homes and businesses, the Proposed Development aims to provide a series of wider benefits, both locally and nationally, such as:

- The displacement of over 3m tonnes of $C0_2$ from equivalent fossil fuel energy, which equates to taking approximately 101,000 cars off the road for a year;
- Large areas of enhanced and new hedgerow, tree and habitat planning within and between the Panel Areas;
- The cessation of intensive grazing across the Panel Areas and adjacent field margins. Large areas will be rested from nutrient input, seeded and managed to provide enhanced species diverse lowland neutral and acid grassland and wildflower meadows. These will improve habitat diversity and quality whilst allowing soil structure and biodiversity to recover over 40 years;
- Allocating fields in the draft Order Limits solely for biodiversity enhancement, which will be managed during the 40 year duration of the Proposed Development specifically to provide habitat for ground nesting and wintering birds and priority habitats;
- Providing a minimum 10% BNG;
- Providing approximately 1.3km of Permissive Path to be implemented during the construction stage, connecting and enhancing the local public right of way network;
- Provision of approximately 120 jobs (at peak) during construction; and
- A community benefit fund of £1.6 million to contribute to applicable community led environmental projects.

4.6.2 Furthermore, following operation and decommissioning of the Proposed Development and subject to landowner agreement at the time, all environmental mitigation measures will be left in situ to provide a legacy of a landscape with enhanced character and improved network of green infrastructure and habitats.

4.6.3 Following decommissioning the soils across the draft Order Limits will have been rested and fallow for 40 years without any form of intensive farming or nutrient input. This will leave a legacy of improved soil structure, soil biodiversity and nutrient balance. By year 40 it is anticipated that a mosaic of diverse and valuable grassland habitats will have established. Decommissioning of the Proposed Development will be carefully designed to avoid damage to landscape features and soil to maximise the legacy benefits of the project.

4.6.4 As evidenced in the remaining chapters of this document, the Proposed Development has been and will continue to be designed in such a way that it will celebrate and enhance the historical, ecological and landscape features of the surrounding communities, and which will enable renewable energy generation for the next 40 years, should it be granted development consent.

5 Engagement

5.1 Engagement strategy and process

5.1.1 Engagement and consultation have been at the centre of the design process for the Proposed Development from its inception and will continue through to the submission of the DCO application.

5.1.2 Following the project launch in March 2024 engagement and consultation with members of the public and key stakeholders has taken place in a number of stages up until this current statutory consultation stage, as summarised below and detailed within the Programme Document and Non-statutory Consultation Summary Report.

5.1.3 The Non-statutory Consultation Summary Report also provides an overview of how the feedback received from the engagement activities to date has been taken into consideration during the design evolution. An updated Statutory Consultation Summary Report will be submitted in support of the DCO application and include an overview of the statutory consultation activities and feedback received.

Stage 1: Project launch – March – September 2024

- Landowner engagement – surveys and options meetings
- PINS engagement – inception meeting
- LPA engagement – introductory meeting
- Statutory consultee engagement – introductory meetings
- Dean Moor Solar Farm engagement - introductory meeting
- EIA Scoping Report – submitted to PINS in June 2024
- Political engagement –non-statutory consultation soft launch
- Community representative engagement –non-statutory consultation soft launch
- Community engagement –non-statutory consultation soft launch

Stage 2: Non-statutory consultation – September – October 2024

- Six week non-statutory consultation period from 11 September – 23 October 2024
- Purpose to provide an introduction of the Proposed Development and Applicant
- Seek initial feedback on the Proposed Development and emerging proposal to in-form design refinement
- Identify local schemes or initiatives the Proposed Development could support or deliver to benefit those communities closest to the Proposed Development
- Understand any opportunities to improve consultation methods ahead of Phase Two Consultation
- Three in person public consultation events were held and one virtual webinar hosted
- Feedback on the Proposed Development from all interested parties was sought through a variety of communication channels

Stage 3: Pre-statutory consultation – October 2024 – March 2025

- Landowner engagement – surveys and options meetings
- PINS engagement – pre-statutory consultation meeting
- LPA engagement – post EIA Scoping Opinion meeting and pre-statutory consultation meeting
- Statutory consultees engagement – post EIA Scoping Opinion meetings
- Dean Moor Solar Farm engagement – cumulative effects meetings
- Political and community engagement –statutory consultation soft launch

Stage 4: Statutory consultation – March – April 2025

- Current six week statutory consultation period from 19 March – 30 April 2025
- Purpose to gather feedback on the refined design, proposed mitigation and enhancement and information presented in the PEIR and other draft DCO documents including draft Management Plans
- Identify potential opportunities for community benefits associated with the Proposed Development
- Three in person public consultation events to be held and virtual webinar to be hosted
- Feedback on the Proposed Development from all interested parties sought through a variety of communication channels as detailed on the project website www.lostriggsolar.com

5.2 Design Review Panels

5.2.1 In addition to the public and stakeholder engagement and consultation, design review has taken place and is programmed to take place through a series of reviews at appropriate milestones during the project design development:

- Following the initial landscape and visual sensitivity appraisal process, a critical review of whether the findings of the appraisal represented robust advice as to which of the candidate field parcels should and should not be included in the development area was undertaken. Then the impact of this advice on the viability and deliverability of the Proposed Development was reviewed. It was agreed that a viable development could be designed within the areas of land identified as having medium to low sensitivity whilst avoiding impacts on the most sensitive parts of the landscape.
- Between July and November 2024 a series of internal design team and Applicant facing workshops and review sessions were held during the DCO scoping and PEIR process leading up to statutory consultation. This gave the environmental disciplines in the team ample opportunity to influence the design of the Proposed Development. Following these the Applicant approved a range of design parameters scheduled at Table 6-1.
- A series of internal environmental design review charette sessions where the environmental design lead presents to an independent panel of design discipline

leads is programmed to take place between the start of statutory consultation and the submission of the final DCO application.

6 The design parameters

6.1 Securing good design

6.1.1 This section of the document presents the parameters against which the future detailed design for the Proposed Development must accord. The parameters have been determined through the environmental-led design process and are underpinned by the design principles set out in Table 4-4.

6.1.2 The parameters establish the baseline for securing good design, whilst providing an element of flexibility for aspects of the Proposed Development which may evolve over time, or which are not yet finalised.

6.1.3 Key definitions of relevance to the design parameters will be presented in the draft DCO at application submission stage.

6.2 Enabling flexibility

6.2.1 It is the intention of the Applicant to implement the advice within PINS Advice Note Nine: Rochdale Envelope [10]regarding the degree of flexibility that may be considered appropriate with an application for development consent under the Planning Act 2008.

6.2.2 In particular, the Advice Note outlines that:

- The DCO application documents should explain the need for, and the timescales associated with, the flexibility sought, and this should be established within clearly defined parameters;
- The clearly defined parameters established for the Proposed Development must be sufficiently detailed to enable a proper assessment of the likely significant environmental effects and to allow for the identification of necessary mitigation, if necessary, within a range of possibilities;
- The assessments in the ES should be consistent with the clearly defined parameters and ensure a robust assessment of the likely significant effects;
- The DCO must not permit the Proposed Development to extend beyond the clearly defined parameters which have been requested and assessed. The SoS may choose to impose Requirements to ensure that the Proposed Development is constrained in this way; and
- The more detailed the DCO application is, the easier it will be to ensure compliance with the EIA Regulations.

6.2.3 The Advice Note also acknowledges that “there may be aspects of the design that are not yet fixed, resulting in the need for the EIA to assess likely worst case variations to ensure that all foreseeable significant environmental effects of the Proposed Development are assessed”.

6.2.4 NPS EN-1 additionally sets out in 4.3.12 that “the Rochdale Envelope approach should be utilised where details are still to be finalised and seek to utilised worst case parameters for assessment.” This is of particular importance to maintain due to the ever-evolving technology and speed of development within solar panels and energy storage markets.

6.2.5 For the Proposed Development the design parameters have been set to define a worst-case scenario for the following elements of the design which are not fixed at this time. These have been used to set the Rochdale Envelope for assessment purposes within the PEIR.

6.3 Design parameters

6.3.1 Table 6-1 sets out the known design parameters for the Proposed Development at this stage.

Table 6-1 Design parameters

Element of Proposed Development	Parameter Type	Design Parameter
Ground mounted solar photovoltaic generating station within Northern, Central and Southern Panel Areas comprising – (a) solar panels fitted to mounting structures.		
Solar panels fitted to mounting structures	Location	The solar panels will be located as shown on PEIR Figure 1.2 Layout of Proposed Development in the Panel Areas.
	Location	The Panels Areas will be located on Grade 5, 4 and Subgrade 3b agricultural land.
	Design	The solar panels will be fixed.
	Design	The solar panels will include rows aligned in an east-west rows.
	Design	The solar panels will be positioned on the mounting structures at an angle of between 10 and 30 degrees from horizontal.
	Design	The solar panels will slope towards the south.
	Design	The mounting structure for the solar panels will be a metal frame (usually anodised aluminium alloy).
	Design	Cabling from the solar panels to the hybrid packs will be fixed to the mounting structures above ground. A small section will be placed underground where it leaves the solar panel and connects to the hybrid packs.
	Layout	An 8m buffer will be maintained between solar panels and existing external boundary hedgerows to retain foraging and commuting corridors for bats. This will be 3m from hedgerows to security fencing and 5m from security fencing to solar PV cells.
	Layout	The solar panels will be a minimum of 4m and maximum of 12m distance between the solar panel rows.
	Layout	The layout of the Panel Areas has been designed to respond to known former mining constraints / workings.
	Layout	A 16m buffer will be maintained between solar panels and riparian boundaries and watercourses, comprising of 14m buffer from the perimeter of the watercourse and 2m infrastructure offset from the fencing.
	Layout	Appropriate buffers will be maintained between solar panels and trees with potential bat roost features, in line with British Standard BS 5837 by establishing a construction exclusion zone around their RPA.
	Layout	A minimum 50m buffer between residential dwellings and the nearest solar panels has been applied to mitigate potential effects on residential visual amenity.
	Scale	The maximum height of the solar panels will be 3.5m.
	Scale	The minimum height of the lowest part of the solar panels (i.e. not including the mounting structure) will be 0.8m. Solar panels will be raised sufficiently above the 1.0% AEP flood level and not impede overland flow routes.

Element of Proposed Development	Parameter Type	Design Parameter
	Scale	The mounting structures will be fixed to the ground by galvanized steel poles which are typically driven into the ground to a depth of approximately 1m. This will avoid interaction with the water table. Where the mounting structures are located within a mine shaft or its associated zone of instability, an alternative mounting structure will be proposed, in the form of ballast slabs which sit on the surface rather than penetrating the ground. Ballast slabs may also be required in some parts of the draft Order Limits, in response to geophysical and planned targeted trial trenching. The need for this will be determined prior to the submission of the DCO application.
Hybrid packs comprising – (a) co-located BESS; (b) power conversion units including inverter, transformer and DC-DC converters; (c) containers or enclosures housing all or any of (a) and (b) and ancillary equipment sitting on a concrete foundation slab or placed on metal skids; (d) monitoring and control systems; (e) heating, ventilation and air conditioning systems; (f) fire safety infrastructure including water storage in tanks or other containers, and drainage and water containment features and associated infrastructure; and		
Hybrid packs	Location	The hybrid packs will be located within the Panel Areas as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Location	The hybrid packs will be located on lower quality land Grade 5, 4 and Subgrade 3b.
	Location	The hybrid packs will be located outside the Flood Zones 2 and 3.
	Location	The location of the hybrid packs has been designed to respond to known former mining constraints / workings and avoid the location of all mine shafts and associated zones of potential instability.
	Design	The hybrid packs will be co-located amongst the solar panels throughout the Panel Areas and will contain the BESS, inverter and converter.
	Design	The surface of the hybrid packs will comprise compacted gravel underlaid by a membrane.
	Scale	The hybrid packs will be up to 3.5m in height, up to 22m in length and up to 13m in width.
	Scale	There will be up to 27no. hybrid packs co-located within the Panel Areas.
Power conversion units	Location	The power conversion units will be located within the hybrid packs in the Panel Areas as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Design	Noise generating equipment, including inverters, transformers and converters will be located as far as reasonably possible from existing sensitive receptors.
	Design	The containers will be finished in a light grey, white, dark green or similar.
	Design	The containers which house the power conversion units will be placed on concrete slabs, on compacted gravel and underlaid by a membrane.
	Scale	The containers which house the power conversion units will be up to 3.5m in height, up to 12.5m in length and up to 2.5m in width.
BESS	Location	The BESS will be located within the hybrid packs in the Panel Areas as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Location	The BESS will be located as far as reasonably possible from existing noise sensitive receptors, and at a minimum of 300m from those sensitive receptors where possible. Where necessary acoustic fencing will be located around the BESS.
	Design	There will be no permanent buildings associated with the BESS.
	Design	The BESS containers will be finished in a light grey, white, dark green or similar.
	Design	The BESS containers will be placed on concrete slabs, on compacted gravel and underlaid by a membrane.

Element of Proposed Development	Parameter Type	Design Parameter
	Design	The BESS will require heating, ventilation and cooling systems which will be integrated within the individual containers.
	Design	The BESS containers will be spaced at least 3m apart to prevent the spread of fire and two sides of access will be maintained for local fire service access.
	Scale	The BESS containers will be up to 3.5m in height, up to 12m in length and up to 2.5m in width.
	Scale	If required the BESS acoustic fencing will have a maximum height of 3m.
Customer switchgear comprising – (a) standalone switchgear within the Northern and Southern Panel Area		
Customer switchgear	Location	The customer switchgear will be located within the Northern and Southern Panel Areas as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Design	The customer switchgear will be finished in a grey.
	Design	The customer switchgear containers will be placed on concrete slabs, on compacted gravel and underlaid by a membrane.
	Scale	The customer switchgear will be up to 3m in height, up to 12.5m in length and up to 2.5m in width.
	Scale	There will be up to 2no. customer switchgear in the Northern Panel Area and up to 2no. in the Southern Panel Area.
Storage containers comprising – (a) standalone storage containers to contain extra equipment to support maintenance activities		
Storage containers	Location	The storage containers will be located within the Panel Areas as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Design	The storage containers will be finished in a grey.
	Design	The storage containers will be placed on will be placed on concrete slabs, on compacted gravel and underlaid by a membrane.
	Scale	The storage containers will be up to 3m in height, up to 12.5m in length and up to 2.5m in width.
	Scale	There will be up to 5no. storage containers within the Panel Areas.
33kV electrical cabling and associated works within and between Panel Areas comprising – (a) 33kV electrical cables connecting the solar panels and the hybrid packs to the onsite substation;		
33kV electrical cabling	Location	The 33kV electrical cabling will be located between the Panel Areas and the on-site substation as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Location	Cabling between the Panel Areas and to the on-site substation will be underground in off-road routes within the draft Order Limits.
	Design	A cable plough will be used for the installation of the 33kV electrical cabling. If this is not possible, other methods such as conventional open cut trenching or HDD will be used.
	Layout	Cables will be located in existing gaps in hedgerows wherever feasible.
	Layout	HDD will be used where cables cross existing watercourses, unless there is an existing watercourse crossing or the watercourse is dry and then a cable plough or conventional open cut trenching will be used.
	Layout	The layout of the 33kV electrical cabling outside the Panel Areas has been designed to respond to known former mining constraints / workings and avoid the location of all mine shafts and associated zones of potential instability.
	Layout	The layout of the 33kV electrical cabling outside the Panel Areas has been designed to respond to known ecological constraints.
	Scale	The maximum dimension of the 33kV cable trench will be 1.2m wide by 1.5m deep. The construction working width will be 10m.
On-site substation comprising – (a) substation, switch room buildings, concrete foundations and ancillary equipment including reactive power units; (b) power conversion system units including inverters, switch gear, transformers and ancillary equipment;		

Element of Proposed Development	Parameter Type	Design Parameter
(c) control building housing offices, storage containers and space, welfare facilities, waste storage within a fenced compound, car parking; (d) monitoring and control systems for the solar panels, BESS and onsite substation; (e) 132kV harmonic filter compound; (f) electrical cables; (g) communications mast being not more than 15m in height; (h) deluge system including water tanks and fire suppression, and drainage and water containment features and associated infrastructure; and (i) access gates and tracks, security palisade fencing and bunding.		
On-site substation	Location	The on-site substation will be located within the Central Panel Area as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Location	The on-site substation will be located on Subgrade 3b and Grade 4 agricultural land.
	Design	The on-site substation will be enclosed by palisade fencing.
	Design	The substation buildings will have a concrete slab foundation. The remainder of the substation compound surface will be hardstanding.
	Layout	The layout of the on-site substation has been designed to respond to known former mining constraints / workings and avoid the location of the head wall of the open cast mine.
	Scale	The on-site substation compound will be up to 90m in length and will be up to 70m in width.
	Scale	The electrical equipment will have a maximum height of 8m.
	Scale	The communications tower will have a maximum height of 15m.
	Scale	The parking and turning area will be up to 70m in length and 30m in width.
	Scale	The palisade fencing will have a maximum height of 2.4m.
132kV electrical cabling between the on-site substation and PoC and associated works comprising – (a) 132kV electrical cabling connecting the on-site substation and the PoC; (b) PoC comprising two existing or replacement on-site 132kV pylons and up to two PoC masts; (c) fencing, gates, boundary treatment and other means of enclosure; and		
132kV electrical cabling	Location	The 132kV cabling will be located between the on-site substation and the PoC as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Location	The 132kV cabling will be underground in an off-road route.
	Design	A cable plough will be used for the installation of the 132kV electrical cabling. If this is not possible, other methods such as conventional trenching will be used or HDD will be used.
	Layout	Cables will be located in existing gaps in hedgerows wherever feasible.
	Scale	The maximum dimension of the 132kV cable trench will be 2.0m wide by 1.6m deep. The construction working width will be 30m.
Two existing or replacement on-site 132kV pylons	Location	The two existing or replacement on-site 132kV pylons will be located at the PoC as shown on PEIR Figure 1.2 Layout of Proposed Development to connect to the existing ENW distribution network.
	Location	Should replacement 132kV pylons be required these will be located up to 50m from the existing pylons.
	Design	Should replacement 132kV pylons be required the design of the pylons will seek to match the existing and will likely be installed by the DNO.
	Scale	Should replacement 132kV pylons be required the height of the pylons will match the existing or be lower.
PoC masts	Location	Up to two PoC masts may be used to connect to the existing or replacement on-site 132kV pylons. The PoC masts will be located within 25m of the pylons at the PoC as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Design	Should PoC masts be required they will be a slim monopole design and will likely be installed by the DNO.
	Scale	Should PoC masts be required, the height of the mast will be lower in height than the existing or replacement pylons.
Associated works within and between Panel Areas comprising –		

Element of Proposed Development	Parameter Type	Design Parameter
(a) fencing, gates, boundary treatment and other means of enclosure; (b) improvement, maintenance and use of existing private tracks; (c) laying down of internal access tracks, ramps, means of access, footpaths, roads, including the laying and construction of drainage infrastructure, signage and information boards; (d) works for the provision of security and monitoring measures such as CCTV columns, lighting columns and lighting, cameras, communication infrastructure, and perimeter fencing; and (e) works required for crossing, moving re-routing or over/undergrounding of existing utility assets (including water, gas, sewer pipes, electricity distribution/transmission cabling, telecommunications etc.).		
Fencing, gates and boundary treatments	Location	The fencing will be located as shown on PEIR Figure 1.2 Layout of the Proposed Development.
	Location	The fencing will be located a minimum of 8m from riparian boundaries and watercourses, 5m from existing PRoW and 3m from hedgerows.
	Design	The majority of the fencing will be deer fencing. The fence will be designed in such a way to allow small animals to pass through.
	Design	The fence will be gated.
	Layout	Fencing will be located in existing gaps in hedgerows wherever feasible.
	Scale	The fencing will have a maximum height of 2m.
Internal access tracks	Location	The internal access tracks will be located as shown on PEIR Figure 1.2 Layout of the Proposed Development.
	Location	The access tracks where possible will upgrade and utilise existing private tracks.
	Location	Where new access tracks are proposed they will be located on Grade 5, 4 and Subgrade 3b agricultural land.
	Location	Where possible, access tracks are located outside of Flood Zones 2 and 3. Where tracks are located within the Flood Zones they will remain at grade and utilise existing watercourse crossings over Lostrigg Beck to ensure there is no loss of flood plain.
	Location	The access tracks will be located to pass through existing gates and gaps in hedgerows where feasible.
	Design	The access tracks will be installed or upgraded for construction and remain in place for the lifetime of the project for maintenance and decommissioning.
	Design	The access tracks will be completed as soon as possible and surfaced appropriately to protect soils from runoff and will be maintained throughout operation.
	Design	The access tracks will be permeable to allow water to filtrate through and maintain greenfield runoff rates.
	Design	Any small impermeable areas will have an apron of clean crushed stone to promote natural land drainage conditions. The apron will be at least 1m wide beyond the access footprint with a depth of at least 300mm consisting of 40-70mm crushed stone.
	Scale	The access tracks will be up to 4.5m wide.
Drainage	Design	The detailed operational drainage design will be developed after development consent is granted but prior to construction, likely to be secured as a Requirement of the DCO.
	Design	SuDS will be provided at source, ensuring that surface water run-off is managed consistently with existing site conditions.
Pole mounted CCTV	Location	Pole mounted CCTV will be located within the Panel Areas.
	Design	Infra-red security detection cameras will be mounted on poles.
	Design	The cameras will have motion detection technology for recording.
	Design	The cameras will be pointed directly within the draft Order Limits and away from any land outside of the draft Order Limits
	Scale	The poles will have a maximum height of 3m.

Element of Proposed Development	Parameter Type	Design Parameter
Lighting	Location	In general, the Proposed Development will not be lit but lighting will be required at the on-site substation and hybrid packs for security/safety reasons.
	Design	Manually controlled lighting will be installed at the substation compound and PIR motion-controlled lighting at the hybrid packs will be required. The lighting will not be continuous.
	Design	The lighting will be low level, shrouded and designed and installed to face downward to eliminate the risk light spill impacts. This level of lighting will be minimal, infrequent and transitory.
	Scale	The lighting will have a maximum height of 10m.
Temporary construction and decommissioning access tracks and compounds comprising – (a) works to improve existing farm access from public highway, and install temporary traffic lights, banksmen or other measures to manage traffic; (b) works to excavate and store soil, clear vegetation and obstacles, level, shape and prepare surface for construction track to be installed; (c) storage of equipment and materials including waste skips; (d) civils investigations and works to reinforce ground with weight-bearing support infrastructure, maintain integrity of structures beneath road surface; (e) creation of temporary construction access tracks, laydown and working areas; (f) works required for crossing, moving, re-routing or over/undergrounding of existing utility assets (including water, gas, sewer pipes, electricity distribution/transmission cabling, telecommunications etc.); (g) temporary stopping up of watercourses for installation of culverts, drainage and other features to cross water courses; (h) areas of hardstanding; (i) car parking; (j) site and welfare offices, canteens and workshops; (k) area for download and turning; (l) security infrastructure; (m) site drainage and waste management infrastructure; and (n) electricity, water, waste-water and telecommunications connections.		
Temporary construction access tracks	Location	The temporary construction access tracks will be located as shown on PEIR Figure 1.2 Layout of Proposed Development.
	Location	The temporary construction access tracks where possible will upgrade and utilise existing agricultural tracks.
	Location	Where possible, temporary construction access tracks are located outside of Flood Zones 2 and 3. Where tracks are located within the flood zone they will remain at grade and utilise existing watercourse crossings over Lostrigg Beck to ensure there is no loss of flood plain.
	Location	Where new access construction access tracks are proposed they will be located on Grade 5, 4 and Subgrade 3b agricultural land.
	Location	The temporary construction access tracks will be located to pass through existing gates and gaps in hedgerows where feasible.
	Design	Areas of temporary construction access tracks will be completed as soon as possible and surfaced appropriately to protect soils from runoff and will be retained throughout operation for maintenance and decommissioning.
	Design	Any small impermeable areas will have an apron of clean crushed stone to promote natural land drainage conditions in the vicinity of the structures. The apron will be at least 1m wide beyond the structure footprint with a depth of at least 300mm consisting of 40-70mm crushed stone.
	Scale	The temporary construction access tracks will be up to 4.5m wide.
Temporary construction compounds	Location	One temporary construction compound will be located within each Panel Area away from residential receptors.
	Location	One additional temporary construction compound will be required for the on-site substation and will be located away from residential receptors.

Element of Proposed Development	Parameter Type	Design Parameter
	Location	The temporary construction compounds will be located on low biodiversity habitat.
	Design	A 'Durabase Mat System' or a similar non-ground penetrating mat system will be used within each construction compound.
	Scale	Each temporary construction compound within the Panel Areas will measure up to 60m in length and 30m in width.
	Scale	The temporary construction compound for the on-site substation will measure up to 30m in length and 30m in width and will be located within on-site substation compound.
Temporary construction fences	Design	Temporary construction fences or markers will be used to ensure minimal disturbance of the surrounding land.
Temporary construction lighting	Location	If required temporary task-based lighting, in the form of mobile lighting towers with a power output of 8 kilo volt-amperes (kVA), will be required in areas where natural lighting is inadequate during core working hours.
Works to facilitate access for all works comprising – (a) creation of accesses from or across the public highway; (b) visibility splays; (c) works to widen and surface the public highway; and (d) installation of temporary traffic lights or facilities for manned traffic management.		
Works accesses	Location	The construction and emergency accesses will be located as shown on PEIR Figure 1.2 Layout of Proposed Development
	Location	The construction works accesses will utilise and upgrade existing accesses from the public highway. The two emergency accesses to the Southern Panel Area will utilise new accesses from the public highway.
	Design	Each access point will be approximately 8m wide at the point of entry/exit from the public highway.
	Design	Any small impermeable areas will have an apron of clean crushed stone to promote natural land drainage conditions in the vicinity of the structures. The apron will be at least 1m wide beyond the structure footprint with a depth of at least 300mm consisting of 40-70mm crushed stone.
Works for areas of green infrastructure comprising – (a) soft landscaping and planting, including tree and hedgerow planting; (b) habitat creation and management including earthworks, landscaping, means of enclosure and the laying and construction of drainage infrastructure; and (c) laying down of Permissive Path		
Soft landscaping and planting	Location	Tree and hedgerow planting will be located as shown on the PEIR Figure 2.4 Outline Environmental Masterplan.
	Location	Tree and hedgerow removal and protection will be in accordance with the PEIR Appendix A-13 Arboricultural Impact Assessment.
Habitat creation and management including earthworks, landscaping, means of enclosure and the laying and construction of drainage infrastructure	Location	Potential areas of habitat mitigation, planting and enhancement are shown on the PEIR Figure 2.4 Outline Environmental Masterplan. Exact proposals for habitat creation and management will be determined prior to the submission of the DCO.
	Location	A 16m buffer will be maintained between solar panels and riparian boundaries and watercourses, comprising of 14m buffer from the perimeter of the watercourse and 2m infrastructure offset from the fencing.
	Design	Discrete habitat mitigation, planting and enhancement areas will be provided that will remain free of solar panels, as indicated on the PEIR Figure 2.4 Outline Environmental Masterplan. Exact proposals for habitat creation and management will be determined prior to the submission of the DCO.
Laying down of Permissive Path	Location	The routing of the Permissive Path will be located as shown on the PEIR Figure 2.4 Outline Environmental Masterplan.

Element of Proposed Development	Parameter Type	Design Parameter
Management measures relevant to Order Limits		
	Design	Sediment control measures (silt fences, settlement/attenuation ponds etc.) will be used in the vicinity of watercourses, springs or drains where natural features (e.g., hollows) do not provide adequate protection.
	Design	Permanent relocation or longer-term storage of soils will be re-instated with vegetation as soon as practicable.
	Design	No construction activities will take place within the watercourse buffer zones.
	Design	New watercourse crossings will be designed to ensure they do not disconnect the watercourses at times of low flow and will be designed with appropriate freeboard for flood flow capacity.
	Design	New watercourse crossings will be designed to ensure fish and mammal movement is not restricted, increased erosion will not occur and have a buried invert so the natural bed formation remains in situ.
	Design	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.
	Design	The bare root tree stock will be planted at 2m centres with standard/extra heavy standard trees interspersed at 5m centres to create a varied canopy structure.
	Design	Tree pits should have a radius of at least 75mm greater than that of the root system.
	Design	The proposed tree stock will include standard and extra heavy standard trees in locations planted at between 10-20m centres along the hedgerow.
	Design	The proposed hedgerow species will be planted at 300mm centres in a double staggered row with five plants per linear metre.
	Design	Scrub stock will consist of bare root stock (80-100cm, 1+2 transplants) to be planted at 1.5m centres.
	Design	There will be barn owl boxes installed on retained trees, in locations determined by an ecologist at the time of installation and subject to landowner agreement.
	Design	There will be bat boxes installed on retained trees, in locations determined by an ecologist at the time of installation and subject to landowner agreement.
	Design	Where possible, the design and layout seeks to retain woodland, hedgerows and trees. Where possible trees and hedgerows of value to foraging bats are to be retained, with removal of hedgerow focused on poor quality hedgerow where possible.
	Design	Components of the Proposed Development required for the operation will be removed during decommissioning. Any requirements to leave certain infrastructure, for example the access tracks, will be discussed and agreed with landowners as part of the decommissioning process.
	Design	No new proposed access tracks are within 100m radius of the location of the identified public water supplies. Only solar panels are proposed within these zones.

7 Post-consent design development

7.1.1 The Proposed Development is at a preliminary stage. Further detailed design work will be carried out by the appointed contractor following consent. The current design has been driven by the level of survey effort undertaken, specific on-site constraints such as ecology and coal mining risk, and engagement undertaken with consultees.

7.1.2 Despite this, a degree of flexibility remains, as secured through the parameters presented in Table 6-1.

7.1.3 The Applicant recognises that there will be areas of refinement and matters of detailed design that will be subject to further engagement with statutory bodies and local authorities. This detailed design will largely relate to aspects where flexibility is retained through the draft DCO, for example, the exact cable route installation method.

7.1.4 In preparing the detailed design, the requirement to be included within the draft DCO will ensure that the Applicant accords with:

- The location plan;
- Works plans;
- Environmental masterplan;
- The principles set out in the ES; and
- The final DAD.

7.1.5 The authorised development must then be carried out in accordance with the approved details.

7.1.6 In addition to this requirement, the draft DCO will also contain a number of other Requirements in relation to Management Plans, many of which will be submitted in outline form alongside the DCO application. These management plans contain a number of commitments which have been made in relation to the preliminary design and must be followed and/or delivered by the appointed contractor, through the detailed design and construction phase of the Proposed Development. Outline Management Plans to be submitted alongside the application and available in draft at this statutory consultation stage are set out in Table 7-1.

Table 7-1 Management Plans

Management Plan	Purpose	Stage
PEIR Appendix C-1 Outline Construction Environmental Management Plan	Sets out how negative environmental impacts will be minimised during construction.	Construction
PEIR Appendix C-2 Outline Construction Traffic Management Plan	Sets out how construction traffic and staff vehicles will be managed during construction.	Construction
PEIR Appendix C-3 Outline Soil Resources Management Plan	Sets out the overall approach to managing soil resources affected by the Proposed Development.	Construction

Management Plan	Purpose	Stage
PEIR Appendix C-4 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.	Operation
PEIR Appendix C-5 Outline Landscape and Ecological Management Plan	Sets out the management of the landscape and ecological features of the Proposed Development.	Construction Operation Decommissioning
PEIR Appendix C-6 Outline Public Rights of Way Management Plan	Sets out how PRoWs will be managed to ensure they remain safe to use, and disruption to users of the PRoW is minimised.	Construction Operation Decommissioning
PEIR Appendix C-7 Outline Decommissioning Environmental Management Plan	Sets out how negative environmental impacts will be minimised decommissioning.	Decommissioning

7.2 Management, maintenance and monitoring

Construction

7.2.1 As likely significant effects on some environmental receptors will occur during construction of the Proposed Development, monitoring of these effects will be undertaken in accordance with the following management plans:

- PEIR Appendix C-1 outline CEMP;
- PEIR Appendix C-2 outline Construction Traffic Management Plan;
- PEIR Appendix C-3 outline Soil Resources Management Plan;
- PEIR Appendix C-5 outline LEMP; and
- PEIR Appendix C-6 outline PRoW Management Plan.

7.2.2 The implementation of the mitigation planting during construction will be monitored by the Applicant during the works to ensure that best practice relating to ground preparation, plant handling and planting techniques is followed. This monitoring will be undertaken in accordance with the measures set out within the outline LEMP, which will be submitted with the DCO and developed further post-consent. The draft of the outline LEMP is provided in PEIR Appendix C-5 outline LEMP.

Operation

7.2.3 The successful establishment and effectiveness of the environmental mitigation measures described in the PEIR and shown on PEIR Figure 2.4 Outline Environmental Masterplan will be managed and monitored in accordance with the following operational management plans:

- PEIR Appendix C-5 outline LEMP;
- PEIR Appendix C-6 outline PRoW Management Plan; and
- PEIR Appendix C-7 outline Decommissioning Environmental Management Plan.

7.2.4 Monitoring of the growth and maintenance of planting and habitats will be undertaken by the Applicant during the first five years following planting to ensure its successful establishment.

7.2.5 All environmental measures incorporated into the design of the Proposed Development will be routinely inspected, managed and maintained during the contract period in accordance with the requirements as stipulated within the relevant final management plans. The content of the final management plans will be based on the outline management plans submitted with the DCO application.

7.2.6 Such maintenance and management practices will include inspecting and, where necessary, replacing defective elements to ensure that all measures are fully functional and planting establishes and achieves their intended environmental functions and objectives.

7.2.7 Landscape and ecological measures largely comprise planting and seeding which are living features that grow and establish over time. PEIR Appendix C-5 outline LEMP explains that after the establishment period, the longer-term maintenance and management will commence. To ensure their successful establishment this will be monitored by landscape architects during bi-annual inspections of proposed measures up to year 15 of operation.

7.2.8 At year 15 a monitoring visit will be made by the Applicant to each viewpoint identified within the LVIA and to each habitat features predicted to experience significant visual effects to ensure that the proposed mitigation has established and is delivering its intended function.

7.2.9 Should the measures be found not to have established as intended or be insufficient to provide the required function, remedial works will be undertaken as necessary. These works could, for example, include establishing further planting within the draft Order Limits to augment that already in place.

Opportunities for enhancement

7.2.10 Strategic opportunities to incorporate environmental enhancements have been identified through the design development process to date. These are shown on PEIR Figure 2.4 Outline Environmental Masterplan.

7.2.11 The Applicant is currently exploring the following potential mitigation and enhancement opportunities (subject to landowner agreement):

- Management of the habitats within and around the solar panels to optimise their biodiversity value as far as possible, for example, to encourage tussocky and species-rich neutral or other lowland acid grassland (dependant on soil type), ideally to create priority habitat which is reflective of the baseline habitat conditions and areas outlined for enhancement under the Local Nature Recovery Strategy;
- Adjusting grazing regimes on potential mitigation / enhancement areas outside the Panel Areas, to encourage the development of priority habitat including species-rich neutral and/or acid grassland or purple moor-grass and rush pasture (dependant on soil type) and promote specialist invertebrates;
- Promotion of structurally varied habitat with the creation of small areas of mixed native woodland, planting of mature trees and hedgerow and the retention of small

amounts of bare ground amongst the existing woodland, hedgerow, ditch and stream network to promote specialist invertebrates;

- Enhancement of Green Infrastructure around the Lostrigg Beck and River Marron within the draft Order Limits to support wider Local Plan objectives and policies and project BNG commitments;
- Provision of a new Permissive Path for walkers through the draft Order Limits to connect fragmented parts of the existing PRoW network;
- Management of retained standing and fallen deadwood to promote invertebrates;
- Establishment of gaps beneath perimeter fencing/gates to allow free passage of mammals ideally aligned with existing pathways;
- Provision of barn owl, bird and bat boxes within the draft Order Limits subject to landowner agreement; and
- Where feasible management of existing wildlife ponds to provide habitats for invertebrates and amphibians.

7.2.12 Further work will continue during the preparation of the ES to identify ither environmental enhancement opportunities, which will be embedded within the design of the Proposed Development.

7.2.13 This will include further multi-disciplinary working to define opportunities to deliver BNG and wider Environmental Net Gain, which will be illustrated on the Environmental Masterplan submitted with the DCO application. This will include consideration of the opportunities to enhance natural capital and ecosystem services through the Proposed Development and connections with the wider green infrastructure network.

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