Cottam Solar Project

Environmental Statement Chapter 4:
Scheme Description
Revision A (Tracked)

Prepared by: Lanpro Services
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Cottam
SOLAR PROJECT

Contents

Issue Sheet

Report Prepared for: Cottam Solar Project Ltd.
DCO Submission

Environmental Statement Chapter 4: Scheme Description Revision A (Tracked)

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4 Scheme Description

4.1 Introduction

4.1.1 This chapter provides a description of the proposed Scheme. The physical characteristics of the Scheme are described alongside the key activities that would be undertaken during construction, operation, maintenance and decommissioning. The description of the Scheme as set out in this chapter, informs the technical assessments within chapters 7 to 21 of the ES.

4.1.2 This chapter should be read alongside the following plans and Figures:

DCO Plans

- Location Plan (indicating the Order Limits) **[~~EN010133/~~APP~~/C2.1~~-005]**.
- Works Plans **[~~EN010133/~~APP~~/C2.4~~-007]**.
- Public Rights of Way Plan ~~**[EN010133/APP/C2.5**~~ **[AS-008]**.
- Access Plan **[~~EN010133/~~APP~~/C2.6~~-009]**.

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4.1.3 Illustrative engineering drawings and sections are provided at **Appendix 4.1 [~~EN010133/~~APP~~/C6.3.4.1~~-066]**. These drawings are:

1. Mounting Structure – Tracker Panels.
2. Mounting Structure – Fixed Panels.
3. Mounting Structure – Fixed Concrete Feet Details
4. Solar Inverter details.
5. Battery Storage Container detail.
6. Battery Storage Inverter detail.
7. Water Tank details.

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8. Cottam 1 Sub Station Compound
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16. Cable Trench cross sections.
17. HDD trench section fo132kV, 400kV and Fibre Cables
18. Deer fencing detail.
19. CCTV standard detail.
20. Fence and Gate Elevations.
21. Temporary Construction and Decommissioning Laydown Area Illustrative Layout

4.2 Project Overview and Works Packages

4.2.1 The Scheme comprises a number of land parcels (the 'Site' or 'Sites') described as Cottam 1, 2, 3a and 3b (see Location Plan **[~~EN010133/~~APP~~/C2.1~~-005]** or **Figure 1.1** of the ES) which accommodate ground mounted solar photovoltaic (PV) generating stations (incorporating the solar arrays); grid connection infrastructure and energy storage; and the Cable Route Corridors. The Scheme will comprise the construction, operation and maintenance, and decommissioning of a generating station (incorporating solar arrays) -with a total capacity exceeding 50 megawatts (MW). The Scheme is defined as a NSIP under Sections 14(1)(a) and 15(2) of the Planning Act 2008 (Ref 4-1), as it is an onshore generating station in England with a capacity of more than 50 MW.

4.2.2 The solar array Sites and associated substations and energy storage are to be connected to the National Grid at a substation at Cottam Power Station. The Scheme will connect to the National Grid substation via a new 400kV substation constructed as part of the Scheme to provide the connections to the various solar Sites. The substations, cable connections and energy storage will be required for the duration of the Scheme. The substations and energy storage will be decommissioned and removed at the end of the lifetime of the Scheme but the underground cables are anticipated to be decommissioned in situ to minimise environmental impacts.

4.2.3 The operational life of the Scheme is anticipated to be 40 years. Once the Scheme ceases to operate, it will be decommissioned. A 40-year period for the operational phase of the Scheme has been assessed in the EIA and reported in this ES.

Works Packages

4.2.4 The Order limits comprise 1451.23 ha and include all the land required for the key components of the Scheme set out below including highway improvement and mitigation works. The Scheme is also described in Schedule 1 of the draft DCO **[EN010133/~~APP~~EX1/C3.1_B]** where the "authorised development" is divided into works packages, and the works numbers for those packages are summarised below and referred to throughout this chapter (note that the works package areas overlap):

Work No. 1: Solar Photovoltaic Generating Stations at Cottam 1 (Work No. 1A, 586.61 ha), Cottam 2 (Work No. 1B, 109.04 ha), Cottam 3a (Work No. 1C, 139.34 ha) and Cottam 3b (Work No. 1D, up to 62.4 ha), known as 'The Solar Farm Site' or 'Sites' for ease of refence throughout this ES;

Work No 2: Energy Storage Facility (Option A) at the Cottam 1 Site of 6.75 ha;

Work No 3: Energy Storage Facility (Option B) at the Cottam 1 Site of up to 8.67 ha;

Work No 4: On-site substations at each solar farm Site (Work No. 4A, Cottam 1 2.86 ha; Work No. 4B, Cottam 2 0.7 ha; Work No. 4C, Cottam 3a 0.7 ha; Work No. 4D, Cottam 3b 0.7 ha);

Work No 5: Works at Cottam Power Station to facilitate the grid connection;

Work No.6: Grid connection cable works connecting the four Solar Farm Sites (Work No.1A – 1D) to the main on-site substation at Cottam 1 (Work No. 4A) and subsequently to the Point of Connection (POC) at Cottam Power Station (Work No.5) including the provision of access tracks, construction laydown areas (construction compounds), jointing bays and fibre optic communications chambers. Work No. 6 includes the construction of the parts of the grid connection located in proximity to the cable connections for the Gate Burton Energy Park and West Burton Solar Project (the 'Shared Cable Corridor');

Work No. 7: Works associated with each of the Solar Farm Sites including fencing, gates, boundary treatment and other means of enclosure; the provision of security and monitoring measures such as CCTV columns, lighting columns and lighting, cameras, weather stations, communication infrastructure, and perimeter fencing; landscaping and biodiversity mitigation and enhancement measures including planting; improvement, maintenance and use of existing private tracks; laying down of internal access tracks, ramps, means of access, footpaths, permissive paths, cycle routes and roads, including the laying and construction of drainage infrastructure, signage and information boards; temporary footpath diversions; earthworks; SuDs Ponds, runoff outfalls, general drainage and irrigation infrastructure and improvements or extensions to existing drainage and irrigation systems; electricity and telecommunications connections; and secondary temporary construction compounds;

Work No 8: Temporary construction and decommissioning laydown areas within each of the Solar Farm Sites and works associated with these including areas of

hardstanding; car parking; site and welfare offices and workshops; security infrastructure, including cameras, perimeter fencing and lighting; area to store materials and equipment; site drainage and waste management infrastructure (including sewerage); and electricity, water, waste water and telecommunications connections.

Work No 9: Works to facilitate both temporary construction access, and permanent access to the Solar Farm Sites and Cable Route Corridors (including the Shared Cable Route Corridor);

Work No. 10: Works to create and maintain Habitat Management Areas (80.93 ha);

Work No.11: Works to provide a permissive footpath from Stow village to Stow Pastures including landscaping and biodiversity mitigation and enhancement measures.

4.2.5 The Scheme also includes further associated development in connection with Work Nos. 1 to 11 including fencing, gates, boundary treatment and other means of enclosure; bunds, embankment, trenching and swales; irrigation systems; drainage systems; services and utilities connections; works to alter the course of non-navigable rivers, streams or watercourses; ramps, bridges and means of access; security and monitoring measures; improvement, maintenance and use of existing private tracks; footpath diversions and enhancement; landscaping and related works; habitat creation and enhancement; site establishment and preparation works; earthworks and excavations; works for the protection of buildings and land; tunnelling, boring and drilling works; and other works to mitigate any adverse effects on the construction, maintenance, operation or decommissioning of the Scheme.

4.3 Rochdale Envelope

Flexibility and Design Parameters

4.3.1 The need for flexibility in design, layout and technology is recognised in National Policy Statement EN-1 as elements of a development may not be finalised. To accommodate flexibility, a 'Rochdale Envelope' approach is used, as described in the Planning Inspectorate Advice Note 9 (Ref. 4-2). This involves assessing the maximum (and where relevant, the minimum) parameters for the Scheme where flexibility needs to be retained~~,~~ while ensuring all potentially significant effects (positive or adverse) are considered. The principles and justification for this approach are set out in Chapter 2: EIA Process and Methodology of this ES **[~~EN010133/~~APP~~/C6.2.2~~ 037]**.

4.3.2 The maximum design scenarios are identified from the range of potential options for each design parameter for the Scheme. The maximum design scenario assessed is therefore the scenario which would give rise to the greatest potential impact. The maximum design scenarios are set out in the Concept Design Parameters and Principles document **[EN010133/~~APP/4.2~~EX1/C7.15_A]** which is secured by a Requirement in the draft DCO.

4.3.3 Whilst it is inherent in the DCO process that flexibility can be built ~~in to~~into the Scheme (particularly through the Works Plans [~~EN010133/APP/C2.4~~AS-007]), key areas of optionality that have been included in this DCO Application are:

Table 4.1 Optionality Sought Within the Scheme

Optionality Sought	Assessment Considerations
PV panel type – 'trackers' and 'fixed'	Whilst it is likely that the Scheme will utilise tracker solar panels, optionality is included within the application to be able to utilise fixed panels. Tracker panels have a maximum height parameter of 4.5 metres, whereas fixed panels are up to 3.5 metres. Landscape and Visual - The assessment considers the maximum height parameters of 4.5m. Hydrology, Flood Risk and Drainage – The assessment considers the siting of both types of panels in higher flood risk areas. The tracker panels can be angled to ensure that any flood sensitive equipment can be raised above the 1 in 100 year flood event level. For fixed panels the minimum height above the ground in flood risk areas, will be increased by increasing the height of the lower end of the panel mounting frames, to ensure that there is at least 0.6m freeboard between the maximum water level of the 1 in 100 year flood event level and the bottom of the panel. This will not increase the maximum specified height of 3.5m. Noise – any noise emissions associated with tracker panels has been considered. Glint and Glare – The glint and glare assessment has been based on the illustrative site layouts and considers both panel options.
Energy Storage Options	The application proposes that the Energy Storage Facility for the Scheme will be located within the Cottam 1 Site. Two alternative layouts are presented for energy storage. Anticipating advances in technology, Option A (Work No.2) proposes a smaller area for energy storage, with Option B (Work No.3) allowing for a more extensive area. The more extensive area and therefore greater energy storage capacity, may be required if the demand from the grid dictates a need at the time of implementation of the Scheme. The potential contributions of an energy storage asset to the electricity market are: trading, balancing mechanism, frequency response, reserve operation, reactive power, inertia, black start, constraint management, reduction in new infrastructure requirements if collocated with generation assets. Solar panel and battery energy storage technology is developing rapidly resulting in improved performance which in turn can change the area of land required for the most efficient layout; Options A and B allow for scenarios predicted by the developer. The developer will give consideration to these factors when determining which option to pursue. The developer will require the approval of the local authority for the detailed design of the Energy Storage Facility. The favoured option will be the subject of this application. In the Option A

	scenario, solar panels will be constructed where that land is not required for energy storage. Landscape and Visual – the maximum height of any structures associated with the Energy Storage Facility is 3.5m. The assessment has therefore considered the worst case scenario which is Option A given that the maximum parameter for solar tracker panels is 4.5 metres in height. Noise – The noise assessment considers Option B as a worst case scenario given the combined noise emissions associated with the energy storage units and the Cottam 1 sub-station (Work No.4A) (which is proposed to be co-located with the Energy Storage Facility, and the more extensive energy storage equipment.
Fire suppression water storage	Water will be required to be stored on site in close proximity to the energy storage systems. This water will be stored in either above ground tanks or open water bodies so that they can be accessed by the fire service in the unlikely event of a fire. Both options are retained in the DCO and assessed in the ES.

4.3.4 The Works Plans **[~~EN010133/APP/C2.4~~AS-007]** indicate the maximum extents of different types of development (i.e. ~~,~~ panels, substations, cabling etc.) for which development consent is being sought can be located and have informed the assessment of environmental impacts.

4.3.5 Whilst illustrative layout plans have been included in the DCO Application (Figures 4.1 – 4.8) this represents one example of how the Scheme could be developed in accordance with the Concept Design Parameters and Principles. The ability of the Applicant to micro-site during construction is an important consideration and this may be required to reflect any technological advancement or changes in plant design or shape. The draft DCO submitted with the application **[EN010133/~~APP/3~~EX1/C3.1_B]** includes in Schedule 2 pre-commencement Requirements obliging the Applicant to submit to the relevant planning authority for approval the final detailed design proposals prior to commencement of construction of the Scheme. These Requirements would have the effect of demonstrating that the final detailed design remains within the design parameters (and therefore the Rochdale Envelope standards considered in this ES) and accords with the design principles identified within the Concept Design Parameters and Principles document **[EN010133/~~APP/7~~EX1/C7.15_A]**.

4.3.6 The Scheme's temporal timescales (construction, operation and decommissioning) that have been adopted for the purposes of the assessments (as outlined in **Chapter 2** of the ES~~),~~ **[APP-037])**, are as follows:

a) The Scheme currently has a grid connection date of 2029 although there is the potential that an earlier connection could be achieved. It is currently anticipated that construction works will commence, at the earliest, in Q4 2024

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and will run to Q4 2026. As such, the construction programme for the entire Scheme is anticipated to be 24 months with the potential likelihood of overlapping construction works on the different Scheme Sites. This is anticipated to be the following:

- Cottam 1:
  - North – 529 working days (Month 1 – 24)
  - South – 440 working days (Month 1 – 20)
  - West – 337 working days (Month 1 – 15)
- Cottam 2: 251 working days (Month 1-11)
- Cottam 3a: 242 working days (Month 9-20);
- Cottam 3b: 178 working days (Month 11-19)

This scenario has been assessed in this ES;

b) The operational life of the Scheme is anticipated to be 40 years and decommissioning is therefore estimated to be no earlier than 2066. Decommissioning is expected to take between 12 and 24 months. A 24 month decommissioning period has been assumed for the purposes of a worst case assessment in this ES, unless specifically stated otherwise. A requirement to decommission the Scheme is secured via a Requirement in the draft DCO.

c) 'Shared Cable Route corridor'. As noted at **Chapter 2** of the ES, part of the Gate Burton Energy Park cable route and West Burton Solar Project cable route will fall within the cable corridor for the Scheme, in the vicinity of Cottam Power Station. The cumulative environmental effects of the simultaneous or sequential construction of these cables has been assessed in the ES. This is in order to seek to minimise potential environmental effects and identify the benefits of combined construction activities. To accommodate the potential sequential installation of all three projects' ducts and cables, a five-year construction duration is adopted for this, and assessed in this ES. This will be over the period Q1 2024 to Q1 2029. This period has been chosen given that the grid connection dates for Cottam is 2029, West Burton 2028 and Gate Burton Energy Park 2028 and it allows for these works to take place within that period.

4.3.7 Further details regarding the construction of the Scheme are set out in Section 4.6 of this chapter.

Shared Cable Route Corridor

4.3.8 Given the proximity of the Scheme with West Burton and the Gate Burton Solar Project being progressed by Low Carbon, the Applicant and Low Carbon have worked in partnership to identify areas where all projects can collaborate to manage environmental effects. A key example of this approach is the commitment to a

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Shared Cable Route Corridor. Other proposed commitments to joint mitigation are identified below:

- Cultural Heritage: within the Shared Cable Route Corridor, a joint approach to archaeological mitigation. This will streamline the mitigation and achieve a consistent approach within the shared area.
- Water Environment: joint consultation with the Environment Agency and Trent Valley Internal Drainage Board for the purpose of pre-construction permits and consents should these be required;
- Noise and Vibration and Air Quality: co-ordinated monitoring, and a Joint Community Liaison Group during construction of the Shared Cable Route Corridor;
- Ecology and Nature Conservation: for the purpose of the Shared Cable Route Corridor, the Framework Construction Environmental Management Plan (CEMP) includes a commitment to working together where there is overlap in surveys, pre-construction mitigation and monitoring between projects; and
- Traffic and Transport: commitment to a Joint Construction Traffic Management Plan (CTMP) which will include mitigation such as timing of HGV movements, staff travel routes and timings, coordination of deliveries, and shared banksmen provided at access points and PRoW.

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4.4 Design Parameters

4.4.1 The design of the Scheme has been an iterative process, based on the various environmental assessments and consultation with statutory and non-statutory consultees. Chapter 5: Alternatives and Design Evolution of this ES describes this process further, including options that have been considered and discounted or considered and amendments made to the Scheme design. The Design and Access Statement also submitted with the DCO Application **[~~EN010133/~~APP~~/C7.6~~-342 to APP-345]** explains the design process, rationale and solution.

4.4.2 A number of the detailed design aspects and features of the Scheme cannot be confirmed until the tendering process for the design and construction of the Scheme has been completed. Use of design parameters is therefore being adopted to present a likely worst-case assessment of potential environmental effects of the Scheme that cannot yet be fixed. Wherever an element of flexibility is maintained, the likely worst-case impacts have been reported in the ES. This ES and the assessments within it are based on the works proposed in the draft DCO Schedule 1 **[EN010133/~~APP~~EX1/C3.1_B]**, the Works Plans **[~~EN010133/APP/C2.4~~AS-007]** and the Concept Design Parameters and Principles document **[EN010133/~~APP~~EX1/C7.15_A]**. The Applicant will commit to the 'design parameters' and the 'design principles' within the DCO. These parameters and principles have been taken into account for the purposes of the assessment in the ES.

4.4.3 Each Scheme component is described in more detail in Section 4.5 below.

4.5 Components of the Scheme

4.5.1 The description of the key Scheme components are set out below and are based on the Works No.s (or 'Works Packages') summarised above:

The Ground Mounted Solar Photovoltaic Generating Stations (Work No.1)

The Solar Farm Sites

4.5.2 Illustrative layouts of the Solar Farm Sites Figures are provided as part of this Chapter which show an indicative layout of solar PV infrastructure throughout the Sites. The layout of the solar PV infrastructure has been determined through the assessment of various environmental constraints; and through consultation with stakeholders, landowners and utilities asset owners.

4.5.3 The design process for the solar Sites has incorporated a number of off-sets from features such as drainage ditches, watercourses, water bodies, hedgerows and tree lines, tree canopies, utilities, public rights of way, and residential dwellings, as identified in the Concept Design Parameters.

Solar PV Panels

4.5.4 Solar PV panels convert sunlight into electrical current (as direct current 'DC'). These are typically 'monofacial', meaning that they consist of a series of photovoltaic cells beneath a layer of toughened glass on the upper surface of the module. 'Bifacial' modules are a relatively new technology and have PV cells and toughened glass on both the upper and lower surface, allowing sunlight to be converted to electricity on both sides of the panel. The Scheme may use either, or a combination of both types of panels, although visually and environmentally there is negligible difference between the two. The panel frame encasing the cells is typically built from anodised aluminium.

4.5.5 A range of PV technologies are developing rapidly and may be available at the time of construction; therefore the generating capacity, technology type and size of individual PV Panels are not specified in the DCO Application, rather the maximum total surface area of all PV Panels is limited to the area shown on the Works Plan for Work No. 1.

Mounting Structures

4.5.6 PV Panels will be mounted on a metal assembly of PV Mounting Structures, called "PV Tables". The PV Tables include metal rails (usually made of aluminium) to directly support the PV Panels; those rails will be supported by larger metal frames (usually made of galvanised steel), which are fixed on top of metal piles. The metal piles are also typically made of galvanised steel and are driven into the ground to a maximum depth of up to 3.5m.

4.5.7 The draft DCO seeks consent for both tracker and fixed panel options within the array Sites. The following design parameters have been assessed in the ES and are

set out in the Concept Design Parameters and Principles document which are secured in the draft DCO:

Tracker

- The maximum height of the highest part of the tracking solar PV modules at its greatest inclination will be 4.5m.
- The maximum height of the highest part of the tracking solar PV modules when horizontal will be 2.5m.
- The minimum height of the lowest part of the tracking solar PV modules at its greatest inclination will be 0.4m.
- The tracking solar PV modules will be aligned in north-south rows, and incline to the east or west up to a maximum inclination of 60 degrees from horizontal.

Plate 4.1 Typical Tracker Panels

Fixed

- The maximum height of the highest part of the fixed solar PV modules will be 3.5m.
- The minimum height of the lowest part of the fixed solar PV modules will be 0.6m.
- The fixed solar PV modules will be aligned in east-west rows, and slope towards the south at a fixed slope of 15 to 35 degrees from horizontal.

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Plate 4.2 Typical Fixed Panels (with Inverters)

4.5.8 For the purposes of the ES, the tracker panels have been assessed in Chapter 8 of the ES Landscape and Visual Impact Assessment **[~~EN010133APP/C6.2.8~~APP-043]** as a worst-case scenario given their larger scale. Chapter 15 of the ES Noise **[~~EN010133/APP/~~APP~~/C6.2.15~~-050]** assesses tracker panels given that fixed solar panels do not have any moving parts and therefore have no noise emission associated with them. Chapter 16 of the ES Glint and Glare considers both fixed and tracker panel options.

4.5.9 Foundations are most likely to be galvanised steel poles driven into the ground. These will either be piles rammed into a pre-drilled hole, with a pillar attaching to a steel ground screw. Maximum depth of piled mounting structures will be 3.5m below ground level. Foundations in areas of archaeological interest will be concrete feet onto which the mounting structures will be affixed.

Plate 4.3 Panels on Concrete Feet

4.5.10 Separation distance between rows of tracking panels will be a minimum of 3.0m at the closest point, and there will be a maximum distance of 12.0m between solar module centrelines.

Conversion Units (inverters, transformers, switchgear, and monitoring and control systems)

4.5.11 The Conversion Units incorporate the inverters, transformers and switchgear and are required to manage the electricity generated by the PV Panels. These would either be standalone equipment or they would be housed ('integrated') together within a container. The Concept Design Parameters allow for both options. Both options would sit on a concrete foundation slab, strips or footings for each of the units and a levelling layer of aggregate with a maximum depth of 0.8m; or a concrete plinth set atop the topsoil where non-ground-penetrative works are required. Inverters are required to convert the DC electricity collected by the PV Panels into alternating current (AC), which allows the electricity generated to be exported to the National Grid.

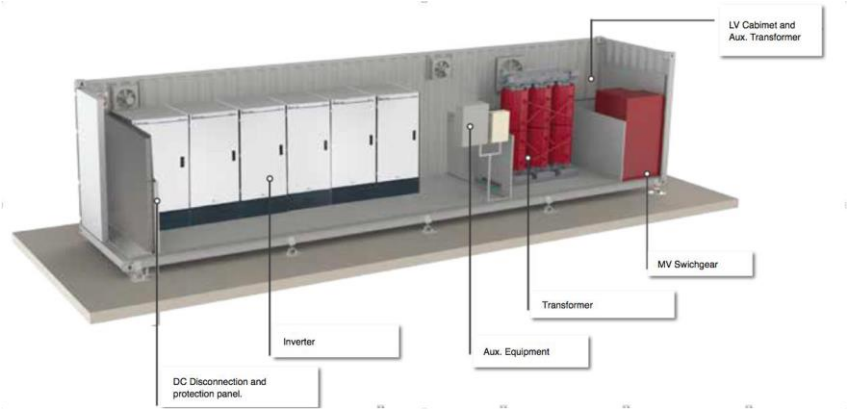
4.5.12 Transformers are required to step up the voltage of the AC electricity generated by the inverters across the solar sites before it reaches the site substation.

4.5.13 Switchgear is the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used both to de-energise equipment to allow work to be done and to clear faults.

4.5.14 An integrated Conversion Unit would comprise one or two central inverters, transformers and switchgear all housed within a complete, pre-assembled and pre-configured unit with maximum dimensions as set out in the Concept Design Parameters of 15m in length by 5m in width and a maximum height of up to 3.5m in height (unless sited within a higher risk flood zone, in which case it could be up to 4.5 m in height). The external finish for the integrated containers will be in keeping with the prevailing surrounding environment, most likely with a light grey (or white) painted finish. Monitoring and control systems would consist of manual controls at

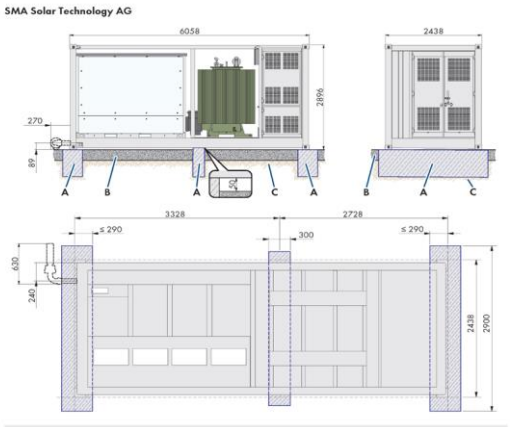
the conversion units, and automatic and centralised monitoring and control features at the control rooms on the onsite substations. An example is shown below.

Plate 4.4 Integrated Conversion Unit



4.5.15 The maximum parameters of an inverter will be 9m in length by 6.5m in width and 3.5m in height. Inverters will sit in containers, externally finished to be in keeping with the prevailing surrounding environment, most likely with a light grey painted finish. An example is shown below.

Plate 4.5 Typical Inverter Unit



Position	Designation
A	Strip foundation
B	Pea gravel ground
C	Solid ground, e.g., gravel

4.5.16 The following design parameters apply to standalone transformers:

- The maximum parameters of the transformer will be 5.5m in width by 6.5m in length and 3.5m in height.
- Externally finished to be in keeping with the prevailing surrounding environment, most likely with a green, light grey or white painted finish.

4.5.17 The following design parameters apply to standalone switchgear equipment:

- The maximum footprint will be 2.5m in width by 6.5m in length and a maximum height of 3.5m, sited within the dimensions of the solar station. There will be one switchgear per solar station.
- Externally finished to be in keeping with the prevailing surrounding environment, most likely with a green, light grey or white painted finish.

Plate 4.6 Conversion Unit (independent equipment)

4.5.18 Conversion units will be required on each Site at a maximum rate of one conversion unit per 2.5 MW of peak solar energy generation. Resultantly a maximum number of conversion units would be required as follows:

- Work 1A "Cottam 1" – 215;
- Work 1B "Cottam 2" – 45;
- Work 1C "Cottam 3a" – 55;
- Work 1D "Cottam 3b" – 30.

DC electrical ('combiner') boxes

4.5.19 These are required to combine the cables from the solar panels to link to the Conversion Units. The Maximum width of the boxes is 0.55m, maximum length 0.65m and maximum height 0.26m. Up to a maximum of 24 DC boxes per inverter is set out in the Concept Design Parameters and Principles document.

Inter Solar Panel Electrical Cabling

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4.5.20 Electrical cabling will be required between the PV panels, conversion units and on-site substations. This will be a combination of above ground and underground cabling. For example, suspended cabling may be required in areas of archaeological sensitivity. An example of suspended cabling is shown below.

Plate 4.7 Suspended Cabling System

Energy Storage Facility (Work No.s 2 and 3)

4.5.21 The DCO Application proposes that the energy storage for the Scheme will be located within Cottam 1. Two alternative layouts are presented for energy storage. These are Work No. 2 and Work No. 3. The ES has considered both options. As stated above, solar panel and battery energy storage technology is developing rapidly resulting in improved performance which in turn can change the area of land required for the most efficient layout; the options allow for scenarios predicted by the developer. The developer will give consideration to these factors when determining which option to pursue.

4.5.22 Work No.2 proposes the Energy Storage Facility for the Scheme. This is shown on Figure 4.3 (Cottam 1 West 'A' Solar Project, Illustrative Layout). Work No. 3 proposes additional areas for energy storage shown on Figure 4.4 (Cottam 1 West 'B' Solar Project, Illustrative Layout). The areas for energy storage in both options are positioned amongst Work No.1A) at the Cottam 1 'West' Site. If Option A were pursued, a more extensive area for solar panels will be facilitated through Work No.1A. In terms of environmental impacts, there is the potential for reduced landscape and visual impacts associated with Work No.3 (when considering it against Work No.3) given the energy storage units are lower than the tracker panels. However, the more extensive Energy Storage Facility that could be implemented through Work No.3, has the potential to give rise to greater noise impacts. These are considered in the relevant ES chapters.

4.5.23 The Energy Storage Facility is designed to provide peak generation and grid balancing services to the electricity grid by allowing excess electricity generated either from the solar PV panels, or imported from the electricity grid, to be stored in

and dispatched when required. The DCO Application and this ES assumes that the form of energy storage will be battery storage and as such, the Energy Storage Facility as it is termed in the draft DCO Schedule 1, is often referred to as a 'BESS' (Battery Energy Storage System) throughout the ES documents. The Energy Storage Facility will utilise a lithium ion energy storage system. The batteries, inverters, transformers and switchgears ('conversion units' as explained below) will be mounted on a concrete foundation in a single compound. A piling solution may be required, depending on the results of geotechnical surveys. If piling is required, it would involve piling up to 12m in depth.

4.5.24 One BESS compound will be required for Works No.2 and 3 for Works No.3. The final layout of the BESS compound will be determined during detailed design.

4.5.25 The batteries will be housed within containers. The maximum dimensions of individual modular battery storage container and interconnector container within a BESS compound is 2.0m width by 3.0m length and up to 3.5m in height. The maximum dimensions of modular battery storage and interconnector container strings within a BESS compound is 24.0m by 3.0m footprint and up to 3.5m in height. This is based on strings consisting of up to 12no. modular containers. These containers may be modular and joined depending on equipment choice to be determined at detailed design stage. **Plate 4.8** below shows a typical battery storage compound configuration.

4.5.26 The battery units will also incorporate a conversion unit which includes inverters, transformers, switchgear and an energy management system.

Plate 4.8 Battery Storage Compound

4.5.27 The precise number of individual battery storage containers will depend upon the level of power capacity and duration of energy storage that the Scheme will require. However, the maximum total surface area for the energy storage is limited to the

area shown on the Works Plan for Work No.2 or Work No. 3 (depending on the option taken forward).

4.5.28 Each BESS will require a heating, ventilation and air conditioning or liquid cooling system to ensure the efficiency of the batteries, which will be integrated into the containers or housed separately in its own container or control room. This may involve a HVAC or liquid cooling system that is external to the containerised unit located either on the top of the unit or attached to the side of the unit. If this uses air to heat and cool it will have a fan built into it that is powered by auxiliary power.

4.5.29 The monitoring and control system operates, isolates, and controls the exported power from the BESS. This will comprise a building of similar dimensions to the containers; either an adapted container or built from GRP, located within the main BESS compound within the same container or room as the HVAC or liquid cooling system or in its own container or control room. This is incorporated within the maximum parameters for the BESS compound. As the Scheme design develops, the likely configuration of equipment will be determined based upon environmental and technical factors. A reasonable worst-case scenario has been assessed based on maximum parameters.

4.5.30 Onsite cabling will be required between battery stations and battery containers, and between battery stations and the onsite substation. Underground maximum cable trench dimension will be a depth of 0.4m and 0.4m wide. Cabling between battery containers and battery stations will be above ground in cable trays or laid in an underground trench. Cabling between battery stations and the onsite substation will be in an underground trench.

BESS – Fire Safety

4.5.31 The Outline Battery Storage Safety Management Plan [~~EN010133/~~APP~~/C7.9~~-348] provides the requirements for the BESS in the event of a fire. It outlines the requirement for two sources of firefighting water: internal automated sprinkler or water mist system; and firefighting water for the Fire and Rescue team.

4.5.32 Each BESS container will be fitted within an automatic sprinkler or water mist system for fire suppression in the event of a fire. The water supply for this system will be integrated into the design of each BESS container and located either internally or externally (centralised or decentralised) to each BESS. The containment of this water would be within a sump integrated into the BESS container.

4.5.33 External firefighting water storage units accommodating no less than 228000 litres in capacity (as agreed with the Lincolnshire Fire and Rescue Services), will be provided for use by fire fighters in case of a fire in the BESS compound. Water would be stored in either steel panel tanks or bunded open water areas.

4.5.34 Each BESS area would be lined with a bunded impermeable surface to prevent water used during firefighting operations infiltrating into the soils underlying the BESS area. Surface water would run from the impermeable surface to a bunded lagoon capable of capturing 242.5m3 of fire water. The lagoon would have a volume of

approximately 410m3, which would allow the water to be stored following an emergency event and removed from Site if contaminated.

Substations (Work No.4)

4.5.35 Substations will be required at each Solar Farm Site. Maximum parameters for the onsite substations, including control building or container, welfare facilities, hardstanding areas and hardstanding parking areas therein, but excluding the full extent of the cabling are outlined below:

Site Area Parameter:

- Work 4A "Cottam 1" – 2.90 ha
- Work 4B "Cottam 2" – 0.70 ha
- Work 4C "Cottam 3a" – 0.70 ha
- Work 4D "Cottam 3b" – 0.70 ha

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Height Parameter:

- Work 4A "Cottam 1" – 13.2m
- Work 4B "Cottam 2" – 6.5m
- Work 4C "Cottam 3a" – 6.5m
- Work 4D "Cottam 3b" – 6.5m

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4.5.36 The Works Plans identify the areas where the substations can be located and illustrative layout drawings include an example configuration ~~-~~for each substation. A 132kV substation is required at Cottam 2, Cottam 3a and Cottam 3b, with a larger 400kV substation to be required at Cottam 1.

Plate 4.9 Typical (large 400kV) power transformer

4.5.37 The substations will consist of electrical infrastructure such as the transformers, switchgear and metering equipment required to facilitate the export of electricity from each respective Site. They will include office space and welfare facilities and may also include operational monitoring and maintenance equipment (operational monitoring equipment could be housed separately in its own container). Waste water associated with welfare facilities at the substations will be contained in a septic tank to be emptied as and when required, by tanker. The control buildings will be a painted block building with external colours and finishes subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will, most likely be as similar as feasibly possible to a grey colour such as Goose Grey (HEX code 848889). Hardstanding will be provided at each substation and parking spaces.

4.5.38 The maximum height of the substation at Cottam 1 will be 13m to the top of the busbars. The maximum height of the sub-stations at Cottam 2, 3a and 3b will be 6.5m to the top of the busbars 2.6m high palisade fencing will be provided around the substation compound.

Grid Connection Works at Cottam Power Station (Work No. 5)

4.5.39 Works at the existing National Grid Cottam 400KV substation Site to facilitate connection to the Scheme will include re-equipping an existing (but currently unused) generator bay with a 400KV circuit breaker, current transformers, metering current transformer/voltage transformer (CT/VT) units and line disconnector for the 400KV connection to the Cottam 1 Solar Site. Provision of a stand-alone building to house duplicate feeder protection systems, commercial metering systems, National Grid owned protection and control equipment and User Remote Control and data acquisition apparatus.

Works to lay electrical cables - the Cable Route Corridor (Work No. 6A) and Shared Cable Route Corridor (Work No.6B)

Cottam Cable Corridor (Work No.6A)

4.5.40 The electricity generated by the Scheme will be exported to the National Grid substation at Cottam Power Station via a number of underground cable circuits sited within the cable route corridor. The works / components to be located within the cable route corridor are:

1. A 400kV cable circuit (consisting of up to 3 No. cables) cables will export the power generated by the Scheme and power stored at the BESS from the substation at Cottam 1, to the National Grid substation at Cottam Power Station. The length of this cable is approximately 13.3 km.
2. A 132kV cable circuit (consisting of up to 3 No. cables) will export power from the substation at Cottam 3a to the substation at Cottam 1. The length of this cable is approximately 14.2km.
3. A 132kV cable circuit (consisting of up to 3 No. cables) will export power from the substation at Cottam 3b to the substation at Cottam 1. The length of this cable is approximately 12.6km.
4. A 132kV cable circuit (consisting of up to 3 No. cables) will export power from the substation at Cottam 2 to the substation at Cottam 1. The length of this cable is approximately 9.3 km.

4.5.41 Each of these cable circuits are also required to facilitate the import of electricity to be stored within the BESS at Cottam 1.

4.5.42 The Cable Route Corridor (Work No. 6A) broadly extends to 50m in width (there may be slightly wider areas where the Route deviates).

4.5.43 The exact location of the cable circuits within the cable route corridor, will be determined at the detailed design stage. For assessment purposes, the placing of the cable anywhere within the Cable Route Corridor (Work No.6A) has been considered, including the avoidance of environmentally sensitive locations.

4.5.44 Design parameters for the Cable Route Corridor are:

- Where set in surface-dug trench, the maximum width of the dug cable trench for a single 132kV circuit is 0.6m set within the 50m cable corridor. This applies

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except where jointing bays or horizontal directional drilling sections are located.

- Where set in surface-dug trench, the maximum width of the dug cable trench for two parallel 132kV circuits is 1.0m set within the 50m cable corridor. This applies except where jointing bays or horizontal directional drilling sections are located.
- Where set in surface-dug trench, the maximum width across the dug cable trenches for a single 400kV circuit is 1.1m set within the 50m cable corridor. This applies except where jointing bays or horizontal directional drilling sections are located.
- Where set in surface-dug trench with no constraints, the maximum depth of the dug cable trench is 1.5m below ground level. Where crossing existing buried utilities or apparatus, the maximum depth of the dug cable trench is 1.5m below the level of the existing apparatus.
- Where set in horizontal directional drilling sections, the maximum bore of a single drilled cable tunnel is 1.0m.
- Where multiple circuits are directional drilled along parallel paths, the minimum separation distances between drilled cable circuits is 3.0m.
- Where set in horizontal directional drilling sections, the maximum depth of the drilled cable tunnel is 25m below ground level. This depth is required because the River Trent is tidal, and has high river banks owing to its flow rate. The water surface level can be 6m below the river bank level, which constitutes the ground level. The surface water level can be 5m deep to the silt level. The silt level is likely to be 1m deep before the river bed level has been achieved. Average depths to be achieved for an HDD is 3m below river bed level. Launch and receive pits are anticipated to be some distance away from the river, and so 25m gives some flexibility to account for the depths of the river and that the ground will likely have a gradient.
- Smaller obstacles such as ditches and hedgerows which require HDD would only be drilled to a depth of 5m or less below ground level.
- Electrical cables will be direct buried or set in ducts arranged as either a single or two parallel circuits, with each circuit set in trefoil formation.
- Trenches will be cut with vertical walls.

4.5.45 The voltage of the cables and the number of circuits will affect the width and number of cable trenches required. However, the width and spacing of the cable trenches may differ depending on environmental constraints, engineering requirements or if crossing third party apparatus (e.g. railway lines). A Typical arrangement for 132 kV and 400 kV cables is provided on the drawing 132kV and 400kV Cable Trench Cross Section within **Appendix 4.1**.

4.5.46 In terms of installation, the cables will be laid directly into the trenches, or ducting will be installed, and the cables pulled through the ducting. Where the cable route encounters obstacles such as tree root systems, the width of the cable route (both permanent and temporary) may change locally. Jointing bays will be a minimum of 500m to a maximum of 2000m apart. Based on this, between 14 – 55 jointing bays are anticipated across the Scheme. The dimensions of these are determined by how many sets of cables will be in the jointing bay. A joint bay for six cables / joints would be approximately 20m long and 6m wide and approximately 3m deep. The base of the joint bay must be level and a concrete pad installed (approximately 150mm thick with light reinforcement) as a working surface. The sides of the excavation are shored to prevent collapse.

Plate 4.10 Typical Joint Bay

4.5.47 The base of the jointing bays will be lined with a concrete floor and sandbags will be stacked above this to support the cables where required. Excavated soil will then be backfilled on top of the installed cables.

4.5.48 Fibre communications chambers will be required and are likely to be provided every 500 to 750m, ~~-~~but could be every 2000m apart if required, along the cable route. These will be located in hard surface or at edges of fields with the final location to be determined at detailed design. The excavation for this type of chamber would be approximately 1.4m length X 0.9m wide and 1.2m deep. The appearance is provided in the images below. These would stand 10mm-20mm above ground.

Plate 4.11 Fibre Chambers (construction and external appearance)

4.5.49 The cable route will need to cross a range of existing infrastructure such as major roads, minor roads and tracks, PRoW, existing buried/underground utilities (such as medium and high-pressure gas mains), railways, rivers, field drains and main drains. All potential crossings are identified in the Crossing Schedule **[EN010133/~~APP~~EX1/C7.17~~]~~. A]**. Open cut trenching will be primarily utilised for crossings. The open cut technique may require the temporary closure of PRoWs, and minor roads and tracks. All temporary closures of PRoWs will be avoided as far as possible. The management of PRoW's during construction is addressed in the Outline Public Rights of Way Management Plan **[EN010133/~~APP~~EX1/C6.3.14.3 A]** appended to Chapter 14 of the ES (Transport and Access).

4.5.50 The Outline CTMP and Public Rights of Way Management Plan of the ES, provide further detail regarding closure of PRoWs and minor roads and tracks.

4.5.51 As noted above there is the need for HDD construction techniques at a number of locations across the cable corridor, however, this will depend on the results of ground investigations and the final detailed design. At certain crossing locations such as railways; and watercourses such as the Rivers Trent and Till, HDD will be required. This is addressed in the Crossing Schedule **[EN010133/~~APP~~EX1/C7.17 A]**.

4.5.52 HDD techniques will require a launch pit to be excavated at the starting point for the machinery to drill from, to a 'reception pit' to be excavated at the end point where the machinery will drill to. These launch pits and reception pits will be up to 2m deep, 8m in length and 4m wide. Both launch and reception pits will be a minimum distance of ~~10m~~16m from a watercourse and will be backfilled and reinstated following installation of the cables. The precise location and dimensions of the launch and reception pits will be determined during detailed design.

'Shared' Cable Route Corridor (Work No.6B)

4.5.53 As discussed in Chapter 2 of the ES, the combined construction effects of a number of cable circuits will be considered in this assessment.

4.5.54 Part of the Gate Burton Energy Park cable route and West Burton Solar Project cable route are proposed to be located within the cable route corridor for the Scheme's cable circuits (the Shared Cable Route Corridor). This is identified as Work No.6B on the Works Plans. The cumulative environmental effects of the simultaneous or sequential construction of these cable circuits have been assessed in this ES. This is in order to seek to minimise potential environmental effects and identify the benefits of combined construction activities.

4.5.55 The basis for assessment of the cumulative scenarios is set out below:

- The DCO Application will seek development consent for the Scheme's cable circuits only. The proposed West Burton DCO Application will seek development consent for its cable, and the proposed Gate Burton DCO Application will seek development consent for its cable. Part of the cable route corridors for all three projects are proximate to each other, however, it has not yet been determined exactly where each cable circuit will be micro-sited or the exact crossing point(s). For this reason, the Shared Cable Corridor shown as Work No. 6B on the Works Plans is wide enough to accommodate all three cable circuits. The exact location of the Scheme's cable circuits within the Shared Cable Corridor will be determined at the detailed design stage post DCO consent in collaboration with the promoters of the Gate Burton Energy Park and the West Burton Solar Project. Where appropriate and practicable to do so, the intention of the Applicant and the promoters of the Gate Burton Energy Park and the West Burton Solar Project is to coordinate the discharge of any pre-construction requirements relating to works in the Shared Cable Corridor. It is anticipated that there will be no significant cumulative operational effects, associated with the cables once they are constructed and the land re-instated, that need to be assessed in this ES. The construction and decommissioning phases have been assessed.
- Two cumulative scenarios have been considered for each environmental aspect:
  - i) The construction of all three projects' ducts and cables at the same time, within the same construction programme. The ES assumes an 18 months duration for this. In this scenario, the likely construction method would be for all three projects' ducts to be installed at the same time, but the cables would all then subsequently be 'pulled through' separately, at the appropriate time during the construction programme for each individual project. An assessment of all ducts dug and installed together in the early period of the 18 month construction period, and three lots of separate cable-pulling activities over the 18 month construction period has been considered. For cable duct construction assumed works for all three projects consist of haul road, compounds / laydown areas, bridge crossings (bailey bridges), horizontal drilling activities and associated laydown areas. For cable pulling the assessment has assumed the haul

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road, compounds / laydown areas have remained in situ; and that the additional works associated with the cable pulling is the construction of the joint bays and communications chambers.

ii) The installation of each projects' ducts and cables, sequentially over a 5 year period. Over this period, it is assumed that haul roads, laydown areas / compounds and bridges remain in situ for the 5 year period. This would represent a worst case scenario from an assessment perspective given the potential for on-going construction activities over this period.

4.5.56 The Shared Cable Route Corridor (Work No. 6B) varies in width and is 620m at it its widest (at the connection to Cottam PS), and 365m just north of Cottam Road. Design parameters for the Shared Cable Route Corridor are:

- Where set in surface-dug trench, the maximum width of the dug cable trench for the electrical cables is 4.1m set within the 50m cable corridor. This applies except where jointing bays or horizontal directional drilling sections are located.
- Where set in surface-dug trench with no constraints, the maximum depth of the dug cable trench is 1.5m below ground level. Where crossing existing buried utilities or apparatus, the maximum depth of the dug cable trench is 1.5m below the level of the existing apparatus.
- Where multiple circuits are trenched along parallel paths, the minimum separation distances between cable circuits is 5.0m.
- Where set in horizontal directional drilling sections, the 3no. cables making up a single electrical cable circuit will be drilled through individual bores separated by approximately 5.0m set within the 50m cable corridor.
- Where set in horizontal directional drilling sections, the maximum bore of a single drilled cable tunnel is 1.0m.
- Where multiple circuits are directional drilled along parallel paths, the minimum separation distances between drilled cable circuits is 5.0m.
- Where set in horizontal directional drilling sections, the maximum depth of the drilled cable tunnel is 25m below ground level.
- Electrical cables will be set in ducts or directly buried arranged in parallel formation. Trenches will be cut with vertical walls.

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Various Works Within the Solar Farm Sites (Work No.7)

4.5.57 Work No. 7 includes for a range of works within the Solar Farm Sites including fencing, security measures, lighting, landscaping ('green infrastructure'), laying down of access tracks, earthworks, SuDs features, and construction laydown areas.

Fencing, Security and Lighting

4.5.58 Perimeter fencing will be deer wire mesh and wooden post fencing with a maximum height of 2.5m as illustrated in Plate 4.9.

Plate 4.12 Typical Deer Fencing

4.5.59 Pole mounted internal facing CCTV systems will be used around the perimeter of the operational elements of the Sites. It is anticipated that these will be galvanised steel painted green poles with a maximum height of 3m.

4.5.60 There will be palisade fencing around the substations and energy storage compound which will have a maximum height of 2.6m.

Plate 4.13 Steel Palisade Fence

4.5.61 Lighting is not required within the solar arrays. Lighting will be provided within substations and within the Energy Storage site to be used only in the event of it being required for maintenance and security purposes. Down lighting would be used on lighting columns of a maximum height of 3m.

Landscaping

4.5.62 The Scheme has been designed to integrate with and enhance the local green infrastructure network, improving ecological and recreational connectivity across the Order limits. The proposed planting design has responded to landscape and ecological character.

4.5.63 Areas under the solar panels and around the perimeter of the Sites will be planted with native grassland mix, and hedgerows will be planted or augmented to provide visual screening (see Figures 8.16.1 – 8.16.10 Detailed Landscape Mitigation Plans for all sites Ref: ~~APP~~**[EN010133/EX1/C6.4.8.16.1 ~~APP~~ A to EN010133/EX1/C6.4.8.16.10~~)~~]).** More 'strategic' landscaping and habitat creation and enhancement areas proposed within the scheme are addressed and described, under Work No.10.

4.5.64 An Outline Landscape and Ecological Management Plan (OLEMP) **[EN010133/~~APP~~EX1/C7.3_A]** has been prepared to accompany the DCO application. This document sets out the principles for how the land will be managed throughout the operational phase, following the completion of construction. A detailed LEMP will be produced and submitted to the relevant planning authority for approval following the granting of the DCO and prior to the start of construction, which is secured by a Requirement in the draft DCO.

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Internal Access Tracks

4.5.65 Access tracks will be constructed within each of the Sites. The width of internal access tracks will be between a minimum of 3.0m and a maximum of 6.0m. Internal access tracks will be hardcore or gravel over a levelling layer of substrate, subject to ground load-bearing capacity and archaeological features.

Surface Water Drainage

4.5.66 Chapter 10 of the ES: Hydrology, Flood Risk and Drainage **[EN010133/~~APP~~EX1/C6.2.10_A]** addresses surface water drainage. Given the nature of the Scheme, the increase of permanent impermeable area on the Site will be negligible, however equipment such as the proposed substations and BESS will generate increased surface water runoff when compared to the current undeveloped nature of the Site. There can be no off-site detriment in terms of surface water runoff rates and volumes and therefore it is proposed to maintain the predevelopment surface water regime post development. This will be achieved through:

- Utilising permeable surfacing (Type 2 aggregate) for the Site access, ensuring that surface water is retained where it falls and is allowed to infiltrate to subsoils as per the existing situation.
- Installation of linear infiltration trenches around Critical infrastructure (the substations and battery storage compounds) or any other required hardstanding such as concrete bases. Infiltration trenches will ensure that any surface water generated by hardstanding is retained adjacent to the infrastructure, allowing it to infiltrate to subsoils as per the existing situation.
- The solar panels have the potential to concentrate rainfall under the leeward edge of the panels themselves. Research in the United States by Cook & McCuen~~-~~, suggested this increase would not be significant however, there is a potential increase in silt ladened runoff. With the implementation of suitable planting (such as a wildflower or grass mix) the underlying ground cover is strengthened and is unlikely to generate surface water runoff rates beyond the baseline scenario.

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4.5.67 Given the nature of the battery storage within the scheme, there is a potential risk of fire which could result in the mobilisation of pollution within surface water run-off.

4.5.68 Where practical, at detailed design stage it is recommended that runoff from the battery storage area will be contained by local bunding and attenuated within gravel subgrade of lined permeable SuDS features prior to being passed forward to the local land drainage network. In the event of a fire a system of automatically self-actuating valves at the outfalls from the battery storage areas will be closed, isolating the battery storage areas drainage from the wider environment. The water contained by the valves can then be tested and either treated and released or

tankered off-site as necessary and in consultation with the relevant consultees at the time.

4.5.69 Local fire water provision has also been provided adjacent to the battery storage sites as requested by the fire department.

4.5.70 The DCO will include a Requirement for the approval of written details of the surface water drainage scheme and (if any) foul water drainage system to be in accordance with the outline drainage strategy **[~~EN010133/~~APP~~/C6.3.10.1~~-090]**.

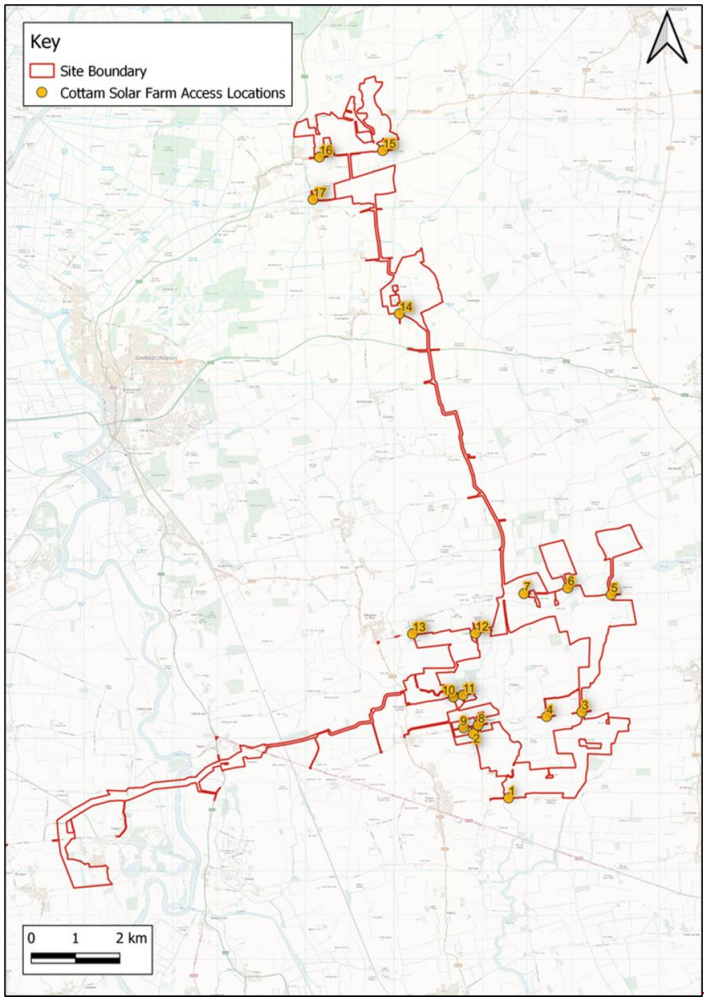
Secondary Construction Laydown Areas

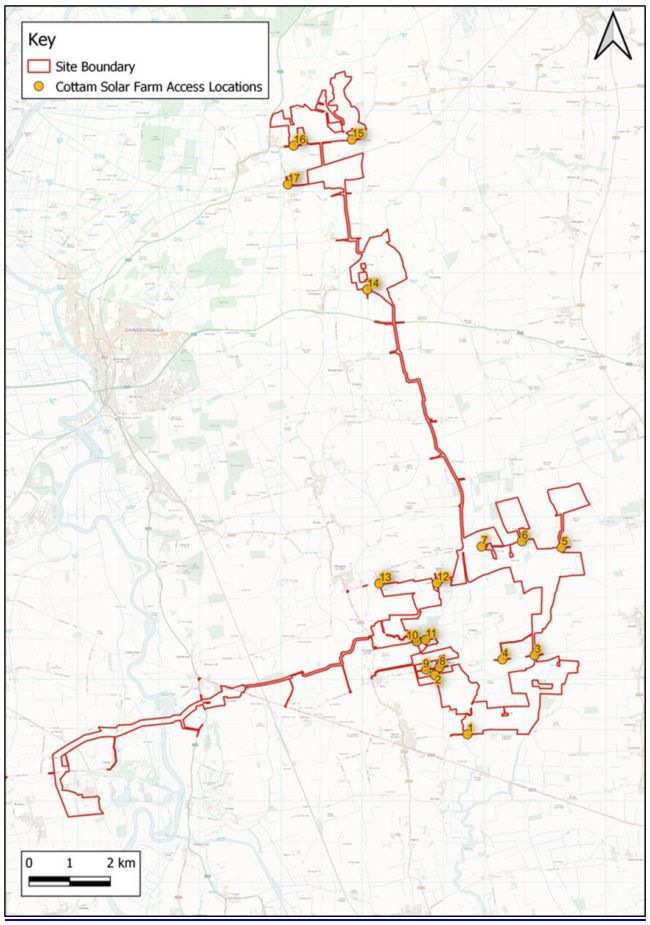
4.5.71 The main laydown areas for site construction are part of Work No. 8 and are described in section 4.6 'Construction', below. Additional secondary construction laydown areas may be required to facilitate construction within each of the Solar Farm sites. Access (Work No.9)

4.5.72 Work No.9 comprises works for the creation of permanent and temporary (construction) accesses to the Solar Farm Sites and Cable Route Corridor from the public highway; the creation of visibility splays; works to alter the layout of any street or highway temporarily; and offsite works for the facilitation of movement of any abnormal loads.

4.5.73 Permanent and temporary access points are described and assessed in detail in the Transport Assessment **[EN010133/~~APP~~EX1/C6.3.14.1_A]** and Outline Construction Traffic Management Plan (CTMP) **[EN010133/~~APP~~EX1/C6.3.14.2_A]** at **Appendices 14.1** and **14.2** to the Transport and Access Chapter of the ES. There will be a total of 17 access points for Cottam 1, 2 and 3a and 3b. The access locations to the Solar Farm Sites (Cottam 1, 2 and 3) are shown in **Figure 4.1** below:

Figure 4.1 Access Locations – Cottam 1, 2 3a and 3b





4.5.74 The accesses and their use are described in the table below:

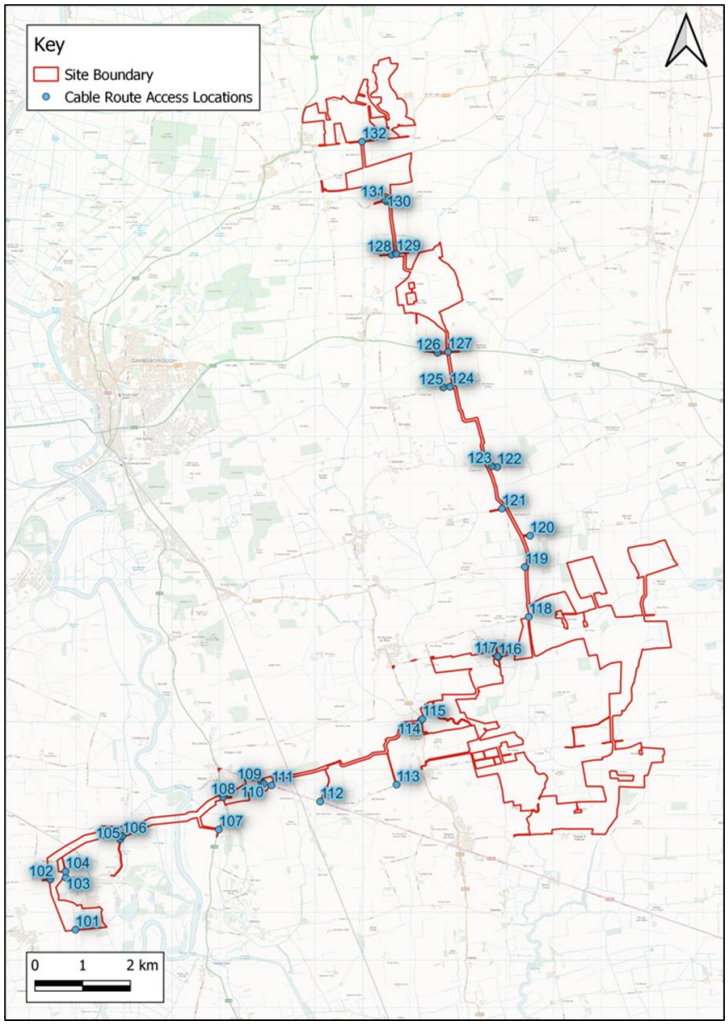
Table 4.3 Proposed Accesses - Cottam 1, 2 3a and 3b

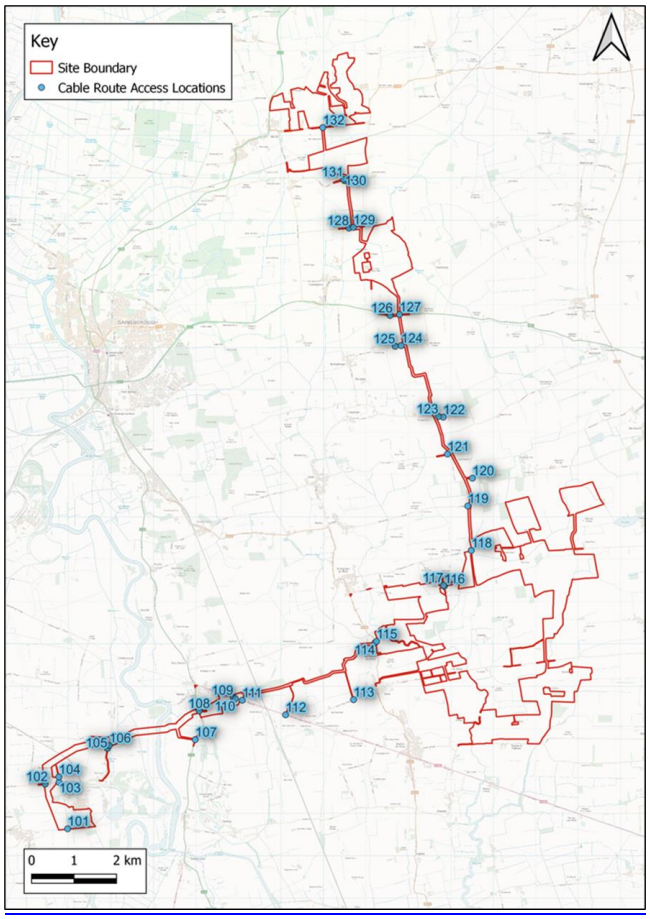
Figure and Drawing Ref	Location	Description	Use
Cottam 1 South			
1	Thorpe Lane, at Thorpe Bridge	Improved existing field access	Construction Operational
2	Fleets Lane, 200m south of Ingham Road	Improved existing field access	Construction Operational
Cottam 1 North			
3	Stow Lane (North), between Blackthorn Hill and Furze Hill	Improved existing field access	Construction
4	Stow Lane, Grange Farm access	Existing field access	Operational
5	Willingham Road, Fillingham Grange track (North and South)	Improved existing access	Construction Operational
6	Willingham Road, Adj. North Farm	Improved existing access	Construction Operational
7	Willingham Road, West of Turpins Farm	Improved existing access	Construction Operational
Cottam 1 West			
8	Ingham Road, 100m east of 31 Ingham Road	Improved existing field access	Construction
9	Green lane Track from Coates Lane to Ingham Road, 400m north of Ingham Road	Existing green lane access	Operational
10	Coates Lane, at River Till bridge	Improved existing field access	Construction Operational
11	Coates Lane, 200m east of River Till bridge	Improved existing field access	Construction Operational

12	South Lane	Improved existing field access	Construction Operational
13	Stone Pit Lane, at Cot Garth Lane	Improved existing field access	Abnormal Load
Cottam 2			
14	Access road from East Lane to A631, adj. Corringham Grange	Improved existing field access	Construction Operational Abnormal Load
Cottam 3a			
15	B1205 Kirton Road, adj. Blyton Park Driving Centre	Existing access	Construction Operational
16	B1205 Kirton Road, 150m west of JG Pears	Existing access	Construction Operational Abnormal Load
Cottam 3b			
17	Station Road/Pilham Lane, adj. Glebe Farm	Improved existing field access	Construction Operational Abnormal Load

4.5.75 For the construction of the Cable Route Corridor, 32 temporary accesses are required, approximately one every kilometre. The locations of these accesses are shown in Figure 4.2 below.

Figure 4.2 Access Locations – Cable Route Corridor





4.5.76 The Accesses are described in the table below:

Table 4.4 Proposed Accesses Cable Route Corridor

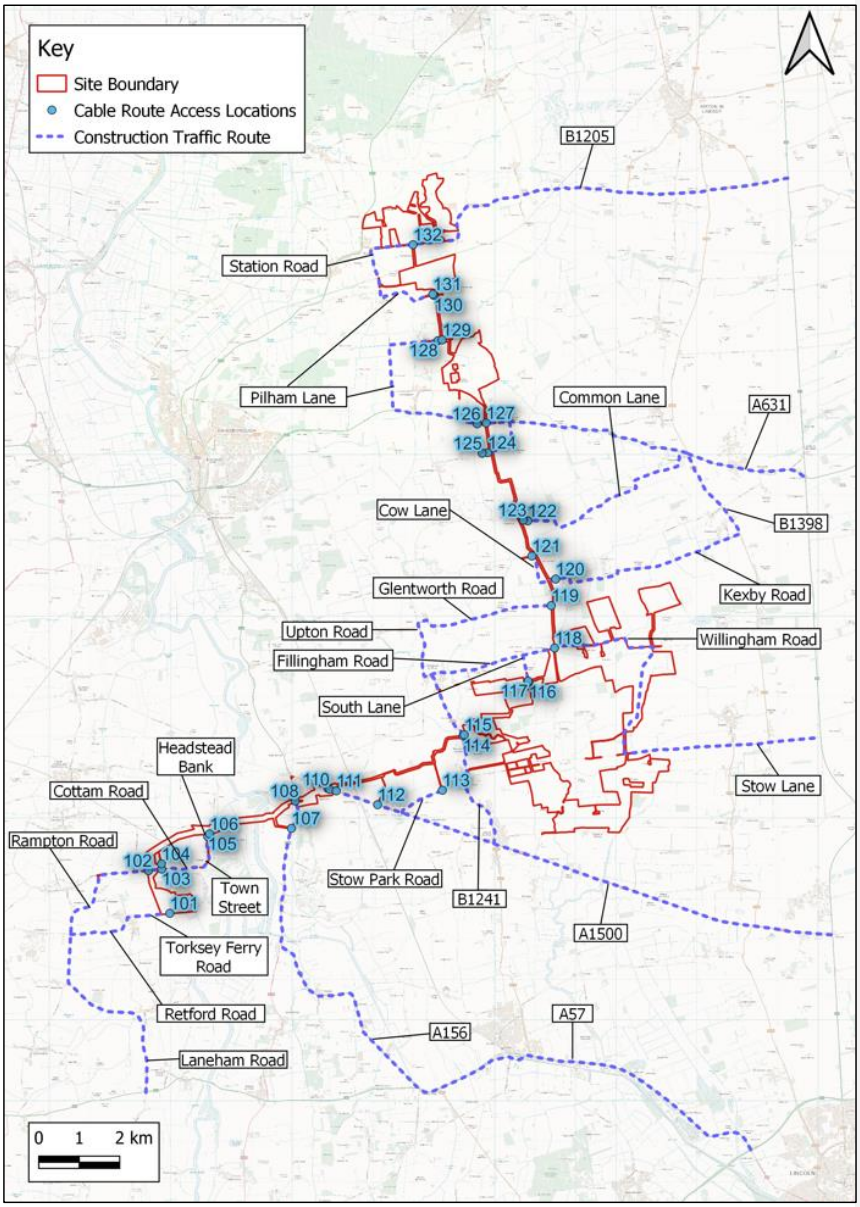
Figure and Drawing Ref	Location	Description	Use
101	Torksey Ferry Road, opp. Nightleys Road	Improved existing field access	Shared cable route (with Gate Burton) from Cottam Power Station to Rampton Thorns drains
102	Cottam Lane, 150m west of Cow Pasture Lane	Improved existing field access	Shared cable route from Rampton Thorns drains to Cottam Lane
103	Cottam Lane, to the west of Cow Pasture Lane	Improved existing field access	Shared cable route from Cottam Lane to Cow Pasture Lane
104	Cow Pasture Lane	Improved existing access	Shared cable route from Cow Pasture Lane to Cottam Power Station branch railway
105	Headstead Bank (west), 250m south of Broad Lane	Improved existing field access	Shared cable route from Cottam Power Station branch railway to Headstead Bank
106	Headstead Bank (east), south of Broad Lane	Improved existing field access	Shared cable route from Headstead Bank to River Trent
107	A156 Lea Road, via Footpath Bram/66/1	Improved existing field access	Shared cable route from River Trent to Brampton drain
108	A156 High Street, 200m south of Chestnut House	Improved existing field access	Shared cable route Brampton drain to A156
109	A1500 Stow Park Road (north), west of Marton	New field access	Shared cable route from West Burton Solar Project WB3 Site to A1500
110	A1500 Stow Park Road (south), west of Marton	New field access	Shared cable route from north of A1500
111	A1500 Stow Park Road, Marton Grange track	Improved existing field access	Cable from A1500 to Sheffield-Lincoln railway line
112	A1500 Till Bridge Lane, Manor Farm track	Improved existing field access	Cable from Sheffield-Lincoln railway line to Sustain Solar Farm
113	Wooden Lane	Improved existing field access	Cable from Sustain Solar Farm to Wooden Lane
114	B1241 Normanby Road, West Farm access	Improved existing field access	Cable from Wooden Lane to B1241

Figure and Drawing Ref	Location	Description	Use
115	B1241 Normanby Road, East Farm access	Improved existing field access	Cable from B1241 to Cottam 1 substation
116	South Lane, opp. Lowfield Farm	Improved existing field access	Cable from Cottam 1 substation to South Lane, Willingham
117	South Lane, 200m south of Moor Farm	Improved existing field access	Cable from South Lane, Willingham to Moor Bridge drain
118	Fillingham Lane	Improved existing field access	Cable from to Moor Bridge drain to Gipsy Lane Bridge
119	Glentworth Road, 600m south of Kexby Road	Improved existing field access	Cable from Gipsy Lane Bridge to Kexby Road, Glentworth
120	Kexby Road, 100m east of Glentworth Road	Improved existing field access	Cable from Kexby Road to Cow Lane
121	Cow Lane, 1100m east of Upton Grange	Improved existing field access	Cable from Cow Lane to unnamed drain
122	Common Lane (south), 250m east of Heapham Cliff	Improved existing field access	Cable from unnamed drain to Heapham
123	Common Lane (north), 250m east of Heapham Cliff	Improved existing field access	Cable from Common Lane to Bratt Field South Road
124	School Lane (south), 350m west of Grange Cottage	Improved existing field access	Cable from Bratt Field South Road to School Lane
125	School Lane (north), 350m west of Grange Cottage	Improved existing field access	Cable from School Lane to A631
126	A631 Harpswell Lane (north), 600m west of Grange Lane	Improved existing field access	Cable from School Lane to A631
127	A631 Harpswell Lane (south), 600m west of Grange Lane	New field access	Cable from A631 to Cottam 2
128	Unnamed Road (south), 400m east of Aisby	New field access	Cable from Corringham Beck to Pilham Lane

Figure and Drawing Ref	Location	Description	Use
129	Unnamed Road (north), 400m east of Aisby	New field access	Cable from Pilham Lane to Aisby Beck
130	Green Lane, 400m west of Pilham Lane	New field access	Cable from Aisby Beck to Green Lane
131	Green Lane, 400m west of Pilham Lane	New field access	Cable from Green Lane to Cottam 3b
132	B1205 Kirton Road, 300m east of The Fields	New field access	Cable from Cottam 3b to 3a

4.5.77 All construction traffic to Cottam 1, 2, 3a and 3b will be routed from the A15 to the east of the Site. Construction traffic routes to the Cable Route Corridor are shown on Figure 4.3 below:

Figure 4.3 Cable Route Corridor Construction Vehicle Route



4.5.78 The following design parameters are proposed for permanent and temporary accesses:

- Construction and decommissioning access points will be a minimum of 5.0m in width for two-way movements up to a maximum of 6.5m in width where passing places are required.
- Accesses required for permanent operation and maintenance access will be a minimum of 3.5m in width up to a maximum of 6.0m in width.
- Access tracks will be trackpad covered ground; compacted earth, hardcore, or gravel over a levelling layer of substrate; or metalled surface if pre-existing, subject to ground load-bearing capacity and archaeological features, and utilising of existing accesses.

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Abnormal Loads

4.5.79 There will be a number of abnormal load movements associated with the construction of the Scheme. Abnormal load specialist consultants have prepared a report detailing the required movements. This is included in Appendix F of the Transport Assessment (**ES Appendix 14.1~~).~~ [EN010133/EX1/C6.3.14.1_A]).**

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4.5.80 The Abnormal Load movements associated with the substations and their access are summarised in Table 4.5 below.

Table 4.5 Abnormal Load Movements

Substation Location	Transformer Dimensions (Length/Width/Height)	Vehicle Type	Access	Frequency
Cottam 1	7.24m/5.00m/4.78m 157 tonnes	16 axle girder frame (approx. 70m in length)	Stone Pit Lane (Access 13)	5
Cottam 2	7.90m/4.86m/4.50m 100 tonnes	5 axle bed with 5 axle draw bar trailer (approx. 36m in length)	A631 (Access 14)	2
Cottam 3a	7.90m/4.86m/4.50m 100 tonnes	5 axle bed with 5 axle draw bar trailer (approx. 36m in length)	Kirton Road (Access 16)	2
Cottam 3b	7.90m/4.86m/4.50m 100 tonnes	5 axle bed with 5 axle draw bar trailer (approx. 36m in length)	Station Road (Access 17)	1

4.5.81 For the Cable Route Corridor, the 30 tonne cable drum will be delivered on a Cable Reel Trailer. This vehicle is classified as an abnormal load. However, the vehicle is not nearly as big as those required to deliver the transformers at 26m in length. Each~~–~~ section of the Cable Route will require around 100 cable drum deliveries (around 25 per access).

4.5.82 The Cable Reel Trailer and vehicle will get as close to the relevant access location as possible. From here, the cable drum will be unloaded and towed along the haulage road to the appropriate location for installation.

4.5.83 For Cottam 1, 2, 3a and 3b, loads will be transported by river to the Immingham Docks. From here they will use the A160, A180 and M180 to reach the A15. From the A15, the routes to the relevant substations within each Site are as follows:

- Cottam 1: A15 → A1500 Till Bridge Lane → Stow Road/Church Road → B1241→ Cot Garth Lane → Stone Pit Lane Access;
- Cottam 2: A15 → A631 → Access Road;
- Cottam 3a: A15 → B1205 Kirkton Road → Access;
- Cottam 3b: A15 → A631 → Pilham Lane → Station Road → Access.

4.5.84 The specialist abnormal loads consultants have undertaken analysis of the access routes to the Cable Route Corridor described above. They have concluded that all accesses are accessible by the Cable Reel Trailer except Accesses 122 and 123. Therefore, these will not be used for abnormal load movements.

Habitat Management Areas (Work No.10)

4.5.1 New areas of habitat creation and management are proposed within the Scheme as shown as Work No. 10 on the Works Plans . Across the Order limits, the following approximate areas will be planted for habitat creation, landscaping and visual screening:

- Native grassland planting: approximately 800 ha
- Woodland planting and infilling of existing vegetation: 24ha
- New hedgerow planting and infilling of existing hedgerows (length): 20.5 km

4.5.2 Offsetting provisions have been embedded within the Scheme design for Skylark which includes:

- Approximately 75ha of grassland, arable or set-aside habitat suitable for skylark nesting at high densities situated within large fields containing no solar or BESS infrastructure.

4.5.3 Offsetting provisions have been embedded within the Scheme design for Lapwing which includes:

- Approximately 28ha of grassland, wetland scrapes and arable land suitable for nesting lapwing situated within large fields containing no solar or BESS infrastructure.

4.5.4 Approximately 800 ha of predominantly arable farmland have been embedded within the Scheme for reversion to grassland, specifically managed to create a close-cropped sward, suitable for a diverse range of species, including invertebrates, small mammals, amphibians, reptiles, and birds. The Outline Landscape and Ecological Management Plan **[EN010133/~~APP~~EX1/C7.3_A]** sets out the principles for how the

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land will be managed throughout the operational phase, following the completion of construction. A detailed LEMP will be produced and submitted to the relevant planning authority for approval following the granting of the DCO and prior to the start of construction and is secured by a Requirement in the draft DCO).

4.5.5 In terms of Biodiversity Net Gain (BNG) the Scheme will make the following contributions:

- non-linear habitats (grasslands, fields) - 96%;
- linear habitats (hedgerows) 70%; and
- rivers/ditches 11%.

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4.5.6 More detail is set out in the Biodiversity Net Gain Report **[EN010133/~~APP~~EX1/C6.3.9.12_A]**, (ES Appendix 9.12).

Permissive Footpath (Work No.11)

4.5.7 A permissive footpath is incorporated into the Scheme design, in the vicinity of Stow, as shown as Work No. 11 on the Work Plans. This permissive path will contribute to the wider network of footpaths in the area and facilitate greater public access to the Countryside.

4.5.8 The design and implementation of the permissive path is set out in the Outline LEMP and secured by a Requirement in the draft DCO.

4.6 Construction

Construction Programme

4.6.1 As described at paragraph 4.3.6 above, the Scheme currently has a grid connection date of 2029 although there is the potential that an earlier connection could be achieved. It is currently anticipated that~~-~~ construction works will commence, at the earliest, in Q4 2024 and will run to Q4 2026. As such, the construction programme for the entire Scheme is anticipated to be 24 months with the potential likelihood of overlapping construction works on the different Scheme Sites. Table 4.6 indicates the potential construction durations across the different parts of the Scheme, showing a series of overlapping stages.

Table 4.6 Indicative Construction Programme

Site/Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Cottam 1 (N)																								
Cottam 1 (S)																								
Cottam 1 (W)																								
Cottam 2																								
Cottam 3a																								
Cottam3b																								
BESS																								
Grid Connect																								

4.6.2 'Shared Cable Route corridor'. As noted at **Chapter 2** of the ES, part of the Gate Burton Energy Park cable route and West Burton Solar Project cable route will fall within the cable corridor for the Scheme, in the vicinity of Cottam Power Station. The cumulative environmental effects of the simultaneous or sequential construction of these cables has been assessed in the ES. This is in order to seek to minimise potential environmental effects and identify the benefits of combined construction activities. To accommodate the potential sequential installation of all three projects' ducts and cables, a five year construction duration is adopted for this, and assessed in this ES. This will be over the period Q1 2024 to Q1 2029. This period has been chosen given that the grid connection dates for Cottam is 2029, West Burton 2028 and Gate Burton Energy Park 2028 and it allows for these works to take place within that period.

4.6.3 Outside of the main construction period, there will be commissioning and connection to the National Grid. The timing of these works are dependent on National Grid.

4.6.4 The different elements of the construction works shown at Table 4.6 above, mean that enabling works do not need to be complete in all areas of the construction site before solar farm construction commences in another part of the site.

4.6.5 The construction phase is expected to commence not earlier than the last quarter of 2024 and be completed not earlier than the last quarter of 2026. During the construction phase, several temporary construction laydown areas will be required as well as temporary roadways to facilitate access to all land within the Order limits.

Construction Activities

Site Preparation and Enabling/Civil Engineering Works – Solar Farm Sites (Work No.8)

4.6.6 The following activities will be required as part of the site preparation and civil engineering works:

a) Preparation of land for construction, including localised site levelling (where required). The land level changes will be localised and minor;

b) Import of construction materials, plant and equipment to site;

c) Establishment of the perimeter fence;

d) Establishment of the construction laydown areas;

e) Construction of the internal access roads; and

f) Marking out the location of the Scheme infrastructure.

4.6.7 The following activities would be required as part of the enabling works (not necessarily in order):

a) Construction of site entrance and construction vehicle delivery holding area.

b) Establishment of the main temporary construction laydown areas, which includes site offices/welfare area and parking area.

c) Upgrade, modification or improvement of highways where required for site construction.

d) Preparation of land for construction, including localised site levelling (where required) and vegetation clearance.

e) Import of construction materials, plant and equipment to site.

f) Establishment of the construction area fence where required for construction works to progress (the installation of the perimeter fence will progress with site construction in each area and therefore will not be complete at the start of site construction).

g) Establishment of the secondary temporary construction laydown areas within the Solar Farm Sites.

h) Construction of the internal access roads.

i) Marking out the location of the operational infrastructure.

Installation of Solar PV Panels

4.6.8 The following activities will be required to install the PV Panels:

a) Import of components to site;

b) Piling and erection of module mounting structures.

c) Mounting of modules will be undertaken using hand-held power tools;

d) Trenching and installation of electric cabling;

e) Transformer, inverter and switchgear foundation excavation and construction;

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f) Installation of transformers, inverters and switchgears. Cranes will be used to lift equipment into position; and

g) Installation of control systems, monitoring and communication.

Construction of Electrical Infrastructure

4.6.9 The following activities will be required to construct the onsite electrical infrastructure comprising the cabling and solar stations:

a) Site preparation and civils for the onsite substations and control building;

b) Trenching and installation of electric cabling;

c) Pouring of the concrete foundations and plinths for the electrical equipment;

d) Import of components to site. Cranes will be used to lift the components into position; and

e) Installation of the solar inverter stations.

Construction of Electrical Cables

4.6.10 For cables between the Conversion Units and the substation within the Solar Farm Sites, the following methodology and works description applies:

a) Underground cables, including HV power cables, will be laid to provide a link between the PV arrays, the transformer/inverter stations and the substations where the main switchgear panels are located. There will also be underground cables from the BESS enclosures to the Cottam 1 Substation (suspended in areas of archaeological sensitivity).

b) Generally on-site cables will be laid underground in excavated trenches adjacent to on-site tracks where possible and between the rows of PV panels. They will be laid at a suitable depth and positioned at a distance far enough away from the PV structures to allow future repair or maintenance. Some sections of cable may be installed in ducting if required to provide additional protection or where other infrastructure such as roads and hardstandings will be built over the top.

c) Where at all possible, trenching will be carried out using a trapezoidal bucket to ensure stability during installation. Trenching and cable laying will be carried out progressively across the site and be phased to not interfere with other site operations such as piling, PV Mounting Structure assembly or PV Panel installation.

d) Care will be taken to ensure cable trench excavations can be managed and backfilled in a timely manner to avoid collapse. Trenching may be curtailed in periods of wet weather to avoid collapse of trenches of excessive contaminated run off.

Energy Storage Construction

4.6.11 The following activities will be required to construct the BESS:

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a) Installation of electric cabling;

b) Construction of foundations;

c) Import of components to site;

d) Installation of transformers; and

e) Installation of batteries, inverters and switchgear.

Fencing, Security and Lighting

4.6.12 The permanent deer fence and security system will be established during the solar farm installation. The fencing will be installed early on in the works where possible to reduce the amount of temporary fencing needed. Where required, temporary fencing will be installed to secure work areas not naturally contained by existing hedgerows or fencing.

Cable Route Corridor Construction

4.6.13 The following activities would be required to construct the cable circuits:

a) Site preparation and appropriate surveys;

b) Excavation will be undertaken using an appropriately sized tracked excavator, excavation will normally be carried out in layers;

c) Topsoil will be segregated and stored on site to be reused;

d) The trench will be cleared and bottomed out, ensuring there are no hard protrusions;

e) Sand bedding will be installed at the bottom of the trench; and

f) Cable installation will follow behind excavation in the same sequence. However, it is not expected that cable installation will be continuous. Cables will be installed in groups or sections to ensure that works are completed in the most efficient manner possible.

4.6.14 Aggregates would be stored within the temporary construction laydown areas, while cables and ducts would be stored at the secure compound area.

4.6.15 The following activities would be required to construct the jointing bays:

a) Excavation activities will be as listed above;

b) Jointing bay locations will be re-measured to verify their position before excavation commences; and

c) Jointing bay excavation will be coordinated with the cable pulling programme to ensure that jointing bays are not left open for longer than necessary.

4.6.16 For trenchless cabling / HDD methods of construction, the following activities would be required:

a) Site preparation and appropriate surveys;

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b) Launch and reception pits will be excavated using a suitable excavator, with any required shoring or battering installed. Plant and spoil will be placed a safe distance away from the edge of the excavation so as to minimise the risk of the trench sides collapsing;

c) Once the launch pit has been excavated, work will then commence on the initial drill (the 'pilot bore').

d) Upon completion of the pilot bore the drill head will be removed and a reamer will be attached to the drill string, this will be carried out until the bore is of an acceptable size to accept the duct;

e) Once the bore is enlarged to the required size the product pipe will then be connected to the reamer via a swivel for installation.

4.6.17 If field conditions are not suitable to track plant and equipment to the launch and reception pits, trackway or similar will be employed to facilitate access and egress. An area of up to 25m by 25m will be required at the launch pit and the reception pit. The area of hardstanding will be removed and the area reinstated following construction.

4.6.18 It is anticipated that water-based drilling and bentonite will be utilised. During drilling operations the fluids pumped through the drill string will be closely monitored by checking volume of returns flowing back to the launch pit and visual checks across the drill line. If required the pumping activities will be stopped until any issues are rectified.

Construction Workers and Hours of Working

4.6.19 On an average day, there is expected to be 450 workers spread across the Site. During the peak periods this could increase to around 600 construction workers. In addition, there will be approximately 50 workers positioned at the BESS in Cottam 1 (West).

4.6.20 Construction activities will be carried out Monday to Friday 07:00-18:00 and between 08:00 and 13:30 on Saturdays (this doesn't include for start-up and shut down works). However, some activities may be required outside of these times (such as the delivery of abnormal loads, night time working for cable construction works in public highways or HDD activities). Construction deliveries by HGV will arrive between 09:30-16:30. They will be coordinated to avoid construction vehicle movements during the traditional AM peak hour (08:00-09:00) and PM peak hour (17:00-18:00). In addition, construction worker shift patterns will be coordinated to avoid travel during the network peak hours of 08:00-09:00 and 17:00-18:00. These provisions are set out in the Outline CTMP **[EN010133/~~APP~~EX1/C6.3.14.2_A]** and will be secured via a Requirement in the DCO.

Construction Traffic, Plant and Site Access

4.6.21 Construction accesses have been described above. Site entrances will include a security gate and kiosk to manage access and egress. The site entrance will allow

HGVs to drive off the public road and park up before entering site without causing queues on the public highway.

4.6.22 Site access and routing strategies have been discussed and agreed in consultation with the Highways Authorities as set out within the Outline CTMP.

4.6.23 There are existing surfaced tracks within the Order limits currently utilised for farm machinery, which are proposed to be upgraded for use to minimise the use of the network of minor roads around the Order limits.

4.6.24 In order to access all of the construction sites, a network of tracks will be used:

a) Construction and decommissioning access points. These will be a minimum of 5.0m in width for two-way movements up to a maximum of 6.5m in width where passing places are required;

b) Accesses required for permanent operation and maintenance access will be a minimum of 3.5m in width up to a maximum of 6.0m in width;

c) Existing access tracks will be widened or resurfaced for temporary accesses; and

d) Existing tracks will be used where already suitable~~;~~.

4.6.25 The Transport Assessment **[EN010133/~~APP~~EX1/C6.3.14.1 A]** examines construction phase traffic. It is expected that there will be a relatively flat profile of deliveries throughout the construction period. Therefore, an average number of deliveries per day has been calculated based on the length of the construction period. Notwithstanding, it is acknowledged that there will be small peaks throughout the construction period, especially during Site set up. To account for this, a 50% uplift has been applied for the purposes of assessment. The assessment shows that there could be the following HGV movements.

- Average HGV Arrivals and Departures per Day – 38 (76 Movements)
- Peak HGV Arrivals and Departures per Day – 58 (116 Movements)

4.6.26 The Transport Assessment also shows that there could be up to 233 construction worker arrivals by car and shuttle bus associated with Cottam 1, 2, 3a and 3b on a busy day. These are likely to arrive in the morning, with the same amount of the departures in the afternoon/evening. Shift patterns will be coordinated to avoid construction work travel during the traditional network peak hours of 08:00-09:00 and 17:00-18:00. As shown in the construction programme in **Table 4.6** there is only one month where the construction of all aspects of the development overlap (Month 11).

4.6.27 Temporary car parks will be provided for construction workers within the main construction laydown areas shown on the Works Plans (Work No.8) and shown indicatively on the 'Temporary Construction and Decommissioning Laydown Area Illustrative Layout' drawing included at **Appendix 4.1** to this Chapter.

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4.6.28 As noted above, an Outline Construction Traffic Management Plan (CTMP) has been developed as part of the ES which will guide the delivery of materials and staff onto the Scheme during the construction phase.

Construction Laydown Areas

Main Construction Laydown Areas

4.6.29 Main construction laydown areas (sometimes referred to as 'construction compounds') will be located within each Solar Farm Site as indicated on the Works Plans (Work No.8) Construction laydown areas will also be established at locations along the Cable Route Corridor as shown as Work No. 6A and 6B on the Works Plans.

4.6.30 The Solar Farm Site laydown areas will consist of compounds of approximately 13,000m2 and will contain offices, mobile welfare units, canteens, storage and waste skips, parking areas and space for storage, download and turning area.

4.6.31 No long-term onsite storage of materials is required during the construction phase. Materials will be delivered via HGVs at regular intervals to the construction compounds and transported directly to where it is required within the Order limits using smaller LGVs. Short term storage of materials and plant can be accommodated within the construction compound until it is required. Topsoil, spoil and other construction materials will be stored outside of the 1 in 100 year floodplain extent and only moved to the temporary works area immediately prior to use.

Secondary Laydown Areas (Work No 7)

4.6.32 A network of access tracks will be progressively built across the Solar Farm Sites to allow access to all internal areas from the site entrance. The main temporary construction laydown areas will be established close to the site entrance to allow control of deliveries, parking and material storage.

4.6.33 There will be secondary temporary laydown areas progressively established across the Solar Farm Site in each working area. These will be located across the Solar Farm Site and the purpose of each one will be to service the local works. This includes storage for materials, fuel, equipment etc. needed for such works as well as welfare facilities, office space etc. required to avoid unnecessary internal movement of personnel over long distances.

4.6.34 The secondary laydown areas will typically be set up ahead of the installation of the PV Arrays, electrical components and cabling and will be decommissioned as the relevant works in their locality progress and become completed.

Surface Water Drainage During Construction

4.6.35 The Outline Construction Environment Management Plan **[EN010133/~~APP~~EX1/C7.1_A]** (CEMP) accompanying the application, describes water management measures to control surface water run-off and drain hardstanding and other structures during the construction, operation and decommissioning of the

Scheme. This will form part of a Pollution Prevention Plan (PPP) to be implemented for the Scheme.

Soil and Spoil Management

4.6.36 There will be no site wide reprofiling required, however there may be a need to flatten areas within the Order limits. In some locations to intercept extreme surface water runoff, scrapes and swales are proposed within low lying areas and parallel to the Order limits contours. This is unlikely to create excess topsoil, subsoil and spoil (spoil typically being material below 1m) and it is not expected that this would need to be removed from the Order limits. Topsoil, subsoil and spoil material is only expected to be generated from cable trenches, temporary and permanent compounds, internal roads, BESS and substation compounds, and supporting infrastructure.

4.6.37 During construction the topsoil, subsoil and spoil will be stored temporarily within designated areas adjacent to the cable route and within the construction laydown areas. The topsoil, subsoil and spoil will be utilised to backfill and reinstate the soil profile in the cable trenches, reinstate the soil profile on the temporary laydown areas and any temporary access roads. Any excess topsoil, subsoil and spoil will be utilised across the Order limits. Utilisation of the material in the reinstatement should be in accordance with the requirements of the Outline Soil Management Plan **[EN010133/~~APP~~EX1/C7.18_A]**. It is not anticipated that any material would be removed from the Order limits.

Construction Lighting

4.6.38 Construction temporary site lighting, in the form of mobile lighting towers with a power output of 8 kilo volt-amperes (kVAs), will be required in areas where natural lighting is unable to reach (sheltered/confined areas) and during core working hours within winter months. Artificial lighting would be provided to maintain sufficient security and health and safety for the Order limits, whilst adopting the mitigation principles to avoid excessive glare and minimise spill of light to nearby receptors (including ecology and residents) outside of the Order limits as far as reasonably practicable. All construction lighting will be deployed in accordance with the following recommendations to prevent or reduce the impact on human and ecological receptors:

a) The use of lighting will be minimised to that required for safe site operations;

b) Lighting will utilise directional fittings to minimise outward light spill and glare (e.g. via the use of light hoods/cowls which direct light below the horizontal plane, preferably at an angle greater than 20° from horizontal); and

c) Lighting will be directed towards the middle of the Order limits rather than towards the boundaries.

4.6.39 Measures to control lighting are set out in the Outline Construction Environmental Management Plan **[EN010133/~~APP~~EX1/C7.1_A]** accompanying the application.

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Waste

4.6.40 Chapter 20 of the ES, Waste, **[~~EN010133/~~APP~~/C6.2.20~~-055]** considers wate arisings during construction including paint, solvents, chemical cans and containers, vegetation, pallet wood, mounting structure packing and other packaging, pallet nails, mixed wood, plastic, metal and cable drums.

4.6.41 Solid waste materials generated during construction will be segregated and stored onsite in containers prior to transport to an approved, licensed third party landfill and recycling facilities. The removal of waste from the Sites is likely to generate additional traffic movements on the local highway network as a result of increased HGV movements from the Sites to authorised waste management centres. These impacts are assessed to be of a low magnitude during the construction and decommissioning stages, given the geographic spread of the Scheme.

Construction Environmental Management Plan

4.6.42 As noted above, an Outline Construction Environmental Management Plan (CEMP) **[EN010133/~~APP~~EX1/C7.1_A]** has been prepared and included in the DCO Application. The Outline CEMP aims to provide a clear and consistent approach to the control of construction activities in the Order limits. A range of 'standard' or best practice mitigation and construction management measures are accounted for in the EIA.

4.6.43 The Outline CEMP details the construction mitigation measures and sets out the monitoring and auditing activities designed to ensure that such mitigation measures are carried out, and that they are effective. The Outline CEMP details measures to control construction impacts, including impacts relating to:

a) Climate change
b) Cultural heritage
c) Ecology
d) Water Environment
e) Landscape and Visual Amenity
f) Noise and vibration
g) Socio-economics and Amenity
h) Transport and Access
i) Air quality
j) Ground conditions
k) Major accidents and disasters
l) Telecommunications, Television Reception and Utilities
m) Waste

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4.6.44 The detailed CEMP will be produced by the appointed construction contractor following granting of the DCO and prior to the start of construction and submitted to the relevant planning authority for approval (as part of a Requirement under the DCO). The CEMP will identify the procedures to be adhered to and managed by the Principal Contractor throughout construction. It may be that more than one CEMP is produced, as individual CEMPs may be produced and approved for different parts of the Scheme.

4.6.45 Contracts with companies involved in the construction works will incorporate environmental control, health and safety regulations, and current guidance and will ensure that construction activities are sustainable and that all contractors involved with the construction stages are committed to agreed best practice and meet all relevant environmental legislation including: Control of Pollution Act 1974 (COPA), Environment Act 1995, Hazardous Waste (England and Wales) Regulations 2005 (as amended) and the Waste (England and Wales) Regulations 2011.

4.6.46 Records will be kept and updated regularly, ensuring that all waste transferred or disposed of has been correctly processed with evidence of signed Waste Transfer Notes (WTNs) that will be kept on-site for inspection whenever requested. Furthermore, all construction works will adhere to the Construction (Design and Management) Regulations 2015 (CDM).

Site Reinstatement and Commissioning

4.6.47 Following construction, a programme of site reinstatement will commence.

4.6.48 Embedded mitigation measures for the construction phase are set out in the Outline CEMP, including measures such as construction and exclusion zones in relation to retained vegetation, ensuring a tidy and neat working area, covering stockpiles and storing topsoil in accordance with best practice measures.

4.6.49 An Outline Landscape and Ecological Management Plan (LEMP) **[EN010133/~~APP~~EX1/C7.3_A]** has been prepared. This document sets out the principles for how the land will be managed throughout the operational phase, following the completion of construction. A detailed Landscape and Ecological Management Plan will be produced following the granting of the DCO and prior to the start of construction (this is secured by a Requirement in the draft DCO).

4.6.50 Testing and Commissioning of the Scheme will include testing and commissioning of the process equipment. Commissioning of the Solar PV infrastructure will involve mechanical and visual inspection, electrical and equipment testing, and commencement of electricity supply into the grid. Individual sub-systems will be commissioned separately, with each having its own procedures and prerequisite lines, and it may be necessary to commission these elements separately or at the same time, depending on the end technology utilised at the time of construction.

4.7 Operational Activities

4.7.1 During the operational phase, activity within the Scheme will be minimal and will be restricted principally to vegetation management, equipment maintenance and servicing, replacement and renewal of any components that fail, and monitoring. It is anticipated that maintenance and servicing would include the inspection, removal, reconstruction, refurbishment or replacement of faulty or broken equipment and adjusting and altering the solar panel orientation to ensure the continued effective operation of the Scheme and improve its efficiency as set out within the Outline Operational Environmental Management Plan (OEMP) **[~~EN010133/~~APP~~/C7.16~~-353]**.

4.7.2 Along the Cable Route Corridor, operational activity will consist of routine inspections (schedule to be determined) and any reactive maintenance such as where a cable has been damaged.

4.7.3 It is anticipated that the Scheme will create in the region of 15 staff jobs but none will be based on site (they will be visiting staff) during the operational phase. This will lead to a very small number of daily vehicle trips, with additional staff attending when required for maintenance and cleaning activities.

4.8 Decommissioning

4.8.1 Decommissioning is expected to take between 12 and 24 months and will be undertaken in phases, and for the purposes of the assessment is expected to occur after approximately 40 years of operation of the Scheme. A Decommissioning Environmental Management Plan will be prepared prior to decommissioning and will be secured through the Outline Decommissioning Statement ~~[EN010133/~~**[APP~~/C7.2~~-338]** which is secured by a Requirement in the draft DCO.

4.8.2 The Solar PV Array Works Area and related components, substations, BESS and all associated works (with the exception of the cable ducts) will be removed and recycled or disposed of in accordance with good practice and market conditions at that time.

4.8.3 The effects of decommissioning are similar to, or often of a lesser magnitude than construction effects and will be considered in the relevant sections of this ES. However, there is a high degree of uncertainty regarding decommissioning as engineering approaches and technologies are likely to change over the operational life of the Scheme.

Removal of Waste

4.8.4 The number of vehicles associated with the decommissioning phase are not anticipated to exceed the number set out for the construction phase.

4.8.5 The infrastructure such as PV panels and battery storage units will be recycled as far as practical and in accordance with legislation and guidance applicable at the time, or if more suitable at the time, sold for refurbishment and reuse. It is expected that a Decommissioning Resource Management Plan (DRMP) will be needed and is secured by a Requirement in the draft DCO to manage the disposal of waste from

the Order limits, but the approach to and content of this will be driven by the relevant legislative and policy requirements at the time of decommissioning.

Land Reinstatement

4.8.6 Upon decommissioning, the above-ground physical infrastructure at the Solar Farm Sites will be removed and the Solar Farm Site returned to the landowner. This will include the areas of agricultural land where the agricultural resource has been maintained (and potentially improved) during operation, and the established habitats. Post-decommissioning, the landowner may return the Solar Farm Site to arable use, although it is assumed that established habitats such as hedgerows and woodland would be retained given their potential benefits to agricultural land and the wider farming estate.

4.8.7 The 33kV, 132kV and 400 kV cables may be left in situ, depending on the least environmental damaging approach at the time. If these are removed this would be achieved by pulling the cables out of the ducts, limiting the locations where the surface would need to be disturbed. This same principle will apply to the low voltage cabling throughout the Order limits. Any cabling removed will be taken to an appropriate facility for recycling.

4.8.8 Foundations and other below ground infrastructure will be cut to 1m below the surface to enable future ploughing. Any piles would be removed. Areas of planting and habitats will be maintained by the Applicant until the point of handover to the landowner.

4.8.9 Permissive paths would be removed during decommissioning, with the precise timing to be determined by the contractor(s) and communicated to the relevant local authority in accordance with the approved Decommissioning Environmental Management Plan.

4.8.10 Some soil profiling may be required and the land will be contoured in agreement with the landowner and in accordance with the approved Decommissioning Environmental Management Plan, approximately similar to the current topography.

4.8.11 Excavations will be backfilled, using appropriate imported soil if required, otherwise with soil sourced on site, using appropriate soil management techniques as set out in the approved Decommissioning Environmental Management Plan. If necessary, the soil will be tilled to mitigate for any compaction. Areas where grass does not exist because of the footprint of the previous infrastructure (e.g. the BESS and on-site substations) shall be reseeded with suitable native species, in liaison with the landowner and in accordance with the approved Decommissioning Environmental Management Plan, in order to integrate the newly restored soil into the future land-use.

4.8.12 A Decommissioning Environmental Management Plan (DEMP), to include timescales and transportation methods, will be secured by requirement in the DCO and approved by the relevant planning authority.

References:

Ref 4-1: The Planning Act 2008 (Ref 1-1).

Ref 4-2: Rochdale Envelope: Planning Inspectorate Advice Note 9 (2008).