2 PROJECT DESCRIPTION

2.1 Introduction

This chapter provides a description of the project and forms the basis for the environmental assessment provided in this ES. Further information can be found in the drawing pack accompanying this planning application and appendices to this chapter provided in Volume 3 of this ES.

For the purposes of the final planning submission, the full description of the development is as follows:

"Erection of a 49.9MW Ground Mounted Solar Array with Associated Underground Cable Route, Substation with POC Mast, Battery Storage and Ancillary Equipment & Structures at Caudwell Farm."

In line with the requirements of the EIA Regulations, the assessment of the effects of the project have been assessed throughout the ES based on what is likely on the basis of this project description, taking account of the site location and the environmental sensitivities of the location. Measures which would reduce or avoid adverse environmental effects arising have been embedded and are integral to the project design. Details of these mitigation measures are provided in this chapter and set out in each topic chapter where that embedded mitigation is relevant to the consideration of likely effects.

This chapter provides a description of the Site and the key components of the project, including an overview of the approach to construction.

This chapter, together with the subsequent topic chapters, provide the data required to identify and assess the main and likely significant effects of the project in accordance with Regulation 18 and Schedule 4 of the EIA Regulations.

2.2 Project Summary

It is proposed to install a solar photovoltaic (PV) farm with a maximum export capacity of 49.9MW on an area of agricultural land covering approximately 114 hectares.

The Proposed Development is located at Caudwell Farm, east of the A17 and west of The Wash, approximately 3km off the coast, within the South Holland district of Lincolnshire, at postcode PE12 8EW.

The components of the Proposed Development and all related ancillary development and equipment are set out in the bullet points below and described in greater detail in the relevant sections of this chapter.

- Installation of PV Panels, divided into two separate formats with those to the west of the site consisting of tracking solar arrays and those to the east of the site being fixed, south facing solar arrays.
- A containerised Battery Storage Facility.
- Inverter/Transformer (SPS) Stations to be located across the site.
- One point of connection (POS) mast up to 35m in height.
- Distribution Network Operator (DNO) Substation, access and cable route to connect into the 132kV power line.
- Buried underground cable between the site and the DNO Substation.
- On-site substation/ Switchgear and Meter Kiosk.
- Strategically placed CCTV cameras for security purposes.
- Perimeter security fencing.
- Internal service tracks constructed of permeable stone material.
- Temporary construction access & compounds of permeable stone material providing for plant/material storage and Staff Welfare Facilities.
- Embedded/integrated habitat enhancement measures proposed offsetting any impact on habitat and producing a biodiversity net gain.
- It is estimated that the solar panels would generate up to 49.9 MW peak, enough to power approximately 16,581 homes. The Proposed Development benefits from an agreed point of connection (‘POC’) to a proposed Distribution Network Operator (‘DNO’) electricity substation located to the south of the site, approximately 1.3km away at National Grid Reference: TF 38437 2896.

2.1.1 Design Principles

Construction work on the Proposed Development, assuming planning permission is granted, would not commence until a final investment decision has been made by the Applicant (and a contractor appointed. Following the award of the contract(s), the appointed contractor would carry out a number of detailed studies to inform the technology selection for the Proposed Development and also to optimise its layout and design before starting work at the Site. It follows that it has not been possible for the Applicant to be expressly definitive in relation to all of the design details of the Proposed Development at this stage.

The Applicant is therefore seeking to incorporate a degree of design flexibility. This relates to the dimensions and layout of structures forming part of the Proposed Development, including the precise layout of the Site and the height of the solar panels. In order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, the assessments that form part of the ES have been undertaken adopting the principles of the 'Rochdale Envelope' in common with the approach for other similar developments including the 'Layer Solar Farm', Colchester which is one of a number of approved solar farm planning applications following this principle.

The approach involved assessing the maximum parameters for those elements where flexibility is required. For example, the solar panels have been assessed for the purposes of landscape and the visual impact as being a maximum of 3.7m high, which is the worst-case scenario. The approach also involved defining development zones, rather than having a defined layout. For the purposes of assessment, the development zones define the maximum extent of the developed area.

A number of key design principles have underpinned the design evolution of this project. These include:

- The layout has been informed by the existing topography and landscape features so that development proposals reflect and respect the existing site constraints including field boundaries, existing vegetation and site topography.
- There will be no cut and fill or regrading of land to facilitate panel placement and excavation is only required for cable laying and access tracks as well as inverter and substation bases. This constitutes a minimal percentage of the site area.
- To protect against damage to landscape features the layout has evolved to include a buffer zone between existing hedgerows and solar panels. Internal access tracks will utilise existing field openings where possible.
- As detailed further below, areas of greatest environmental sensitivity within the wider site are excluded from development and a package of environmental management proposals including landscape proposals and ecological enhancement measures are integral components of the project.

The proposals are set out in detail in the Landscape & Ecological Management Plan (LEMP, ES, Volume 3).

The proposals involve substantial habitat enhancement measures including the creation of species-rich grassland, botanically diverse wildflower grassland, new native species-rich hedgerows, tree belts and groups, a community orchard, beehives, significant enhancements areas for skylarks and fieldfares, bat roost boxes and bird nest boxes, otter holts, hedgehog nest boxes, insect hotels, log piles, amphibian and reptile hibernacula features, and mammal gates or small gaps. These measures will result in a biodiversity net gain of 17.48% for habitat units and 94.35% for hedgerow units, with a significant improvement in the support for wildlife and the biodiversity of the site.

The proposed community orchard will consist of a variety of local and English fruit tree varieties, providing a sustainable source of food, supporting local biodiversity, and promoting environmentally friendly practices. The orchard will also be a valuable resource for the local community, offering access to fresh, locally grown fruit, and enhancing community cohesion. The ongoing management of the orchard will require community involvement, providing opportunities for education and skill-building.

Overall, the proposed development of the Caudwell Solar Farm will improve the site's biodiversity and the species it supports through habitat enhancement and creation measures. The mitigation measures implemented for nesting birds, disused badger setts, roosting bats, and great crested newts will ensure no significant effects on the wildlife present on the site. The implementation of these measures will result in a significant biodiversity net gain, providing a positive contribution to the environment and the local community.

2.1.2 Site & Surrounding Area

The application site ('the Site') extends to circa 114 hectares of agricultural land located in the countryside at Caudwell Farm between Holbeach St Matthew, approximately 1.7kms to the north and Holbeach St Marks, around 3.5kms west. As shown on Figure 2.1, the site is approximately 15kms northeast of the market town of Holbeach.

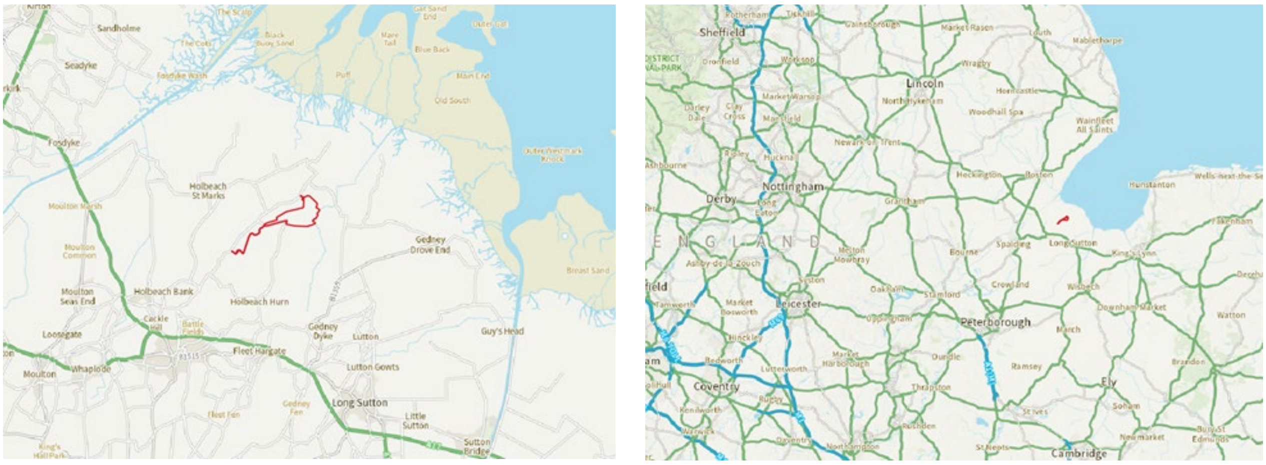

Figure 2.1: Site Location

Eastern Road between Holbeach St Matthew and Holbeach forms the northern boundary of the Site. While the minor road of March Road marks the southern boundary. The Eastern boundary is delineated Scots Hole Bank, a small country lane running from Holbeach St Matthews towards Gedney Dyke to the south. A public footpath runs east to west through the centre of the Site, following existing farm tracks.

The application site comprises six large fields, currently arable. The fields are divided by hedges which are typically 2 – 6m high and support the occasional large tree. Two field boundaries also include two small deciduous copses and in the centre of the site, there is a hardstanding used for agricultural use alongside a series of hedgerows arranges for shooting. Tracks for farm vehicles run alongside most of the internal hedges and some of these are the routes of the public rights of way (PRoW). There are no landscape features within the fields, such as mature trees or structures.

The fields are drained via a series of ditches which take the water in a southeast direction towards the Fleet Haven drain on the southeast side of the site.

The flat agricultural landscape is relatively sparsely settled with occasional farms and cottages, accessed from minor road networks and private tracks. Typically, the farm buildings are surrounded by larger modern barns and sheds. Hedgerows and some woodland contain some views in this open landscape. Holbeach St Matthew and Holbeach St Marks form the main villages in the area, with clusters of houses in the villages softened by well-treed settings.

The proposed Site is not subject to any statutory environmental designations, ancient woodland within or directly adjacent to the site boundary, or designated groundwater source protection zones. The site is not heritage-sensitive, having no statutory or local designations protecting it nor is it subject to any landscape designation. The Site lies 3 km southwest of The Wash SPA and The Wash and North Norfolk Coast SAC. The Wash is an important area for wildlife, particularly for migratory birds and seals. The Wash SPA is the most important area in Britain for wintering waterfowl, early autumn moulting waders, wintering passerines, breeding waders, and terns. Saltmarshes within The Wash support a diverse breeding bird population, including over 4,000 pairs of black-headed gull, shelduck, and numerous wader species. Breeding redshank occurs at exceptionally high densities.

The MoD operates several military training areas, including the RAF Holbeach Air Weapons Range, which is situated to the north of Holbeach St Matthews. This range is used for air-to-ground weapons training and other exercises involving low-flying aircraft.

In 2013, Caudwell Farm Solar Limited was granted approval by South Holland District Council for two planning applications to construct solar arrays to the north and south of Caudwell Farm, Sutton Bridge. The southern solar farm, which was completed in 2015, has been operational and producing renewable electricity. In addition, Caudwell Farms received approval for the construction of a winter storage reservoir at Hartley Farm in August 2013. This reservoir is now operational, ensuring reliable water supply during dry periods, mitigating flood risks, and offering a habitat for wildlife.

2.1.3 Solar Panels, Mounting System & Arrays

The proposed solar farm will use bifacial solar panels on both the fixed and tracking solar arrays (Figure 2.2). Bifacial solar panels are an innovative technology that enables the generation of electricity from both sides of the module, harnessing sunlight reflected off the ground in addition to direct sunlight. These panels are designed with a transparent back-sheet or dual-layer glass, allowing them to capture and convert light from the front and rear faces, thereby increasing their overall efficiency. For the proposed solar farm, 600W panels are anticipated to be utilized and the development will comprise circa 91,000 panels in total.

The front edge to panels is set at over 70cm above ground and will allow mowing equipment and/or sheep to access the grass beneath the leading edge of the solar panels and prevent shading from taller flowers or grasses. The proposed Layout and elevations are based on informed assumptions regarding specifications of equipment currently available on the market. However, it may be that availability of equipment, or specific site requirements, mean that the final detailed design differs in some minor respects from the proposed layout. The ES assesses the indicated layout as a worst-case scenario.

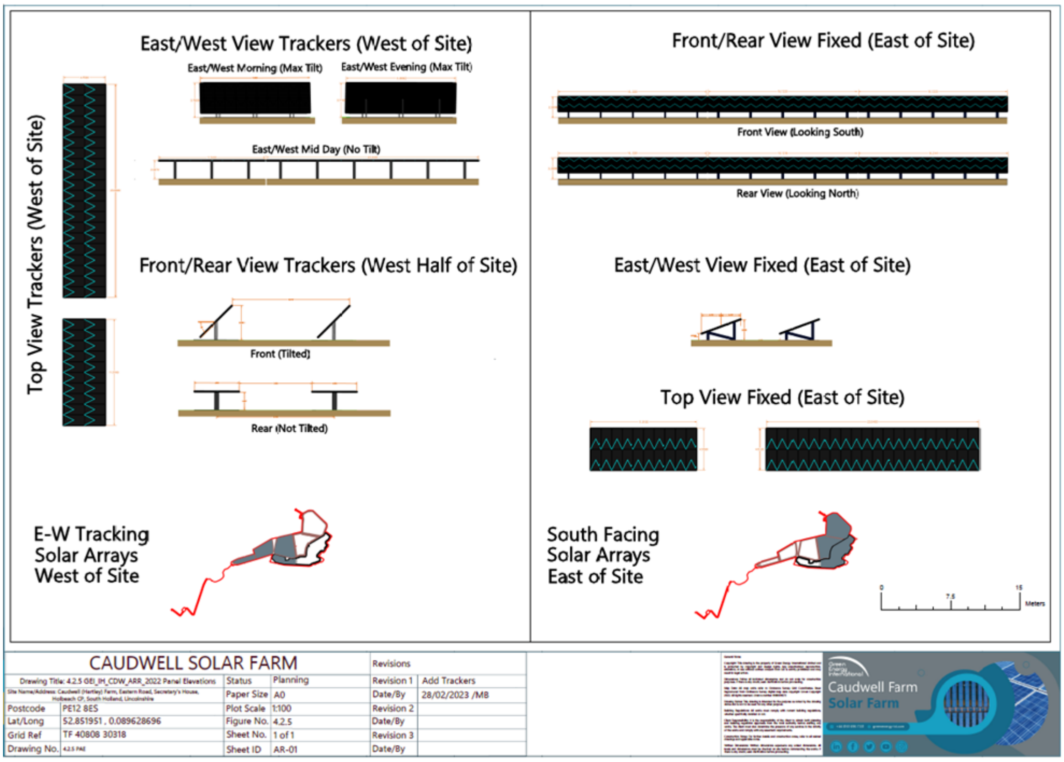

Figure 2.2: Solar Arrays

The solar arrays would be set within the flat landscape with partial enclosure provided by the framework of hedgerows and small blocks of woodland which are to be enhanced as part of the landscape proposals. The mounting system used in solar farms is crucial to providing a stable and even surface on which to install the solar panels at the optimal tilt and orientation. The panels on the east of the site (the pink areas in Figure 2.3) would be laid out in straight arrays set at an angle of between 10 to 35 degrees from east to west across the field enclosures. The distance between the arrays would typically be between 3-6 m. The top northern edges of the panels would be up to 2.8 m above ground level and the south lower edges of the panels would be no less than 0.7m above ground level. These arrays would be static. The south-facing solar arrays are designed to ensure that the panels are installed at an optimal tilt angle of around 23 degrees.

The arrays on the western side of the proposal (Yellow areas in Figure 2.3) include single-axis trackers where the mounting is designed to ensure that the panels remain at an optimal angle throughout the day as they track the sun's movement from east to west. Single-axis trackers are used to rotate the solar panels in one direction to follow the sun's movement from east to west throughout the day, increasing the panels' energy production by up to 20%.

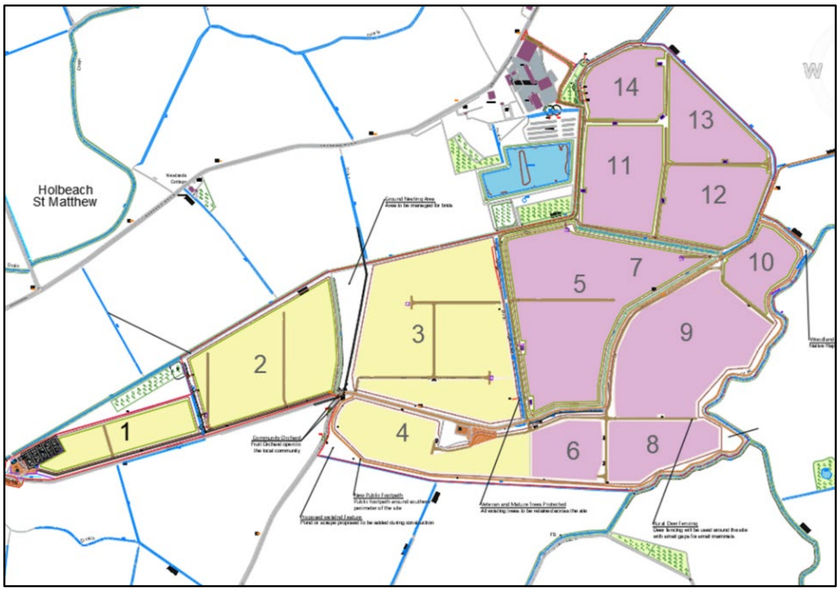

Figure 2.3: Development Land Parcels

These arrays are approximately 1.9metres (m) off the ground; with a maximum height of approximately 3.7m from ground level when the tracks are at a maximum east or west tilt of 45 degrees. Panels will be placed in arrays atop frame tables which are supported on posts screwed or pile driven into the ground.

The overall photovoltaic (PV) panel heights to be considered are between 0.7m at their lowest point and 3.7m at their highest point as the maximum extent of the development.

Figure 2.4: Typical solar array with bi-facial solar panels

The metal framework that houses the modules will be supported at intervals by either single or double mounted posts approximately 5 m apart, depending on the orientation/configuration of the panels. The posts will be driven into the ground at an approximate depth of 1.5-2.5m. The solar panels will be constructed of non-reflective glass. Each solar panel would be connected to an inverter via a cable buried to a depth of approximately 0.8m.

Figure 2.5: Typical South facing Solar Arrays

Figure 2.6: Typical Single Axis Tracking Solar Arrays

2.1.4 Inverter/Transformer Substations

Inverter stations are required to convert Direct Current (DC) electricity generated by the panels into Alternating Current (AC) electricity which is compatible with transfer to the local electricity grid. The inverters would be contained within shipping containers or similar cabin type structures, each unit would measure around 2.9 m high, 12.2 m long and 2.5 m wide. Transformers would be contained within the inverter cabins, converting the low voltage output from the inverters into high voltage suitable for feeding into the local electricity distribution network. Inverters are located towards the centre of the development zones as shown in the layout plan.

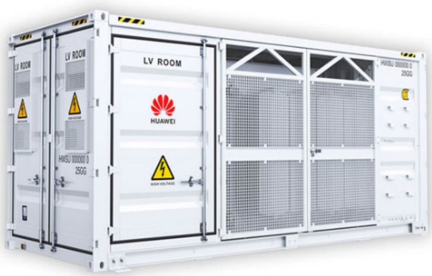

Figure 2.7: Typical Inverter Unit

2.1.5 Substation

The proposed development will include two substations, one for the DNO (District Network Operator) located near to the point of connection (POC) and another switch room located on the Site. The substation compound for the DNO grid connection would measure up to 50 m by 25 m. This would become partly adopted by the DNO for their assets and will consist of overhead electrical busbars and other electrical infrastructure along with a DNO control building and a customer switch room housing the metering equipment. These structures would measure up to approximately 6 m high.

The DNO control building would measure approximately 6 m long, 8 m wide and 4.1 m high.

From the substation compound, a cable would be installed to DNO substation and then on to a customer switch room on-site. Each would be placed on a concrete base. They would either be clad in brick or wood to comply with local vernacular, or coloured green (or alternative colour deemed to be appropriate by the planning authority) to minimise any visual impact. The substation, inverters and solar panels would be connected by underground electrical cables (buried approximately 1 - 1.5 m below ground level).

Figure 2.7: Typical Switch Room & Substation in Containerised format

The proposed Site compound includes the utilization of repurposed shipping containers to enhance functionality and efficiency. Painted green to blend in with the surrounding environment, these containers serve as practical storage solutions for spare parts and equipment necessary for ongoing maintenance operations. Additionally, a second shipping container will be allocated for staff welfare facilities, offering a comfortable and dedicated space for rest and recuperation during maintenance work.

2.1.6 Battery Storage

Battery storage is a critical role in the solar energy project by storing excess energy generated during the day and releasing it during peak demand periods or lower power output periods which helps to stabilize the power output and make it nearly continuous, addressing the intermittency issues associated with solar energy generation. The proposed facility has been designed to reduce visual impacts by reducing the number of storage containers while still retaining its load-shifting potential.

The battery storage containers are likely to be 6m long and 2.4m wide/high (like a average shipping container). The overall compound contains around 48 battery containers and 8 STS units covering an area of 6,500m² (130m by 50m) and will be surrounded by 2m high security fencing will planting to ensure that any visual impact is minimised. The finishes for the battery containers will be chosen to blend in with the surroundings with green paint, minimizing the visual impact. The materials used for the ancillary infrastructure will be chosen for their durability and environmental sustainability.

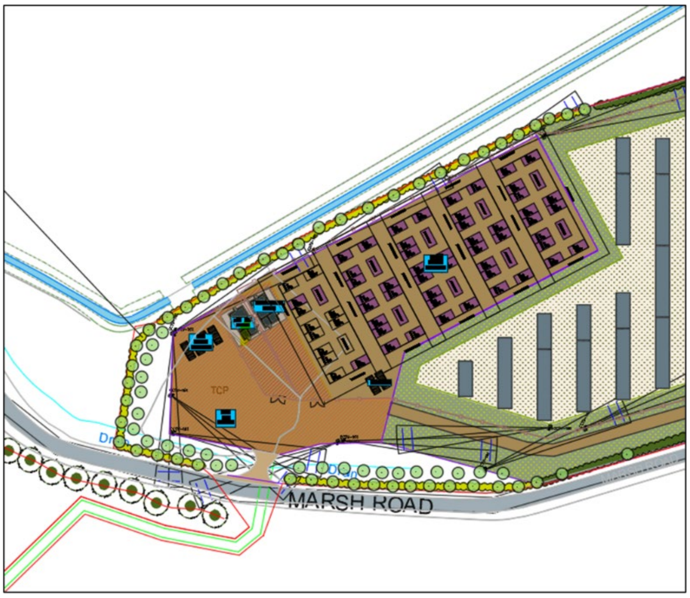

Figure 2.8: Battery Storage Compound Location

Figure 2.9: Typical Battery Storage Containers

2.1.7 Grid Connection & Cable Route

The proposal includes a buried cable connection between the solar farm and the substation, covering a distance of 1.91km. Cables are to be buried, and the trenches are created by removing topsoil and subsoil into separate piles, then, following installation of the cables, reinstating the land back to its original profile. The development has a 49.9MW export connection tied to Caudwell Farm which is formally accepted and will be made on the Walpole to Boston 132kv circuit 2, specifically between towers 48HW60 and 48HW59.

The intention for the Proposed Development is to connect to the 132Kv power line which runs north-south through fields to the south of the Site. All cabling required for the Proposed Development and cable route would be installed in buried trenches. To connect the site to the DNO substation, the cabling will be required to cross Marsh Road which will be delivered through either open-cut and fill or Horizontal Directional Drilling (HDD).

The cabling would follow the field boundaries to a POC Mast of up to 35m in height located within a compound at National Grid Reference TF 38437 28963.

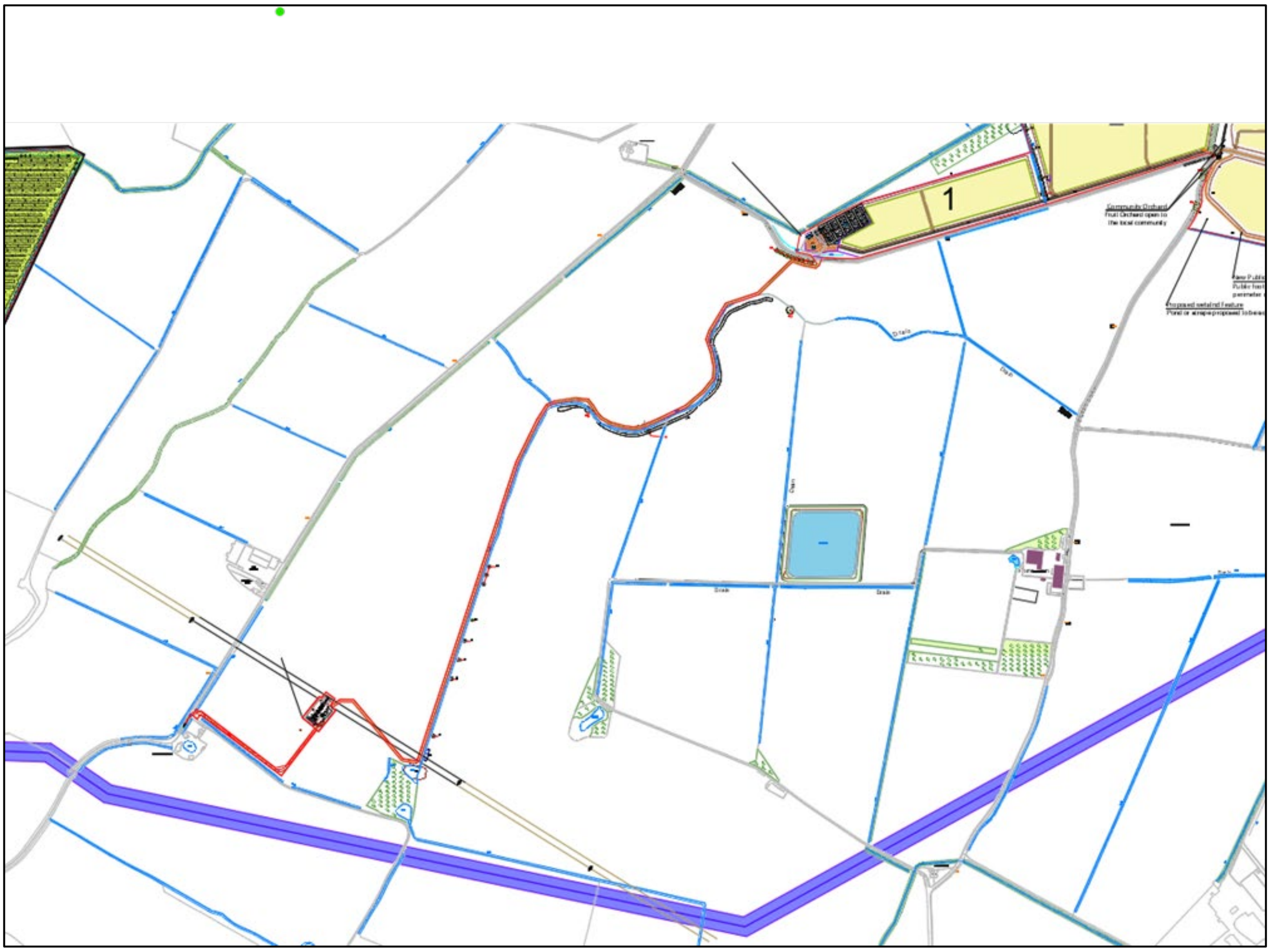

Figure 2.10: Proposed Cable Connection Route

The proposed DNO substation and POC mast will be located alongside the existing trellis tower as shown in the plan above. An access track is provided for 24/7 DNO access and the underground cable has been positioned to minimise potential damage to land drains. Details of the underground electricity cable configurations are shown in the Cable Trench Cross-Section Plan (ES, Volume 3 Figures & Drawings).

2.1.8 Access & Internal Tracks

The primary access routes to the Site are from Eastern Road. In addition, there is an access from Marsh Road, primarily to serve as the site exit, and as a backup access to the Site which would be used infrequently. Appropriate visibility splays are achievable from all access junctions with some vegetation clearance. Three of the access junctions will be constructed, or modified as appropriate, as part of the development to provide 6m kerb radii and 6m wide carriageway, with the remaining three access points likely already being capable of accommodating all anticipated vehicle turning manoeuvres.

The roads to/ from the Site are considered suitable to accommodate all construction and operational vehicle types, as all of the roads on these routes are currently used by large vehicles. Therefore, the construction vehicles and operational traffic associated with the development will be easily accommodated. It is anticipated that the vehicle routing for the construction, operational and decommissioning phases will be the same.

The existing PRoW which runs through the centre of the Site will be suitably managed throughout construction and operation of the development. Therefore, there would be no impacts upon these PRoWs, and they shall remain accessible at all times.

Internal access tracks will be required during the construction phase with existing farm tracks retained, enhanced and used wherever possible. Smaller HGV's will be able to drive directly onto the field of the construction site using a small track of compacted gravel which will connect the construction site to the primary access track into the site. Thereafter access to repair panels and to carry out routine maintenance can be undertaken by small vehicles. Vehicles will access the site in a one-way method, with the HGVs accessing the site from Eastern Road through an existing access gateway by-passing the farmyard using a new track and running along existing tracks through the centre of the site. All vehicles will exit the site at the existing gateway onto Marsh Road.

Where additional internal tracks and hard standings are required, they will typically be constructed on a sub-base consisting of a layer of compacted crushed stone, of locally sourced limestone, granite, or other suitable materials, which provides a stable foundation for the track or hard standing area. The sub-base thickness can vary depending on the load-bearing requirements and soil conditions. A geotextile membrane or permeable fabric placed between the sub-base and the native soil will help to improve stability, prevent intermixing of materials, and facilitate drainage. The membrane also helps to reduce erosion and maintain the integrity of the access track or hard standing. A surface layer of gravel, crushed stone, or recycled materials, such as crushed concrete or brick, is used to create a durable and permeable surface suitable for vehicle access and parking. The thickness of the surface layer depends on the anticipated traffic load and site-specific conditions.

Two temporary construction compounds will be included on the site, shown in the images below.

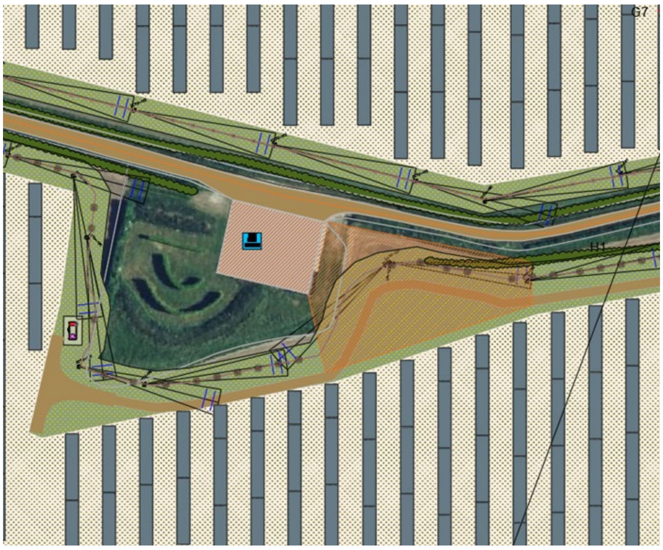

Figure 2.11: Temporary Construction Compound East

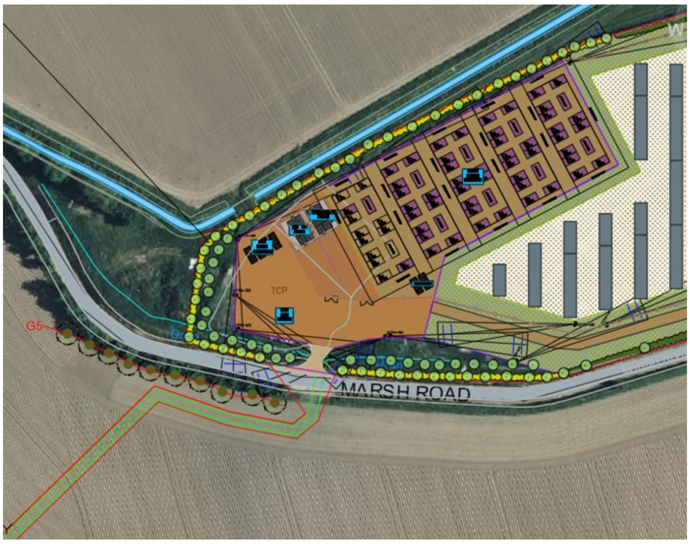

Figure 2.12: Temporary Construction Compound West

2.1.9 Security

It is proposed that stock-proof fencing (mesh with wooden posts or similar) to a height of approximately 2 m would be installed along the outer edges of the Site in order to restrict unauthorised access. The security fence will be erected on the inside of the hedgerows, so that it will be screened by the hedgerows in views from the surrounding area, further mitigating any visual impact. The fence line will normally be set approximately 4-5m inside the hedge, keeping it separate from the hedge and allowing ease of maintenance for both the hedge and the fence. Although where necessary the buffer between the security fence and the hedge has been enhanced for ecological reasons. Gates would be installed at the Site access point for maintenance access. These would be the same design, material and colour as the fencing.

Figure 2.13: Typical example of a security fence

The perimeter of the Site would be protected by a system of CCTV cameras, which would provide full 24-hour surveillance around the entire perimeter. Thermal imaging cameras will be placed around the park, with 1 day/night camera located at entrance gates to fields. The camera at the site entrances will be day/night cameras capable of viewing in colour in the daytime. It will switch to black and white at night. The thermal imaging cameras only identify a heat source and this means that in either daylight or at night the camera would be able to see if a human being was climbing the fence or if an animal is making contact with the fence. The cameras are energised 24 hours a day but only record when motion is detected. An intelligent sensor management system would manage the cameras. The cameras would be on poles of approximately 2.5 m high, spaced at approximately 50 m intervals along the security fence meaning there would be a total of around 240 cameras. The cameras are controlled by an external manned operations room and will not overlook adjacent property. The cameras are all programmed to automatically move to pan to the area of the perimeter fence that has had an alert, which will then record if they can see motion. There would be no lighting within the Site at night with the exception of internal lights inside substation buildings and battery units for use in the event of an emergency.

2.3 Construction, Operation & Decommissioning

The proposed solar farm development has a **lifespan of 40 years**, after which the site will be decommissioned and restored to agricultural use. The planning application for the project is expected to be submitted in Spring 2023, and work will commence once all necessary permissions have been obtained and pre-commencement planning conditions have been discharged.

2.3.1 Construction Phase

The construction period is estimated to last approximately 6 months, beginning in 2024, subject to all necessary permissions being obtained. During the construction period, there will be temporary effects on landscape and visual amenity, such as the construction of new built forms, temporary construction compounds and fencing, machinery and material storage, plant and vehicle movements, HGV and abnormal load deliveries, construction site lighting, and reinstatement work. To minimize the environmental impacts during the construction phase, mitigation measures such as good housekeeping, protection of valued features, minimal external lighting, and protection of trees and vegetation will be implemented. Additionally, light pollution will be minimized through the use of cowls/shielding of lights and directional lighting.

The construction of the solar array will follow a 4-stage program over 20 weeks, similar to the construction program fo the Bilbo Solar Farm in Aberdeenshire. Working hours are 08:00-18:00 Monday to Friday and 08:00-13:00 on Saturdays. During the construction period, construction vehicles and deliveries will visit the site, with vehicles limited to HGV tippers for road/track stone and sand, HIAB flatbed crane trucks, other HGVs, and light vehicle movements associated with staff working on the site.

There shall be no construction works or deliveries on Sundays, public holidays or bank holidays. Ground piling works shall be limited to 09:00 - 17:00 each day Monday - Friday, and there shall be no ground piling works on Saturdays, Sundays, public holidays, or bank holidays.

In the case of the Caudwell solar farm, the risk of pollution to the local area is expected to be low. Most of the materials used in the development are designed to be recycled and reused at the end of the project's life, minimizing waste and its impact on the environment. It is important that waste is managed effectively throughout the construction phase to ensure the project's sustainability and avoid any adverse effects on the surrounding area. The appointed contractor will be required to sign up to a detailed Site Waste Management Plan to control how waste will be handled and disposed of during the construction phase.

2.3.2 Operational Phase

Maintenance and monitoring are essential aspects of ensuring the long-term performance and profitability of a solar farm. Regular inspections and maintenance of solar panels, inverters, and other equipment are necessary to ensure maximum energy efficiency and minimal downtime. Maintenance procedures may include cleaning solar panels, repairing or replacing faulty equipment, and checking wiring and electrical connections. The frequency of maintenance checks may vary, but it is typically carried out every six months, with more frequent inspections during periods of high demand or inclement weather conditions.

Monitoring is also a vital aspect of the operation of a solar farm, as it enables operators to keep track of energy production and identify any issues that may arise. Advanced monitoring systems can provide real-time data on the performance of individual solar panels, inverters, and other equipment, allowing for timely intervention in case of any problems. Regular data analysis and reporting are also necessary to evaluate the solar farm's performance and identify opportunities for improvement.

2.3.3 Decommissioning

The decommissioning process for the solar photovoltaic (PV) array and electrical storage facility, is outlined in the Design and Access Statement. Planning permission for the facility is temporary and will cease to have effect on 40 years from the date of energization. After this date, all solar PV array infrastructure, including modules, mounting structures, cabling inverters, and transformers, will be removed from the development site and recycled or disposed of according to good practice and market conditions at the time.

The decommissioning process is expected to take approximately 20 weeks, during which the removal and disposal of the infrastructure associated with the development will occur, followed by site restoration. Some removal works will happen concurrently to maximize efficiency and minimize time spent on site. Restoration of the site will occur in tandem with the removal of structures and is incorporated into the relevant timescales.

Upon completion of the decommissioning process, the land usage will be returned to its original condition, likely as agricultural land. This will require some re-planting of grassland and will be facilitated and funded by a process agreed upon before the decommissioning begins. The future of any electrical compound or energy storage facility at the site will be determined by network operators, the landowner, and the local planning authority prior to decommissioning commencement. Throughout the decommissioning process, an inventory of the infrastructure on site will be maintained to ensure the final DRP covers any replacements or upgrades that occur within the lifetime of the development.