Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works at

Land at Six Hundreds Farm, Six Hundred Drove, East Heckington, Sleaford, Lincolnshire.

Preliminary Environmental Information Report

Volume 1: Main Report and Figures

Ecotricity (Heck Fen Solar) Ltd.

Prepared by Pegasus Group | June 2022 | PINS REF: EN010123

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 0: Table of Contents and Statement of Competence

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

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0. STATEMENT OF COMPETENCE

1.1.11 In line with Regulation 14(4) of the EIA Regulations, the PEIR and all technical assessments have been undertaken by suitably qualified 'competent experts' within the project team. Details of their relevant expertise are set out in **Table 1.1.**

Table 1.1: Statement of Competence

Logo	Specialism	Statement of Competence
PEGASUS GROUP IEMA Transforming the world to sustainability - EIA -	Planning Environmental Impact Assessment Cultural Heritage Socio- Economics Landscape and Visual Residential Visual Amenity Transport and Access Miscellaneous Issues	Pegasus Group (Pegasus) is the consultancy that has compiled this Environmental Statement (ES). This consultancy was established in 2003 and has over the years expanded to a company that strives for "good development" across the whole of the UK. Pegasus is a multi-disciplinary planning consultancy and has provided the following services in the context of this ES: planning, environmental planning, heritage, and economics. Pegasus is Institute of Environmental Management and Assessment (IEMA) 'Quality Mark' Accredited and its ESs and the processes that it undertakes to create them are regularly subjected to external review via this accreditation to ensure that all Pegasus Environmental Impact Assessments (EIA) are legally compliant and apply best practice. This ES has been coordinated by a Chartered Environmentalist and Member of IEMA. Our Heritage Team is the trusted UK market leader in the provision of quality archaeological and heritage services, delivered from a national network of offices. We provide expertise in heritage consultancy, archaeology, geophysical survey and marine archaeology supported by specialist staff from our graphics, research and outreach teams. We are registered members of a number of professional bodies. The Transport and Infrastructure team at Pegasus provide consultancy services in transport planning and infrastructure design. The company employs an experienced team whom have extensive background in the production of Environmental Statements and supporting Transport Assessments, Travel Plans, Construction Traffic Management Plans

Logo	Specialism	Statement of Competence
		and other technical documentation for a wide range of development projects. The main author of the ES chapter is a Chartered Transport Planning Professional (CTPP) and all staff who have inputted to the preparation of the chapter are members of the Chartered Institution of Highways and Transportation. Within the Socio-Economics team working on this application, Laura Day (BA (Hons), MA, PIEMA, MIED) is a Principal Consultant in the Economics team at Pegasus Group. Laura has almost 14 years' experience working in Socioeconomics and Environmental Impact Assessment (EIA) project management. Her experience spans a range of sectors including residential, commercial, retail, renewable energy and energy infrastructure. Richard Cook (BA (Hons), MA, MIED) is a Director in the Economics team at Pegasus Group. Richard has more than 18 years' experience working in economic development and has written more than 20 socio-economic chapters in the last two years for a variety of schemes, including residential, commercial, student accommodation and older person accommodation developments. The landscape team at Pegasus have broad range of experience in landscape assessment and a detailed understanding of the requirements of the EIA Regulations, undertaking Landscape and Visual Assessments (LVIA) as part of the EIA process, including input into scoping, screening and assessment. They carry out all LVIA in accordance with the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) 2013, published by the Landscape Institute (LI) and IEMA, along with all relevance guidance. BMD is also a LI Registered Practice and the staff that have undertaken this LVIA are all Chartered Members of the Landscape Institute (CMLI).
HOARE LEA H.	Air Quality Noise and Vibration	Air Quality Chapter: Chris Rush (Hoare Lea), BSc (Hons), MSc, PG Dip Acoustics, CEnv, MIOA, MIEMA, MIEnvSc, MIAQM-Chris is an Associate Director Air Quality Consultant with Hoare Lea. He is a Chartered Environmentalist, a Member of

Logo	Specialism	Statement of Competence
		the Institute of Acoustics, a Full Member of the Institute of Environmental Management and Assessment, a Member of the Institution of Environmental Sciences and a Full Member of the Institute of Air Quality Management (IAQM). He has a diverse portfolio of experience and has worked on a range of projects from initial site feasibility, through planning and development to construction and operation. Chris's expertise covers planning, noise and air quality, specifically in relation to residential developments, industrial fixed installations such as waste management centres and transportation environmental impact on developments including air traffic. Chris is involved in the testing and assessment of the impact of indoor air quality and how building design contributes to this. He also is a member of Chartered Institute of Building Services Engineers (CIBSE) Air Quality Working Group and a committee member of the IAQM. Lauren Buchanan (Hoare Lea), MSc, BSc (Hons), AMIEnvSc, MIAQM-Lauren is a Senior Air Quality Consultant at Hoare Lea. She is an Associate Member of the Institution of Environmental Sciences and a Member of the Institute of Air Quality Management. She has worked on a range of projects gaining experience in many different aspects of air quality assessment, including monitoring and detailed dispersion modelling of dust, odour, roads and industrial emissions for a variety of sectors and to fulfil Local Air Quality Management (LAQM) duties on behalf of Local Authorities. Lauren has undertaken air quality assessments for permit requirements and planning applications, including stand-alone reports, Environmental Impact Assessments, Habitats Regulations Assessments and Development Consent Orders. Noise and Vibration Chapter: Matthew Cand Dipl. Eng., PhD, MIOA, Associate Director within Hoare Lea LLP. Hoare lea's acoustic group is one of the UK's largest and longest established acoustic consultancies. Matthew is a full member of the Institute of Acoustics. Within Hoare Lea LLP, Matthew heads the environmental

Logo	Specialism	Statement of Competence
		noise group, which has a focus on Environmental Impact Assessments (EIAs). He has over 17 years' experience in the assessment of environmental acoustics and has conducted more than 50 noise assessments for EIA. Matthew has been engaged as expert witness at several planning inquiries and noise nuisance cases.
Kevin Shepherd Consultant Ornithologist ecotricity	Ecology Ornithology	Neil Bostock qualified from Bath University in 1980 with a 2:1 BSc (Hons) in Applied Biology, and is a Full Member of CIEEM since 2008. Since May, 2003 Neil has worked as an ecological consultant conducting surveys on birds, bats, butterflies and Odonata along with Extended Phase 1 Habitat Surveys. Neil has conducted and reported extended Phase 1 Habitat Surveys (at 50 sites); target noting Badger activity, Water Vole and Otter activity, sightings of reptiles and identified potential sites for Great Crested Newts and for roosting bats. Neil has worked on behalf of a wide range of companies including: Ecotricity, Npower, Golder Associates (UK) Ltd., ECOSA, AB Ecology Ltd., Torc Ecology Ltd., RSPB, Betts Ecology, Scott-Wilson, SKM Ltd., Kevin Shepherd Ornithological Consultancy, Heritage Environmental Ltd., ESS-Ecology, Thompson Ecology Ltd., CSa Environmental Planning and Avian Ecology. Kevin Shepherd (BSc Hons Zoology, University of Aberdeen) has been an active ornithologist for 48 years, a professional ornithologist for 39 years and an independent Consultant Ornithologist for 28 years. He has been constantly involved with bird survey and assessment throughout these periods, with increasing focus on precise and pragmatic application of the numerous and varied techniques to suit all requirements. He co-designed the universally recognised and applied 'Brown & Shepherd' technique for survey of upland breeding birds. Professionally, he has undertaken ornithological assessments for numerous road, housing, industrial, forestry, quarrying, opencast coalmine, pipeline, solar and onshore wind farm projects, the latter in particular where he has been involved in the compilation of over one hundred Ecological

Logo	Specialism	Statement of Competence
		Technical Chapters and Environmental Impact Assessments. Dr. Simon Pickering, who carried out the Assessment, is an experienced ecologist. Dr. Simon Pickering has a Bachelor of Science with Honours degree in Biological Sciences from Hatfield Polytechnic and a degree of Doctor of Philosophy in Zoology from the University of Durham. He has worked as a professional ecologist for over 40 years and has been the Principal Ecologist at Ecotricity since 2008. He is responsible for overseeing the ecological assessment process for renewable energy as well as other development projects for the company and has experience of writing over 40 Ecological Impact Assessments (EcIA), including the original Heckington Fen Wind Park EIA, and the most recent ones being for the approved Forest Green Rovers football stadium, energy storage facilities at Berkeley Green in Gloucestershire, solar parks in Leicestershire and Devon, and wind parks in the Scottish Borders and Argyll and Bute.
JBA consulting	Hydrology, Hydrogeology, Flood Risk and Drainage	The Hydrology, Hydrogeology and Flood Risk and Drainage Chapter has been prepared by JBA Consulting on behalf of Ecotricity Generation Limited. JBA Consulting is registered with the Institute of Environmental Management and Assessment (IEMA) as an EIA Quality Mark organisation. The EIA Quality Mark is a scheme operated by IEMA that allows organisations (both developers and consultancies) that lead the co-ordination of statutory EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed.
LUC	Climate Change	The Climate Change Chapter has been written by LUC and 3ADAPT, consultants competent in climate change assessment. The lead author, Joanna Wright (MA MSc FIEMA CEnv), has almost 30 years of professional EIA experience with LUC and postgraduate masters level qualifications in both EIA and carbon management.

Logo	Specialism	Statement of Competence
	Land Use and Agriculture	The Land Use and Agriculture Chapter has been prepared by Tony Kernon BSc(Hons), MRICS, FBIAC. Tony is a Chartered Surveyor with 35 years' experience in assessing the effects of development on agricultural land, and the practical and policy implications of development. The land quality has been assessed by a team of ALC surveyors who meet the BSSS ALC standards. Appendix 16.3 of the PEIR was prepared by Duncan Winspear and Christopher Miles at Savills. Duncan gained a 1st class BSc Hons degree in Agriculture from Newcastle University. He has undertaken a post graduate diploma in Farm Business and Rural Management from Harper Adams and has worked as a farm consultant for 15 years. He is a Fertiliser Advisers Certification and Training Scheme (FACTS) qualified advisor, and on day-to-day basis gives detailed technical advice on farm cash flows and budgets, soil management, crop and grass nutrition and overall farm business decisions. Christopher is a qualified Chartered Surveyor with 30 years' experience at Savills advising Farmers and Landowners on strategic business planning including the sale and purchase of farms and estates. He has been a director of Savills for over 10 years and is on National Farms and Estates board and the EXCO board for the central region.
	Glint and Glare	The Glint and Glare Chapter was co-written by Paul Evans and Simon Allen at Wardell Armstrong. Paul Evans is a Chartered Environmentalist with the Energy Institute and has worked exclusively in the fields of renewable energy and climate change. He is currently the sector head for energy & climate change at Wardell Armstrong LLP where he has worked on over 150 wind farm applications and was instrumental in consenting the UK's first grid scale solar farm. Following this he has since been involved with many hundreds of MW of solar PV development nationally and internationally. He also led the consents team for the UK's first commercial deep geothermal well. This has lead on to a number of innovative projects including 'Solar Wind' and the use of energy storage

Logo	Specialism	Statement of Competence
		to maximize grid connections and the use of renewable energy to reduce diesel dependence at remote mine sites. More recently he has been working with clients to assess and reduce carbon emissions and both corporate and project levels as well as assisting listed entities with their carbon and environmental reporting requirements. Simon Allen has over 15 years' experience as an Energy & Climate Change consultant, after graduating from Exeter University with a 1st Class degree in Renewable Energy. He has been involved in various aspects of wind and solar PV development and is competent in project managing Environmental Impact Assessments and planning applications for a range of renewable developments. Previous projects have included onshore wind, biomass CHP, deep geothermal and solar PV developments. His other responsibilities have included writing technical chapters, feasibility assessments and detailed financial appraisals across a range of different project types, as well as carrying out resource modelling, GIS and data interpretation. He has completed numerous greenhouse gas and climate change assessments across activities as diverse as built development to mining operations, as well as carrying out site appraisals and due diligence work.

ecotricity PEGASUS GROUP

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 1: Introduction

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

1 INTRODUCTION

1.1 INTRODUCTION

1.1.1 The Preliminary Environmental Information Report (PEIR) has been prepared on behalf of Ecotricity (Heck Fen Solar) Ltd (the "Applicant"). It presents the preliminary findings of the Environmental Impact Assessment (EIA) process for the proposal of a ground mounted solar photovoltaic (PV) electricity generation and energy storage facility (referred to within this report as "the Energy Park") at Land at Six Hundreds Farm, Six Hundreds Drove, East Heckington, Sleaford, Lincolnshire. The Energy Park will create clean, renewable energy contributing towards the UK's net zero targets.

1.1.2 The PEIR will also assess the cable route for the grid connection and the above ground works needed for connection to the National Grid Bicker Fen Substation. The Heckington Fen Energy Park will comprise of the following three elements: the Energy Park, cable route to, and above ground works at, the National Grid Bicker Fen Substation (referred to within this report as "the Proposed Development"). At the time of the PEIR, the proposal of the final cable route for the grid connection has not been agreed and two options are assessed.

1.2 THE APPLICANT

1.2.1 Ecotricity was founded in 1995 as the world's first green energy company and now supplies customers across the UK from a growing portfolio of wind and sun parks, with all its electricity supply coming from 100% renewable energy. Ecotricity is a high technology business, developing cutting edge green technology and energy for a low carbon future.

1.2.2 Ecotricity (Heck Fen Solar) Limited, an Ecotricity company, has been formed to create and develop the Heckington Fen Energy Park.

1.3 SITE LOCATION

1.3.1 The Energy Park is located within the county of Lincolnshire on an area of agricultural land approximately 3.7km east of the village of Heckington and 8.9km west of the town of Boston. The connecting cable route extends approximately 7-8km in length from the Energy Park to the connection point at the National Grid Bicker Fen Substation.

1.3.2 The Energy Park lies wholly within the administrative area of North Kesteven District Council and immediately adjacent to the boundary of Boston Borough Council along the eastern edge. A majority of the cable route options, and the above ground works at the National Bicker Fen substation lie within the Boston Borough Council boundary. A small section of one of the cable route options, as it leaves the Energy Park, is in North Kesteven District Council.

1.3.3 The site location of the Proposed Development is shown on **Figure 1.1**, with administrative boundaries illustrated on **Figure 1.2.**

1.4 OVERVIEW OF THE PROPOSED DEVELOPMENT

1.4.1 The Proposed Development comprises the construction, operation (including maintenance) and decommissioning of ground mounted solar PV panel arrays, an energy storage facility and supporting infrastructure. Subject to obtaining the necessary consents, construction is anticipated to commence at the earliest in 2026, and to be completed ready for operation no earlier than 2027, with decommissioning no later than 40 years after the commencement of operation (2067).

1.4.2 It is anticipated the Energy Park could create renewable energy to power 100,000 homes and would prevent 75,000 tonnes of carbon dioxide (CO_2) per year from entering the atmosphere. Further details of the benefits of the Proposed Development are provided in **Chapter 4- Proposed Development.**

1.4.3 The Proposed Development includes the following key components:

- Solar PV panels;
- PV module mounting structures;
- Inverters;
- Transformers;
- Switchgear;
- Cabling (including high and low voltage) – mixture of above (on the energy park site only) and below ground (on the energy park site and the Grid Cable Route);
- One or more Battery Energy Storage Systems (BESS) (battery technology not determined at this time);
- Onsite substation(s) comprising of a substations and control buildings;
- Fencing and Security Measures;
- Internal access tracks;
- Community orchard;
- Permissive path;
- Construction of new access point onto highway (already consented);
- Landscaping including creation of new habitat areas;
- Construction of temporary construction areas and worker facilities;
- Digging of cable trench and laying cables for connection to the National Grid Bicker Fen Substation
- Installing above ground grid cable access points along the Grid Route; and
- Extension of Bicker Fen National Grid Substation and installation of above ground equipment.

1.4.4 The land that forms the subject of this PEIR extends to approximately 1184.98ha, encompassing the entire Proposed Development, see **Figure 1.1-SLP.** The Energy Park extends to approximately 586.85ha. The Energy Park site boundary is shown on **Figure 1.3- Energy Park Boundary.** Further details of the site description are provided in **Chapter 3- Site Description, Site Selection, and Iterative Design Process** of this PEIR, while a description of the Proposed Development is provided in **Chapter 4- Proposed Development.**

1.5 CONSENTING REGIME AND REQUIREMENT FOR ENVIRONMENTAL ASSESSMENT

Consenting Regime

1.5.1 Heckington Fen Energy Park represents a significant planning project and is defined as a National Significant Infrastructure Project (NSIP) in accordance with the Planning Act 2008. The Proposed Development falls within the definition of an onshore generating station in England exceeding 50 megawatts (MW) and therefore represents an NSIP under section 14 and 15 of the Planning Act 2008.

1.5.2 The Planning Act 2008 dictates that the Secretary of State is responsible for determining the application for a Development Consent Order (DCO), with the power to appoint the Planning Inspectorate to manage and examine the application. In this role, the Planning Inspectorate will examine the application through an appointed Examining Authority for the Scheme and make a recommendation to the Secretary of State who will then decide whether to grant a DCO which authorises and permits the development.

1.5.3 The Planning Act 2008 defines the key stages in the application process for Nationally Significant Infrastructure Projects (NSIPs). These are summarised in **Diagram 1.1.** on the following page. The Project is currently at this pre-application stage.

Diagram 1.1: Overview of Application Process

Pre- Application	•The developer prepares the application and undertakes pre-application consultation in accordance with the requirements of the Planning Act. Where required, Environmental Impact Assessment is undertaken (involving consultation on the scope of the process and on Preliminary Environmental Information to inform an Environmental Statement).
Submission	•Submission of the application for development consent.
Acceptance	•28-day period for the Planning Inspectorate to decide whether or not the application meet the standards required to proceed to the examination phase.
Pre-examination	•Examining Authority holds a preliminary meeting and sets the timetable for the examination. Stakeholders can register as an interested party.
Examination	•Examining Authority has six months to carry out the examination.
Recommendation and Decision	•Examining Authority issue a recommendation to the Secretary of State within three months of the end of the examination process. The Secretary of State has a three-month period to issue a decision.
Post- Decision	•Where the decision issued is to grant the Development Consent Order, the developer can then implement the project in accordance with the Development Consent Order (including its requirements for mitigation).

Need for EIA

1.5.4 EIA is the process of identifying and assessing the significant effects (beneficial or adverse) likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions during/following the construction, operational and decommissioning phases of a development should it proceed.

1.5.5 For NSIPs in England, the legislative requirements for EIA are set by The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as amended (referred to in this report as the EIA Regulations).

1.5.6 EIA is not required for all developments. Schedule 1 of the EIA Regulations identifies development types that always require EIA. Schedule 2 identifies development types that require EIA if they are likely to lead to significant effects on the environment by virtue of factors such as their nature, size or location.

1.5.7 The Proposed Development would fall under Schedule 2, under Paragraph 3(a) of Schedule 2 of the EIA Regulations as it constitutes *'industrial installations for the production of electricity, steam and hot water'.* Taking into account the nature and scale of the development proposed, EIA is being undertaken for the Proposed Development.

Scoping

1.5.8 The Applicant has notified the Secretary of State in a letter to the Planning Inspectorate dated 7th January 2022 under Regulation 8(1)(b) of the EIA Regulations that an ES will be provided with the DCO application for the Proposed Development. Therefore, in accordance with Regulation 6(2)(a) of the EIA regulations, the proposed development is EIA development.

1.5.9 On the 7th January 2022, the Applicant submitted an EIA Scoping Request to the Planning Inspectorate on behalf of the Secretary of State. The issues that the Applicant considers the EIA will need to address were identified in the Heckington Fen Solar Park Scoping Report (see **Appendix 1.1 - Heckington Fen Solar Park Scoping Report**).

1.5.10 The Planning Inspectorate reviewed and consulted on the Scoping Report and published a Scoping Opinion on the 17th February 2022 which included the formal responses received by the Planning Inspectorate and other consultees (see**: Appendix 1.2 - Scoping Opinion** and **Appendix 1.3- Natural England Scoping Response**). All issues raised in the Scoping Opinion have been considered during the EIA process and are discussed in further detail in the technical chapters.

1.6 PURPOSE OF THIS REPORT

1.6.1 The PEIR presents the preliminary findings of the EIA process in accordance with Regulation 12 of the EIA Regulations. Regulation 12 requires an applicant to compile 'preliminary environmental information' that allows:

> **'consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development)'.**

1.6.2 This PEIR provides details of the Project, together with an overview of the alternatives considered to date. For each environmental topic, details of the approach to assessment, the existing and likely future environmental conditions, and the preliminary findings regarding the likely significant effects of the Proposed Development are set out, based on the information available at this time. Initial details of the measures proposed to avoid, prevent, reduce or offset significant adverse effects (known as mitigation measures) are also provided.

1.6.3 The EIA process is currently ongoing, with further work being carried out to enhance the understanding of existing environmental conditions and to provide further detail of the likely significant environmental effects. Feedback provided during the consultation process will be considered in refining the design of the Proposed Development, during the ongoing assessment work and during the development of further mitigation measures where necessary. The results of this further work will be set out within the Environmental Statement (ES) that will accompany the application for Development Consent.

1.7 STRUCTURE OF THE PEIR

1.7.1 This PEIR comprises studies on each of the aspects of the environment identified as likely to be significantly affected by the Proposed Development (the 'technical chapters'), which are supported with figures and technical appendices where appropriate.

1.7.2 This PEIR is structured as follows:

- **PEIR: Main Text** - Comprises the main volume of the PEIR, including 'general chapters' that describe the EIA context, provide a description of the Proposed Development, and set out the scope of the PEIR, followed by the technical chapters containing topic-by-topic environmental information with the associated figures and concluding with a summary.
- **PEIR: Technical Appendices** - Comprises the technical appendices supporting the main report, including specialist reports providing relevant background and technical information.
- **PEIR: Non-Technical Summary (NTS**) – this provides a concise summary of the PEIR identifying the likely significant environmental effects and the measures proposed to mitigate or to avoid adverse effects of the Proposed Development.

1.7.3 This PEIR has been structured to allow relevant environmental information to be easily accessible. The content of the PEIR comprises three main elements listed below. **Chapter 0- Contents and Statement of Competence** outlines in full the chapter titles, relevant appendices, and figure list.

1. **Volume 1: Main Text and Figures**
    - Chapter 1 Introduction
    - Chapter 2 EIA Assessment Methodology
    - Chapter 3 Site Description, Site Selection and Iterative Design
    - Chapter 4 Proposed Development
    - Chapter 5 Planning Policy
    - Chapter 6 Landscape and Visual
    - Chapter 7 Residential Visual Amenity
    - Chapter 8 Ecology and Ornithology
    - Chapter 9 Hydrology, Hydrogeology, Flood Risk and Drainage
    - Chapter 10 Cultural Heritage
    - Chapter 11 Socio-Economic
    - Chapter 12 Noise and Vibration
    - Chapter 13 Climate Change
    - Chapter 14 Transport and Access

- Chapter 15 Air Quality
- Chapter 16 Land Use and Agriculture
- Chapter 17 Glint and Glare
- Chapter 18 Miscellaneous Issues
- Chapter 19 Summary
- Chapter 20 Glossary

2. **Volume 2: Technical Appendices**
   - Appendix 1.1 Heckington Fen Solar Park Scoping Report
   - Appendix 1.2 Scoping Opinion
   - Appendix 1.3 Natural England Scoping Response
   - Appendix 2.1 Schedule 4 Requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as amended.
   - Appendix 2.2 Heckington Fen Solar Park Transboundary Screening
   - Appendix 2.3 Cumulative Sites Long List
   - Appendix 6.1 LVIA Methodology
   - Appendix 7.1 RVAA Methodology
   - Appendix 8.1 Extended Phase 1 Survey Report (Energy Park)
   - Appendix 8.2 Ornithological Survey Methods & Results
   - Appendix 8.3 Lincolnshire Environmental Records Centre
   - Appendix 8.4 Preliminary Biodiversity Net Gain Calculation- Headline Results
   - Appendix 8.5 Confidential Badger Report
   - Appendix 9.1 Hydraulic Modelling Method Statement Correspondence with Environment Agency
   - Appendix 10.1 Summary Report of Geophysical Survey Results
   - Appendix 12.1 Noise Survey
   - Appendix 12.2 Noise Modelling
   - Appendix 14.1 Draft Outline Construction Traffic Management Plan
   - Appendix 14.2 Summary of the Personal Injury Collision Records
   - Appendix 16.1 Agricultural and Soils Significant of Effect Methodology
   - Appendix 16.2 Semi Detailed Agricultural Land Classification
   - Appendix 16.3 Methodology of Practical Farming vs ALC Report (Savills)

3. **Non-Technical Summary**

1.7.4 For continuity, the figures and appendices are arranged and presented using the same reference numbers as the chapters as a means of providing supportive background and technical information.

1.8 THE EIA CONSULTANT TEAM

1.8.1 The team responsible for the production of the PEIR has been co-ordinated and managed by Pegasus Group. Pegasus Group is accredited under the Institute of Environmental Management and Assessment (IEMA) ‘Quality Mark’ scheme which is a mark of excellence in EIA co-ordination and management. Pegasus Group have extensive experience of undertaking EIA work across a range of projects and development types.

1.8.2 The consultants who have contributed to the preparation of this PEIR are set out in **Table 1.1**

Table 1.1: Consultant Team

Topic	Consultant
EIA coordination and planning	Pegasus Group
Project Design and Buildability	Ecotricity
Landscape and Visual	Pegasus Group
Residential Visual Amenity	Pegasus Group
Ecology and Ornithology	Ecotricity Kevin Shepherd- Consultant Ornithologist Neil Bostock- Consultant Ecologist
Hydrology, Hydrogeology, Flood Risk and Drainage	JBA Consulting
Cultural Heritage and Archaeology	Pegasus Group
Socio-Economic	Pegasus Group
Noise	Hoare Lea
Climate Change	Land Use Consultants (LUC)
Transport and Access	Pegasus Group
Air Quality	Hoare Lea
Land Use and Agriculture	Kernon Countryside Consultants Ltd Savills
Glint and Glare	Wardell Armstrong LLP
Miscellaneous Issues	Pegasus Group
Cumulative effects and inter-relationships	Assessment team

1.8.3 A Statement of Competence setting out the relevant expertise of each of the topic authors is provided in **Chapter 0- Contents and Statement of Competence.**

1.9 PEIR AVAILABILITY AND COMMENTS

1.9.1 The PEIR has been prepared to provide the basis for formal consultation under the Planning Act 2008, as amended. This builds on the consultation undertaken to date, including consultation in relation to the scope of the EIA process (see Chapter 2: Environmental Assessment Methodology and Public Consultation for further details).

1.9.2 The Proposed Development website will include all consultation documents, together with a virtual and in-person consultation events and details of document deposit points. In addition, the consultation process will include:

- Face-to-face consultation events as suitable, publicly accessible venues located within the core and wider consultation zones;
- Provision of all consultation documents (including the PEIR) on the Project website;
- Provision of hard copies of the documents at public consultation information points (libraries, local authority offices and other public locations) within each host or neighbouring local authority;
- Live Q&A webinar sessions to be held throughout the consultation period;
- Provision of individual hard copies of the documents on request;
- Telephone enquiries for members of the public – including a call back feature out of hours;

- Virtual presentations and events for stakeholder groups on request;
- Feedback form for anyone wishing to respond to the statutory consultation;
- Use of a newsletter to publicise the consultation and details of how to access consultation documents; and
- Use of social media to publicise the consultation and encourage feedback; and freephone, freepost and email address.

Availability and Comments

1.9.3 Copies of the PEIR may be obtained from Pegasus Group, the costs for which are set out below:

- Main Text and Technical Appendices- £0.35p per sheet to cover printing costs
- Non-Technical Summary (NTS) - Free of charge
- Digital copies of the above documents on a CD or USB stick - £15

1.9.4 Postage is payable on all orders. For copies of any of the above please contact Pegasus Group (quoting reference P20-2370) at the following address:

Pegasus Group
Pegasus House
Querns Business Centre
Whitworth Road
Cirencester
Gloucestershire
GL7 1RT
Telephone: 01285 641717
Email: Cirencester@pegasusgroup.co.uk or
heckingtonfensolar@ecotricity.co.uk

1.9.5 Document deposit points, for the period of consultation, are set out in **Table 1.2** on the following page.

1.9.6 Details of how members of the public may respond to the consultation are set out in the Statutory Consultation Booklet.

Table 1.2: Proposed Consultation Document Deposit Points

Deposit Locations	**Opening Times** *(correct at time of publication)*						
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**
North Kesteven District Council, Kesteven Street, Sleaford, NG34 7EF **By appointment**	**09:00 – 17:00**	**09:00 – 17:00**	**09:00 – 17:00**				
Lincolnshire County Council, County Offices, Newland, Lincoln LN1 1YL	**08:30 – 17:00**	**08:30 – 17:00**	**08:30 – 17:00**	**08:30 – 17:00**	**08:30 – 16:30**		
Boston Borough Council, Municipal Buildings, West Street, Boston, PE21 8QR	**08:45 – 17:15**	**08:45 – 17:15**	**08:45 – 17:15**	**08:45 – 17:15**	**08:45 – 16:45**		
Heckington Community Hub, Council Chambers, St Andrew's Street, Heckington, Sleaford, NG34 9RE	**10:00 – 12:00**	**10:00 – 12:00**	**10:00 – 12:00**	**10:00 – 12:00**	**10:00 – 12:00**	**10:00 – 12:00**	
Boston Library, County Hall, Boston, PE21 6DY	**09:00 – 17:00**	**09:00 – 17:00**	**09:00 – 17:00**	**09:00 – 17:00**	**09:00 – 18:00**	**09:00 – 16:00**	
Sleaford Library, 13 - 16 Market Place, Sleaford, NG34 7SR	**09:00 – 17:00**	**09:00 – 17:00**	**09:00 – 17:00**	**09:00 – 18:00**	**09:00 – 17:00**	**09:00 – 13:00**	

Next Steps

1.9.7 The consultation process to date and ongoing consultation will continue to influence the Proposed Development design. The next stage, following completion of consultation and analysis of the consultation responses, is to make an application for Development Consent, and having regard to the consultation responses received.

1.9.8 Following consultation, an ES will be prepared. The ES will accompany the application for development consent and will take into account the comments received during consultation with the community, statutory consultation bodies and other interested parties.

1.9.9 Details of the consultation undertaken during the preparation of the application will be set out in a separate Consultation Report. The Consultation Report will demonstrate how the comments received during consultation with the community, statutory consultation bodies and other interested parties have been considered and taken account of in the application. The Consultation Report will be submitted alongside the final ES at the time of application.

1.9.10 The ES and other planning application documentation will also be available to view on the National Infrastructure Planning website https://infrastructure.planninginspectorate.gov.uk/. The site is managed by the Planning Inspectorate, the government agency responsible for examining applications for NSIPs.

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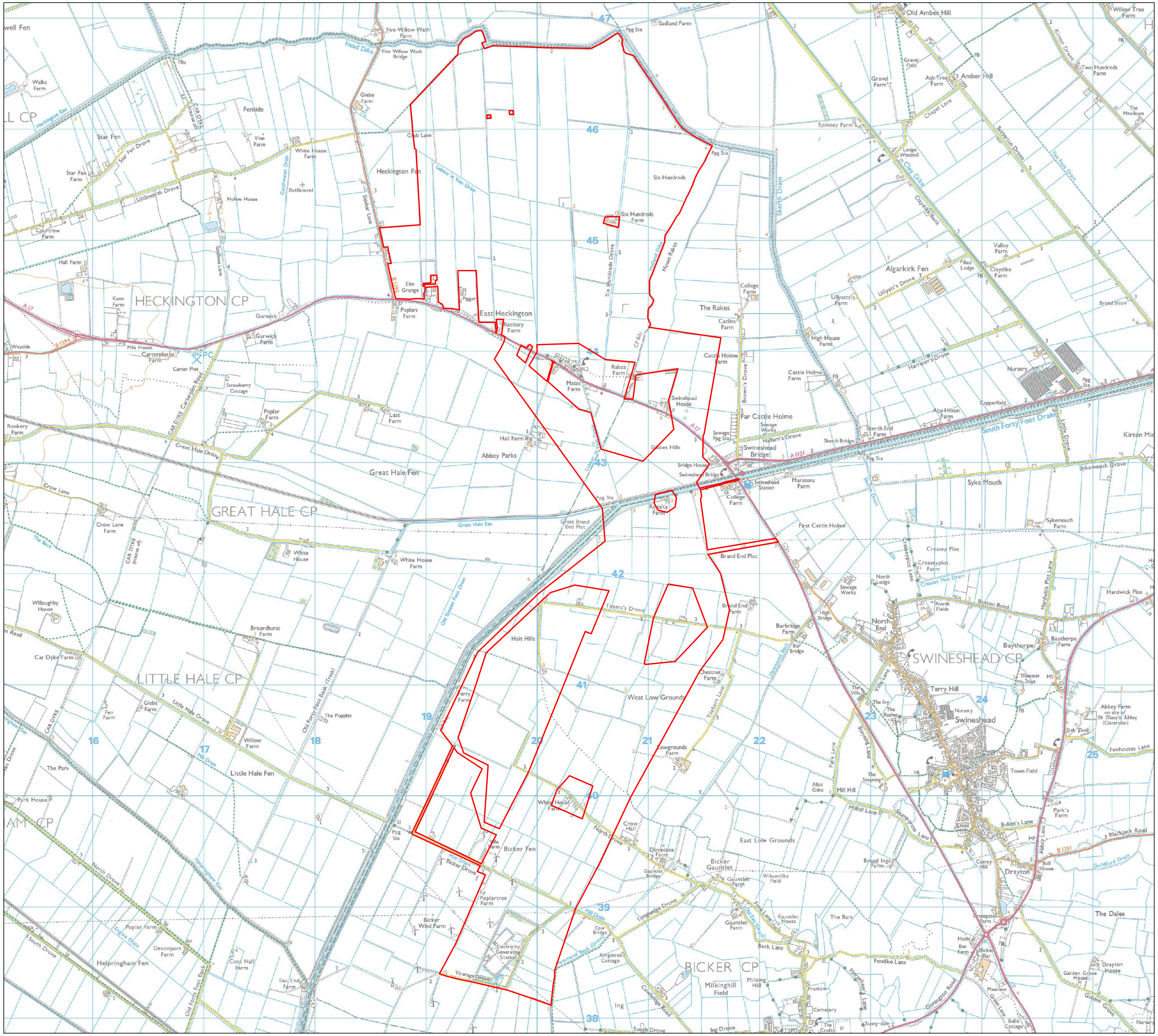
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 1.1- Site Location Plan

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

Site Boundary

FIGURE 1.1

Site Location Plan

DRWG No: **P20-2370_01** Sheet No: **-** REV: **-**

Date: 26/05/2022

Scale: 1:35,000 @ A3

0 1 km

N

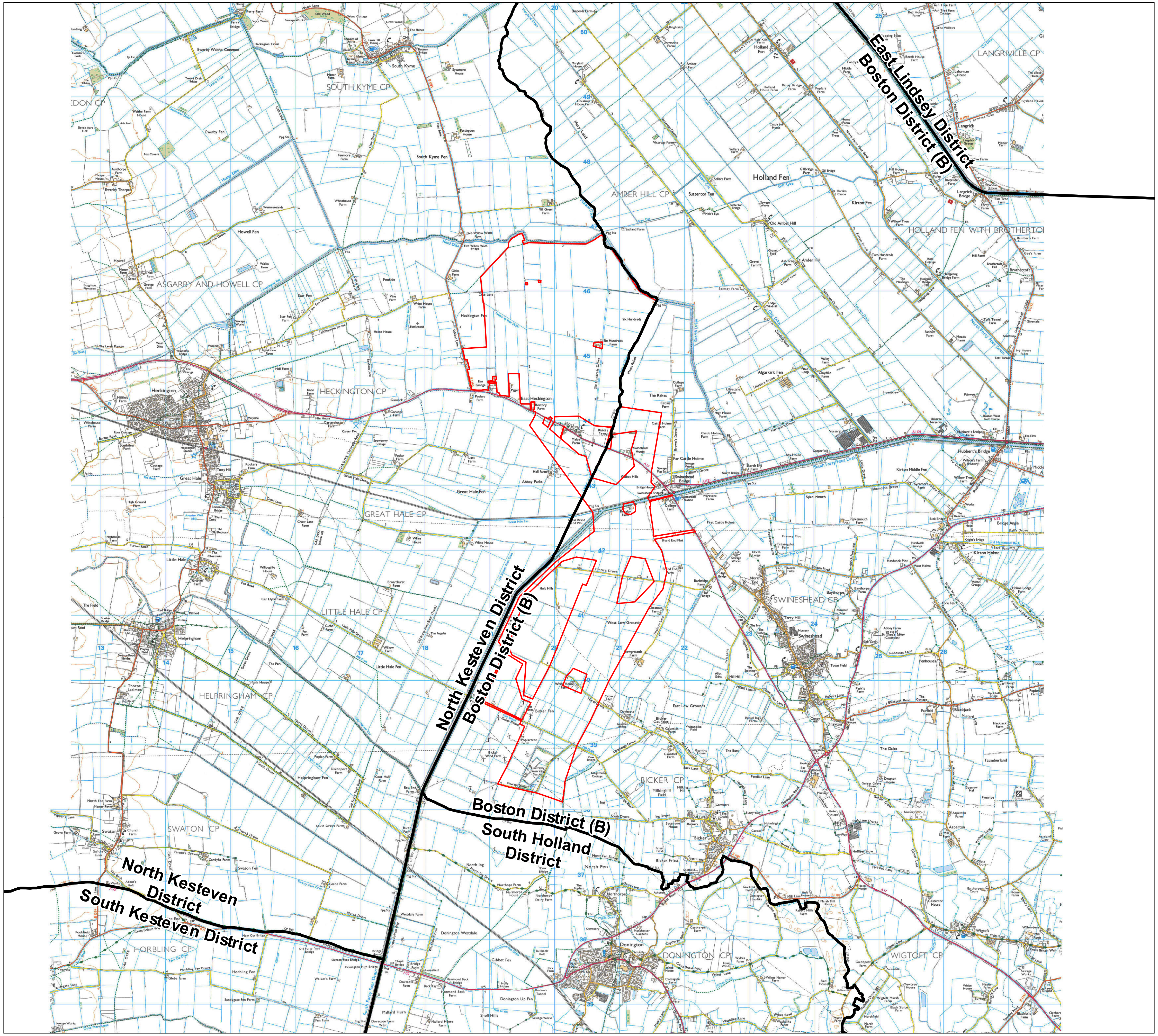
DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 1.2- Administrative Boundaries

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

Site Boundary

Local Authority Boundary

Note: Boundary falls under Lincolnshire county

0 2 km

N

FIGURE 1.2

Administrative Boundaries

DRWG No: **P20-2370_24** Sheet No: **-** REV: **-**

Date: 26/05/2022

Scale: 1:60,000 @ A3

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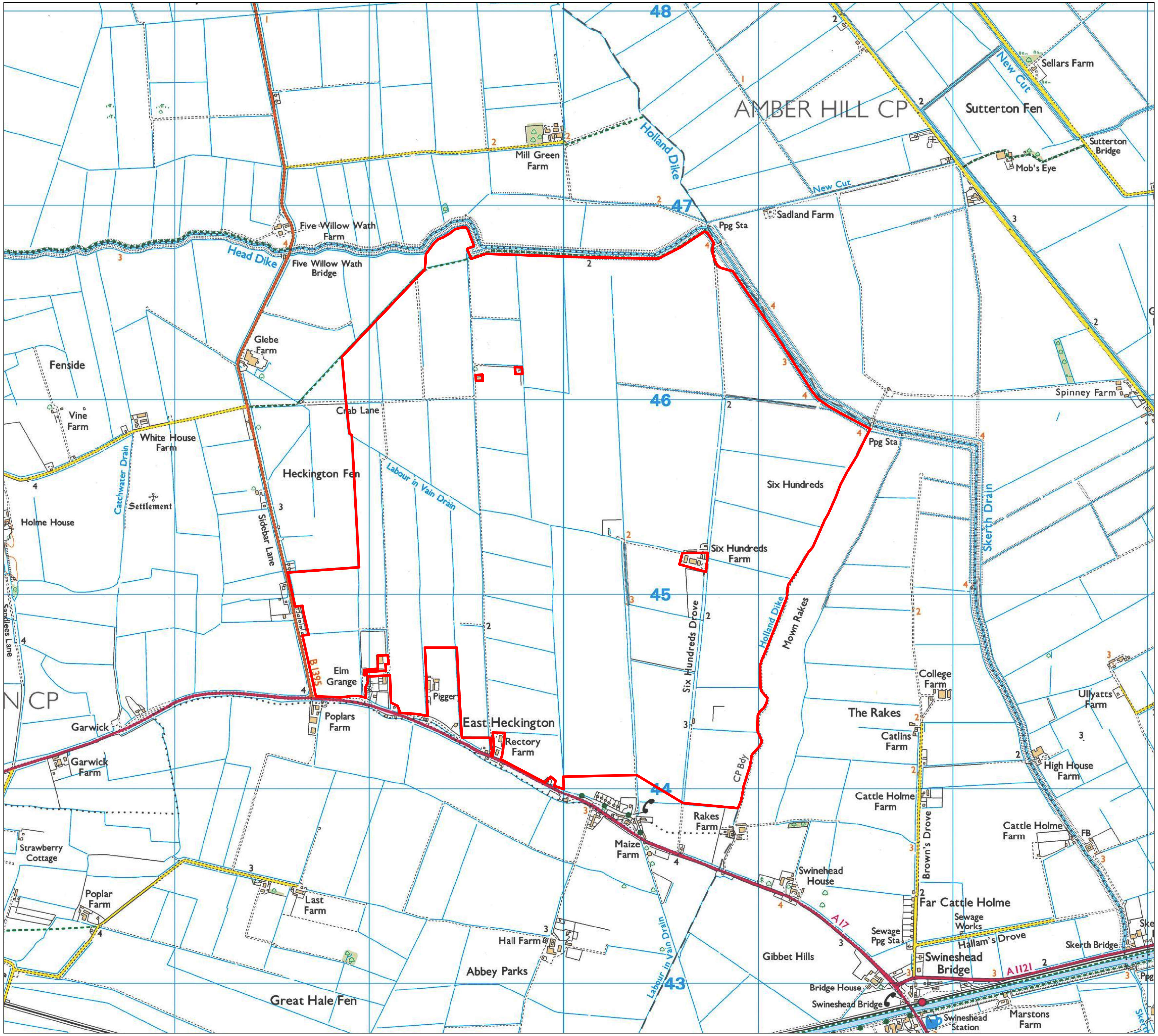
Preliminary Environmental Information Report
Figure 1.3- Energy Park Boundary

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

Energy Park Boundary

FIGURE 1.3

Energy Park Boundary

DRWG No: **P20-2370_25** Sheet No: **-** REV: **-**

Date: 26/05/2022

Scale: 1:20,000 @ A3

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Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 2: Environmental Impact Assessment Methodology

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

2 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

2.1 INTRODUCTION

2.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) sets out the approach taken to the Environmental Impact Assessment (EIA) process to date, explaining the methodology used to prepare the technical chapters of this PEIR and describes its structure and content. In particular, it sets out the process of identifying and assessing the likely significant environmental effects of the Proposed Development. This chapter also includes details of the consultation undertaken and the overall approach to the assessment of the effects of the Proposed Development. Further details of topic specific methodologies, such as survey methods, are provided in the relevant PEIR topic chapters (**Chapters 6-18**).

2.2 SCOPE OF ENVIRONMENTAL IMPACT ASSESSMENT

2.2.1 Scoping is the process of identifying the environmental topics that will require detailed assessment within the EIA process (establishing the scope of the assessment). Scoping is therefore an important preliminary procedure, which sets the context for the EIA process. Through scoping, the key environmental issues of concern are identified at an early stage, which permits subsequent work to concentrate on those environmental topics for which significant effects may arise as a result of a proposed development.

2.2.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as amended (hereafter referred to as the "EIA Regulations"), allow the applicant to request that the Planning Inspectorate (on behalf of the Secretary of State) sets out its opinion (known as a Scoping Opinion) as to the issues to be addressed in the EIA process. Whilst there is no formal requirement in the EIA Regulations to seek a Scoping Opinion prior to the submission of an application, it is recognised best practice to do so.

2.2.3 On the 7th January 2022, the Applicant submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects and, where necessary, to determine suitable mitigation measures for the construction and operational phases of the Proposed Development. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Proposed Development would not have the potential to give rise to significant environmental effects in these areas (see **Appendix 1.1- Heckington Fen Solar Park Scoping Report**).

2.2.4 Following consultation with the statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on the 17th February 2022 (see **Appendix 1.2- Scoping Opinion**). The PEIR and EIA process has also taken into account Natural England's response which did not form part of the Secretary of State's Scoping Opinion. The Natural England's scoping response is attached at **Appendix 1.3- Natural England Scoping Response**.

<u>Topics Scoped in of the EIA Process</u>

2.2.5 **Table 2.1** summarises the scope of the EIA process in the context of the requirements of Regulation 14(2) of the EIA Regulations. The environmental themes scoped into the PEIR and subsequent ES are included in **Table 2.1**

Table 2.1: Summary of the Preliminary Environmental Information Requirements (Regulation 14(2) of the EIA Regulations)

<table>
<tr><th>Required Information</th><th>Location within PEIR</th></tr>
<tr><td>(a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;</td><td>Chapter 3: Site Description, Site Selection and Iterative Design Process</td></tr>
<tr><td>(b) a description of the likely significant effects of the proposed development on the environment;</td><td rowspan="2">•Chapter 6 Landscape and Visual
•Chapter 7 Residential Visual Amenity
•Chapter 8 Ecology and Ornithology
•Chapter 9 Hydrology, Hydrogeology, Flood Risk and Drainage
•Chapter 10 Cultural Heritage
•Chapter 11 Socio-Economic
•Chapter 12 Noise and Vibration
•Chapter 13 Climate Change
•Chapter 14 Transport and Access
•Chapter 15 Air Quality
•Chapter 16 Land Use and Agriculture
•Chapter 17 Glint and Glare
•Chapter 18 Miscellaneous Issues

Cumulative effects and inter-relationship effects on the above factors are assessed under each environmental topic chapter undert the headline 'Cumulative and Interactive Effects'</td></tr>
<tr><td>(c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;</td></tr>
<tr><td>(d) a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;</td><td>Chapter 3: Site Description, Site Selection and Iterative Design Process</td></tr>
<tr><td>(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and</td><td>Non-Technical Summary</td></tr>
<tr><td>(f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected</td><td>Appendix 2.1 - Schedule 4 Requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as amended.</td></tr>
</table>

Topics Scoped out of the EIA Process

2.2.6 The EIA Scoping Report (**Appendix 1.1- Heckington Fen Solar Park Scoping Report**) concluded that several topics are not likely to cause significant effects, and therefore do not require a full chapter within the PEIR or subsequent ES. **Table 2.2** describes the environmental themes scoped out of the PEIR and subsequent ES.

Table 2.2: Environmental Topics Scoped out of the EIA Process

Environmental Topic	How/ Where Addressed / Reason for Scoping Out
Soil	There is no history of soil contamination on the Proposed Development site nor have activities taken place that would be a high risk to unknown soil contamination as the Energy Park site has always been in agricultural land use. Therefore, there is no reason to expect any form of land contamination of the Energy Park site. The land grade and soil structure of the Energy Park will be considered and contained within **Chapter 16: Land Use and Agriculture**.
Material Assets	The EIA Regulations refer to 'material assets', including cultural heritage, architectural and archaeological aspects and landscape. The phrase 'material assets' has a broad scope, which may include an asset of human or natural origin, valued for heritage, landscape or socioeconomic reasons. It is not considered that there are any further 'material assets' to those already addressed within the other EIA topics, such as **Chapter 10: Cultural Heritage**, **Chapter 6: Landscape and Visual** and **Chapter 11: Socio-Economics**. Therefore, no separate consideration of 'material assets' is considered necessary. This approach was confirmed in the Scoping Opinion provided by the Planning Inspectorate.
Risk of Major Accidents and Disasters	The nature, scale and location of the Proposed Development is not considered to be vulnerable to or give rise to significant impacts in relation to the Risk of Accidents and Major Disasters[1]. Potential effects relating to soil conditions, surface water flooding and climate change are all considered in other EIA topics. Therefore a standalone EIA chapter for 'Risk of Major Accidents and Disasters' was confirmed not to be included as specified in the Scoping Opinion provided by the Planning Inspectorate. During all phases of the development (construction, operation and decommissioning) the developer would implement measures to be in accordance with the relevant health and safety legislation, regulations, and industry guidance to ensure that risks are suitably controlled and managed (for instance in relation to working near to overhead power lines or electrical infrastructure). A draft Construction Methodology is provided in **Chapter 4: Proposed Development**, which would inform the Construction and Environmental Management Plan (CEMP) to be submitted with the ES accompany the DCO application. Risk of battery fire and explosion is addressed at **Chapter 18: Miscellaneous Issues**, where information regarding the measures in place designed to minimise impacts on the environment in the event of such an occurrence are detailed.
Human Health	The possible effect on human health will be considered within the EIA process but not within a standalone chapter. It will be considered within **Chapter 11: Socio-Economics**, **Chapter 12: Noise and Vibration**, and **Chapter 15: Air Quality** and therefore the scope of effects on Human Health have been shaped by their assessment criteria and scope of works. This approach

[1] No definition of 'major accidents and disasters' is provided in the EIA Regulations, however the IEMA Quality Mark Article on 'Assessing Risks of Major Accidents / Disasters in EIA' produced by WSP in 2016 provides the following definition "man-made and natural risks which are considered to be likely, and are anticipated to result in substantial harm that the normal functioning of the project is unable to cope with/rectify i.e. a significant effect."

Environmental Topic	How/ Where Addressed / Reason for Scoping Out
	was confirmed in the Scoping Opinion provided by the Planning Inspectorate.

Transboundary Effects

2.2.7 The EIA Regulations require consideration of transboundary effects of development on the environment. Transboundary effects are the effects of a project on the environment of another European Economic Area (EEA) member state.

2.2.8 Paragraph 3 of Schedule 3 to the EIA Regulations requires that:

> **'the likely significant effects of the development on the environment must be considered… taking into account - … (c) the transboundary nature of the impact'.**

Further, at Schedule 4, the EIA Regulations state that the ES must include:

> **'the description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary… effects of the development'.**

Regulation 32 also obligates the Secretary of State (or Planning Inspectorate on behalf of the Secretary of State) to form a view on the potential for transboundary impacts and, where relevant, consult with relevant EEA states.

2.2.9 The Scoping Opinion provided by the Planning Inspectorate outlined given the nature, scale and location of the Proposed Development, the Inspectorate does not consider that it has the potential for significant transboundary effects on the environment of any EEA State. Subsequently the Planning Inspectorate issued a Transboundary Screening Opinion at **Appendix 2.2- Heckington Fen Solar Park Transboundary Screening** concluding,

> **'the likelihood of transboundary effects resulting from the Proposed Development is so low that it does not warrant the issue of a detailed transboundary screening.'**

2.3 GENERAL ASSESSMENT APPROACH

2.3.1 The ES must contain the information specified in regulation 14(2) and must meet the requirements of Regulation 14(3) and 14(4). It must also include any additional information specified in Schedule 4- Information for Inclusion in Environmental Statements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, Regulation 14(2) (the "EIA Regulations") which is relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.

2.3.2 The PEIR has been prepared to satisy the requirements of the EIA Regulations, comprising the following information detailed in Regulation 14(2), 14(3), 14(4) and Schedule 4 of the EIA Regulations below.

2.3.3 Regulation 14(2), 14(3) and 14(4) states: -

(2) An environmental statement is a statement which includes at least—
(a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;

> (b) a description of the likely significant effects of the proposed development on the environment;
>
> (c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
>
> (d) a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;
>
> (e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and
>
> (f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.
>
> (3) The environmental statement referred to in paragraph (1) must—
>
> (a) where a scoping opinion has been adopted, be based on the most recent scoping opinion adopted (so far as the proposed development remains materially the same as the proposed development which was subject to that opinion);
>
> (b) include the information reasonably required for reaching a reasoned conclusion on the significant effects of the development on the environment, taking into account current knowledge and methods of assessment; and
>
> (c) be prepared, taking into account the results of any relevant UK environmental assessment, which is reasonably available to the applicant with a view to avoiding duplication of assessment.
>
> (4) In order to ensure the completeness and quality of the environmental statement—
>
> (a) the applicant must ensure that the environmental statement is prepared by competent experts; and
>
> (b) the environmental statement must be accompanied by a statement from the applicant outlining the relevant expertise or qualifications of such experts.

2.3.4 Schedule 4 states: -

> **1.** A description of the development, including in particular—
>
> (a) a description of the location of the development;
>
> (b) a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;
>
> (c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;
>
> (d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.
>
> **2.** A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.
>
> **3.** A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.
>
> **4.** A description of the factors specified in regulation 5(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.
>
> **5.** A description of the likely significant effects of the development on the environment resulting from, inter alia—
>
> (a) the construction and existence of the development, including, where relevant, demolition works;
>
> (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;
>
> (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;
>
> (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;

(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;

(g) the technologies and the substances used.

The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(**1**) and Directive 2009/147/EC(**2**).

6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.

7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.

8. A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU of the European Parliament and of the Council(**3**) or Council Directive 2009/71/Euratom(**4**) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

9. A non-technical summary of the information provided under paragraphs 1 to 8.

10. A reference list detailing the sources used for the descriptions and assessments included in the environmental statement.

2.3.5 In preparing the PEIR, reference has also been made to the following government or institue guidance and has been taken into account in the EIA process:

- Planning Act 2008: Guidance on the pre-application process for major infrastructure projects (Ministry of Housing, Community and Local Government, 2015);
- Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011);
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (DECC, 2011);
- National Policy Statement for Electricity Networks Infrastructure (EN-5) (DECC, 2011);
- Draft Overarching National Policy Statement for Energy (EN-1) (2021);
- Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) (2021);
- Draft National Policy Statement for Electricity Networks Infrastructure (EN-5)(2021);
- Advice Note Three: EIA Consultation and Notification (Planning Inspectorate, 2017);
- Advice Note Six: Preparation and Submission of Application Documents (Planning Inspectorate, 2020a);
- Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping (Planning Inspectorate, 2020b);
- Advice Note Nine: Using the Rochdale Envelope (Planning Inspectorate, 2018);

- Advice Note Eleven: Working with Public Bodies in the Infrastructure Planning Process
- Advice Note Twelve: Transboundary Impacts and Process (Planning Inspectorate, 2020c);
- Advice Note Seventeen: Cumulative Effects Assessment (Planning Inspectorate, 2019);
- Environmental Impact Assessment Guide to: Shaping Quality Development (IEMA, 2015);
- Environmental Impact Assessment Guide to: Delivering Quality Development (IEMA, 2016);
- Health in Environmental Impact Assessment: A Primer for a Proportional Approach (IEMA, 2017a);
- Delivering Proportionate EIA: A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA, 2017b);
- IEMA Guide to: Materials and Waste in Environmental Impact Assessment-Guidance for a Proportionate Approach (IEMA, 2020);
- Institute of Environmental Management & Assessment (IEMA) Guide: A New Perspective on Land and Soil in Environmental Impact Assessment (IEMA, 2022) and
- Institute of Environmental Management & Assessment (IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance. 2nd Edition (IEMA, 2022).

2.4 DEVELOPMENT PARAMETERS AND ROCHDALE ENVELOPE

2.4.1 The Proposed Development, which has been the subject of this EIA, is described in more detail within **Chapter 3: Site Description, Site Selection and Iterative Design Process** and **Chapter 4: Proposed Development**. Together, these contain the parameters and controls defining those aspects of the Proposed Development capable of having significant environmental effects, as defined in the EIA Regulations. An accompanying Indicative Site Layout with set parameters has been drafted and the EIA process will assess against **Figure 2.1- Indicative Site Layout.** As the environmental assessments progess this Indicative Site Layout may be amended to allow for mitigation through design in the Proposed Development. Therefore, the Indicative Site Layout within this PEIR may not be the one considered within the ES for the submitted DCO application.

2.4.2 The matters encapsulated within the Indicative Site Layout include:

- Structure heights within the Proposed Development, above ground works along the Cable Route and Bicker Fen Substation;
- Land Use – Ecological Enhancements, Solar Panels, Energy Storage, Substations, existing utilities and landforms such as drains and ditches;
- Access points from Highway to the Proposed Development, Cable Route and Bicker Fen Substation; and
- Onsite Facilities – Permissive Path and Community Orchard (to be accessed via agreement)

2.4.3 Where flexibility is required, guidance produced by the Planning Inspectorate with regard to the use of the 'Rochdale Envelope' approach[2] has therefore been applied within the EIA to ensure a robust assessment of the likely significant environmental effects of the Scheme. This involves assessing the maximum (and where relevant, minimum)

[2] Planning Inspectorate's Advice Note 9: The Rochdale Envelope (Planning Inspectorate, 2018, version 3)

parameters for the elements where flexibility needs to be retained, recognising that the worst-case parameter for one technical assessment may differ from another.

2.4.4 Any assumptions made regarding the maximum design scenarios have been identified in each of the topic chapters and have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group.

2.4.5 As is relevant for each technical discipline, alternative designs under the Rochdale Envelope approach have been assessed, in order to predict worst-case overall impacts. These have been used in the assessment of significance of effects. Each of the **Chapters 6 to 18** describe the parameters applied in relation to the particular discipline. As the Proposed Development design evolves, key elements of the design may be fixed. However, it is likely that flexibility will need to be maintained for some aspects of the Proposed Development for the DCO application. Where flexibility is to be retained in the Application, any changes to design parameters will remain within the likely worst-case envelope. Justification for the need to retain flexibility in certain parameters is outlined in **Chapter 3: Site Description, Site Selection and Iterative Design Process**.

2.5 PRELIMINARY ENVIRONMENTAL INFORMATION REPORT ASSESSMENT METHODOLOGY

2.5.1 The content of the PEIR is based on the following:

- Review of the baseline situation through existing information, including data, reports, site surveys and desktop studies;
- Consideration of the relevant local, regional and national planning policies, guidelines and legislation relevant to the EIA such as the National Policy Statements (EN1, EN3 and EN5), Draft National Policy Staements (EN1, EN3 and EN5), National Planning Policy Framework (NPPF) and accompanying 'live' document National Planning Practice Guidance (NPPG), and the statutory extant and emerging development plan policies;
- Consideration of potential sensitive receptors;
- Identification of likely significant environmental effects and an evaluation of their duration and magnitude;
- Expert opinion;
- Modelling and calculations;
- Use of relevant technical and good practice guidance; and
- Specific consultations with appropriate bodies.

2.5.2 Each topic chapter provides details of the methodology for baseline data collection and the approach to the preliminary assessment of effects. Each environmental topic has been considered by a specialist in that area.

2.5.3 Each topic chapter defines the scope of the assessment within the methodology section, together with details of the study area, desk study and survey work undertaken.

2.5.4 Environmental effects have been evaluated with reference to definitive standards and legislation where available. Where it has not been possible to quantify effects, assessments have been based on available knowledge and professional judgment.

2.6 STRUCTURE OF THE TECHNICAL CHAPTERS

2.6.1 Throughout the EIA process, the likely significant environmental effects of the Proposed Development will be assessed. The information which will inform the EIA process has generally been set out in the following way:

Executive Summary – short overview summarising the key effects of the chapter;

Introduction – to introduce the topic under consideration, state the purpose of undertaking the assessment and set out those aspects of the Proposed Development material to the topic assessment;

Assessment Approach – to describe the method and scope of the assessment undertaken and responses to consultation in relation to method and scope in each case pertinent to the topic under consideration;

Baseline Conditions – a description of the baseline conditions pertinent to the topic under consideration including baseline survey information;

Assessment of Likely Significant Effects - identifying the likely effects, evaluation of those effects and assessment of their significance, considering the construction, operational and decommissiong phases and direct and indirect effects;

Mitigation and Enhancement - describing the mitigation strategies for the significant effects identified and noting any residual effects of the proposals;

Cumulative and In-combination Effects - consideration of potential cumulative and in-combination effects with those of other developments; and

Summary – a non-technical summary of the chapter, including baseline conditions, likely significant effects, mitigation and conclusion.

2.7 DETERMINING THE BASELINE CONDITIONS

2.7.1 The existing and likely future environmental conditions in the absence of the Proposed Development are known as 'baseline conditions'. Each topic-based chapter includes a description of the current (baseline) environmental conditions. The baseline conditions at the Site and within the study area form the basis of the assessment, enabling the likely significant effects to be identified through a comparison with the baseline conditions.

2.7.2 Consideration will also be given to how the baseline conditions would evolve in the absence of the Proposed Development, known as the 'future baseline'.

2.7.3 The consideration of future baseline conditions has also taken into account the likely effects of climate change, as far as these are known at the time of writing. This has been based on information available from the UK Climate Projections project, developed by the Met Office and Environment Agency (Met Office, 2018), which provides information on plausible changes in climate for the UK.

2.7.4 Topic authors have also considered other factors relevant to identification of future baseline conditions, such as trends in population size of protected species or changes in socio-economic conditions over time.

2.8 ASSESSMENT YEARS

2.8.1 The approach to assessment has incorporated the use of identified assessment years to allow for preliminary evaluation of the likely effects during the phased construction process and during the operation of the Energy Park. The following assessment years have been used to inform this PEIR:

- Existing Baseline (2021/22) – this is the principal baseline against which environmental effects will be assessed in which the baseline studies for the EIA are being undertaken. Some survey work has taken place in 2021, hence the spread in years for the exisiting baseline;

- Future Baseline (No Development) in 2026, 2027, 2067. These assessment years are explained below.

- Construction (2026) (With Development): — The peak construction years for the purpose of the EIA is anticipated to be 2026/27; this assumes commencement of construction in 2026 and that the Proposed Development is built out over an 18-month period. This is a likely worst case from a traffic generation point of view because it compresses the trip numbers into a shorter duration and represents the greatest impact on the highway network. A lengthened construction phase would likely result in lower traffic, air quality and noise impacts; therefore, the likely worst case scenario has been assessed within the PEIR.

- Operation (2027) (With Development): — This is the opening year of the Proposed Development; this assumes that the Proposed Development will be operational during 2027 and is determined by the timeframe National Grid has stated within their Grid Offer for completion of the connection at Bicker Fen Substation.

- Decommissioning (2067/2068) – this is the proposed year when the design life of the Proposed Development has been achieved, albeit the assessment will be high level and qualitative and the operational life may extend beyond this date. It is proposed that the solar park and energy strorage will be operational for 40 years.

2.9 DETERMINING SIGNIFICANCE OF EFFECTS

2.9.1 The purpose of the EIA is to identify the likely 'significance' of environmental effects (beneficial or adverse) arising from a Proposed Development. In broad terms, environmental effects are described as:

- Adverse – detrimental or negative effects to an environmental resource or receptor;
- Beneficial – advantageous or positive effect to an environmental resource or receptor; or
- Negligible – a neutral effect to an environmental resource or receptor.

2.9.2 Effects will be considered against three phases of the development; the construction phase, operational phase and decommissioning phase.

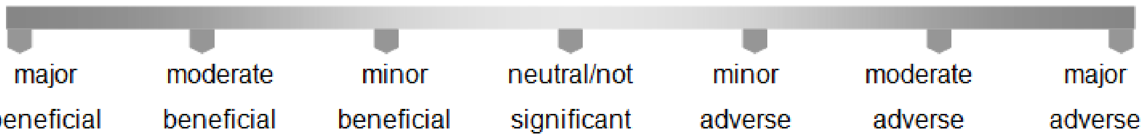
2.9.3 The construction phase effects are those effects that result from activities during enabling works, construction, and commissioning activities. This covers sources of effects such as construction traffic, noise and vibration from construction activities, dust generation, site runoff, mud on roads, risk of fuel/oil spillage, and the visual intrusion of plant and machinery on site. Some aspects of construction related effects will last for longer than others. For example, impacts related to earth moving are likely to be relatively short in duration compared with the construction of energy infrastructure and landscaping activities, which are likely to persist throughout the entire construction period.

2.9.4 Operational effects are the effects that are associated with operational and maintenance activities during the generating lifetime of the Proposed Development. This includes the effects of the physical presence of the energy infrastructure, and its operation, use and maintenance. Timescales associated with these enduring effects are as follows:

- Short term – a period of months, up to one year;
- Medium term – a period of more than one year, up to five years; and
- Long term – a period of greater than five years.

2.9.5 Decommissioning effects are changes resulting from activities beginning and ending during the decommissioning stage. This covers sources of effects such as decommissioning site traffic, recycling of solar PV panels, noise and vibration from decommissioning activities, dust generation, site runoff, mud on roads, risk of fuel/oil spillage, and the visual intrusion of plant and machinery on site, for example. Typically, decommissioning phase effects are similar in nature to the construction phase, although may be of shorter duration and of slightly less intensity.

2.9.6 It is proposed that the significance of environmental effects (adverse, negligible/neutral or beneficial) would be described in accordance with the following 7-point scale:-



2.9.7 Significance reflects the relationship between two factors:

- The magnitude or severity of an effect (i.e. the actual change taking place to the environment); and
- The sensitivity, importance or value of the resource or receptor.

2.9.8 The broad criteria for determining magnitude are set out in **Table 2.3**.

Table 2.3: Degrees of Magnitude and their Criteria

Magnitude of Effect	**Criteria**
High	Total loss or major/substantial alteration to elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes will be fundamentally changed.
Medium	Loss or alteration to one or more elements/features of the baseline conditions such that post development character/composition/attributes of the baseline will be materially changed.
Low	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible / detectable but the underlying character / composition / attributes of the baseline condition will be similar to the pre-development.
Negligible	Very little change from baseline conditions. Change not material, barely distinguishable or indistinguishable, approximating to a 'no change' situation.

2.9.9 The sensitivity of a receptor is based on the relative importance of the receptor using the scale in **Table 2.4**.

Table 2.4: Degrees of Sensitivity and their Criteria

Sensitivity	**Criteria**
High	The receptor / resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Medium	The receptor / resource has moderate capacity to absorb change without significantly altering its present character, or is of high and more than local (but not national or international) importance.

Sensitivity	Criteria
Low	The receptor / resource is tolerant of change without detrimental effect, is of low or local importance.
Negligible	The receptor / resource can accommodate change without material effect, is of limited importance.

2.9.10 Placement within the 7-point significance scale would be derived from the interaction of the receptor's sensitivity and the magnitude of change likely to be experienced (as above), assigned in accordance with **Table 2.5**, whereby effects assigned a rating of Major or Moderate would be considered as 'significant'.

Table 2.5: Degrees of Significance

Magnitude of Change	Sensitivity of Receptor				
		High	**Medium**	**Low**	**Negligible**
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

2.9.11 The above magnitude and significance criteria are provided as a guide for specialists to categorise the significance of effects within the ES. Where discipline-specific methodology has been applied that differs from the generic criteria above, this is clearly explained within the given chapter under the heading of Assessment Approach.

2.9.12 As can be seen from **Table 2.5** when an environmental effect is assessed as having a major or moderate degree of significance it is deemed to be "significant". These are the shaded cells in **Table 2.5**. When such a significant effect occurs consideration of mitigation solutions or enhancements to minimise the effect (which can include design alterations) will be considered. Once these mitigations and enhancements have been assessed the degree of significance may decrease to minor/moderate, minor or negligible.

2.10 ADDRESSING UNCERTAINTY IN ASSESSMENT

2.10.1 There is some degree of inherent uncertainty within the EIA process, in relation to factors such as future improvements to construction and design, the potential effects of climate change on existing receptors and in terms of the margin of error within forecasting or modelling tools. In all cases, where uncertainty exists, or where difficulties have been encountered, this has been identified within the relevant chapter of the PEIR, together with details of the measures that have been taken to reduce uncertainty as far as reasonably practicable. As the EIA process progresses, the degree of uncertainty is anticipated to reduce.

2.10.2 The assessment of construction and decommissioning effects will be undertaken based on existing knowledge, techniques and equipment. A 'reasonable worst-case' scenario will be used with respect to the envisaged construction methods, location (proximity to sensitive receptors), phasing and timing of construction activities.

2.10.3 Where modelling tools have been used within the topic assessments, care has been taken to ensure that the tool selected is appropriate for the assessment, taking into account topic-specific good practice and guidance. Calibration has been used to ensure a reasonable degree of accuracy in measurements. Topic chapters within the PEIR set out measures taken to address any uncertainty with regard to modelling inputs and outputs and any assumptions made.

2.11 MITIGATION

2.11.1 The EIA Regulations (Regulation 14(2)(c)) require that where significant effects are identified **'a description of any feature of the Project, or measures envisaged in order to avoid, prevent or reduce or, if possible, offset any likely significant adverse effects on the environment'** should be provided.

2.11.2 The development of mitigation measures is part of the iterative EIA process. Therefore, measures are under consideration throughout the EIA process in response to the findings of initial assessments. The Proposed Development has had several measures incorporated into the concept design to avoid or minimise environmental impacts. In some cases, these measures may result in enhancement of environmental conditions.

2.11.3 Where mitigation measures are proposed that are specific to an environmental theme (i.e. ecological measures incorporated into the landscaping scheme etc) and incorporated into the design, these are also outlined within **Chapter 3: Site Description, Site Selection and Iterative Design Process**, and highlighted within the relevant technical chapter.

2.11.4 Where the assessment of the Proposed Development has identified potential for significant adverse environmental effects, the scope for mitigation of those effects has been considered and is outlined in the appropriate technical chapter. It is assumed that such measures would be subject to appropriate Development Consent Order (DCO) requirements.

2.11.5 Where the effectiveness of the mitigation proposed has been considered uncertain, or where it depends upon assumptions of operating procedures, then data and/or professional judgement has been introduced to support these assumptions.

2.11.6 The topic chapters included in this PEIR consider the following mitigation types:

- measures included as part of the Proposed Development design (sometimes referred to as mitigation by design or embedded mitigation)
- measures proposed to avoid effects occurring or to minimise environmental effects, and are not included within the design (referred to as additional mitigation); and
- measures proposed that bring additional benefits to the Proposed Development but are not necessary to make the development acceptable (referred to as enhancements).

2.11.7 Standard measures and the adoption of construction best practice methods to avoid, minimise or manage adverse environmental effects, or to ensure realisation of beneficial effects, are assumed to have been incorporated into the design of the Proposed Development and the methods of its construction from the outset.

2.11.8 As the EIA process progresses, further work in relation to mitigation measures will be undertaken and this will inform the design of the Proposed Development for which development consent is sought. This will be reflected in the ES. The draft DCO will be developed to be consistent with the measures identified in the ES and any draft management plans, in order to ensure consistent implementation of the measures identified through the EIA process.

2.12 CUMULATIVE AND IN-COMBINATION EFFECTS

2.12.1 Cumulative effects are assessed under two types of relationships:

1) Inter-project effects: combined effect of individual development - for example, noise, dust and visual on one particular assessment; and

2) Inter-relationship: several developments with insignificant impacts individually but which together represent a significant cumulative effect.

Legaslative Policy and Context

2.12.2 With respect to inter-project cumulative effects, the EIA Regulations state that consideration should be given to,

> **"with other existing and/or approved projects taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources…"**

(Schedule 4, paragraph 5(e)) in relation to cumulative effects. No further guidance or requirement beyond the need for the requirement for an assessment of the interrelationships between types of effect is provided.

2.12.3 This is also re-iterated in the Overarching National Policy Statement for Energy EN-1 (DECC, 2011) stating that:

> **"when considering cumulative effects, the ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence."**

2.12.4 Schedule 4 Part 1 of the EIA Regulations requires:

> **"a description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from:**
>
> - **The existence of the development;**
> - **The use of natural resources;**
> - **The emission of pollutants, the creation of nuisances and the elimination of waste; and**
> - **The description by the applicant of the forecasting methods used to assess the effects on the environment."**

2.12.5 In-combination effects arise where effects from one environmental element bring about changes in another environmental element. Examples of types of interactive effects may include, for example effects of water discharges on ecology or effects of landscaping on ecology. The potential for such effects are reviewed in the technical chapters of the PEIR. The assessment of inter-related project effects and inter-relationship effects presented in this PEIR is based on information known about the Proposed Development at this stage. The assessment will be further refined at the ES stage to produce a conclusion on whether likely significant inter-related effects would arise.

2.12.6 Planning Inspectorate Advice Note Seventeen (Planning Inspectorate, 2019) provides a clear and systematic approach to cumulative effects which forms the basis of the cumulative effects assessment for the Proposed Development. The approach consists of a four stage process which is further described below.

2.12.7 In relation to the assessment of inter-relationships, the Planning Inspectorate Rochdale Envelope Advice Note Nine (Planning Inspectorate, 2018), states that the assessment should: **'…ensure that the assessment of the worst case scenario(s) addresses impacts which may not be significant on their own but could become significant when they inter-relate with other impacts alone or cumulatively with impacts from other development (including those identified in other aspect assessments).**'

Cumulative Effects Assessment Aproach

2.12.8 The EIA considers cumulative effects of the Proposed Development in combination with the environmental effects of other existing and/or approved developments on sensitive receptors identified through the EIA process. The scope of cumulative assessment includes identification of a long list of development within the appropriate Zone of Influence (ZoI) for each topic discipline, which will form the basis of the search area for the cumulative effects assessment. The cumulative effects assessment will draw upon the method as set out within Advice Note Seventeen (Cumulative Effects Assessment), as published by PINS in August 2019.

2.12.9 **Table 2.6** identified the four stage process to assess cumulative effects:

Table 2.6: Summary of the four stage process for cumulative effect assessment

Cumulative Effect Assessment Stage	Description of Stage
Stage 1	Establish the National Significant Infrastructure Project's Zone of Influence and identify long list of 'other developments'.
Stage 2	Identify shortlist of 'other developments' for Cumulative Effects Assessment.
Stage 3	Information gathering of the 'other developments'.
Stage 4	An assessment of the likely cumulative effects. Mitigation measures are identified (where appropriate) where an adverse cumulative effect is identified. The apportionment of effect between the Proposed Development and the 'other developments' is considered, eg whether the contribution to the effect is demonstrably related to one development or whether there is an equal contribution from either development.

Stage 1

Establishing the long list

2.12.10 A review of other developments has been undertaken, initially encompassing a 'Zone of Influence' defined by the environmental topic specialists to prepare a long list of 'other developments'.

2.12.11 The long list of other existing and/or approved development will be established using the tiered approach in accordancw with Planning Inspectorate's Advice Note Seventeen: Cumulative Effects Assessment (Planning Inspectorate, 2019) Table 2- Assigning certainty to 'other existing development and/or approved development.

2.12.12 Developments included in the initial long-list are based on the following criteria:

1. Large-scale development currently under construction;
2. Approved applications which have not yet been implemented;
3. Large-scale submitted applications not yet determined;
4. Refused large-scale applications, subject to appeal procedures not yet determined;
5. On the National Infrastructure Planning Programme of Projects;
6. Development identified in the relevant Development Plan (and emerging Development Plans); and
7. Development identified in other plans and programmes which set the framework for future development consents/approvals where such development is reasonably likely to come forward.

2.12.13 Criteria are developed and applied to filter developments which may be excluded from the initial long list, having regard to the size and spatial influence of each development. This long list will be kept under continual review up until the point of determination of the application to ensure that the information within the ES is up to date at the point of decision.

Zone of Influence

2.12.14 The 'Zone of Influence' for each environmental topic area has been identified based on the extent of likely effects as identified as the study area in each of the individual topic chapters (**Chapters 6 - 17**) of this PEIR. The 'Zone of Influence' has been identified in line with industry specific guidance along with professional judgement and knowledge of the local area relevant to each environmental topic area. The identified 'Zone of Influences' are presented in **Table 2.7** below for the scoped in topic chapters.

Table 2.7: Zone of Influence Identified for the Cumulative Effects Assessment

Environmental Topic	Zone of Influence
Landscape and Visual	Landscape and visual receptors: 3km
Residential Visual Amenity	Residential Visual Amenity receptors: 1km
Ecology and Ornithology	• Internationally designated sites: 10km • Nationally designated sites: 2km • Locally designated sites: 2km • Protected species records: 2km • Surveys – most surveys limited to Site boundary and immediate vicinity but will extend to 500m for great crested newt (GCN) ponds and winter bird survey will include adjacent fields where access allows.
Hydrology, Hydrogeology, Flood Risk and Drainage	Hydrological and hydrogeological receptors within a 5km radius from the Proposed Development, based on the hydrological and hydrogeological connectivity of water bodies located in the vicinity of the Proposed Development.
Cultural Hertiage	Cultural Heritage receptors: 5km
Socio-Economic	North Kesteven District Council, Boston Borough Council and Lincolnshire County Council
Noise and Vibration	• 250m from Energy Park Boundary • 1km from Energy Park Substation(s) • 500m from Grid Connection Route
Climate Change	Climate change influence determined by identified receptors and their subsequent study areas in individual scoped in topic chapters.

Environmental Topic	Zone of Influence
Transport and Access	Extent of the local road network affected by the construction and decommissioning phases, as well as any identified sensitive receptors (A17)
Air Quality	5km from Proposed Development.
Land Use and Agriculture	Energy Park and adjoining agriculture land where relevant.
Glint and Glare	5km from Proposed Development.

2.12.15 **Appendix 2.3- Cumulative Sites Long List** presents the identified long list of existing and/or approved developments within the search area and sets out the threshold criteria applied to identify the preliminary shortlist of existing and/or approved developments for each environmental topic.

Stage 2

2.12.16 There is no formal guidance on the size of a 'Study Area' when considering the cumulative impact of a development. Factors such as topograghy of a landscape can effect the extent of a visual envelope for cumulative or sequential views; flight lines for birds moving from a roosting to a feeding ground could affect the cumulative impact on ecology. As a result consideration was given to the known environmental constraints on and around the Proposed Development to determine what factors could effect extent of cumulative sites.

2.12.17 To ensure that the cumulative assessment is proportionate a threshold criteria has ben applied to the long list is order to esablish a shortlist. The criteria ensures that only other existing and/or approved development, which is likely to result in significant cumulative effects, is taken forward to the assessment stage. The threshold criteria used considers the following factors:

- Temporal scope;
- Scale and nature of the development;
- Other factors such as, nature and capacity of the receiving environment, source-pathway-receptor approach; and
- Professional judgement.

2.12.18 The Scoping Response from the Planning Inspectorate (**Appendix 1.2**) stated that the search area for cumulative sites should not just consider a search area for the Energy Park, but also a search area for the Proposed Development (grid cable route connection options and above ground works at National Grid Bicker Fen Substation) due to the need for improvement works at Bicker Fen Substation to allow for the connection of the Energy Park to the grid system.

2.12.19 The Planning Inspectorate also made the request that other NSIP schemes should be considered within the cumulative assessment to determine whether regional scale likely significant effects could occur with other large scale solar projects. These NSIP schemes consist of those within Lincolnshire and Rutland County Council areas.

2.12.20 Multiple Screened Zone of Theoretcial Visibility (ZTV) were run which considered a maximum solar PV panel height (4.5m), 132kv substations (10m), 400kv substation (15m), battery storage unit (6m) and National Grid Bicker Fen Substation extension (15m), to help inform judgement of the shortlist sites. The ZTV's showed that there was the potential for visibilty of the Proposed Development within 5km of the Site.

2.12.21 A new South Lincolnshire Reservoir as a Strategic Regional Water Solution-Gate One is currently being proposed by Anglian Water and Water Reaources East. A Preliminary Feasibility Assessment for the South Lincolnshire Reservoir was undertaken in

July 2021, however the location of the new reservoir has not been revealed, the location will be revealed later in 2022. At the time of preparing this PEIR the new South Lincolnshire Reservoir has not been considered as part of the long list or short list as no formal details are available at this time. This long list will be kept under continual review up until the point of determination of the application.

2.12.22 Following on from the Scoping Response the shortlist for 'other developments' has been reviewed and the list of sites to be considered within the EIA has been expanded. The cumulative assessment within the PEIR will now consider the following sites:

Table 2.8 Details of Shortlist Cumulative Schemes

	Name of Scheme	LPA	NSIP	Reference Number	Size of Scheme	Distance from Application Site
1	Vicarage Drove – Approved	BBC[3]	No	B/21/0443	49.9MW	*c.* 4.5km south of the Energy Park Site at its closest point but adjacent to the the proposed extension to the substation at Bicker Fen
2	Land at Little Hale Fen-Screening	NKDC[4]	No	21/1337/EIASCR	49.9MW	*c.* 4.6km north-east of the Energy Park Site at its closest point
3	Land at Ewerby Thorpe – Screening	NKDC	No	14/1034/EIASCR	28MW	*c.* 4.1km north-west of the Energy Park Site at its closest point
4	Land to the North of White Cross Lane – Approved	NKDC	No	19/0863/FUL	32MW	*c.* 8.4km west of the Energy Park Site at its closest point
5	Land South of Gorse Lane, Silk Willoughby – Approved	NKDC	No	19/0060/FUL	20MW	*c.* 11km west of the Energy Park Site at its closest point
6	Cottam Solar Project	PINS – BDC[5] & WLDC	Yes	EN010133	50MW + (NSIP)	*c.* 43.6km north-west of the Energy Park Site at its closest point
7	Gate Burton Energy Park	PINS – BDC[3] & WLDC	Yes	EN010131	50MW + (NSIP)	*c.*48.6km north-west of the Energy Park Site at its closest point
8	West Burton Solar Project	PINS – BDC[3] & WLDC	Yes	EN010132	50MW + (NSIP)	*c.*41.3km north-west of the Energy Park Site at its closest point
9	Mallard Pass Soalr Farm	PINS - SKDC[6]	Yes	EN010127	50MW + (NSIP)	*c.*33.2km south-west of the Energy Park Site at its closest point

[3] Boston Borough Council

[4] North Kesteven District Council

[5] Bassetlaw District Council and West Lindsey District Council

[6] South Kesteven District Council

2.12.23 These cumulative sites are shown on **Figure 2.2- Cumulative Plan.**

2.12.24 Subsequent to the development of the long list and shortlist provided for assessment work, a further potential solar farm has been noted with a request made for a Screening Opinion at Boston District Council on land to the north and west of Northorpe (planning reference: B/21/0412). No formal application for this scheme has yet been made. This scheme has not been cumulatively assessed within the PEIR, however it wil be assessed as part of the four stage approach for the ES accompanying the DCO application.

2.12.25 Where schemes have been discounted, they will continue to be monitored to ensure that any changes to those schemes are identified and their omission from the shortlist is reassessed.

2.12.26 The long list and the shortlist have not yet been finalised and views are actively being invited on schemes that should be added to the long list for consideration. Any other schemes that are identified, will be considered in the long list and a decision will be taken using the assessment criteria and professional judgement applied to determine whether the scheme(s) will be included in the shortlist.

2.12.27 Any new projects added to the short list will be assessed in the ES. The long list and short list will be finalised in advance of submission of the DCO Application

<u>Stage 3</u>

2.12.28 A desk study search of the environmental information available for each of the 'other developments' has been undertaken. This included searching on Local Planning Authorities and the Planning Inspectorate websites. The information gathered has been used to identify the likely significant cumulative effects. In our ongoing consultations with Lincolnshire County Council, North Kesteven District Council and Boston Borough Council, requests have been made to determine if there are any other schemes, which may not be in the wider public domain, that should be included within the cummulative assessment to try and ensure that the list of 'other developments' is robust.

<u>Stage 4</u>

2.12.29 The assessment of likely cumulative effects will be undertaken to an appropriate level of detail commensurate with the information available on other existing and/or approved developments within each technical chapter of the PEIR.Measures will be set out envisaged to reduce or avoid any identified significant adverse cumulative effects and, where appropriate, any proposed monitoring arrangements.

2.12.30 The assessment wihtin each topic chapter includes a list of those developments considered to have the potential to generate a cumulative effect together with the Proposed Development. The assessment does not aim to assign significance levels (such as negligible, minor, moderate or major) for the identified effects. Instead the assessment is used to identify where there is the potential for cumulative effects to occur and to provide details of whether cumulative effects are likely to be significant or not. A statement is made as to whether the cumulative effect would be worse or better than the effects predicted for the Proposed Development alone, whether the cumulative effects have the potential to be more significant than the effects of the Proposed Development alone and, if so, whether this would be adverse or beneficial.

2.13 GENERAL ASSUMPTIONS AND LIMITATIONS

2.13.1 The principal assumptions that have been made and any limitations that have been identified in preparing this PEIR are set out below:

- All of the principal land uses adjoining the Proposed Development remain as present day, except where redevelopment proposals have been granted planning consent. In those cases it is assumed the redevelopment proposals will be implemented or would but for the development being implemented;
- Information received from third parties is complete and up to date;
- The design, construction and completed stages of the Proposed Development will satisfy legislative requirements; and
- Requirements will be attached to the DCO with regards "mitigation", where considered necessary to make the development acceptable.

2.13.2 The PEIR provides a preliminary view on the likely significant effects and the appropriate methodologies to assess and address those effects. The environmental assessment is ongoing and, therefore, the development of the design and appropriate mitigation, monitoring and enhancement measures will be refined alongside the continued assessment and taking into account the consultation responses received. The findings will be reported in the ES, which will form part of the application for development consent.

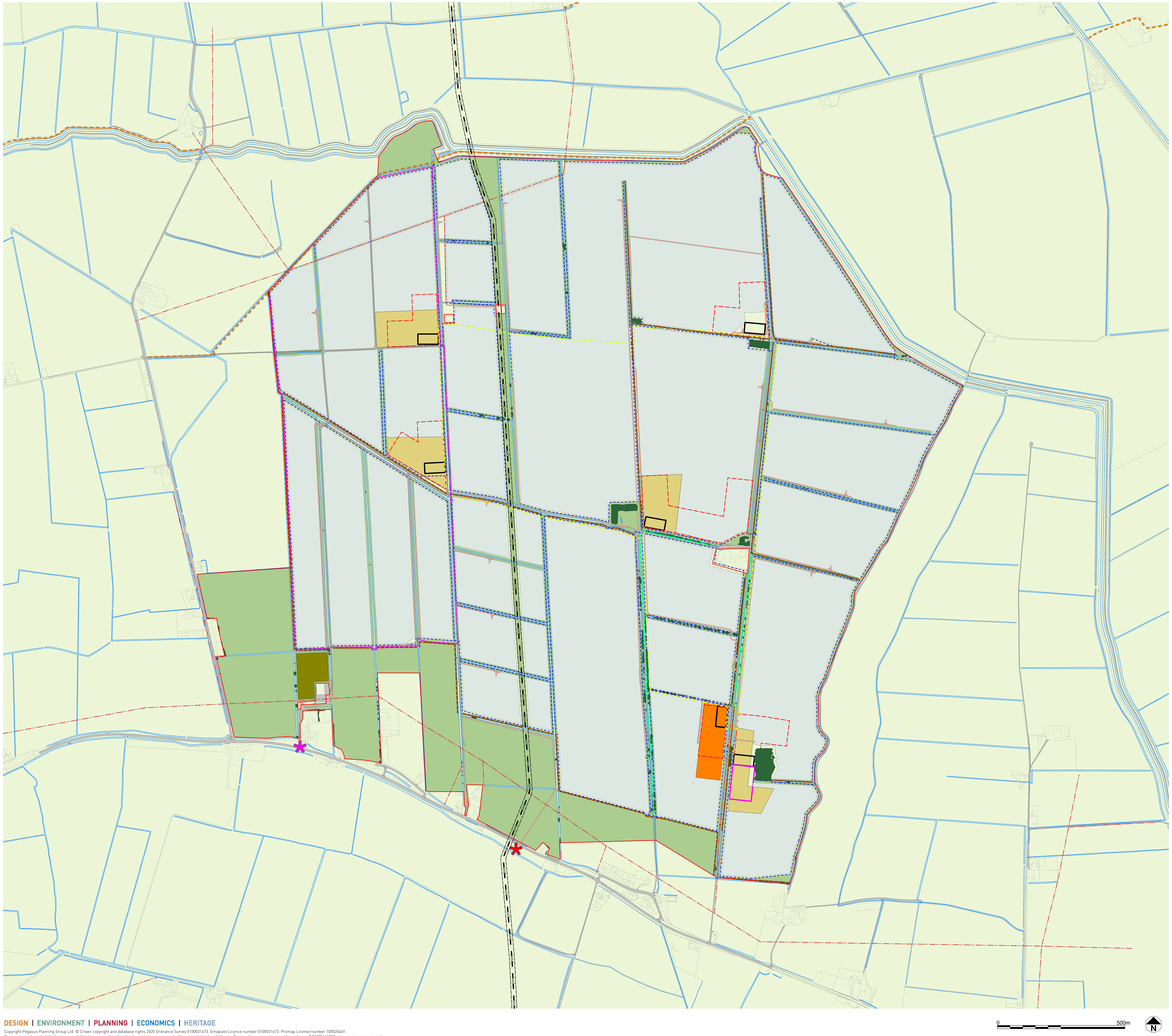
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 2.1- Indicative Site Layout

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Security Fence
- Proposed Site Entrance
- Temporary Access
- Primary Access Track
- Existing Road/Track
- Solar Development Area
- Public Right of Way
- Proposed Permissive Footpath
- Potential Biodiversity Net Gain (112.15ha)
- Trees, Woodland and Hedgerows
- New Hedgerow (10.19km)
- Enhanced Hedgerow (1.98km)
- Community Orchard
- Ditch
- Gas Pipeline
- 11kV Overhead Line
- Construction Compound
- Primary Energy Storage
- Indicative 400kV Substation Location
- Indicative 132kV Substation Location
- 132kV Substation and Energy Storage Zone
- Indicative 132kV Overhead Cable Route

Buffers to development:
- 9m to BSIDB maintained open watercourses
- 8m to all other watercourses
- 10m to gas pipeline
- 5m to 11kV overhead line

Notes:
Hedgerows would be up to 3m in width when mature and would be maintained up to 4m in height.

The Solar Development Area will include some localised electrical infrastructure such as inverters, transformers, energy storage and smaller substations.

Revisions:
First Issue- 12/10/2021 JS
A - (03/11/2021 JS) Revised layout
B - (09/11/2021 JS Hedgerows amended and orchard added
C - (19/11/2021 JS) Revised site boundary
D - (01/12/2021 JS) Layout amended
E - (14/12/2021 JS) Layout amended
F - (04/05/2022 CR) Layout amended
G - (18/05/2022 CR) Layout amended
H - (25/05/2022 CR) Layout amended

FIGURE 2.1
Indicative Site Layout

DRWG No: **P20-2370_03** Sheet No:_ REV: H
Drawn by : CR Approved by: IH
Date: 25/05/2022
Scale: 1:5,000 @ A0

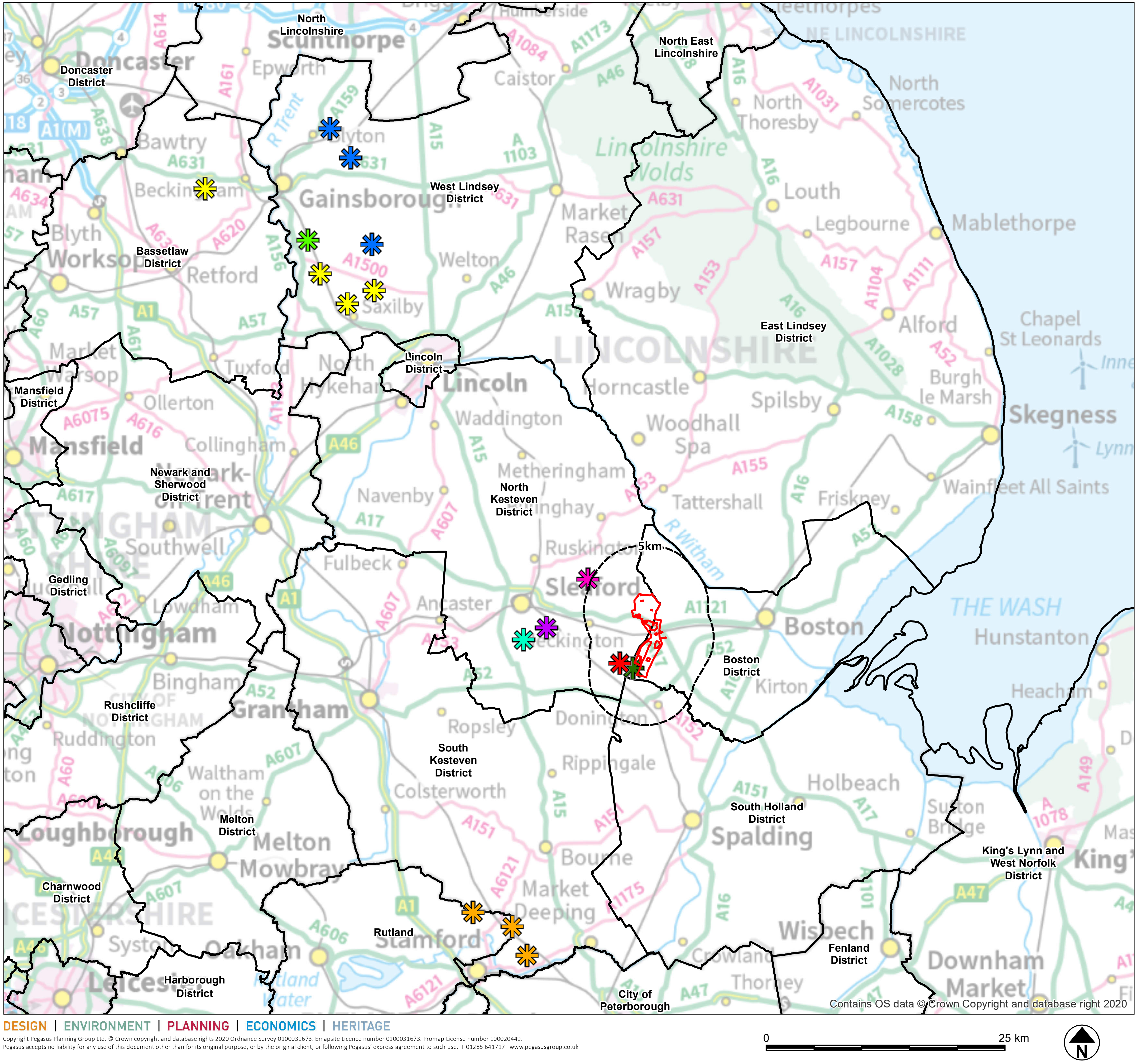
DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 2.2- Cumulative Sites

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- 5km buffer
- Local Authority Boundary
- Cottam Solar Project (Cottam 1,2 & 3)
- Land at Ewerby Thorpe - Screening 14/1034/EIASCR
- Gate Burton Energy Park
- Land South Of Gorse Lane Silk Willoughby Approved - 19/0060/FUL
- Land at Little Hale Fen - Screening 21/1337/EIASCR
- Mallard Pass Solar Farm
- West Burton Solar Project (Sites 1,2,3 & 4)
- Land to the North of White Cross Lane - Approved 19/0863/FUL
- Vicarage Drove [B/21/0443]

FIGURE 2.2

Cumulative Sites

DRWG No:	P20-2370_13	Sheet No:	-	REV:	C
Date:	08/06/2022				
Scale:	1:400,000 @ A3				

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 3: Site Description, Site Selection and Iterative Design Process

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

3 SITE DESCRIPTION, SITE SELECTION AND ITERATIVE DESIGN PROCESS

3.1 INTRODUCTION

3.1.1 This chapter of the PEIR provides a description of the Proposed Development and the surrounding context. Detailed topic specific descriptions are expanded upon in the supporting technical chapters and technical appendices. It also provides a description of the evolution of the Proposed Development design so far and the main alternatives considered.

3.1.2 This chapter includes the following sections:

- Site Description- a description of the existing conditions within the Proposed Development and the surrounding areas and the key receptors that will be assessed in detail within the technical topic chapters;
- Site Selection- an overview of the site selection process undertaken for the Proposed Development; and
- Iterative Design Process- a description of the iterative design process undertaken and a description of the main alternatives to the Proposed Development and the selection of the Energy Park as the preferred option.

3.2 SITE DESCRIPTION

3.2.1 The existing constraints within the Proposed Development outlined in this chapter were identified through a desktop search of readily available data, and include the following:

- Statutory nature conservation designations;
- Local nature designations;
- Scheduled monuments;
- Conservation areas;
- Waterbodies;
- Flood zones;
- Areas of vegetation; and
- Public rights of way (PRoW).

<u>Location of the Energy Park</u>

3.2.2 The Energy Park is located on an area of greenfield land within East Heckington, approximately 3.7km east of the village of Heckington and 8.9km west of the town of Boston, Lincolnshire. The closest major city is Lincoln approximately 32km north-west of the Proposed Development. The village of Heckington is separated from the Energy Park site by agricultural land within the surrounding fenland landscape. The Energy Park extends to approximately 586 hectares (ha). The Energy Park site lies wholly within the administrative district of North Kesteven, abutting Boston Borough Council administrative boundary along the eastern edge of the Energy Park site. The grid route connection predominately lies within Boston Borough Council, with a small section in North Kesteven closest to the proposed Energy Park entrance.

3.2.3 The Energy Park site comprises arable, agricultural land subdivided into rectilinear parcels by long linear drainage ditches that lie principally north-south, connected east-west by shorter ditches including Labour in Vain Drain. The ditches have an engineered profile, colonised in part by emerging aquatic plant species. The Energy Park is bounded by Head Dike to the north, a smaller watercourse to the east, the A17

Sleaford to Holbeach road to the south and B1395 Side Bar Lane and further agricultural land to the west.

3.2.4 Six Hundreds Farm lies in the eastern third of the Energy Park site, with vehicular access gained from Six Hundreds Drove via the A17. Vehicular access is also provided via two other points further west of the A17 frontage at Rectory Farm and at Elm Grange, with tracks connecting to Crab Lane toward the northwest corner of the Energy Park site, and then to Sidebar Lane. The access tracks follow ditch alignments.

Cable Route Corridors

3.2.5 The grid connection corridor covered a much wider corridor in the Scoping Report, which has now been refined. The initial design options predominantly comprised of a Western Route and an Eastern Route, named in relation to their geographical positioning relative to the South Forty Foot Drain.

3.2.6 A report by Freedom Group completed the first stage of design work to support the selection of a preferred connection design and route corridor. One of the outcomes of this report identified technical and practical benefits for the Eastern Route, with an Alternative Route identified, known below as the 50-50 Route. This 50-50 route would see the connection leave the Energy Park close to the new entrance and the existing gas main, to the north-west of the South Forty Foot Drain, before crossing the Drain and the railway before going south on the eastern side of the Drain to Bicker Fen Substation.

3.2.7 A design workshop was held in March 2022 with all the technical authors. The outcome of this workshop allowed the team to refine the routes down to the Eastern and 50-50 Route, which were then taken forward for further consideration. The Western Route was removed due to technical challenges and greater difficulties associated with construction with smaller access roads and interactions with public rights of ways, as well as less favourable landowner engagement. A review of Anglian Water's South Lincolnshire Reservoir (July 2021) identified a number of potential locations for a new reservoir. Whilst not explicitly named as an option, local knowledge and aerial imagery identified one of these areas under consideration as the being close to the villages of Helpringham and Little Hale, on the Western Route. Through on-going consultation with the Local Authorities, it is understood that sites for a new reservoir within the local area are under active consideration. To ensure that there was not a delay in the future with a Grid Route a decision was made to avoid the potential locations of these reservoirs.

3.2.8 Other routes considered and removed during the earlier stages of consideration included a road only route, utilising the A17 which was ruled out due to disruption during construction and difficulties crossing the bridge at Swineshead. The two remaining routes are shown on **Figure 3.4: Indicative Grid Routes.**

Grid Connection Route A – Eastern Route

3.2.9 The Eastern Route leaves the Energy Park on the eastern boundary, crossing the Viking Link and Triton Knoll connections before heading south towards Bicker Fen. Along the cable route crossings will be required for the A17, the South Forty Foot Drain, the railway, a high-pressure gas pipe and a number of watercourses.

Grid Connection Route B – 50-50 Route

3.2.10 The 50-50 Route leaves the Energy Park at the site entrance, on the eastern side of the high-pressure gas pipe. The cable would need to cross the A17 here, before crossing the Viking Link and Triton Knoll connections close to the South Forty Foot Drain and the railway. Once on the eastern side of the South Forty Foot Drain the route broadly follows a similar corridor to the substation, crossing the high-pressure gas pipe and a number of watercourses on the way.

Bicker Fen National Grid Substation Extension

3.2.11 Work is ongoing with National Grid to determine the preferred location of the extension to Bicker Fen. National Grid are still completing their layers of assessment, to determine the preferred location for the extension.

3.2.12 Through discussions with National Grid, it is likely that the location of the Bicker Fen substation extension will be on land to the immediate south-west of the existing substation. This area of land is currently an area of rough grassland and plantation/screening wood. For the extension to be built the area of plantation/screening wood will need to be removed.

Landform and topography

3.2.13 In terms of landform, the Energy Park site is very flat and low-lying at between 2m and 3m Above Ordnance Datum (AOD) across the entire Energy Park site. The Energy Park is situated on the Lincolnshire Fens, a coastal plain in the east of England which comprises a large area of broad flat marshland supporting a rich biodiversity. The Energy Park falls within National Character Area 46: The Fens described as an-

> **'expansive, flat, open, low-lying wetland landscape influenced by the Wash estuary, and offering extensive vistas to level horizons and huge skies throughout, provides a sense of rural remoteness and tranquillity…'**
>
> **'Overall, woodland cover is sparse, notably a few small woodland blocks, occasional avenues alongside roads, isolated field trees and shelterbelts of poplar, willow and occasionally leylandii hedges around farmsteads, and numerous orchards around Wisbech. Various alders, notably grey alder, are also used in shelterbelts and roadside avenues.'**
>
> **'Open fields, bounded by a network of drains and the distinctive hierarchy of rivers (some embanked), have a strong influence on the geometric/rectilinear landscape pattern. The structures create local enclosure and a slightly raised landform, which is mirrored in the road network that largely follows the edges of the system of large fields.'**
>
> **'Settlements and isolated farmsteads are mostly located on the modestly elevated 'geological islands' and the low, sinuous roddon banks (infilled ancient watercourses within fens). Elsewhere, villages tend to be dispersed ribbon settlements along the main arterial routes through the settled fens, and scattered farms remain as relics of earlier agricultural settlements.'**

3.2.14 The Energy Park site displays these key characteristics.

Land Use, Buildings and Infrastructure

3.2.15 Land use across the Energy Park site is in arable, agricultural use.

3.2.16 Agricultural land can be graded according to its inherent limitations for agricultural use. Grade 1 is excellent quality and Grade 5 is very poor quality. Grade 3 is divided into subgrades 3a "good" and 3b "moderate" quality land. Grades 1, 2 and 3a are defined as the "best and most versatile" in the NPPF (2021).

3.2.17 An Agricultural Land Classification Assessment was undertaken in November 2021 across the Energy Park. This has involved a semi-detailed survey of 138 auger locations on a regular 200-metre grid across the Energy Park site. The auger density was lower than 1 per hectare as per Natural England guidelines. No auger measurements were taken for the offsite cable route to Bicker Fen as the cable will be laid via underground trenching/moling and so therefore no loss of agricultural land is predicted. Following discussions with Natural England and the Planning Inspectorate further survey work will be completed prior to the submission of the ES. This will include further auger points on the Energy Park in the location of electrical infrastructure, such as the substations and energy storage. The area whereby the cable route will be laid will assume a worst-case scenario of all BMV for the purposes of assessment. The location of small above ground infrastructure (earthing link boxes) will be located so far as practical at field edges. An auger point at these locations will also be undertaken.

3.2.18 The Energy Park is utilising an area of over 586ha of agricultural land. The ALC results for the 525ha area proposed for the solar panel arrays within the Energy Park (i.e. excluding the Potential Biodiversity Net Gain areas where soils are to be unaffected), show 50% of the site is Grade 3b land or below and therefore considered to be poorer quality land. The remaining 50% of the area for energy generation is a combination of Grade 3a (31%), Grade 2 (11%), Grade 1 (6%) and Non-Agricultural land (2%) which is considered Best and Most Versatile (BMV).

3.2.19 Overhead lines supported on wooden poles traverse the Energy Park, running parallel to Six Hundreds Drove and the A17 in the south, and near the north-western boundary of the Site. An underground gas pipeline bisects the Energy Park, extending south-north to the east of Rectory Farm.

3.2.20 There are a series of small areas in the Energy Park that are excluded from the Energy Park site boundary. These areas are a combination of farm buildings and infrastructure relating to the gas pipeline which crosses part of the Energy Park.

Landscape

3.2.21 The Energy Park is bound by Head Dike to the north, a smaller watercourse to the east, the A17 Sleaford to Holbeach road to the south and B1395 Sidebar Lane/agricultural land to the west. The Energy Park lies wholly within North Kesteven District Council, abutting Boston Borough Council's boundary along the eastern edge, where the remaining part of the Proposed Development: grid connection and substation upgrade, is located. A small section of the grid connection is within North Kesteven's boundary.

3.2.22 Land within the Energy Park is in arable use and is subdivided into rectilinear parcels by long linear drainage ditches that lie principally north-south, connected east-west by shorter ditches including Labour in Vain Drain. The ditches have an engineered profile, colonised in part by emerging aquatic plant species. Topographically, the Proposed Development is level and low-lying at between 1m and 3m above Ordnance Datum (AOD) and is predominantly within Flood Zone 3.

3.2.23 According to the North Kesteven District Council's online mapping the vegetation within the Energy Park site boundary is not subject to any Tree Preservation Orders (TPO).

3.2.24 There are sporadic residential (2-storey houses and bungalows) and commercial development (Elm Grange Studios, Wilson Prestige Vehicle Repairs, Mountain's Abbey Parks Farm Shop, Four Winds Service Station, and Shell Service Station) and farms (Rakes

Farm, Maize Farm, Rectory Farm, Piggery, Poplars Farm and Glebe Farm) occur at East Heckington, along the A17 and Sidebar Lane to the south of the Energy Park.

3.2.25 Street lights (approximately 10m high) flank the A17 through East Heckington.

3.2.26 The Energy Park site falls within National Character Area 46 The Fens. There are no nationally designated landscape areas within North Kesteven. The North Kesteven Landscape Character Assessment (2007) identifies that the Energy Park Site is within "The Fens Regional Landscape Type" and the "Fenland Landscape Character Sub-Area".

3.2.27 The Grid connection area falls within Boston Borough Council's area and is covered by its own Landscape Character Assessment of Boston (2009). This published assessment identifies that the grid connection falls entirely within the Landscape Type (LT) A Reclaimed Fen and more specifically its Landscape Character Area (LCA) A1 Holland Reclaimed Fen.

Public Rights of Way

3.2.28 One public right of way (PROW) footpath HECK/15/1 runs along the northern boundary, crossing a small part (c.280m) of the Energy Park; no other PROW occurs within the Energy Park.

3.2.29 The definitive map for PROW shows that HECK/15/1 crosses the Head Dyke through the presence of a footbridge. However, onsite survey and discussions with the drainage board have indicated that this footbridge was removed in 2005 and has not been re-instated. Discussions with the drainage board have indicated that there are no plans to re-instate the footbridge as its presence could cause a hazard if flooding were to breach the dyke. As a result, HECK/15/1 terminates in the field, before it reaches the top of the dyke. The LCC PROW team have been made aware of the effective termination of the footpath due to the removal of the footbridge.

3.2.30 The Ordnance Survey mapping does not routinely show the correct delineation of the right of way and for the purpose of this submission, any OS mapping data used for the accompanying drawings have been updated to show the correct definitive map routing.

3.2.31 The Proposed Development on the Energy Park site does not require the closure or diversion of HECK/15/1. It is proposed that an additional permissive path (4.2km) will be linked to HECK/15/1 to effectively create a loop walk around the Energy Park Site.

Biodiversity Features and Environmental Designations

3.2.32 There are no European statutory designated sites (Ramsar, Special Areas of Conservation (SAC) & Special Protection Areas (SPA) or national sites Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserve (LNR) within 10km of the Energy Park site.

3.2.33 The nearest SSSI is Horbling Fen SSSI located 11.5km to the southwest of the Energy Park site, designated for its geological interest. The Wash SSSI/SPA/SAC/Ramsar and NNR, is situated approximately 17km to the southeast of the Energy Park site at its nearest point.

3.2.34 There are no non-statutory designations within the Energy Park site. The South Forty Foot Drain Local Wildlife Site (LWS) is located approximately 1km to the south of the Energy Park site. This is a man-made watercourse with bankside vegetation comprising rough neutral grassland, scrub, and trees. Cole's Lane Ponds LWS is located 6km southeast of the Energy Park site, and Heckington Grassland Site of Nature Conservation Interest (SNCI) is located approximately 5km to the west of the Energy Park site.

3.2.35 The Energy Park site comprises open, arable farmland surrounded by a network of drains and ditches. The most frequently encountered habitat at the Energy Park site consists of open arable farmland. The arable fields comprise of wheat for compound animal feed with a smaller portion used to make a low biscuit grade grist. The previous break crop of harvest 2020 was oilseed rape. The arable fields are generally cultivated right up to the field margins resulting in very few areas of botanical or ecological importance.

3.2.36 The Energy Park site includes one pond surrounded by bankside trees and scrub. There is an area of wet grassland to the west and north of the pond. There are a small number of hedgerows on the Energy Park site which are used by a variety of breeding and over-wintering birds. Field boundary hedgerows are generally species-poor although the hedgerows vary in height, length, condition and management.

3.2.37 Approximately 10.5ha of the Energy Park site is already held under agri-environmental schemes, in the form of enhanced headlands by way of buffer strips.

Cultural Heritage

3.2.38 The bedrock geology of the Energy Park comprises mudstone and siltstone of the West Walton Formation (in the south-western half) and mudstone of the Ampthill Clay Formation (in the north-eastern half). The superficial geology comprises tidal flat deposits of clay and silt.

3.2.39 The upper and midsections of the off-site cable routes for the Proposed Development are characterised by the same bedrock geology as the Energy Park, but the lowermost 2km sections comprises mudstone of the Oxford Clay Formation. The superficial geology is recorded as tidal flat deposits of clay and silt.

3.2.40 There are no designated archaeological remains, e.g. Scheduled Monuments, located within the Energy Park site. Known and potential non-designated built and archaeological remains located within the Energy Park site comprise:

- Upstanding post-medieval/modern buildings of Six Hundreds Farm;
- Upstanding post-medieval/modern brick boundary wall to the west of Elm Grange;
- Upstanding remains of a post-medieval/modern drainage pump close to Head Dike to the north-east;
- Buried remains of a post-medieval duck decoy to the east;
- Buried remains of former outfarms and field boundaries in various locations, some but not all of which are shown on historic maps;
- Buried remains of a possible enclosure of uncertain origin to the west of centre; and
- Buried remains of a possible enclosure and circular and linear features of uncertain origin to the east.

3.2.41 One Scheduled Monument and four Grade II Listed Buildings lie within a 2km radius of the Energy Park site. Details of the locations of these assets can be seen on **Figure 3.5: Environmental Designations Plan**.

Hydrology

3.2.42 The majority of the Energy Park site is within Flood Zone 3, with some sections of the Energy Park falling within Flood Zone 2 and Flood Zone 1.

3.2.43 Source Protection Zones (SPZs) are used to protect areas of vulnerable groundwater that is used for abstraction and where water quality is of high importance (such as drinking water abstractions). SPZs are categorised into three zones, 1-3, with 1 being of highest risk of contamination, and 3 representing the lowest risk but still within the groundwater catchment.

3.2.44 There are no SPZs recorded within 2 km of the Energy Park site. The closest is located approximately 8.5 km to the west.

Air Quality

3.2.45 The Proposed Development is located approximately 11.3 km west of its nearest Air Quality Management Area (AQMA), 'Haven Bridge AQMA' which is located in Boston Borough Council's (BBC) administrative area and which has been declared for exceedances of the annual mean nitrogen dioxide (NO_2) air quality objective (AQO).

3.2.46 The location and extent of the Proposed Development is shown on **Figure 1.1.**

3.3 SITE SELECTION

3.3.1 The information in this following section indicated the key environmental elements that were considered when determining if the Energy Park site was potentially suitable for an Energy Park. These environmental constraints will be examined in more detail through the site design and EIA process. The detail of these assessments, to date, can be seen in the later chapters of this PEIR, along with the findings of other environmental assessments, linked to the more detailed design elements of this Proposed Development.

National Grid Point of Connection

3.3.2 One of the biggest constraints which has to be considered when developing a renewable energy scheme is securing a viable point of connection to the electricity network. Securing grid connection for a scheme of this size needs to be to the 400kV network, which remains constrained in terms of availability and a reasonable timescale for connection. It is therefore a reasonable constraint to take into account. Increasingly, electrical connections are being forced back to substations and Bulk Supply Points as the amount of renewable generation connected within the electrical lines has grown. For storage schemes the situation is more complex as the connecting substation must have sufficient export and import capacity.

3.3.3 The electricity generated by the Proposed Development is to be imported and exported via interface cables from the onsite substations to the Bicker Fen National Grid Substation. The cable corridor will be directed across open countryside and require crossings of the railway, watercourses, various utilities, and roads.

3.3.4 A 400MW export and 250MW import connection has been accepted with National Grid. Whilst these numbers are limits on export and import, the installed capacity of solar panels and energy storage may be in excess of these limits to maximise the energy yield.

3.3.5 Bicker Fen Substation is approximately 5.5km south of the Energy Park as the crow flies. A 400kV underground cable will be installed to connect the Energy Park to the Bicker Fen National Grid Substation. The total length of the underground cable run for Grid Connection Route A will be approximately 7km and Grid Connection Route B approximately 7.7km.

3.3.6 A single circuit connection from the Energy Park site to Bicker Fen substation is proposed, requiring approximately a 25m swathe. An area wider than this 25m swathe is being considered to ensure flexibility within the design including micro siting to allow for ground conditions or other environmental constraints.

3.3.7 Joint bays are required along the route to help with maintenance and replacement should a fault develop. These will be placed at field boundaries so far as possible; this is to reduce the impact on the agricultural regime as an earthing link box will be required which is approximately 2m x 2m x 1m. Approximately 15 are proposed along the cable route.

3.3.8 The cable route will need to cross a range of existing infrastructure such as the Triton Knoll cable route, Viking Link interconnector cable, the railway line, the A17, the South Forty Foot Drain, a high-pressure gas pipe and a number of watercourses.

3.3.9 Open cut trenching will be primarily utilised for crossings. Trenchless techniques, such as boring, micro-tunnelling or moling methods will be undertaken where the EIA or design concludes the need for an alternative to open trenching.

3.3.10 The cable route corridor for Grid Connection A and Grid Connection B, is subject to an iterative design process. A range of constraints will determine the final optimal cable route details with a number of options being explored currently. These include physical, ecological, cultural heritage and human interactions, technical engineering, legal and commercial considerations.

3.3.11 An extension to the Bicker Fen National Grid Substation will be required, including the provision of a new bay, likely required at the south-western corner. An alternative in the north-eastern corner has also been considered by the technical authors.

Solar Irradiation Levels and Shading

3.3.12 An important consideration is selecting a site of suitable shape, orientation and size that can accommodate the Proposed Development. Large open fields without vegetated boundaries reduce the impact that small fields can have on the layout design. Typically, buffers are left around field edges to vegetation due to shading, tree root protection zones and other constraints such as ditches which have an impact on the installed capacity of an array. So significantly less capacity can be sited within a group of smaller fields compared to fewer larger fields.

Proximity to Sensitive Human Receptors

3.3.13 The nearest residential properties to the Energy Park site boundary are along the A17 and the B1395 Sidebar Lane to the south and west of the Energy Park site respectively. The design of the Energy Park site to date means considerable buffers have been made to ensure that no properties are in close proximity to solar panels, energy storage or electrical equipment. A majority of the properties are over 150m from the development.

Topography

3.3.14 A topographical survey has been undertaken over the whole of the Energy Park site in 2021. This data has been used to design the Energy Park site. As would be expected on historically drained fen land the site is fairly flat with a gradient change of only 1-3m over the whole extent of the Energy Park site. The Proposed Development ranges from 1-4mabove ordnance datum (AOD) in height across its whole extent.

Development Access during Construction

3.3.15 Access to the main Energy Park site will be gained via the A17. There is an existing access point which will be used for the initial stages of construction (creation of construction compound and materials for the new access point). This existing access point is on land adjacent to the Elm Grange Studios and the new Build-A-Future School.

3.3.16 It is intended that a new priority access point will be built shortly after the construction of the Energy Park site begins. This new priority access point will be used for the remainder of the construction phase and for the operational phase of the Site. The new access point is also off the A17 and already has the principle of planning consent established, which was achieved through the previously consented wind farm application.

3.3.17 Access will also be required for the construction of the new Grid cable route. The final route of this cable route has yet to be determined, with two routes still being considered.

3.3.18 Since the Scoping exercise was completed the redline of the assessment has been amended to allow for some additional access points off the highway to ensure that all grid route options remain in consideration. Any works required to upgrade these accesses can be captured in the DCO application. These additional access points are shown on **Figure 2.1- Indicative Site Layout**

3.3.19 Once the final grid route has been determined, the final access points for construction and operation of the grid route will be agreed and assessed in the ES.

3.3.20 As noted earlier in this chapter, an extension will be required to the Bicker Fen substation. During the construction phase there will be a small number of traffic movements on HGV's which will contain the larger substation elements. Various routes have been considered for moving this kit to the substation as well as consideration of the comments from the informal public consultation. The comments from the informal public consultation showed that residents of Bicker were concerned about the increase in traffic volumes moving through their village during the construction phase.

3.3.21 As a result, alternative routes have been considered which would take access of the A17 and the A52. The access route off the A52 would utilise the access track which has been constructed for the Triton Knoll substation. Legal discussions are ongoing to obtain access using this route, but at the time of this PEIR agreement has not been reached to confirm access via the A52.

Flood Risk

3.3.22 The majority of the Energy Park site is within flood zone 3, with some sections of the Energy Park site falling within Flood Zone 2 and 1. The Energy Park site is located on the Lincolnshire Fens, a coastal plain in the east of England which comprises a large broad flat marshland supporting a rich biodiversity. Topography on the Energy Park site is only a few metres above sea level and slopes very gentle towards the north-east. The lowest point is at 0.77m AOD in the northern part adjacent to Head Dyke, whilst the highest point is 3.3m AOD at the southern border.

3.3.23 Within draft NPS EN-1[1] Section 5.8 policy states that a Flood Risk Assessment (FRA) needs to accompany a proposed development within Flood Zone 2 or 3. Such an FRA will accompany the DCO Application. There is also a requirement within paragraph 5.8.15 that requires that a sequential test for a development within Flood Zone 2 should be carried out and accompany DCO application.

3.3.24 The current drafting of draft NPS EN-1 is in conflict with Annex 3 of the NPPF[2] it states that solar farms are considered essential infrastructure. Due to this classification as "essential infrastructure" a development within Flood Zone 2 or 3 does not need to be accompanied by a sequential test to show its suitability for development in this location.

[1] Draft Overarching National Policy Statement for Energy, EN-1 (September 2021)
[2] National Planning Policy Framework, July 2021, https://www.gov.uk/government/publications/national-planning-policy-framework--2

3.3.25 To comply with draft NPS EN-1 a sequential test to determine the suitability of the Proposed Development for this development will be submitted as part of the DCO application.

Cultural Heritage

Archaeology

3.3.26 From an initial review of Lincolnshire Historic Environment Record (HER) data, which was procured in August 2021 for a 2km radius measured from the boundaries of the main Energy Park site, it is noted that much evidence for prehistoric and Roman settlement and activity is recorded *c.*0.5-1.5km to the west of the Energy Park site (e.g. HER refs. MLI60731, MLI90708, MLI84683) and that indications of Roman salt-working were identified in the centre of the Energy Park site by a geophysical survey carried out for a previous proposal for wind turbines here (HER refs. MLI87647, MLI87891, MLI87892). Although not yet added to the HER, recent and ongoing archaeological work to the east of the Energy Park site has revealed further evidence of Roman activity in this location.

Built Heritage (Setting)

3.3.27 One Scheduled Monument and four Grade II Listed Buildings lie within a 2km radius of the Energy Park site. From an initial review, it is considered that the following designated heritage assets may be sensitive to the development proposals: Scheduled Monument of 'Settlement site 650yds (600m) E of Holme House' (NHLE ref. 1004927) located *c.*525m west of the Energy Park site; and the Grade II Listed Building of St John the Baptist (NHLE ref. 1360489) located *c.*1km north-east of the Energy Park site.

3.3.28 It is acknowledged that other designated heritage assets within and/or outlying a 2km radius of the Energy Park site may also be sensitive, especially given the flat and low-lying landscape character allowing for long-ranging views towards/from assets and so these will be considered within the assessment. The main assessment area will be 5km from the Proposed Development. If there are any heritage assets just outside this 5km assessment area, professional judgement will be used to determine if they need to be included within the assessment.

Site Walkover Survey

3.3.29 The Heritage consultant completed a site walkover survey in April 2022. This walkover survey has identified the following additional items, that were not known through the desk-based assessment for heritage assets.

- There are the remains of an historic drainage pump, of a similar standard to that of the Listed example on Claydike Bank at the north-east boundary of the Energy Park site;
- In the centre of the Energy Park site are some dilapidated barns and an un-inhabited[3] dwelling for Six Hundreds Farm, these may be considered non-designated heritage assets;
- There are designated views across the Energy Park site from the non-Listed Mill Green Farmhouse which is located a short distance to the north of the Energy Park site;
- There is intervisibility, across the Energy Park site, of the non-Listed chapel on the Sidebar Lane and the Listed chapel on Claydike Bank; and
- The records for the area stated that there was a Listed Building, Sutton House, near Swineshead Bridge. This information is incorrect as Sutton House is not in the

[3] This dwelling has not been inhabited for the last 30 years.

defined location. This inaccuracy has been alerted to Historic England so that they can update their records.

Biodiversity Features

3.3.30 There are no non-statutory designations within the Energy Park site. Cole's Lane Ponds LWS is located 6km southeast of the Energy Park site. The Coles Lane Ponds site consists of two ponds surrounded by bankside trees and scrub. There is an area of wet grassland to the west and north of the smaller pond. The South Forty Foot Drain LWS is located approximately 1km to the south of the Energy Park site. This is a man-made watercourse with bankside vegetation comprising rough neutral grassland, scrub, and trees. The South Forty Foot Drain site is a good corridor linking the centre of Boston with the River Witham. Heckington Grassland Site of Nature Conservation Interest (SNCI) is located approximately 5km to the east of the Energy Park site. This SNCI consists of grassland bordered by hedgerows and is used by a variety of breeding and over-wintering birds. Old Wood South Kyme SNCI is located approximately 5km to the north of the Energy Park site, and is an area of woodland with Ash coppice, scrub, Elm, and tall herbs.

Agricultural Land Classification

3.3.31 A land classification survey has taken place on the Energy Park Site. No land classification survey has taken place on the land for either of the Grid routes. Once crop has been harvested on the land being considered for the Cable Grid Route, land classification survey will take place at the locations where above ground infrastructure is needed.

Commercial Agreement with Landowner

3.3.32 Ecotricity has had a relationship with the landowner of the Energy Park site for a number of years due to the wind park proposal, which was approved in 2013. This has not become operational due to the development timescales of a technical radar solution which formed a 'Grampian Condition' on the wind park planning consent.

3.3.33 The Applicant has an Option to Lease in place on the Energy Park site, which will progress to a Lease once construction of the Energy Park commences.

3.3.34 The two proposed Grid Route options are owned by a series of landowners, none of which are the same landowner as the Energy Park site. At the time of writing a majority of landowners have agreed access for survey work whilst commercial negotiations are ongoing.

3.3.35 Through the findings of these surveys a decision will be made on the preferred Grid Route. At this point, Heads of Terms will continue to be negotiated and then progress to Options being in place. It is the Applicant's intension to progress negotiations and secure Options in time for the SCO application submission to the Planning Inspectorate. The Option will detail the Easement rights being sought.

3.4 ITERATIVE DESIGN PROCESS

3.4.1 The layout of the Proposed Development has evolved iteratively taking into consideration environmental effects, the planning and environmental policy objectives and scheme functionality as well as feedback from stakeholders and non-statutory public consultation between October and December 2021.

Main Design Iterations

3.4.2 Since the non-statutory public consultation and the Scoping Request was made the following design iterations have taken place:

- The circular permissive path has been lengthened,
- The fencing and access track layout has been revised, to avoid new culvert crossings onsite,
- The area for the Proposed Development has been widened in a few selected locations to capture existing accesses.
- Further details on the electrical infrastructure and its location on the Energy Park site has been progressed, including a reduction in size of the main substation area and energy storage.
- A reduction in the Proposed Development to remove the land south of the railway (to the west of the South Forty Foot Drain) following the removal of the Western grid connection route.
- Construction compound areas have been identified.

Alternatives

3.4.3 The EIA Regulations (Schedule 4, Paragraph 2) require for inclusion in an Environmental Statement (ES):

> **"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects"**

3.4.4 The main alternatives to the Proposed Development which the Applicant has considered comprise:

- The 'No Development' Alternative; and
- Alternative Designs, Locations and Technologies.

3.4.5 The Planning Inspectorate's Advice Note 7 sets out that PINS considers that a good ES is one that, among other things: **"explains the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the Proposed Development on the environment."**

3.4.6 There are also other specific legislative requirements and policy circumstances which require the consideration of alternatives. These include the requirement under the Habitats Directive[4] and also in relation to avoiding significant harm to biodiversity and geological conservation interests; flood risk; and development within national designated landscapes set out in sections 5.3, 5.7 and 5.9 of the NPS.

3.4.7 It is also worth noting that within the environmental assessment topic chapters of this PEIR, impacts of alternatives have been considered, where possible or necessary.

The 'No Development' Alternative

[4] Conservation of Habitats and Species Regulations, 2017

3.4.8 The 'No Development' Alternative refers to the option of leaving the Proposed Developments site in its current use and physical state.

3.4.9 Without development it is anticipated that the Energy Park site would continue to be in primarily agricultural use. The ongoing agricultural process on the Energy Park site may change over the next 40 years depending on a number of factors, including the global market for products and chemical costs. Over the past few years the crops grown on the Energy Park site have been predominantly sold to mainland Europe for animal feed and non-food usage.

3.4.10 The 'No Development' alterative would result in the loss of opportunity for providing much needed renewable energy generation within the UK. In the recently published British Energy Security Strategy[5] there is the target of increasing the quantity of solar generation within the UK by 5 times by 2035. At the time of publication of the Strategy there was 14GW of solar operating within the UK, a five-fold increase on the 14 GW would mean 70GW of installed capacity by 2035. Such a target will be challenging and so all opportunities and possible locations for solar farms need to be considered.

3.4.11 No further assessment has been undertaken for the 'no development' scenario because this option is not considered a reasonable alternative to the Scheme as it would not deliver the additional electricity generation and electricity storage proposed. NPS EN-1 at paragraph 4.4.3 states:

> **"..alternative proposals which mean the necessary development could not proceed can be excluded on the grounds that they are not important and relevant to the IPC's** (now Secretary of State) **decision."**

<u>Alternative Technologies</u>

Onshore Wind

3.4.12 This technology has been considered for the Site and assessed at length. A planning application was approved for a 66MW wind farm. This has not been constructed and become operational due to difficulty in satisfying the Grampian condition. The consent had a requirement to put in place a technical mitigation solution for the MOD radar system. The development process for this technical solution is still progressing, and to date a suitable solution for the MOD has not been found.

3.4.13 At this time the wind farm consent remains extant. However, if the Energy Park was to gain consent and become operational the wind turbines would not be progressed further and the wind farm consent would be allowed to lapse.

Ground Mounted Solar

3.4.14 There are currently two different solar technologies being considered on this Site. The two technologies are:

- Fixed Panel System
- Tracking Panel System

3.4.15 The fixed panel system is the technology which has been mainly used within the UK and the global market to date.

[5] British Energy Security Strategy, April 2022 https://www.gov.uk/government/publications/british-energy-security-strategy

3.4.16 Both technology options will have solar panels mounted on the metal frames which are piled into the soil. The fixed panel system would have the solar panel orientated in a southerly direction to capture the maximum amount of daylight.

3.4.17 The tracker system is orientated in a north-south direction, with the panels moving or tracking the daylight on an east-west trajectory.

3.4.18 At this time both solar technologies are still being considered for this Energy Park site.

Other technologies

3.4.19 Tidal power, offshore wind and hydroelectric storage are all not possible on this Energy Park site due to its location within the UK.

3.4.20 Nuclear power was not considered as an alternative because of the high cost of generating electricity from this power source as well as the proximity of residential properties to the boundaries of the Energy Park site.

Alternative Sites

3.4.21 As stated earlier within this chapter, the applicant has had a relationship the with the landowner for a number of years due to the planning approval for the onshore wind farm. As this has not processed, the land was concerned for other forms of renewable energy development.

3.4.22 Within the EIA Regulations there is a reasoned expectation to consider alternative sites to ensure that the Proposed Development site is the preferred option for the Proposed Development.

3.4.23 As outlined within this chapter the need to secure connection onto the 400kV network remains a constraint and one that formed a constrain in the consideration of alternative sites.

3.4.24 Bicker Fen substation therefore became the centre of the site search area, with land within 9km being considered for its possible suitability. The extent of this 9km search area is shown on Figure 3.3: Site Search Exercise. The following constraints were then applied to all land within this 9km search area.

- Aspect of the land facing south-east through to south west;
- None of the alternative sites are to be allocated under the Local Plans for other purposes, such as residential;
- 100m buffer from residential development, 10m buffer to other existing buildings, 10m buffer for roads either side and 10m buffer from railway lines either side;
- No Ecological designations on the site – such as SSSI, SAC, SPA, NNR, LNR, Ancient Woodlands, Woodland, RSPB Reserves or Ramsar;
- Landscape and Heritage Assets such as Conservation Areas, Green Belt, AONB, World Heritage Sites, Schedule Monuments, Listed Buildings, Battlefields, Open Access and Registered Common Land, Country Parks and Registered Parks and Gardens are to be avoided;
- Agricultural Land Classification – sites that are low Grade (Grade 3b, 4 and 5 or Previously Developed). As the Proposed Development has Grade 2 within it Grade 3a land/sites were also be considered;
- Similar Area of land (490ha) to allow for a similar size scheme of development;
- Site not the located within Flood Zone 2 or 3; and
- Land to be within a single landownership.

3.4.25 When all these constraints were applied there was a single alternative site which was identified. This site is located to the west of Swaton and is an area of land owned by the Crown Estates. The location of this site can be seen on **Figure 3.3.**

3.4.26 NPS EN-1 offers guidance when considering alternative sites. Paragraph 4.2.13 states **"the Secretary of State should be guided in considering alternative proposals by whether there is a realistic approach of the alternative delivering similar infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescales as the proposed development."**

3.4.27 This alternative site at Swaton does have a single landowner, but there would have been a considerable delay in reaching a legal agreement for development on the land when compared to the existing legal agreement in place with the landowner on the Energy Park site. Negotiating the necessary legal agreements between applicant and landowner can take over 12 months which would have had a delay in delivery of the Proposed Development and so a similar timescale for delivery of an operational scheme would not be achieved. The delivery programme for new energy schemes is important when considered against the increase in solar generation capacity outlined in the British Energy Security Strategy, 2022 by 2035 of 70GW by 2035.

3.4.28 Therefore, when considered against NPS EN-1 and draft NPS EN-1, this alternative site would not meet the objectives of the Proposed Development and would not deliver the same infrastructure within the same timescales as the Proposed Development this alternative site at Swaton is not a site which requires further investigation as it fails to fulfill the policy requirements.

Summary

3.4.29 Accordingly, the Energy Park site was chosen as a suitable site for the following main reasons:

- Agreement with the landowner (including signed Option Agreements in place);
- A neatly contained Energy Park Site (which is not sporadic in nature) with a single landowner;
- Orientation of land and its open nature, makes the Energy Park site suitable for efficient energy generation;
- No ecological designations or statutory protected areas within or in close proximity to the Energy Park site;
- No landscape designations in or in close proximity to the Energy Park site;
- Visibility into the Energy Park site from the wider landscape is limited, due to the wider low lying nature of the landscape, existing bunding on the some perimeters of the Energy Park site and limited PRoW's in the immediate area;
- Grid connection at a maximum of 7.7km is economically achievable for a development of this generation capacity;
- Access into the Energy Park site is directly off the A17, rather than minor roads which could lead to increased local traffic congestion during construction.
- Limited residential properties are in next to the Energy Park site. The possible environmental impacts to these properties can be mitigated through design.

<u>Alternative Layouts</u>

3.4.30 The purpose of the section is to describe the alternative layouts considered for the Scheme at the key design stages, so far. **Table 3.1** summaries the main design layout iterations considered.

Table 3.1 Main Design Iterations for the Energy Park Site

Stage	**Proposed Layout**	**Consultation which influenced the proposed layout at the Stage**	**Design evolution**
Non-Statutory Consultation Layout (Sept - November 2021)	**Figure 3.1- Working Indicative Site Layout (Revision A)** First Indicative Layout design showing the red line boundary, watercourse offsets, habitat enhancement zone and the solar panel area	Landowner discussions, initial discussions with Lincolnshire County Council, North Kesteven District Council, Boston Borough Council and utility operators on Site.	Areas closest to properties were set aside for Biodiversity Net Gain area. Areas outside the Option area for the Energy Park site are excluded from the red line boundary.
EIA Scoping Layout (January 2022)	**Figure 3.2- Working Indicative Site Layout (Revision E)**	Scoping Opinion comments Consultee comments Discussions with the local community via online presentations and Q&A sessions to understand their main concerns about the proposed development Interested parties from the online presentations and non-statutory consultation	The north-eastern boundary of the solar park was amended to ensure the small section in Boston Borough Council was removed to avoid complications from a discharging authority perspective. The approved wind park access is considered to be the main site entrance. Set back from pipeline, drainage ditches and overhead lines. A permissive path and community orchard were added. The location of the main 400kV onsite substation and battery storage area were altered and increased in size as development of the technical plans determined that these

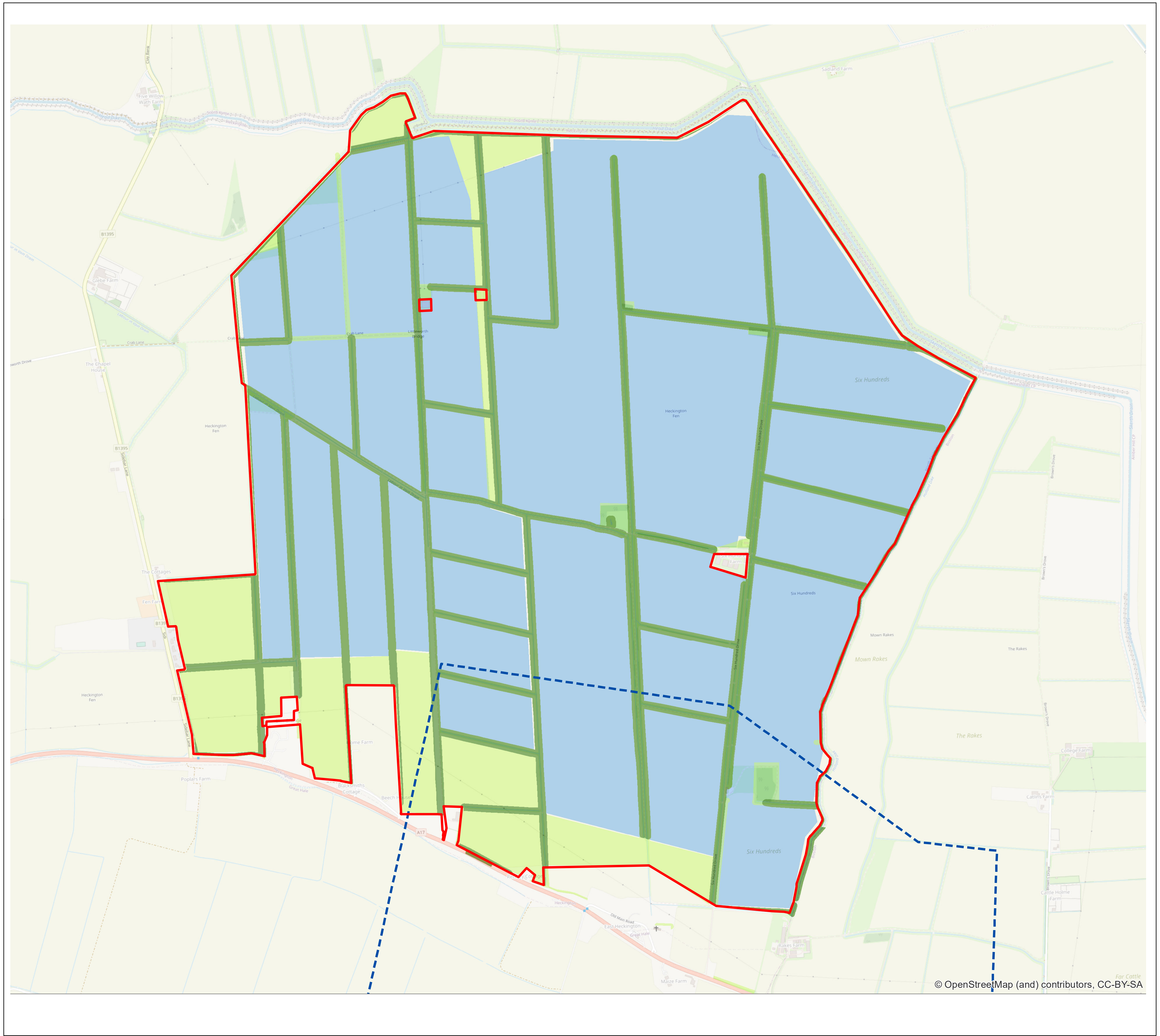
			areas needed to be increased in size for an optimal efficient design Existing access to the Energy Park site was added into the design to aid initial stages of construction. Panels added to the north-western corner of the Site when soil grading analysis determined this area was Grade 3b land.
PEIR Layout (June 2022)	**Figure 2.1-Indicative Site Layout (Revision H)**	A design workshop with the technical authors Ongoing design work with third parties	A reduction in the size of the main substation area following confirmation a single circuit rather than a double circuit 400kV export would be progressed. A series of 132kV substation locations added through the Energy Park site to enable efficient use of cabling. The permissive path has been lengthened and a loop walk with the existing PRoW created. The access tracks have been amended to avoid the introduction of additional culverts so far as possible. The fencing has been considered to avoid crossing Internal Drainage Board watercourses. The construction compound locations and areas for additional substation and energy storage have considered across the Energy Park site.

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 3.1– Working Indicative Site Layout

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Heck Fen Solar Park
- Grid Connection Area
- Watercourse offsets
- Habitat Enhancement Zone
- Solar Park Zone

FIGURE 3.1

Working Indicative Site Layout

DRWG No: **P20-2370_43** Sheet No: - REV: _

Date: 15/06/2022

Scale:

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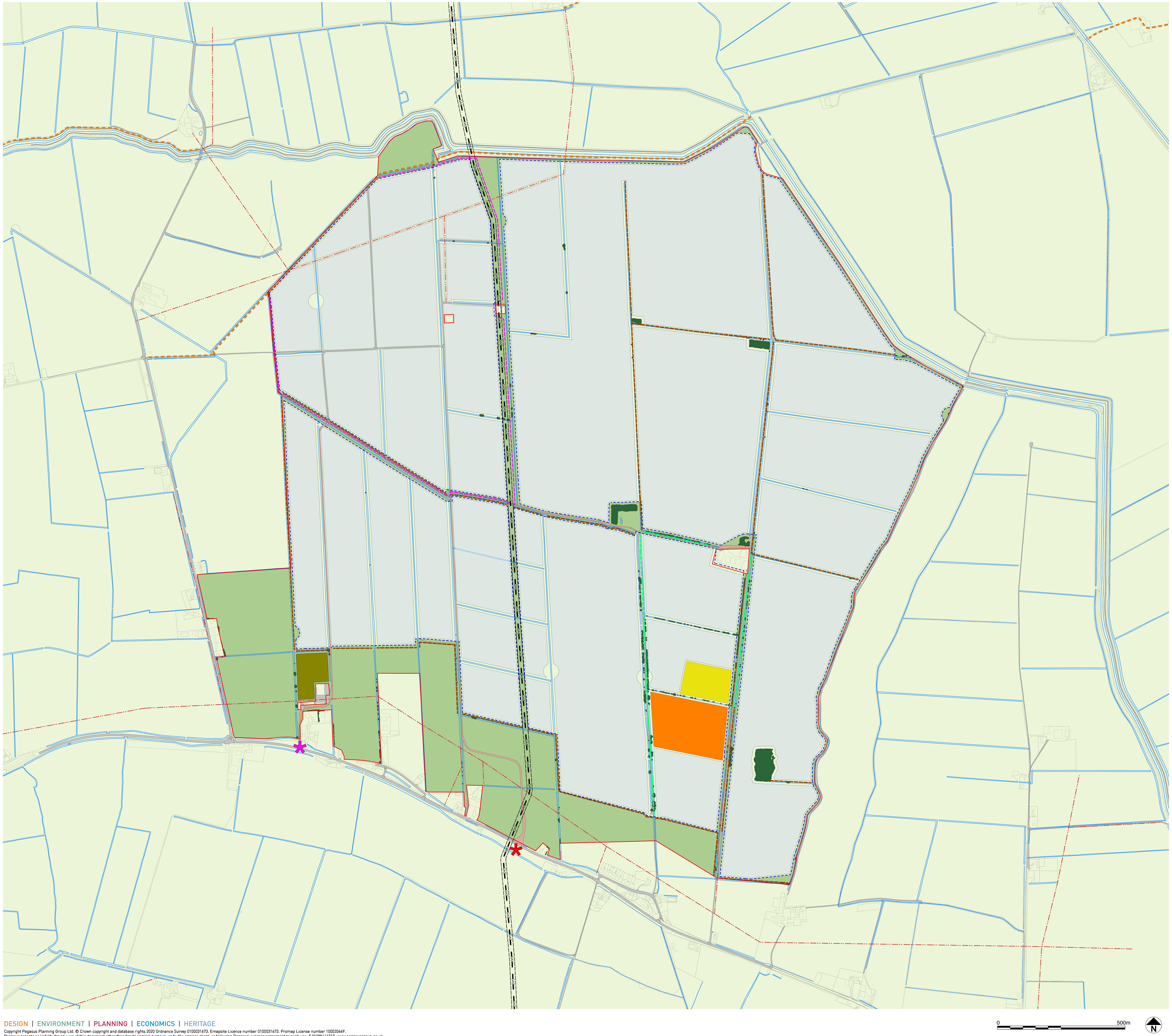
Preliminary Environmental Information Report
Figure 3.2- Working Indicative Site Layout (Revision E)

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Security Fence
- Proposed Site Entrance
- Temporary Access
- Primary Access Track
- Existing Road/Track
- Solar Development Area
- Public Right of Way
- Proposed Permissive Footpath
- Potential Biodiversity Net Gain (95.34ha; 16.24% gain)
- Trees, Woodland and Hedgerows
- New Hedgerow (8.96km)
- Enhanced Hedgerow (1.98km)
- Community Orchard
- Ditch
- Gas Pipeline
- 11kV Overhead Line
- Substation Area
- Primary Energy Storage

Buffers to development:
- 9m to BSIDB maintained open watercourses
- 8m to all other watercourses
- 10m to gas pipeline
- 5m to 11kV overhead line

Notes:
Hedgerows would be up to 3m in width when mature and would be maintained up to 3m in height.

The Solar Development Area will include some localised electrical infrastructure such as inverters, transformers, energy storage and smaller substations.

Figure 3.2

Working Indicative Site Layout (Revision E)

DRWG No: **P20-2370_03** Sheet No:_ REV:
Drawn by : JS Approved by: IH
Date: 14/12/2021
Scale: 1:5,000 @ A0

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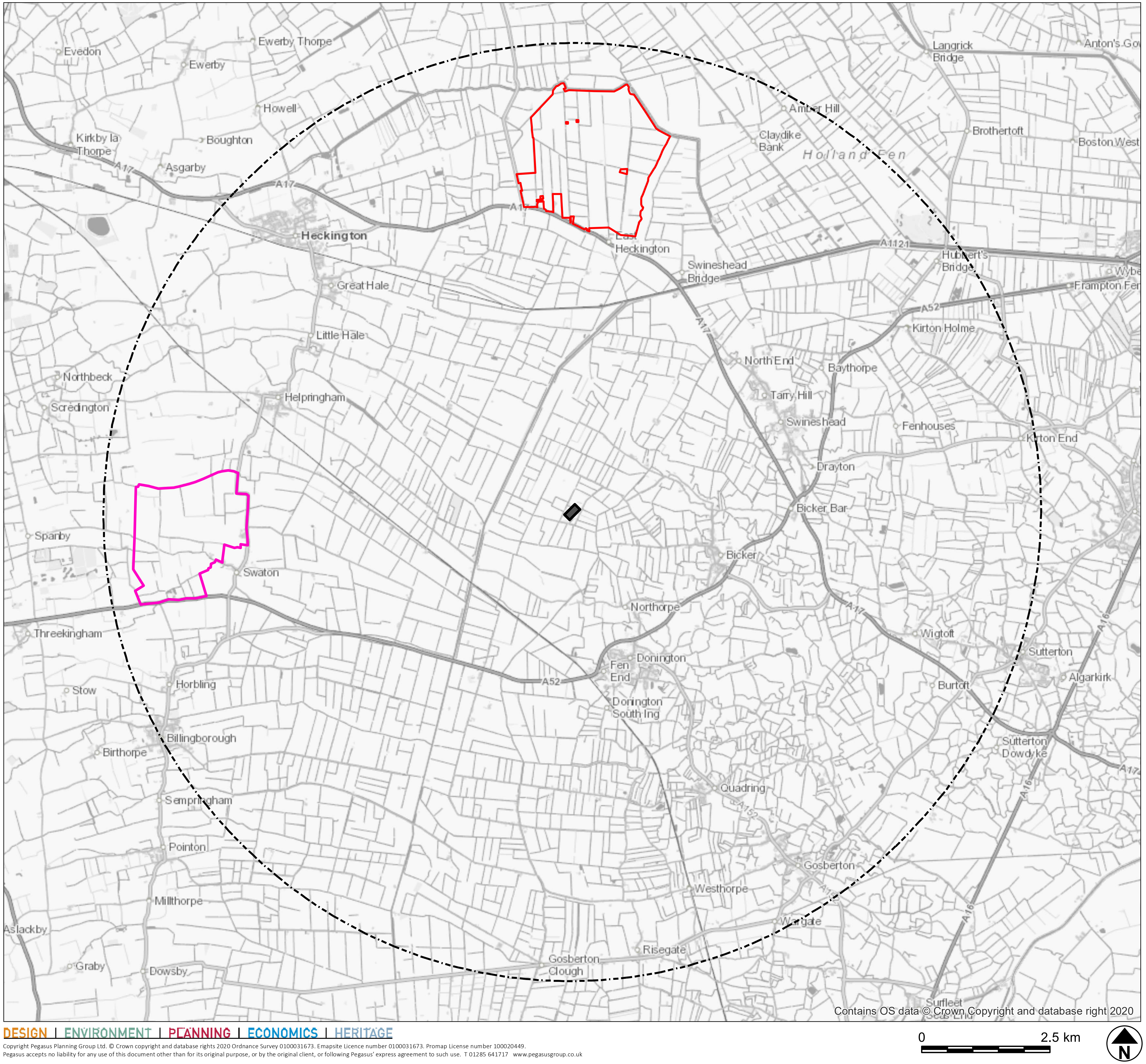
Preliminary Environmental Information Report
Figure 3.3- Site Search Exercise

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Energy Park Area
- Swaton, The Crown Estates
- Bicker Fen Substation
- 9km Buffer from Substation

FIGURE 3.3

Site Search Exercise

DRWG No: **P20-2370_36** Sheet No: - REV: -

Date: 26/05/2022

Scale: 1:75,000 @ A3

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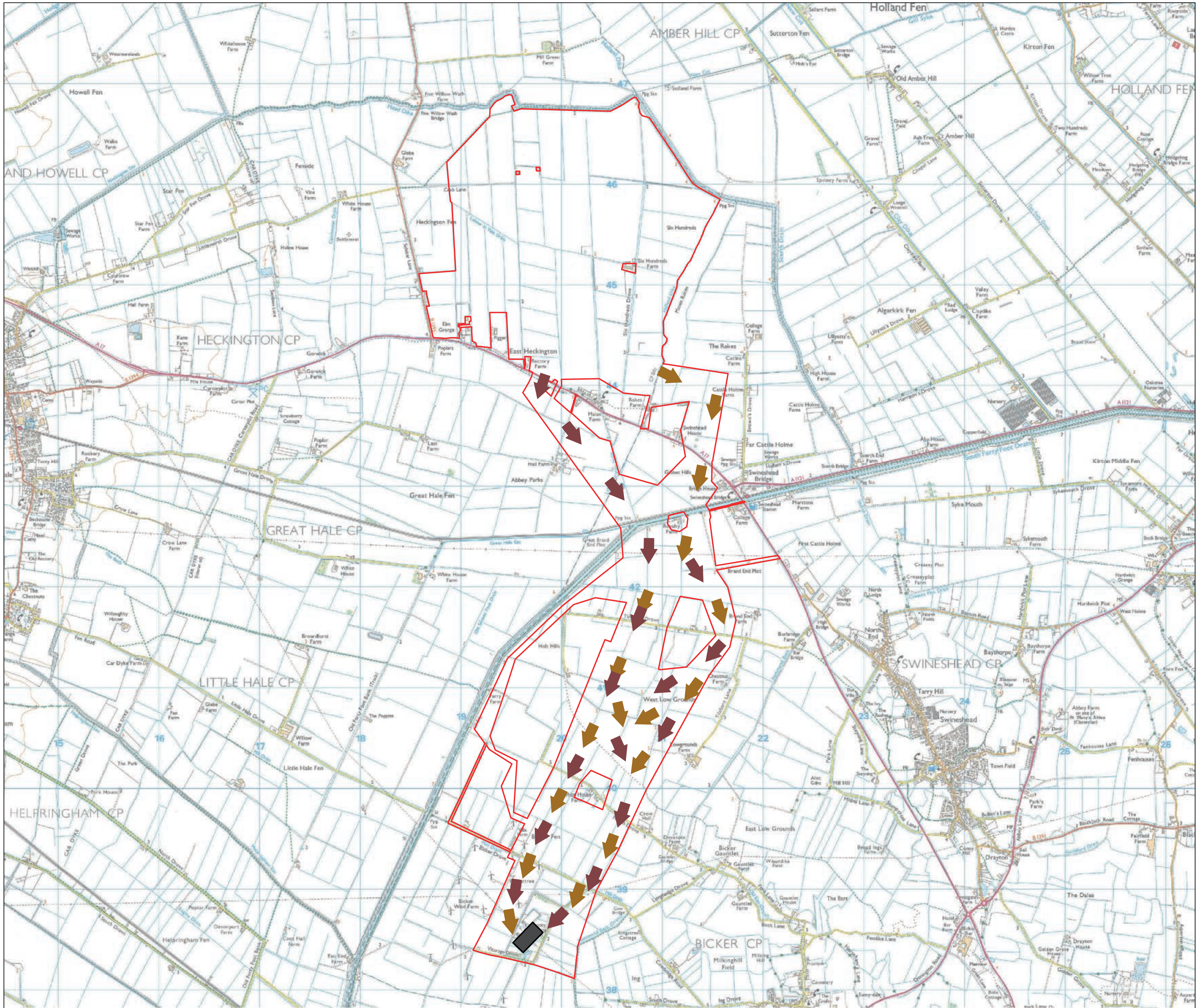
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 3.4- Indicative Grid Routes

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Bicker Fen Substation
- Site Boundary
- Option A
- Option B

These are the proposed routes under consideration for the underground grid cables. The final route is subject to legal agreement with the landowners, but will be within the Site Boundary.

Areas with no indicative cable route are included for access purposes

FIGURE 3.4

Indicative Grid Routes

DRWG No: **P20-2370_40** Sheet No: **-** REV: **A**

Date: 15/06/2022

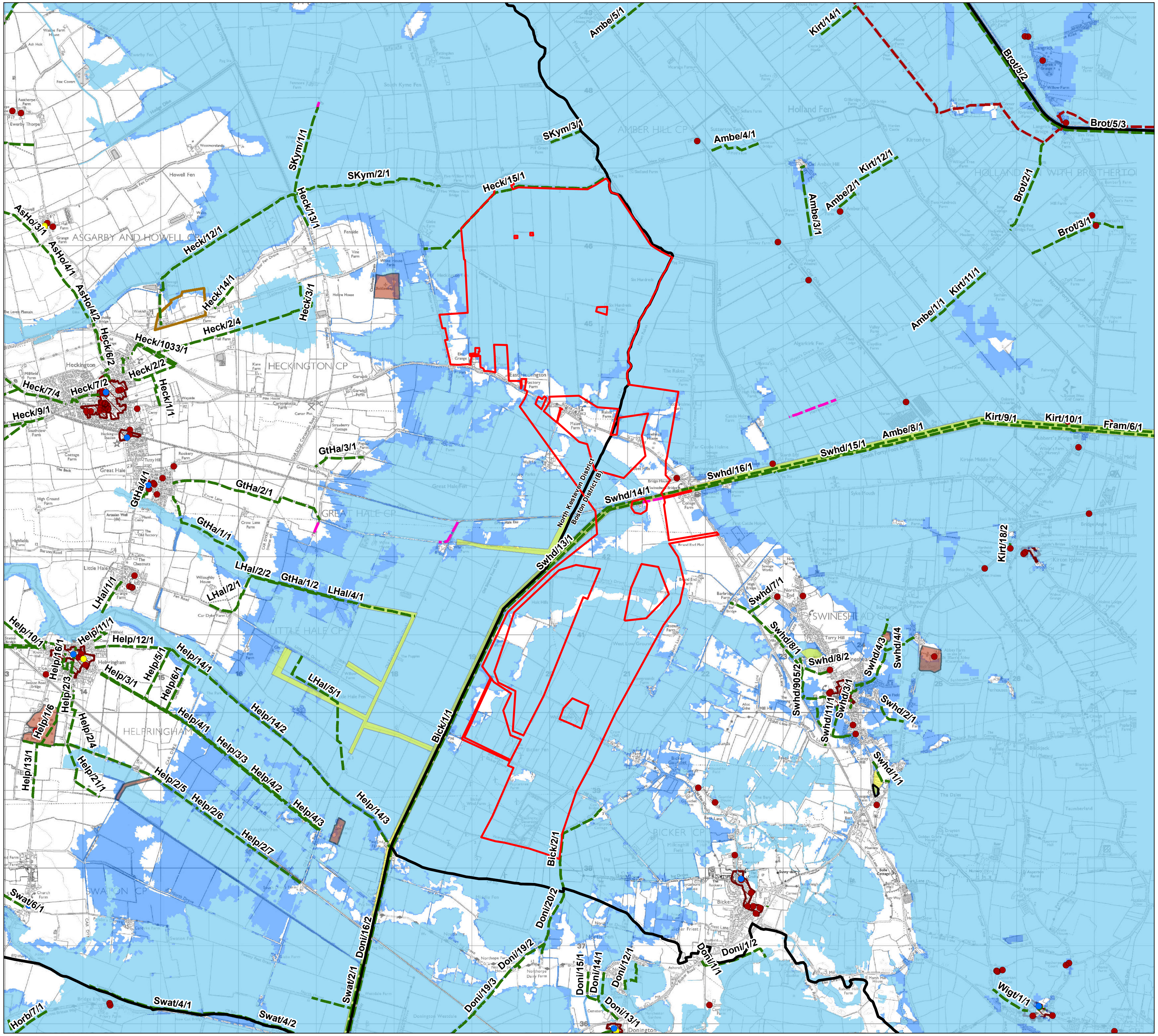
Scale: 1:40,000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 3.5- Environmental Designations Plan

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Local Authority Boundary
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Public Right of Way
- Other Routes with Public Access
- Open Access Land / Registered Common Land
- SUSTRANS National Route
- Scheduled Monument
- Site of Nature Conservation Interest
- Local Wildlife Site
- EA Flood Zone 3
- EA Flood Zone 2
- Conservation Area

FIGURE 3.5

Environmental Designations Plan

DRWG No: **P20-2370_02** Sheet No: **-** REV: **D**

Date: 13/06/2022

Scale: 1:50,000 @ A3

0 2 km

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DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 4: Proposed Development

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https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

4 PROPOSED DEVELOPMENT

4.1 INTRODUCTION

4.1.1 This chapter provides a description of the Proposed Development. The physical characteristics of the Proposed Development are described alongside the proposed programme of works. The key activities that would be undertaken during construction, operational (which includes maintenance) and decommissioning are included in this chapter. These phases will inform each of the technical assessments included in this PEIR.

4.1.2 The Scheme is defined under sections 14(1)(a) and 15(2) of the Planning Act 2008 as a Nationally Significant Infrastructure Project (NSIP), as it consists of construction of an onshore generating station in England exceeding 50 megawatts (MW). Associated development and other ancillary works are also proposed as part of the Scheme.

4.1.3 The application description considered within this PEIR is for a:

"Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and all associated infrastructure works."

4.2 ROCHDALE ENVELOPE

4.2.1 The Scheme comprises of an Energy Park with solar PV and Battery Energy Storage System (BESS) infrastructure. Solar PV and BESS are rapidly evolving and as a result the DCO application and supporting works plans will require a degree of flexibility to allow the latest technology to be utilised at the time of construction.

4.2.2 The flexibility that is to be sought, and how this will considered in the technical assessments is set out in Table 4.1 below.

Table 4.1 Flexibility sought within the DCO and Works Plans

Flexibility Sought	Assessment Approach
Certain areas of land will be able to be used as each, or a combination of solar PV, BESS, on-site substation and/or in some instances an operational compound	Where this is sought the Works Plans and the assessments will have all taken a consistent worst case approach of assuming the maximum spatial parameters for these infrastructure elements, with massing of the BESS and one substation within these areas assumed as the worst case for all disciplines.
Land use for temporary construction compounds during construction will be able to be used for solar PV once its construction use is completed	The temporarily used compounds during construction will be assessed as part of the construction phase assessment. Solar PV panels have been assumed to be in place at these locations in the operational assessments.
Cabling will take place across the Site, including underneath landscaping and other construction and operational areas.	Underground works have been assumed in all areas where this is permitted on the Works Plans and above ground works have been assumed in all areas where they are permitted on the Works Plans.
Land Use for the Grid Cable Route from Heckington Fen to Bicker Fen sub station.	There are currently two grid cable routes being considered. Assessment of the

Flexibility Sought	Assessment Approach
	preferred option is ongoing, and it is expected that by the time the ES is submitted a single preferred grid cable route will have been chosen. The physical area needed for the laying of the grid route is a swathe 25m wide. An area wider than this 25m swathe is being considered to ensure flexibility within the design and allow micro siting to allow for ground conditions and other environmental constraints.

4.2.3 Given the flexibility applied for and in order to ensure a robust assessment of the likely significant environmental effects of the Scheme, the Environmental Impact Assessment (EIA) has been, and will be, undertaken adopting the principles of the 'Rochdale Envelope', where appropriate, as described in the Planning Inspectorate Advice Note 9 (Ref 3-1). This involves assessing the maximum (and where necessary the minimum) parameters of the Scheme where flexibility needs to be retained, as set out above. Where specific elements of flexibility need to be considered by a technical discipline in the context of the Parameters set out in this chapter (Table 4.1), this has been confirmed within the relevant chapters of the PEIR.

4.2.4 This approach sets worst case parameters for the purpose of the assessment but does not constrain the Scheme for being built in a manner that would lead to lower environmental impacts.

4.3 INDICATIVE TIMESCALES FOR THE SCHEME

4.3.1 Indicative timescales for the construction and operation of the Scheme that have been assumed for the purpose to the assessment are as follows:

- It is currently anticipated that (subject to the necessary consents being granted) construction work will commence, at the earliest in the Spring of 2026 and will run for 18 months. This assumes that the Scheme will be built in a single phase, which is considered to give rise to the worst-case scenario for the purpose of the assessment. Construction in a single phase, rather than multiple phases spaced over longer timescales, would result in higher peak traffic volumes and a greater number of construction activities being undertaken concurrently (generating noise, dust etc.)
- It is currently anticipated that the earliest the Scheme will commence commercial operation is Autumn 2027. It is anticipated that sections of the Energy Park will commence their generation in stages, rather than await completion of the whole site before any renewable energy generation enters the National Grid; and
- The operational life of the Scheme is to be 40 years and decommissioning is therefore estimated to take place no earlier than 2068. Decommissioning is expected to take in the region of 6-12 months and will be undertaken in phases. A 6-12-month decommissioning period has been assessed for the purpose of a worst case assessment in this PEIR.

4.4 NEED FOR THE SCHEME

4.4.1 The case for the need for the Scheme is centered on its significant contribution to the three important national energy policy aims, which are:

- **Decarbonisation – achieving Net Zero by 2050 and the importance of urgently deploying zero-carbon generation assets at scale –** the Scheme will provide a large-scale low carbon energy generating asset which is expected to be operational during 2027.
- **Security of supply – geographically and technologically diverse supplies –** the Scheme will provide the security of supply due to its large scale; direct connection to the National Electricity Transmission System, meaning the power that is generates has a national benefit; ability to complement other renewables and the efficient opportunity to integrate energy storage into the design of the Site to help balance electricity needs over the wider Grid system.
- **Affordability –** the Scheme will provide large scale generation at low cost which removes the market fluctuations from fossil fuel costs, which lead to energy prices rising for the end user.

4.4.2 The scheme will therefore be a critical part of the development of the UK's portfolio of large-scale solar generation required to decarbonise its energy supply and provide secure and affordable energy supplies.

4.4.3 There are layers of International and National Policy and Reports which indicate the need for moving away from the use of fossil fuels for energy generation and a move towards the development and use of renewable energy generation sources. The most recent of these is the Energy Security Strategy, 2022 which has indicated that the UK will need to increase its solar generation capacity five-fold by 2035. The details of these policies can be seen in Chapter 5 of this PEIR.

4.4.4 A Statement of Need will be prepared which will accompany the DCO application. For reference, if the draft NPS EN-3 is adopted before the DCO application is submitted, it would dispense with the requirement for a Statement of Need. However, as the timeframe for the adoption of this draft policy document is still to be defined, the applicant is preparing a Statement of Need on the understanding that the DCO application will be submitted Prior to the draft NPS EN-3 being adopted.

4.5 KEY COMPONENTS OF THE PROPOSED DEVELOPMENT

4.5.1 The key components of the Proposed Development are:

- Solar PV panels;
- PV module mounting structures;
- Inverters;
- Transformers;
- Switchgear;
- Cabling (including high and low voltage) – mixture of above (on the energy park site only) and below ground (on the energy park site and the Grid Cable Route);
- One or more Battery Energy Storage Systems (BESS) (battery technology not determined at this time);
- Onsite substations comprising substations and control buildings;
- Fencing and Security Measures;
- Internal access tracks;
- Community orchard;
- Permissive path;
- Construction of new access point onto highway (already consented);
- Landscaping including creation of new habitat areas;

- Construction of temporary construction areas and worker facilities;
- Digging of cable trench and laying cables for connection to the National Grid Bicker Fen substation
- Installing above ground grid cable access points along the Grid Route;
- Improving existing access points off Highways for construction access for Grid Route; and
- Extension of Bicker Fen National Grid Substation and installation of above ground equipment.

4.5.2 Once operational the Energy Park will remain operational for 40 years. After this time the Energy Park will be decommissioned. The assessment for the decommissioning phases assumes that all the structures on the Site will be removed. Discussion with National Grid have indicated that the above ground equipment that is installed at Bicker Fen for this Energy Park will, once operational, have split ownership, where some of the equipment is owned by them and other parts owned by the applicant. At decommissioning, the equipment owned by the applicant will be removed, but the equipment owned by National Grid will remain. The permissive path will also cease to be open, and the route will return to that of the current HECK/15/1.

Solar PV Infrastructure

4.5.3 Illustrative figures for the two solar PV technology types are provided in **Figures 4.2- Fixed Solar PV Panel Technology** and **Figure 4.3- Tracker Solar PV Panel Technology**. The layout of the solar PV infrastructure has been determined through consultation with the landowner, drainage board and known utility asset owners. On site there is a high-pressure gas pipeline which runs in a north-south direction across the centre of the Site. A series of drains, some maintained by the Black Sluice Internal Drainage Board (IDB) and some by the landowner are located on the Site.

4.5.4 A setback distance of 5m from power lines, and 10m easement across the pipeline has been incorporated into the design. The fencing is proposed to cross the gas pipe along with one new access track. A 9m set back from IDB ditches has been incorporated to enable ongoing maintenance throughout the operational lifetime of the Energy Park.

Solar PV Modules

4.5.5 Individual modules/panels are typically 2-2.5 metres long and 1-1.5 metres wide and typically consist of a series of poly-crystalline cells which make up each panel. The module frame is typically built from anodised aluminium. Several panels can be installed in either the landscape or portrait orientation on the racking.

4.5.6 Each module could have a DC generating capacity of between 400-600watts (W), or more depending on advances in technology.

4.5.7 The number of modules required at the Development will be highly dependent upon the iterative layout design process however the initial **Indicative Site Layout** is shown in **Figure 2.1.**

4.5.8 The modules are fixed into a mounting structure in groups known as "strings". This mounting structure can be used for two different systems, a fixed panel system where the panels are fixed in one position and one angle, or a tracking system where the panel rotates on its axis to track the sun throughout the day. It has not yet been determined which technology or mounting system will be used on this development.

4.5.9 The number of modules which will make up each of the strings is not yet known. Various factors will help to inform the number and arrangement of modules in each string, and it is likely some flexibility will be required to accommodate future technology developments.

Module Mounting Structures

4.5.10 Each row of modules will be mounted on a rack supported by galvanised steel poles driven into the ground. Various mounting structures are available however, driven poles are currently expected to be the most likely foundation solution. Between each string of panels there could be an average separation distance of approximately 3.5m to maximise generation and allow sufficient access for maintenance. The spacing between racks of fixed and tracker panels varies, with a minimum of 2m for fixed and 3m for trackers, this spacing can increase to 4m and 6m respectively.

4.5.11 The assessments within the PEIR have assumed that the panel modules are mounted on structures with a clearance of a maximum of 2.2m and an upper height of a maximum of 4.5m. This upper height is subject to ongoing modelling for flood heights on the Site and may be reduced for the assessments when the ES is submitted. Typical panel heights are 1-1.5m at the lower edge. The trackers would pivot with a potential lowest lead edge of 0.1m and highest edge of 3.5m.

4.5.12 **Figure 4.1c- Proposed Solar PV Development Area** details the solar infrastructure arrangement.

Inverters, Transformers and Switchgear

Inverters

4.5.13 Inverters are required to convert DC electricity generated by the PV modules into alternating current (AC) which allows the electricity to be exported to the National Gird. Inverters are sized to deal with the level of voltage which is output from the strings of PV modules.

4.5.14 As a worst case scenario central inverters have been assumed instead of a string system. Multiple central inverters, with a maximum of 127 assessed within the design, will be distributed throughout the Site. The unit itself tends to be containerised with associated control and switchgear equipment within a 13m x 4m x 4m container. Should string inverters be progressed the central inverters would not be required.

Transformers

4.5.15 Transformers are required to control the voltage of the electricity generated across the Energy Park Development site and efficiently transmit the power to the Development substation. A main 400kV step-down transformer will be required alongside smaller transformers. To ensure a worst case scenario six 132kV transformers are proposed across the site.

4.5.16 For distribution power transformers, the approximate dimensions will be 10m x 10m x 10m. For sub-distribution power transformers, the approximate dimensions will be 7m x 4m x 4m.

Switchgear

4.5.17 Switchgear is proposed across the site, likely within the compounds for the 132kV substations. The maximum dimensions are proposed to 15m x 10m x 5m.

4.5.18 **Figure 4.1c- Proposed Solar PV Development Area** details the solar infrastructure arrangement.

Battery Energy Storage System (BESS)

4.5.19 An energy storage facility will be an associated part of the electrical infrastructure of this Development. The primary energy storage area is proposed to be located in the south eastern section of the Site, either in a series of individual containers or housed within a larger building(s). There is the potential for further energy storage area to be located near to the 132kV substations which are located across the Site. It is estimated at this time that the storage capacity of this site would be approximately 200-400MW. A maximum of 6.04 ha is set aside for this element of the Energy Park Development, with a maximum height of 6m The Primary Energy Storage Area is 2.8ha.

4.5.20 The energy storage system which includes batteries, inverters and system controllers but its final design has not yet been determined. Any system installed will be strenuously tested during the factory and pre-commissioning testing regime before being given the final sign off to energise.

4.5.21 There are three main battery storage options used within the industry. These are Li-ion, LIP/LEP (Lithium Ion Phosphate) and Flow Storage technologies.

- Li-ion is an established technology that has been used in mobile phone/laptops electric vehicles for many decades. The battery cells are housed in purpose-made containers, which include an extremely efficient an intelligent management system as well as state of the art cooling and fire suppression systems.
- The systems can detect the off-gases predating the thermal runaway event and shut down the malfunctioning cell/rack safely. The sensors used to do this are sensitive down to 1pmm (parts per million)
- Lithium -Ion Phosphate as a technology has a higher thermal runaway temperature threshold and hence, improved battery safety.
- Flow Storage uses electrolyte as an aqueous form which is inherently safe and non-flammable. Flow batteries are housed in similar purpose-made containers with slightly different management and support systems but ultimately functioning the same as the Li-ion batteries.

4.5.22 **Figure 4.1d- Proposed Battery Storage and New Infrastructure** details the energy storage requirements.

Onsite cabling

4.5.23 Within the PEIR the assessment will consider a mixture of below ground and above ground cabling for the Energy Site. Any above ground cabling will be attached to poles which would traverse the Site. The maximum height of these poles would be 30m.

4.5.24 As the design of the Site develops further it will be determined if any above ground cabling is required. All below ground cabling will be laid into trenches and then the soil will be re-laid. The process will follow a soil management plan to ensure that the soil structure and quality are not degraded as part of the construction process.

4.5.25 The cabling will run the energy from the solar panels to the nearest of the six onsite 132kV substations. These substations will step-up the electricity onto a 132kV circuit which will traverse the site – either above or below ground. The 132kV substations will connect to the main 400kV substation which will again step up the power. Cables will then leave the main substation (400kV) and run to Bicker Fen Substation.

Onsite substations

4.5.26 There are proposed to be six onsite substations within the Site. This is a design difference from the information presented within the Scoping Request. The Scoping Request had indicated that there would be a single substation on the Site located in the southeast in close proximity to the battery storage area.

4.5.27 Since the Scoping Request further design work has taken place and has determined that a series of 132kV substations on the Site will offer greater electrical efficiencies for the scheme. It is currently proposed that there will be 6No. onsite substations. These smaller substations will have dimensions of around 80m x 40m x 10m.

4.5.28 The main 400kV substation will include a control building which will include office space and welfare facilities as well as operational monitoring and maintenance equipment. The dimensions of this control building are dependent of further assessment work and so, as allowed under the Rochdale Envelope Principle, cannot be stated in this PEIR but a worst-case assessment will be adopted for the ES and based on current designs these are expected to be approximately 135m x 90m x 15m.

4.5.29 **Figure 4.1d- Proposed Battery Storage and New Infrastructure** details the substations arrangement.

Customer Switchgear

4.5.30 A switch room building is proposed to be approximately 15m x 10m x 5m and will contain switchgear for connecting to inverters and transformers. A further control room is proposed for the energy storage, which will contain space for breakers, switch gear, operation and maintenance equipment, a server and welfare facilities. This is proposed to be 12m x 9m x 4m.

4.5.31 The customer switchgear area will be located within one of the 132kV substation and energy storage zones. **Figure 4.1d - Proposed Battery Storage and New Infrastructure** details the substation and energy storage zone arrangement.

Fencing, Security and Lighting

4.5.32 A fence will enclose the operational areas of the Site. The fence is likely to be a metal mesh fence of approximately 3m in height. Pole mounted closed circuit television (CCTV) system, which will face towards the Energy Park and away from any land outside of the Site will also be deployed around the perimeter of the Site. These cameras will be mounted on poles of 3.5m height located within the perimeter fence.

4.5.33 It is likely that lighting on sensors for security purposes will be deployed around the BESS area and potentially at any other pieces of critical infrastructure. No areas of the Development are proposed to be continuously lit during the operational phase of this development.

4.5.34 **Figure 4.1a - Current Assets on Energy Park Site** details the assets within the Energy Park.

Site Access and Access Tracks

4.5.35 Currently there are a number of access points into the Site from the A17. It is proposed to use the existing access point near Elm Grange for the very initial stages of construction. The initial phase of construction will include the construction of a new point of access onto the Site. An estimated timeframe of eight weeks is proposed.

4.5.36 This new point of access is also on the southern boundary and would form a new access point off the A17. The new point of access is a previously approved point of access that was not built out as it linked to the approved wind farm application for the Site. This new access point will be used for the remaining stages of the construction process and the operational activities for the Site. The proposed access is smaller than that approved for the wind park, but will be wide enough for two HGVs to pass each other.

4.5.37 The new access will require the creation of a new T-junction with a visibility splay of 215m, which is commensurate with a 60mph speed limit, even though the A17 is a 50mph road.

4.5.38 Once on site the access track will continue northwards and minor internal access tracks will be connected to it. These minor access tracks will connect into each parcel of the development. These primary access tracks that traverse the Site will likely be made of crushed aggregate or other suitable reinforcement. Smaller accesses into fields from the primary access tracks will likely comprise of matting which can be removed following construction.

4.5.39 **Figure 4.1b - Proposed Site Access and Internal Tracks** details the access arrangements

<u>Offsite cabling</u>

4.5.40 The proposed connection point for this Development is the National Grid Bicker Fen substation. This is an existing 400kV substation that is located approximately 5.5km south of the Development site as the crow flies. The exact route for the cable route to connect the Development to this substation is still being determined. However, all the new offsite cabling will be laid underground in trenches or ducting. At certain points along the route, it will be necessary to drill past 'obstacles' such as roads, watercourses, and other utilities. There will be no new above ground power lines for the offsite cabling.

4.5.41 The cable routes are still being surveyed and so more detail on the extents and precise locations of the cable routes cannot be offered within this PEIR.

4.5.42 As this survey work is ongoing, and discussions with National Grid on their preferred location of the connection point into their Bicker Fen substation, there is no more detail that can be provided on this route at this time, nor the depth of the required trench nor the number of cables. The environmental assessment is considering a swathe width of 25m for these trenches, with further land allowed each side to allow for micro location if required due to ground conditions or other environmental constraints. However, these uncertainties will be defined, where possible, within the ES and if still to be finalised can be captured and assessed effectively through the 'Rochdale Envelope' approach which is being used for this ES.

<u>Bicker Fen Substation Works</u>

4.5.43 The electricity generated is expected to be exported via a connection from the Site to the existing National Grid Electricity Transmission (NGET) 400kV Bicker Fen substation.

4.5.44 This will require an extension to the existing structures at Bicker Fen substation. This extension will either be to the south-west or north-east of the existing substation site. The choice of the location for the extension will be determined by National Grid. The area of land required for this extension is approximately 145m x 45m and 15m (at its maximum height). This extension will include a new generation bay with electrical equipment for connection to the Transmission system. The new equipment will look similar to the units already installed at the at the National Grid Bicker Fen site and likely to be approximately

55m x 30m. It is expected that the maximum height of this new unit will be 15m, which is similar to the units already installed at Bicker Fen. A generator bay control room is also proposed and will contain protection and signal interfaces between the Energy Park and National Grid. The size is approximately 8m x 5m x 4m. A perimeter road is proposed within the wider design envelope (145m x 45m) which will be approximately 4.5m wide.

4.5.45 If the south-west location is chosen for the new generation bay, then an area of plantation trees will need to be removed. It is believed that these plantation trees were planted when Bicker Fen Substation was first commissioned. The ES will consider the implications of these trees being removed (if required) to ensure that the worst-case scenario has been assessed.

4.6 DESIGN PARAMETERS

4.6.1 The design of the Scheme is an iterative process, based on preliminary environmental assessments and consultation with statutory and non-statutory consultees.

4.6.2 A number of 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. For example, the enclosure or building sizes may vary, depending on the contractor selected and their specific configuration and selection of plant.

4.6.3 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 worst-case impacts will be reported on in the ES.

4.6.4 The maximum design parameters known to date, are set out in Table 4.2 below. Each Scheme component has been described in more detail in section 4.3 above.

Table 4.2: Design Parameters used for the PEIR assessment.

Element of Development	Parameter Type	Design Principle
a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts comprising— (a) solar PV modules; (b) PV module mounting infrastructure; (c) inverters; (d) transformers; and (e) a network of cable circuits		
Solar PV Array Fields	Location	The solar PV array fields will be located as currently shown indicated on Figure 2.1: Indicative Site Layout
	Scale	The maximum area of the solar PV array fields will be as set out in the DCO application, but the area is shown on Figure 2.1 Indicative Site Layout.
Solar PV Modules and Mounting Structures	Location	All solar photovoltaic modules will be located within the 'fields' marked on Figure 2.1 Indicative Site Layout
	Scale	The total area of solar PV modules in each field will not exceed the solar PV module areas set out in Figure 2.1 Indicative Site Layout

	Scale	The maximum height of highest part of the solar PV modules will be 4.5m above ground level (AGL). If the tracker system were to be used the maximum height would reduce to 3.5m
	Scale	The minimum height of the lowest part of the fixed solar PV modules will be 2.2m AGL. For the tracker solar PV modules this would reduce to 0.1m AGL.
	Design	The solar PV modules within the fixed frame system will face south. In the tracker system they will track east to west through the daylight hours.
	Design	The minimum east-west separation between the external parameters of array tables will be 3-6m for the fixed panel system and 2-4m for the tracker PV system.
	Design	The arrangement of solar PV modules within an array table will be the same across all solar PV array fields e.g. all panels will be portrait or landscape.
	Design	The solar PV modules will be blue / black in colour.
Inverters	Location	All inverters will be located within the areas marked on Figure 2.1 Indicative Site Layout
	Design	Central inverters (x127) are proposed to provide a worst-case scenario within the design.
Transformers	Location	All transformers will be located within the areas marked for solar panels in Figure 2.1 Indicative Site Layout.
	Scale	The transformers will not exceed 4m height AGL of the solar PV modules in the same solar PV array field.
Electric Cabling	Design	All cable circuits within the solar PV array fields will be secured to the solar PV module mounting structures or will be underground. Short section of electrical cabling may be needed from groups of panels to the on site substation.

Table 4.3: Associated Development

Element of Development	Parameter Type	Design Principle
works comprising of; (f) an energy storage facility comprising— (i) energy storage; (ii) transformers; (iii) switch gear and ancillary equipment; (iv) a network of cable circuits; (v) cables connecting to the solar, Battery storge and substations; and (vi) a flood protection bund.		
Flood Protection Bund	Location	The flood protection bund may be required around the energy storage areas or the substations, both 400kV and 132kV.
	Scale	The location and scale of the bund has yet to be determined as flood modelling of the Site is ongoing with the sensitivity testing to protect against the modelled 1 in 1,000 year flood event.
	Design	The flood protection bund would, if needed, entirely enclose the energy storage facility and the Development substation.

	Design	As much site won material from within the electrical compound area will be used to construct the bund as is reasonably practicable.
Battery Energy Storage System Facility (BESS)	Location	The energy storage facility will be located within the areas shown in Figure 2.1 Indicative Site Layout.
	Scale	The components of the BESS will have a maximum height of 6m.
	Design	The technology choice for the energy storage system has not yet been determined. The system currently has a primary area, with the opportunity to split the capacity into zones on the Site if required by environmental constraints.
6No. substations with works comprising— (i) a network of cable circuits; (ii) electrical underground cables connecting to the solar panels, energy storage, substations and the existing substation at Bicker Fen; (iii) construction compounds; (iv) a flood protection bund; and (v) over ground electricity cable poles.		
Development Substation	Location	The 6No. development substations will be located within the areas marked on Figure 2.1 Indicative Site Layout.
	Scale	The components of the majority of the largest substation will be a maximum of dimensions of 135m x 90m, with some of the tallest equipment being 15m. There is expected to be 6No. other substations that will be approximately 80m x 40m, with the tallest equipment being 10m. A series of buildings will be located on site, these include a central control building at the main substation. A switch room building is proposed at each smaller substation (6No.) which will be 15m x 10m x 5m. A control room is proposed for the energy storage, which if split across the site could number 4No, and be 12m x 9m x 4m. Welfare facilities are required for construction and could be placed at 6 (No,) locations which coincides with the construction compounds, these will measure 13m x 7m x 3m.
	Design	The colour of the Development substation components will be grey or galvanised steel.
cabling works across the Site comprising— (a) a network of cable circuits connecting to the solar panels, energy storage and substations; (b) construction compounds; (c) landscaping; (d) earthworks; and (e) drainage.		
Fencing and security measures including as CCTV and lighting	Location	Fencing and security measures will be located within the area shown on Figure 2.1 Indicative Site Layout
	Scale	Fencing and CCTV equipment will not exceed the maximum height 3m AGL as set out in Figure 4.4.
	Design	Fencing will be installed to prevent public access to the solar PV arrays and the electrical compound.

<table>
<tr><td></td><td>Design</td><td>The fence is likely to be a metal mesh fence of approximately 3m in height. Pole mounted closed circuit television (CCTV) system, which will face towards the Energy Park and away from any land outside of the Site will also be deployed around the perimeter of the Site. These cameras will be mounted on poles of 3.5m height located within the perimeter fence.</td></tr>
<tr><td></td><td>Design</td><td>It is likely that lighting on sensors for security purposes will be deployed around the BESS area and potentially at any other pieces of critical infrastructure. No areas of the Development are proposed to be continuously lit during the operational phase of this development.</td></tr>
<tr><td>Internal access tracks</td><td>Design</td><td>The only new permanent road of stone construction will be the primary access track. Other internal tracks will utilise temporary matting.</td></tr>
<tr><td></td><td>Design</td><td>A permissive path will be created linking into public right of way Heck/15/1. This will form a loop walk for local residents.</td></tr>
<tr><td colspan="3">cabling works to South Forty Foot Drain comprising—
(a) a network of cable circuits connecting to the substations on the Energy Park site;
(b) construction compounds;
(c) landscaping;
(d) earthworks; and
(e) drainage.</td></tr>
<tr><td colspan="3">cabling works from HDD crossing under South Forty Foot Drain to National Grid Bicker Fen Substation comprising—
(a) a network of cable circuits connecting to the extension at Bicker Fen substation;
(b) construction compounds;
(c) landscaping ;
(d) earthworks; and
(e) drainage.</td></tr>
<tr><td>Grid Connection</td><td>Design</td><td>The cable between the electrical compound and the existing National Grid Bicker Fen Substation will be underground.</td></tr>
<tr><td colspan="3">Works to create and maintain a means of access for cabling to National Grid Bicker Fen Substation comprising—
(a) improvement of access points off National Highway;
(b) construction compounds;
(c) landscaping ;
(d) earthworks; and
(e) drainage.
and
Works to install new technical equipment at the National Grid Bicker Fen Substation comprising—
(a) a network of cable circuits connecting to the extension at Bicker Fen Substation;
(b) construction compounds;
(c) landscaping ;
(d) earthworks; and
(e) drainage.</td></tr>
</table>

Grid Connection	Location	The grid connection from the electrical compound to the existing National Grid Bicker Fen Substation will be located within the area marked in Figure 1.1 Site Location Plan.
	Design	Widening of existing access points from the Local Highway to enable HGV delivery. All works will comply with necessary visibility splays for speed of local roads.
	Design	Construction of temporary access tracks across land whilst underground cabling is being laid. Tracks are not required to remain in place during operation of Energy Park.
Works to create and maintain a means of access from the A17 to the Site—		
	Location	The location of the new access point is shown on Figure 2.1 Indicative Site Layout.
	Design	Creation of a new access point to enable HGV deliveries on to the Energy Park Site. The access point will comply with the necessary visibility splays for the Highway speed.
	Design	New access point will be a crushed aggregate material and will remain in place throughout the operational phase of the Proposed Development.
works to create and maintain BNG/ habitat management areas, comprising— (i) earth works; (ii) landscaping with new planting; (iii) sheep grazing; and (iv) annual hay cropping.		
Biodiversity Net Gain Area	Location	The Biodiversity Net Gain Area will be located as marked as shown on Figure 2.1 Indicative Site Layout.
	Scale	The area of land which is being proposed for Ecological Enhancement for this Site is approximately 95ha.
Community Orchard	Location	The Community Orchard will be located as marked as shown on Figure 2.1 Indicative Site Layout.
	Scale	The area of land which is being proposed for Ecological Enhancement for this Site is 1.8ha.

4.7 CONSTRUCTION PHASE

4.7.1 The construction phase of the Development is currently anticipated to last up to 18 months but will be dependent on the final design and the findings of the access and traffic assessment. The types of construction activities that may be required include (but are not limited to):

- Importing of construction materials;
- Culverting some ditches on the Site;
- The establishment of the construction compound(s) – this will likely move over the course of the construction process as each phase is built out, a maximum of 6 are proposed and their proposed locations can be seen on Figure 2.1 Indicative Site Layout;
- Creation of a new access point for the Site (A17);
- Installing the security fencing around the Site;
- Importing the PV panels and the energy storage equipment;

- Erection of PV frames and modules;
- Laying of overhead cables onsite and digging cable trenches and laying cables onsite;
- Installing transformer cabins;
- Construction of onsite electrical infrastructure for the export of generated electricity
- New habitat creation;
- Creation of the permissive path;
- Digging of cable trench and laying cables for connection to the National Grid Bicker Fen substation;
- Installing above ground grid cable access points along the Grid Route;
- Improving existing access points off Highways for construction access for Grid Route;
- Clearance of plantation trees at land required for National Grid Bicker Fen substation extension; and
- Installing new technical equipment at the National Grid Bicker Fen substation.

Construction Traffic Management Plan

4.7.2 A draft Construction Traffic Management Plan (CTMP) will be developed as part of the EIA which will guide the delivery of materials and staff onto the Development Site during the construction phase. The principles of the draft CTMP will be available for comment as part of the consultation process to ensure that the comments of local residents and stakeholders are taken into account in its development (Appendix 14.1).

Temporary Construction Compounds

4.7.3 A main temporary construction compound will likely be established close to the Development site entrance. Smaller temporary compounds will be located across the Development as the site is built out in its various phases, currently proposed to be 4. The construction process will take place as one continuous process, so when Phase 1 is completed, Phase 2 would start.

Temporary Roadways

4.7.4 Depending on weather conditions during construction, temporary roadways (e.g. plastic matting) may be utilised to access parts of the Development site.

Site Reinstatement and Habitat Enhancement

4.7.5 Depending on the season, work needed for habitat enhancement will start before, during or after construction is completed. A draft Landscape and Ecological Management Plan will be submitted as part of the ES. This document will set out the proposals for the land and how it will be managed through the operational life of the scheme. It is proposed that the operational lifetime of this scheme will be 40 years.

Soil Management Plan

4.7.6 A draft Soil Management Plan will be submitted as part of the ES. This document has been requested by Natural England and will be set out the proposals for how the soil will be managed through the construction process to ensure that its structure and quality are maintained. Another Soil Management Plan will be required as part of the decommissioning assessment. This will be produced when the Energy Park reaches the end of its operational lifetime as the technology for removal of the solar panels will have been developed by this time.

4.8 OPERATION PHASE

4.8.1 During operation of the Development, human activity on the Site will be minimal and would be restricted principally to vegetation management, equipment maintenance and servicing, replacement of any components that fail, monitoring to ensure the continued effective operation of the Development and the shepherd gaining access to the Site for manage the low intensity flock. This flock will only be present on the Site for a proportion of the year to enable the correct ecological management of the land. It is anticipated that the operation of the Energy Park will create 5 full time jobs. Those working on the site will gain access using light vehicles. HGV movements are not expected unless replacement equipment is required on Site as part of the maintenance programme.

4.8.2 There is a proposed 'Community Orchard' as part of the ecological enhancements of the Energy Park. At this time, it is hoped that students of the new school at Elm Grange, as well as other community groups, would be able to access this orchard. The access arrangements to such a community asset are still to be finalised, but will be discussed over the formal consultation process for this proposal.

Figure 4.1e- Proposed Ecological Enhancements for Operational Energy Park details the locations of the ecological enhancements proposed.

4.8.3 Local residents will also be able to use the proposed permissive path that would offer a loop walk extension to the existing footpath in the northwest corner of the Site (Ref: Heck/15/1).

Figure 4.1f- Proposed Permissive Path details the route of the permissive footpath.

4.9 DECOMMISSIONING PHASE

4.9.1 The Development will be decommissioned at the end of its approved operational phase. All PV modules, mounting poles, cabling above 1m below ground (on and off site) (any cabling buried 1m+ below ground will not be removed at decommissioning), substations, energy storage equipment, inverters, transformers etc would be removed from the Development. These items would be recycled or disposed of in accordance with good practice and market conditions at the time. A Decommissioning Plan, to include timescales (expected to take 6-12 months) and transportation methods would be agreed in advance with the Local Planning Authority. As requested in the Scoping an outline Decommissioning Plan will accompany the DCO application.

4.9.2 It is the intention that after the 40 years of operation the whole of the Energy Park Site will revert to its current use and be used by the landowner for agricultural operations of their choice and determined by the global markets at that time. This will include the areas that will have been used for biological diversification over the lifetime of the Energy Park. It is the intent that the permissive path would also be closed to public once the Energy Park is decommissioned.

4.9.3 At this time the applicant has been advised by National Grid that the additional electricity transformer unit that will be installed at the National Grid Bicker Fen Substation for the Development will be part removed as part of the decommissioning process. However, the extended concrete pad at Bicker Fen will remain. This extended concrete pad will be in the ownership of National Grid. Therefore, the larger footprint of Bicker Fen substation will remain after the Energy Park is decommissioned. The final list of elements to be decommissioned from the Bicker Fen Substation would be agreed with National Grid as part of the decommissioning process.

4.9.4 This could result in connection capacity in the future energy beyond the 40-year life time of the scheme.

4.9.5 The effects of decommissioning are often similar to, or to a lesser magnitude than, the construction effects and will be considered where possible in the relevant sections of the ES. However, there can be a high degree of uncertainty regarding decommissioning as engineering approaches and technologies evolve over the operational life of the Development.

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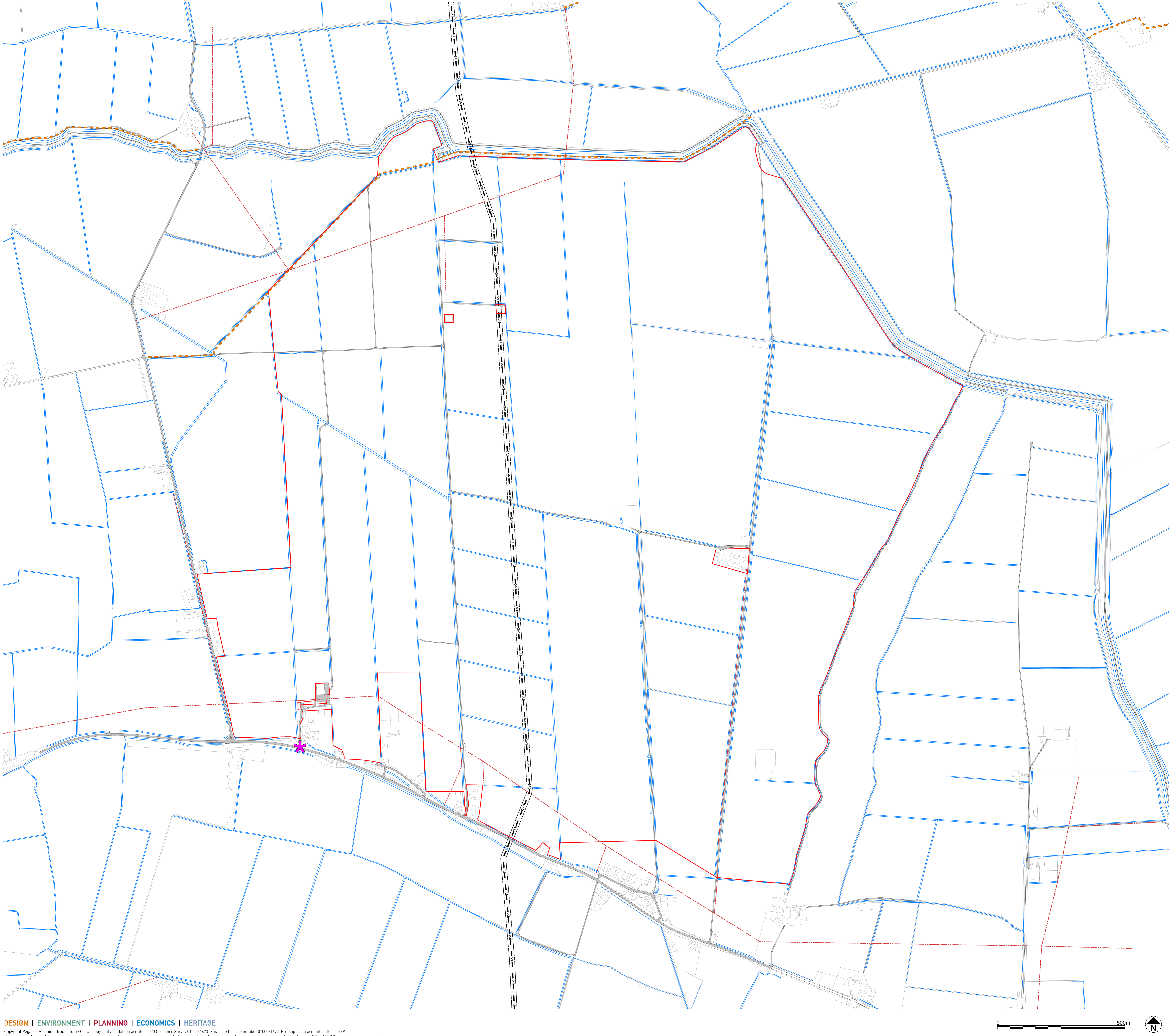
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 4.1a- Current Assets on Energy Park Site

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Current Point of Access
- Existing Road/Track
- Public Right of Way (HECK/15/1)
- Ditch
- Gas Pipeline
- 11kV Overhead Line

Revisions:
First Issue- 27/05/2022 CR

FIGURE 4.1a
Current Assets on the Energy Park Site

DRWG No: **P20-2370_27** Sheet No:_ REV: _

Drawn by : CR

Date: 27/05/2022

Scale: 1:5,000 @ A0

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 4.1b- Proposed Site Access and internal access

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

KEY

- Site Boundary
- Proposed Site Entrance
- Temporary Access
- Primary Access Track
- Existing Road/Track

0 500m

N

Revisions:
First Issue- 27/05/2022 CR

FIGURE 4.1b Proposed Site Access and Internal Access

DRWG No: **P20-2370_28** Sheet No:_ REV: _

Drawn by : CR

Date: 27/05/2022

Scale: 1:5,000 @ A0

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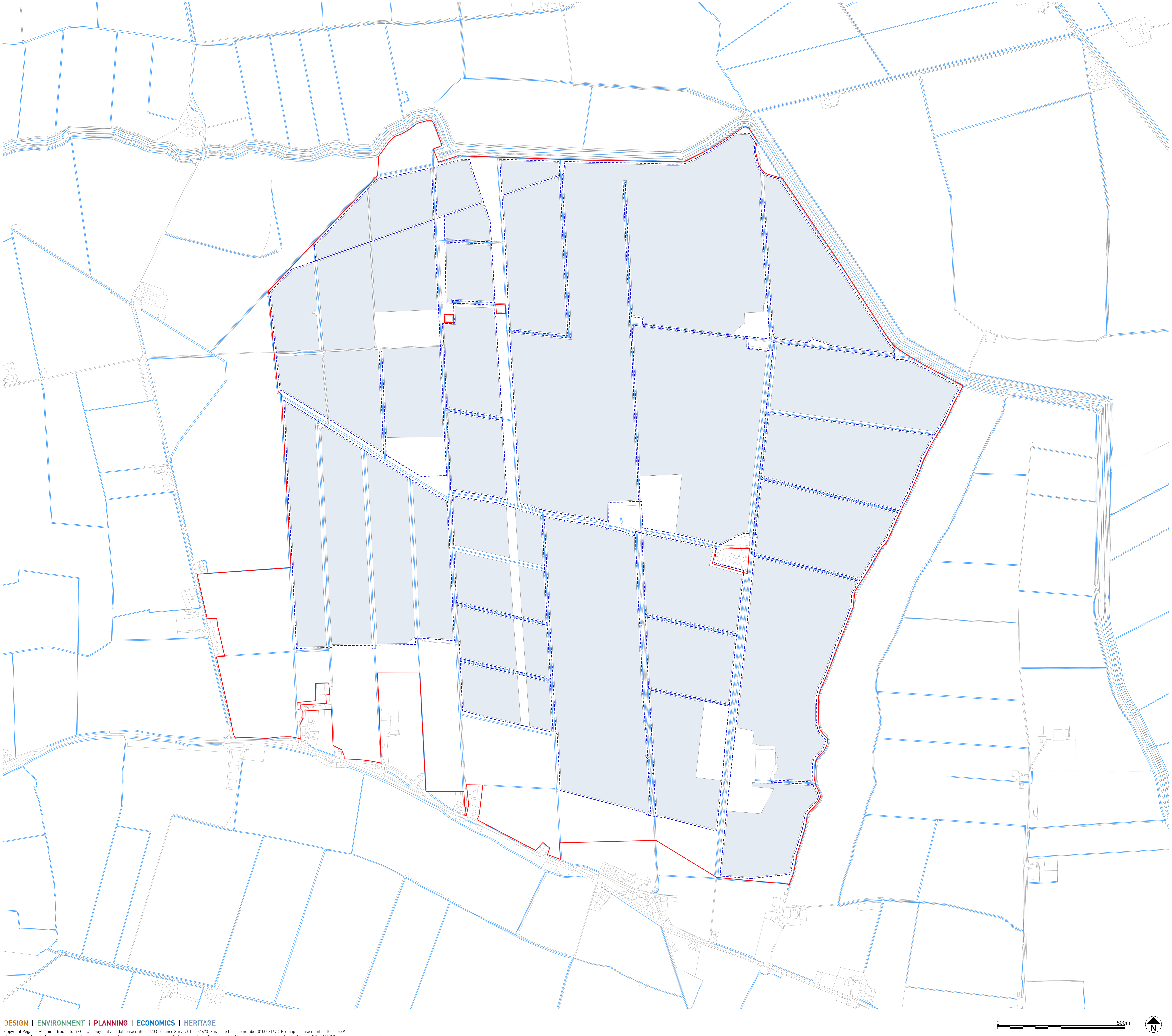
Preliminary Environmental Information Report

Figure 4.1c- Proposed Solar PV Development Areas

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

Site Boundary

Security Fence

Solar Development Area

Buffers to development:
- 9m to BSIDB maintained open watercourses
- 8m to all other watercourses
- 10m to gas pipeline
- 5m to 11kV overhead line

Notes:
The Solar Development Area will include some localised electrical infrastructure such as inverters, transformers, energy storage and smaller substations.

Revisions:
First Issue- 27/05/2022 CR

FIGURE 4.1C
Proposed Solar PV Development Areas

DRWG No: **P20-2370_29** Sheet No:_ REV: _

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Date: 27/05/2022

Scale: 1:5,000 @ A0

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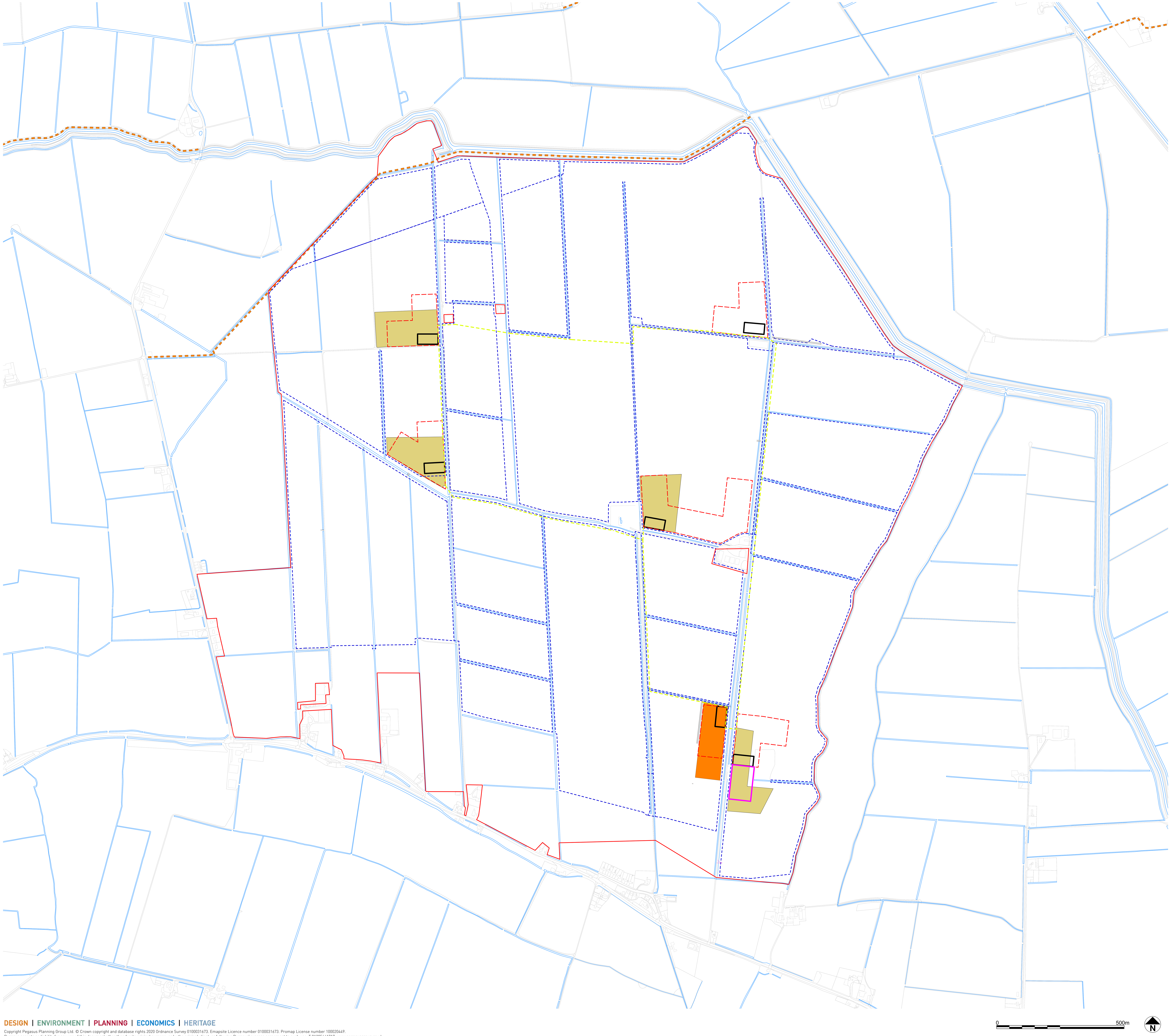
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 4.1d- Proposed Battery Storage and New Infrastructure

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Security Fence
- Construction Compound
- Primary Energy Storage
- Indicative 400kV Substation Location
- Indicative 132kV Substation Location
- 132kV Substation and Energy Storage Zone
- Indicative 132kV Overhead Cable Route

(Following construction, construction compounds are likely to have solar panels installed)

Revisions:
First Issue- 27/05/2022 CR

FIGURE 4.1d
Proposed Battery Storage and New Infrastructure

DRWG No: **P20-2370_30** Sheet No:_ REV: _

Drawn by : CR

Date: 27/05/2022

Scale: 1:5,000 @ A0

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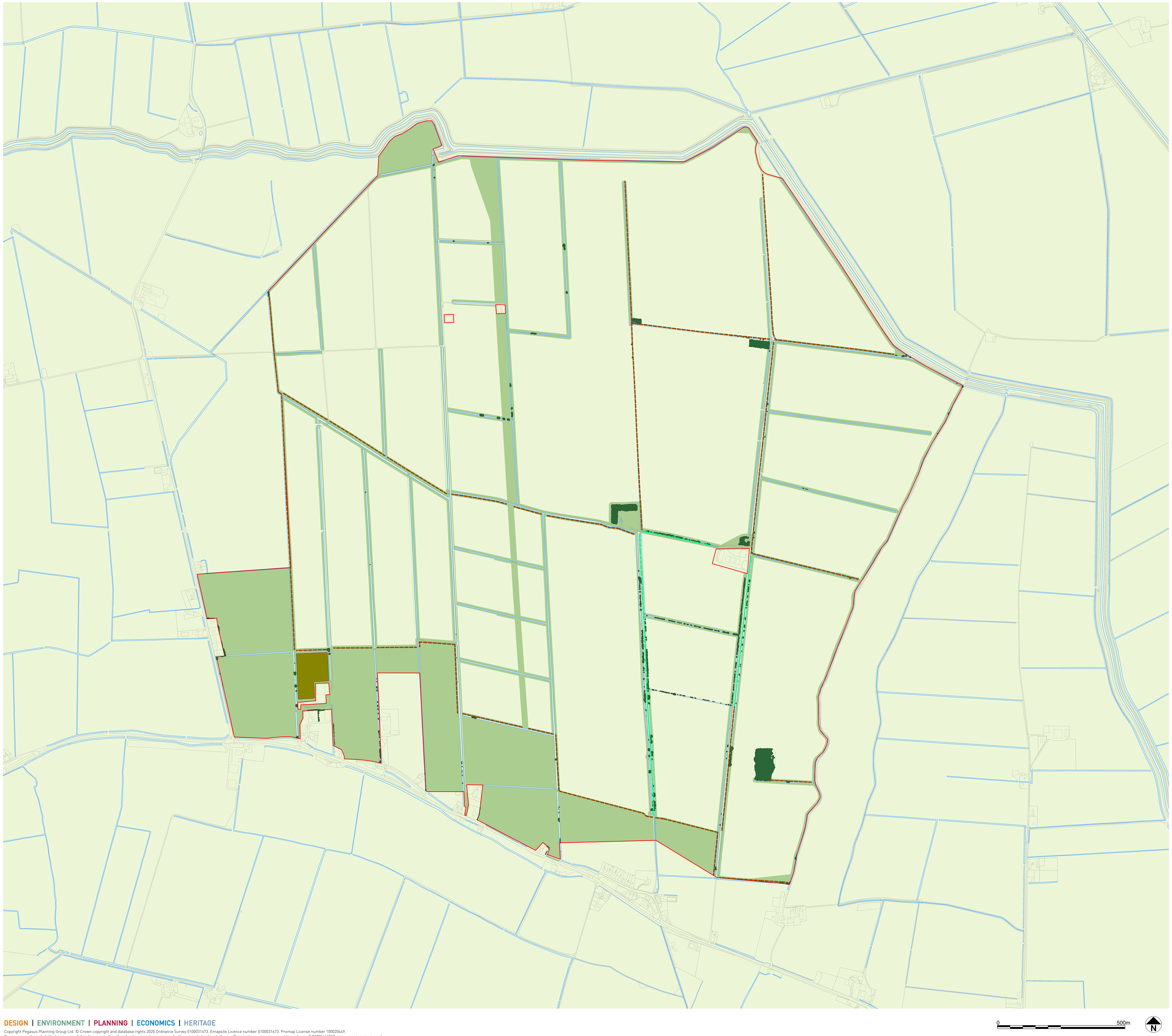
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 4.1e- Proposed Ecological Enhancements for Operational Energy Park

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

Site Boundary

Potential Biodiversity Net Gain (112.15 ha)

Trees, Woodland and Hedgerows

New Hedgerow (10.19km)

Enhanced Hedgerow (1.98km)

Community Orchard

Notes:
Hedgerows would be up to 3m in width when mature and would be maintained up to 4m in height.

Revisions:
First Issue- 06/06/2022 CR

FIGURE 4.1e
Proposed Ecological Enhancements for Operational Energy Park

DRWG No: **P20-2370_31** Sheet No:_ REV: _

Drawn by : CR

Date: 06/06/2022

Scale: 1:5,000 @ A0

DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

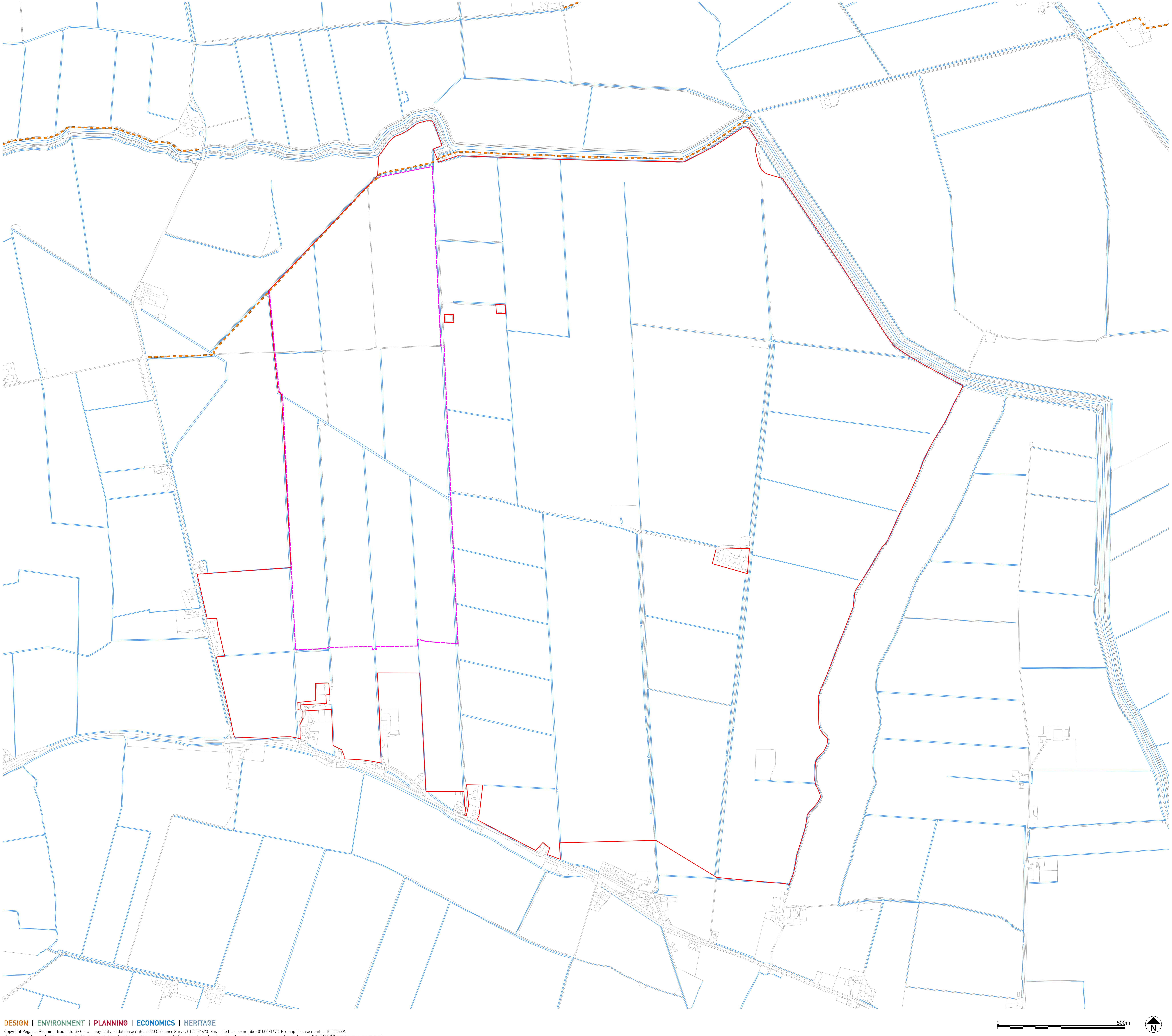
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 4.1f- Proposed Permissive Path

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Public Right of Way (HECK/15/1)
- Proposed Permissive Path

Revisions:
First Issue- 25/05/2022 CR

FIGURE 4.1f Proposed Permissive Path

DRWG No: P20-2370_32 Sheet No:_ REV: _

Drawn by : CR

Date: 27/05/2022

Scale: 1:5,000 @ A0

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Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 4.2- Fixed Solar PV Panel Technology

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

ecotricity

Figure 4.2. Indicative Fixed mounting system option. Viewed from East. Looking West

Panel Angle Range: 10 degrees to 40 degrees. Shown as 20 degrees in drawing below.

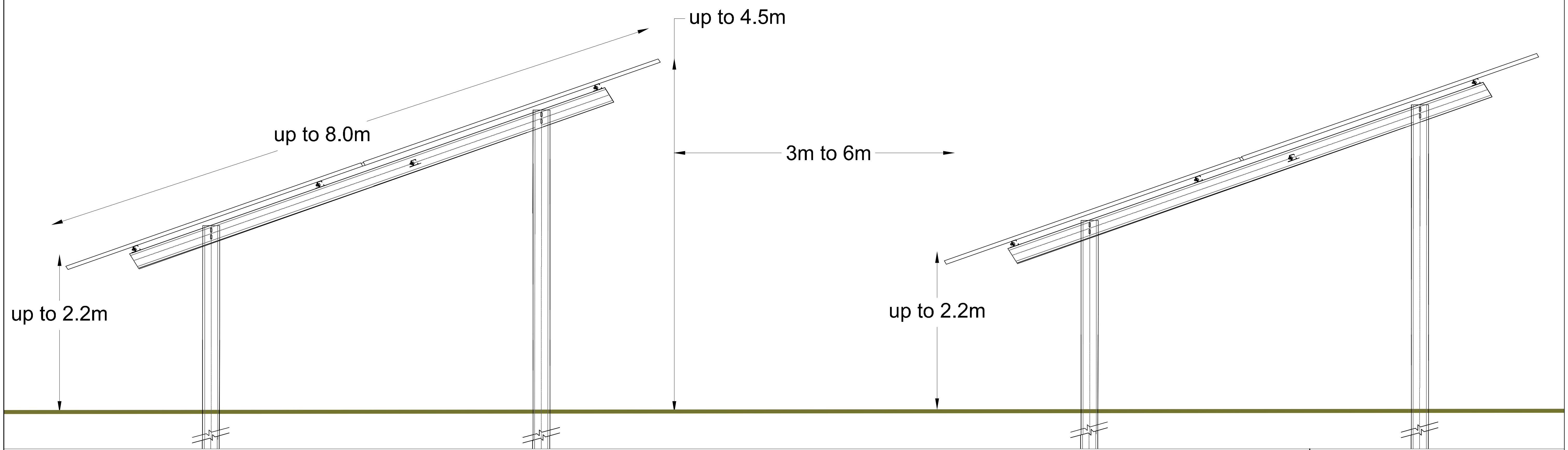

Figure: 4.2
Title: Indicative Fixed mounting system option

Scale: 1: 50 @ A3

Drawn by:	Checked by:	Approved by:
MW	LW	ID

Ref: 6467_T0215_05 **Date:** June 2022

Heckington Fen Solar Park

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

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Figure 4.3- Tracker Solar PV Panel Technology

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

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Figure 4.3. Indicative Tracking mounting system option. Viewed from North / South

Maximum Tracking Angle: 60 degrees from horizontal. Shown as 45 degrees in drawing below.

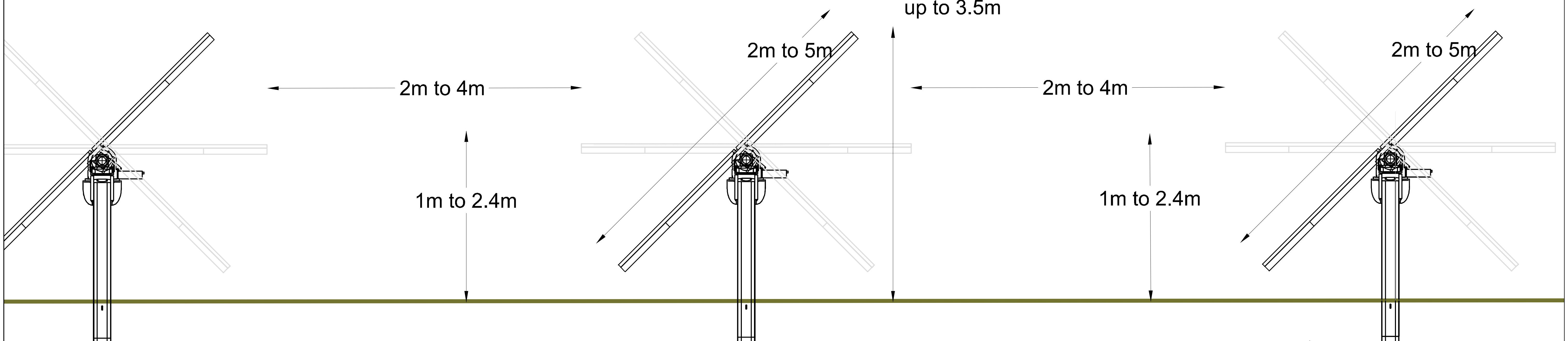
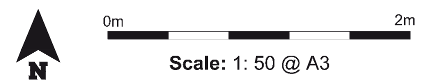


Figure: 4.3.
Title: Indicative Tracking mounting system option



Scale: 1: 50 @ A3

Drawn by:	Checked by:	Approved by:
MW	LW	ID

Ref: 6467_T0215_05 **Date:** June 2022

Heckington Fen Solar Park

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

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Figure 4.4- Indicative Security Fence Design

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

KEY

Image A: Example of Proposed Security Fence (RAL6005)

Image B: Example of Proposed Security Gate

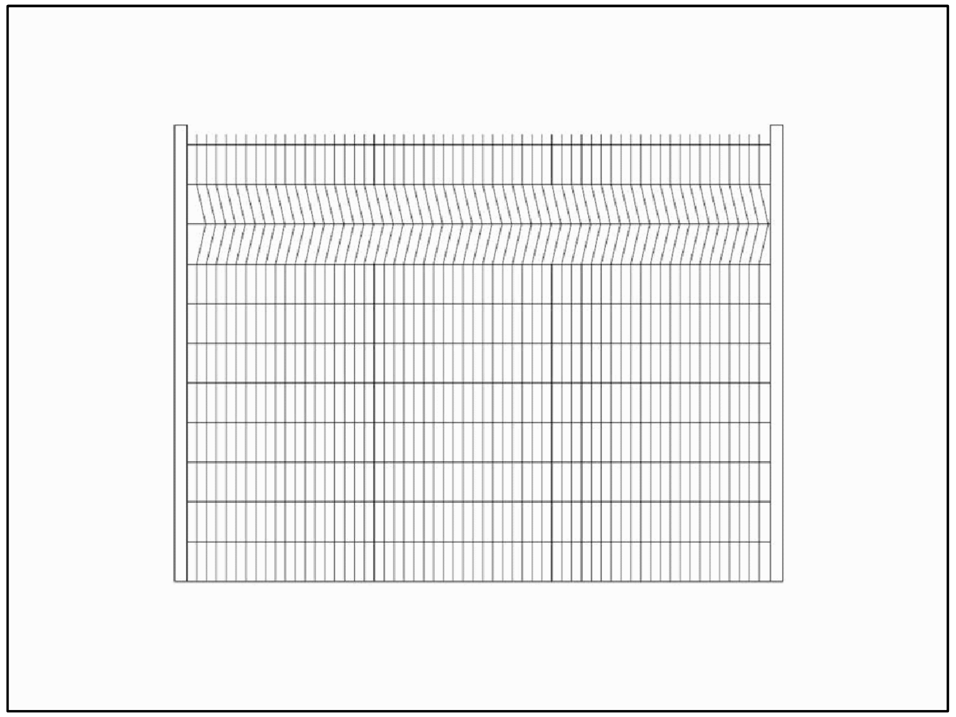


Image C: Detailed Image of Proposed Security Fence

FIGURE 4.4

Indicative Security Fence Design

DRWG No: **P20-2370_41** Sheet No: **-** REV: **_**

Date: 10/06/2022

Scale:

ecotricity PEGASUS GROUP

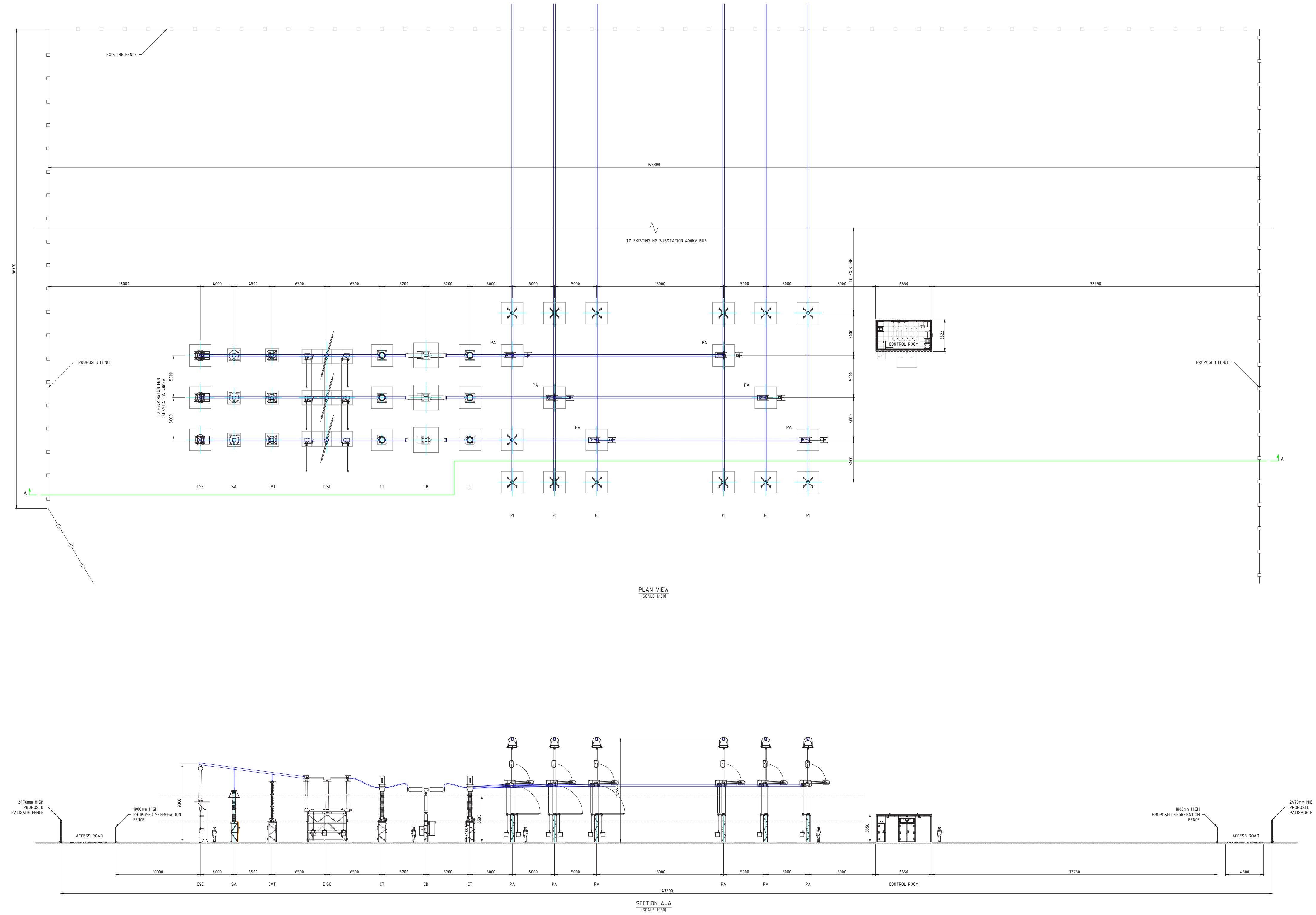
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 4.5- Proposed Bicker Fen Extension Design

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

GEND:

CB	-	CIRCUIT BREAKER
CSE	-	CABLE SEALING END
CT	-	CURRENT TRANSFORMER
CVT	-	CAPACITIVE VOLTAGE TRANSFORMER
DISC	-	DISCONNECTOR
EAT	-	EARTHING AUXILIARY TRANSFORMER
ES	-	EARTHING SWITCH
GA	-	GENERAL ARRANGEMENT
LC	-	LIGHTING COLUMN
NER	-	NEUTRAL EARTH RESISTOR
NG	-	NATIONAL GRID
PA	-	PANTOGRAPH DISCONNECTOR
PI	-	POST INSULATOR
RX	-	REACTOR
SA	-	SURGE ARRESTOR
SGT	-	SUPER GRID TRANSFORMER
TBC	-	TO BE CONFIRMED
TX	-	TRANSFORMER
VT	-	VOLTAGE TRANSFORMER
		400kV BUSBAR
		400kV CABLE
		132kV BUSBAR
		132kV CABLE

SITE LOCATION
(SCALE 1:5000)

FIGURE 4.5

Proposed Bicker Fen Extension Design

DRWG No: **P20-2370_42** Sheet No: - REV: _

Date: 10/06/2022

Scale:

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 5: Planning Policy

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

5 PLANNING POLICY CONTEXT

5.1 INTRODUCTION

5.1.1 This chapter sets out an overview of the relevant planning policy context against which the application for development consent will be determined.

5.2 PLANNING POLICY

5.2.1 This section summarises the key planning policy documents that will inform the EIA process. Each topic chapter of the PEIR sets out the policy relevant to that topic.

National Policy Statements for Energy, Renewable Energy and Electricity Networks Infrastructure

5.2.2 The Planning Act requires that in deciding applications for development consent, regard must be had to any National Policy Statement (NPS) which has 'effect' in relation to development of the description to which the application relates (a 'relevant national policy statement'). Applicants should ensure that their applications are consistent with the instructions and guidance within the NPSs, and the Statements may also be helpful to Local Planning Authorities in preparing their local impact reports.

5.2.3 In 2011 the Government published National Policy Statements for Energy (EN-1), Renewable Energy Infrastructure (EN-3), and Electricity Networks Infrastructure (EN-5); these need to be considered together in view of the Proposed Development consisting of a renewable energy generating station together with a grid cable route and National Grid extension ("electricity networks") infrastructure.

5.2.4 The 'Overarching' NPS for Energy EN-1 sets out how the energy sector can help deliver the Government's climate change objectives by clearly stating the need for new low carbon energy infrastructure to contribute to climate change mitigation.

5.2.5 The NPS sets out the UK's commitments to sourcing 15% of total energy from renewable sources by 2020 (across the sectors of transport, electricity and heat) (paragraph 3.4.1). To hit this target, and to largely decarbonise the power sector by 2030, EN-1 states that:

> **"It is necessary to bring forward new renewable electricity generating projects as soon as possible. The need for new renewable energy electricity generation projects is therefore urgent."**

5.2.6 EN-3 should be read in conjunction with EN-1. EN-3 sets out the national policy for renewable energy projects, highlighting that a 'significant increase in generation from large-scale renewable energy infrastructure is necessary to meet the 15% renewable energy target'.

5.2.7 In late 2021 a consultation was undertaken with regards to reviewing and updating the energy NPSs. The updated documents would ensure that decisions on major energy infrastructure reflect the current legislative framework and strategic policy approach and ensure that the planning policy framework can support the infrastructure required for the transition to net zero.

5.2.8 The draft revised NPS EN-1 explains that the Government's objective is to ensure the UK's supply of energy always remains secure, reliable, affordable and consistent with meeting the target to cut greenhouse gas emissions to net zero by 2050. It states that 'this will require a step change in the decarbonisation of our energy system.' (paragraph 2.3.2).

5.2.9 With fossil fuels still accounting for around 80% of the UK's energy supply in 2019, the document states that the country 'will need to dramatically increase the volume of energy supplied from low carbon sources and reduce the amount provided by fossil fuels' (paragraph. 2.3.4). With an 'urgent need for new generating capacity' (paragraph. 3.3.20) and with wind and solar as the lowest cost ways of generating electricity, the draft NPS concludes that "a secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar" (paragraph 3.3.21).

5.2.10 A draft revision of NPS EN-3 was also published in September 2021. This emphasises the Government's commitment to sustained growth in solar capacity to ensure that the UK is 'on a pathway' that allows it to meet net zero emissions. The document affirms at paragraph 2.47.1 that:

> **"Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. Solar farms can be built quickly and, coupled with consistent reductions in the cost of materials and improvements in the efficiency of panels, large-scale solar is now viable in some cases to deploy subsidy-free and at little to no extra cost to the consumer… As such solar is a key part of the government's strategy for low-cost decarbonisation of the energy sector."**

5.2.11 The Government published the Draft NPS for Electricity Networks Infrastructure (EN-5) in September 2021. This NPS, taken together with the Overarching National Policy Statement for Energy (EN-1), provides the primary policy for decisions taken by the Secretary of State on applications it receives for electricity networks infrastructure.

5.2.12 Whilst EN-1 set out general principles that should be applied in the assessment of development consent applications across the range of energy technologies, EN-5 is concerned with impacts and other matters which are specific to electricity networks infrastructure or where, although the impact or issue is generic and covered in EN-1, there are further specific considerations arising from this technology. The policies set out in this NPS are additional to those on generic impacts set out in EN-1 and do not replace them.

Renewable Energy Framework

5.2.13 Both national legislation and international agreements set targets for the reduction of carbon emissions and the increase in renewable energy generation. The NPPF states at paragraph 2 that planning decisions must reflect relevant international obligations, and the UK's legally binding commitments to energy targets is also an important material consideration.

5.2.14 The overarching context here is set by the Paris Agreement of the United Framework Convention on Climate Change in 2015 which introduced Nationally Determined Contributions (NDCs) - national climate plans that include commitments to increasing renewable energy provision, such as solar.

5.2.15 In 2019 the Government amended the Climate Change Act 2008 by introducing a target for at least a 100% reduction of greenhouse gas emissions (compared to 1990 levels) in the UK by 2050. This is the well-known commitment to 'net zero', requiring a major shift to greater renewable energy generation.

5.2.16 These national and international objectives and commitments were endorsed by the COP26 summit hosted within the UK in November 2021. In order to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change almost 200 countries agreed to the Glasgow Climate Pact, to limit the rise in global temperature to 1.5 degree Celsius from pre-industrial levels.

Energy White Paper (December 2020)

5.2.17 The White Paper was issued by the Department for Business, Energy and Industrial Strategy (BEIS) to address the transformation of the UK's energy system towards the 2050 target for net-zero emissions. The foreword states that:

"The UK has set a world–leading net zero target, the first major economy to do so, but simply setting the target is not enough – we need to achieve it. Failing to act will result in natural catastrophes and changing weather patterns, as well as significant economic damage, supply chain disruption and displacement of populations."

5.2.18 The foreword concludes that:

> **"The way we produce and use energy is therefore at the heart of this. Our success will rest on a decisive shift away from fossil fuels to using clean energy for heat and industrial processes, as much as for electricity generation."**

5.2.19 The White Paper recognises the progress made to increase deployment of renewables and sees the expansion of renewable technologies as a key contributor to achieving an affordable clean electricity system by 2050. It states (page 45):

> **"Onshore wind and solar will be key building blocks of the future generation mix, along with offshore wind. We will need sustained growth in the capacity of these sectors in the next decade to ensure that we are on a pathway that allows us to meet net zero emissions in all demand scenarios."**

The Carbon Budget Order (June 2021)

5.2.20 The UK was the first country to enter legally binding long-term carbon budgets into legislation, first introduced through the 2008 Climate Change Act. Five carbon budgets have subsequently been put into law to eliminate the UK's contribution to climate change by 2050 and target net zero emissions. In April 2021 the Government announced new targets to cut emissions by 78% by 2035 compared to 1990 levels (63% relative to 2019); at the time this represented the world's most ambitious climate change target.

5.2.21 In line with the recommendation from the independent Climate Change Committee (CCC) - the independent, statutory body established under the Climate Change Act 2008 - the sixth Carbon Budget will limit the volume of greenhouse gases emitted over a 5-year period from 2033 to 2037.

> **"The Carbon Budget will ensure Britain remains on track to end its contribution to climate change while remaining consistent with the Paris Agreement temperature goal to limit global warming to well below 2°C and pursue efforts towards 1.5°C."**

5.2.22 The CCC advise that the rapid roll out of renewable electricity generation will form a key part of achieving this carbon budget.

Net Zero Strategy: Build Back Greener (October 2021)

5.2.23 In 2020 the Prime Minister set out the Government's 'Ten Point Plan for a Green Industrial Revolution.' In October 2021 the Net Zero Strategy: Build Back Greener policy paper was published which builds upon that 10 Point Plan in regard to the UK's carbon budgets, 2030 Nationally Determined Contribution and 2050 net zero target.

5.2.24 The Net Zero Strategy will be submitted to the United Nations Framework Convention on Climate Change (UNFCCC) as the UK's second Long-Term Low Greenhouse Gas Emission Development Strategy under the Paris Agreement. The Strategy addresses the objective of a decarbonised power system by 2035 (Section 3i), with a list of delivery commitments including to:

> **"Take action so that by 2035, all our electricity will come from low carbon sources, subject to security of supply, bringing forward the government's commitment to a fully decarbonised power system by 15 years…"**

5.2.25 The Strategy confirms at Section 3i paragraph 11 that:

> **"…the Energy White Paper's fundamental approach remains unchanged. A low-cost, net zero consistent electricity system is most likely to be composed predominantly of wind and solar generation, whether in 2035 or 2050."**

5.2.26 The Strategy affirms that the UK needs to continue to drive rapid deployment of renewables so that it can reach substantially greater capacity beyond 2030 (Chapter 3i, paragraph 35). Section 3i paragraph 36, which states that the Sixth Carbon Budget also requires:

> **"A sustained increase to the deployment of land-based renewables such as locally supported onshore wind and solar in the 2020s and beyond."**

5.2.27 Finally, given the current international situation, with the global increase in gas prices and possible threats to supply, the Strategy recognises that there is an important economic and social dimension to the generation of low carbon energy. The Strategy (Technical Annex, paragraph 87) states that:

"...Gas will continue to play a role in setting the electricity price for some years to come but, over time, will do so less frequently, as more and more low carbon generation (such as wind and solar) connect to the electricity system - consistent with the commitment to a fully decarbonised power system by 2035. This will help put downward pressured [sic] on wholesale electricity prices."

5.2.28 The Government published its British Energy Security Strategy in April 2022. This policy paper set out the steps that the Government is taking to accelerate progress towards net zero, seen as 'fundamental to energy security.' The Government expects a five-fold increase in the deployment of solar energy by 2035 and the policy paper states that the Government will support the 'effective use of land by encouraging large scale projects to locate on previously developed, or lower value land, where possible, and ensure projects are designed to avoid, mitigate, and where necessary, compensate for the impacts of using greenfield sites.'

National Planning Policy Framework

5.2.29 The National Planning Policy Framework (NPPF) was published in 2012 and updated in 2018, 2019 and 2021 (Ministry of Housing, Communities and Local

Government, 2021a). In addition, in January 2021 the Government consulted on a selective review of the NPPF and published a draft Model Design Code (Ministry of Housing, Communities and Local Government, 2021b) to implement policy changes in response to the 'Living with Beauty' report (Building Better, Building Beautiful Commission, 2020).

5.2.30 The NPPF sets out the Government's planning policies for England and how these are to be applied in relation to the determination of planning applications made under the Town and Country Planning Act 1990 (as amended). The NPPF states that Town and Country Planning Act 1990 planning applications should be determined in accordance with the Development Plan for the relevant area unless material considerations indicate otherwise. Paragraph 2 states the NPPF '… is a material consideration in planning decisions'.

5.2.31 Paragraph 5 states that the NPPF does not contain specific policies for NSIPs. These are to be determined in accordance with the decision-making framework set out in the Planning Act and relevant NPSs for nationally significant infrastructure, as well as any other matters that are considered both important and relevant (which may include the NPPF). The NPPF does, however, state that the planning system should support the transition to a low carbon future and support renewable energy and associated infrastructure (paragraph 152) and that local planning authorities should, when determining planning applications for such development, approve the application if its impacts are (or can be made) acceptable.

5.2.32 The NPSs provide the predominant policy context; whilst noting that the PEIR has had regard to NPPF and Guidance, where any inconsistencies may exist between them and the relevant NPSs, it is policies within the latter that prevails.

National Planning Policy Guidance

5.2.33 On 6 March 2014, the then Department for Communities and Local Government (DCLG) (now Ministry of Housing, Communities and Local Government, MHCLG) launched the planning practice guidance web-based resource to support the NPPF. The National Planning Practice Guidance (NPPG) provides guidance across a range of topic areas, including in relation to environmental topic areas relevant to the EIA process.

Local Planning Policy

5.2.34 The Planning Act 2008, as amended, does not incorporate Section 38(6) of the Planning and Compulsory Purchase Act 2004, which provides the principal basis in legislation for the determination of planning applications under the Town and Country Planning Act 1990, namely that they must be determined in accordance with the statutory development plan unless material considerations indicate otherwise. Applications for development consent made under the Planning Act are determined as set out above. The local development plan is not therefore the starting point for the consideration of an application for development consent. Nevertheless, local policy has been considered through the EIA process where relevant.

5.2.35 **Table 5.1** outlines the key local planning policy documents that are under consideration during the EIA process. Where relevant, emerging policy documents are also listed.

Table 5.1: Key Local Planning Policy

Authority	Adopted Policy	Emerging Policy
Lincolnshire County Council *As part of Central Lincolnshire Joint Strategic Planning Committee* *As part of South East Lincolnshire Joint Strategic Planning Committee*	Central Lincolnshire Local Plan 2012-2036 South East Lincolnshire Local Plan 2011-2036	Local Plan Review 2019
North Kesteven District Council	Central Lincolnshire Local Plan 2012-2036 *Adopted April 2017*	Local Plan Review 2019 *Proposed Submission Local Plan – March 2022*
Boston Borough Council	South East Lincolnshire Local Plan 2011-2036 *Adopted March 2019*	

5.2.36 In addition, relevant supplementary planning documents have also been considered where they are relevant and important. Where study areas for individual topics extend beyond the above administrative areas, planning documents relevant to additional administrative areas within the study areas have been taken into account.

5.3 REFERENCES

Legislation

Conservation of Habitats and Species Regulations 2017. 2017 No. 1012.

The Infrastructure Planning (Environmental Impact Assessment) Regulations, 2017. 2017 No. 572.

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009. 2009 No. 2264.

The Planning Act 2008, as amended.

The Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2018. 2018 No. 695.

Published Documents

Department of Energy and Climate Change (2011) Overarching National Policy Statement for Energy (EN-1). [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

Department of Energy and Climate Change (2011) National Policy Statement for Renewable Energy (EN-3). [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37048/1940-nps-renewable-energy-en3.pdf

Department for Business, Energy and Industrial Strategy (2021) Draft National Policy Statement for Electricity Networks Infrastructure (EN-5). [Online] Available at:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015238/en-5-draft-for-consultation.pdf

Department for Business, Energy and Industrial Strategy (2021) Draft National Policy Statement for Energy (EN-1). [Online] Available at:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015238/en-1-draft-for-consultation.pdf

Department for Business, Energy and Industrial Strategy (2021) Draft National Policy Statement for Renewable Energy Infrastructure (EN-3). [Online] Available at:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015238/en-3-draft-for-consultation.pdf

Building Better, Building Beautiful Commission (2020) Living with Beauty: Promoting Health, Wellbeing and Sustainable Growth. [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file /861832/Living_with_beauty_BBBBC_report.pd

Department of Levelling Up, Housing and Communities (2014, as updated) Planning Practice Guidance. [Online] Available at: https://www.gov.uk/government/collections/planning-practice guidance

Department of Levelling Up, Housing and Communities (2021) National Planning Policy Framework (NPPF). [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file /1005759/NPPF_July_2021.pdf

Planning Inspectorate (2017) Advice Note Ten: Habitats Regulations Assessment Relevant to Nationally Significant Infrastructure Projects. [Online] Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/06/Advice-note:10v4.pdf

Planning Inspectorate (2020) Advice Note Seven: EIA: Process, Preliminary Environmental Information, and Environmental Statements. [Online] Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/12/Advice-note-7.pdf

South East Lincolnshire Joint Strategic Planning Committee (2019); South East Lincolnshire Local Plan 2011-2036. [Online] Available at http://www.southeastlincslocalplan.org/adopted-plan/

Central Lincolnshire Joint Strategic Planning Committee (2017); Central Lincolnshire Local Plan 2012-2036. [Online] Available at https://www.n-kesteven.gov.uk/central-lincolnshire/local-plan/

Department for Business, Energy and Industrial Strategy (2022); British Energy Security Strategy. [Online]. Available at: https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 6: Landscape and Visual

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

6 LANDSCAPE & VISUAL

6.1 EXECUTIVE SUMMARY

6.1.1 This Landscape and Visual Impact Assessment PEIR **Chapter 6** seeks to determine the preliminary landscape and visual effects upon the identified receptors, and whether such effects are significant or not.

6.1.2 It is important to acknowledge that significant effects on landscape character and visual amenity are an inherent consequence of a new development of this type and scale. However, in this case, the potential adverse effects have been determined to be limited by the existing vegetation that characterises the close to medium range landscape, distance, and scale of the landscape. The proposed mitigation planting has the potential to considerably reduce the identified significant effects, which would be geographically highly limited, both in character and visual terms.

6.1.3 Whilst certain elements of the Proposed Development would, inevitably, be more visible, for a scheme of its scale the residual landscape and visual effects arising are considered to be highly limited. Those effects which have been identified as being significant should therefore be balanced against the benefits of the Proposed Development.

6.2 INTRODUCTION

6.2.1 This chapter, prepared by Pegasus Environmental (part of Pegasus Group), contains a preliminary assessment of the landscape and visual effects of the Proposed Development as described within PEIR **Chapter 4** during the construction, operation and decommissioning stages.

6.2.2 This chapter considers the preliminary effects on:

- Landscape elements within the Application Site.
- Landscape designations.
- Landscape character.
- Visual amenity (views).

6.2.3 Landscape effects are related to the character of the Application Site and surrounding area and are concerned with landscape elements, landscapes of regional or local distinctiveness and special interest areas including landscape designations. Visual effects are experienced by people through changes in available views. These separate but related issues form the basis of Landscape and Visual Impact Assessment (LVIA) that will be undertaken in detail within **Chapter 6** of the Environmental Statement (ES) that will be submitted with the DCO application.

6.2.4 The following nomenclature is being used in this PEIR **Chapter 6**:

- Proposed Development, which encompasses the Energy Park, off site cable route and above ground works at the National Grid Bicker Fen substation.
- Energy Park, encompassing solar infrastructure, onsite cabling, and energy storage infrastructure, located to the north of the A17.

6.2.5 The following elements within the Proposed Development have been identified as having the potential for adverse landscape and visual effects:

- Short term effects associated with the construction phase of the Proposed Development.
- 6 no. of onsite 132kV substations within the Energy Park, which will have dimensions of approximately 40m x 80m x 10m height.

- 1 no. 400kV substation located in the southeastern part of the Energy Park, 135m x 90m x 15m high.
- 6 no. control building associated with the 132kV substations within the Energy Park. Based on the Rochdale Envelope Principle, the size of the control building is expected to be approximately 15m x 10m x 3m height. A larger control building at the 400kV substation could be 20m x 10m x 3m height.
- Battery Energy Storage System (BESS), proposed to be located in the south eastern part of the Energy Park, either in a series of individual containers or housed within a larger building(s). A maximum of 2.8ha is set aside for this element of the Energy Park Development, with a maximum height of 6m.
- Potential for onsite above ground cabling in the central part of the Energy Park, with overhead cables installed on a series of poles with a maximum height of up to 30m.
- Solar modules up to 4.5m high (both fixed and tracker systems).
- Security fence, 3m high.
- Extension to the existing 400kV Bicker Substation, in the southern part of the Proposed Development within a compound approximately 145m x 45m. The maximum height of selected equipment is 15m. The installed equipment is expected to be 55m x 30m. A control building at Bicker Fen is also anticipated and is estimated to be 8m x 5m x 4m high.

6.2.6 This PEIR Chapter 6 considers the Proposed Development in terms of its maximum parameters: the extent and height of the solar modules, substation elements, overhead power cables, and fencing, as listed above. An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the locations within the Energy Park Site.

6.2.7 The typology and height parameters of the proposed solar modules have not yet been finalised but it will be confirmed in the Environmental Statement. Figures that accompany this PEIR **Chapter 6** have been produced for consultation purposes and the height and massing parameters will be confirmed in the ES.

6.2.8 This chapter also considers the potential landscape and visual mitigation measures that will be implemented to prevent, reduce and offset the identified landscape and visual effects, where appropriate.

6.2.9 This chapter should be read in conjunction with:

- **Figure 6.1** Landscape Character Plan.
- **Figure 6.2** Visual Receptors Plan.
- **Figure 6.3** Screened Zone of Theoretical Visibility and Proposed Viewpoint Locations (3 separate SZTVs combined into one figure).
- **Figure 6.4** Context Baseline Views.
- **Figure 6.5** Cumulative Sites – Regional Context.
- **Figure 6.6** Cumulative Sites – Local Context.
- **Figure 6.7** Photomontages.

6.3 ASSESSMENT APPROACH

6.3.1 The assessment considers the effect on the landscape resource (both direct effects and effects on how the landscape character is perceived) and the effect on visual amenity (views) in construction, operation, and decommissioning. Cumulative effects, arising from the effect of the Proposed Development in conjunction with other solar farms are also considered, where applicable. Further cumulative research will be conducted and explained in the subsequent **Chapter 6** of the ES to review the potential for any cumulative effects with other forms of development, as and if relevant.

Methodology

Guidance

6.3.2 This assessment has been undertaken with regard to the current best practice, as outlined within the following publications:

- *Guidelines for Landscape and Visual Impact Assessment* (3rd Edition, 2013) - Landscape Institute / Institute of Environmental Management and Assessment (hereafter referred to as *GLVIA3*).
- *An Approach to Landscape Character Assessment* (2014) - Natural England.
- *An Approach to Landscape Sensitivity Assessment - To Inform Spatial Planning and Land Management* (2019) - Natural England.
- *Technical Guidance Note (TGN) 06/19 Visual Representation of Development Proposals*, 17 September 2019 by the Landscape Institute.
- *Technical Guidance Note (TGN) 1/20 Reviewing Landscape and Visual Impact Assessments (LVIAs) and Landscape and Visual Appraisals (LVAs)*, 10th January 2020 by the Landscape Institute.
- *Technical Guidance Note (TGN) 2/21 Assessing landscape value outside national designations*, May 2021 by the Landscape Institute.

6.3.3 The full list of guideline documents is included in Pegasus' methodology (see **Appendix 6.1**) and we would invite the consultees to provide their feedback on the completeness and appropriateness of the methodology.

6.3.4 In addition, this PEIR Chapter 6 has been written with reference to the Advice Note 7, Advice Note 9, and Advice Note 17 published by the Planning Inspectorate.

Study Area

6.3.5 This assessment of the likely significant effects of the Proposed Development on the landscape and visual resource has taken account of all of the attributes of the local landscape, and helped in defining the study area. This was informed by a review of published documents, including relevant landscape character assessments, and field surveys (April and May 2022).

6.3.6 A preliminary study area up to 5km was initially analysed through desktop studies and considered in the Scoping Report. This exercise was supported by a Screened Zone of Theoretical Visibility (SZTV). This initial scoping stage SZTV aimed to illustrate the visibility of the proposed solar modules, which are the most extensive element of the Energy Park, in terms of its overall physical footprint. It is important to acknowledge that SZTV did not take into account small areas of woodland, tree belts, and hedgerow vegetation. The site visits confirmed that views from within the site of the Energy Park are medium to long range but are interrupted and terminate, in places, on tree belts and other features present in the local landscape including built form, particularly to its south. The southern edge of the Energy Park is segregated from the surrounding landscape by the built form and vegetation that line the A17. Views north-east do extend towards Amber Hill and across Holland Fen, some 3.5km away, but do not travel beyond the course of the River Witham, which lies just over 5km distance. Views north are interrupted by belts of trees and terminate on the vegetation that encloses South Kyme, located approximately 3.4km away to the north.

6.3.7 It is important to acknowledge that the Head Dike and Skerth Drain, which enclose the Energy Park to the north and east are enclosed by an embankment, which interrupts the inter-visibility with the wider countryside. The spot heights, based on the Environment Agency's 2019 LiDAR dataset, indicate that the top of embankment reaches between approximately 2.7m Above Ordnance Datum (AOD) to 3.9m AOD. In comparison, the levels across the northern part of the Energy Park read approximately 1m AOD, albeit the levels gently rise to approximately 2m – 2.5m AOD along its southern edge.

6.3.8 With regard the views to the west, these include properties along nearby Sidebar Lane, and generally speaking, extend up to 2km distance from the Energy Park Site, terminating on various belts of trees that characterise the medium range landscape to the west.

6.3.9 On that basis, it has been determined that the primary focus of the landscape character and visual assessment should be focused on the study area of up to 3km radii, acknowledging that some of the selected viewpoints may lie beyond this distance. The study area is not intended to provide a boundary beyond which the Proposed Development will not be seen, but rather to define the area within which to assess its potential significant landscape and visual effects. Significant landscape and visual effects are more likely to include effects on close to medium proximity views, the change in character of the Application Site and the area in close proximity to it, as a result of a change in the landscape pattern or the perception of the Energy Park.

6.3.10 With regard to the Extension to the existing 400kV Bicker Substation, located in the southern part of the Proposed Development, this part of the Proposed Development is contextually justifiable, and the local landscape has already been altered by the existing 400kV Bicker Substation and neighbouring wind farm. Therefore, whilst the cable route and extension to the existing Bicker Fen Substation would bring about some adverse effects these are expected to be highly localised. Any effects associated with the underground cable route would be short term and temporary. Further details will be provided in **Chapter 6** of the ES.

<u>Assessment of Effects</u>

6.3.11 Landscape and visual effects are assessed through professional judgements on the sensitivity of landscape elements, landscape character, visual receptors and representative viewpoints combined with the predicted magnitude of change arising from the proposals.

6.3.12 The effects on landscape elements are limited to the area which would be occupied by the Proposed Development and include the direct physical change to fabric of the Application Site, such as the addition or removal of buildings, machinery and lighting.

6.3.13 In general terms, landscape designations are relevant to the assessment as they provide an indication of recognised value and help to inform the identification of landscape and visual receptors or representative viewpoints. Generally speaking, the assessment of effects on landscape designations considers the direct and indirect effects through the introduction and visibility of the proposed development.

6.3.14 Landscape character is defined as the **"…distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse."** Effects on landscape character arise either through the introduction of new elements that physically alter the existing pattern, or through visibility of the Proposed Development that changes the way in which landscape character is perceived. The published assessments by Natural England and the North Kesteven Landscape Character Assessment, prepared by David Tyldesley and Associates for North Kesteven District Council (dated September 2007) constitute the baseline landscape character within the local area and the basis for the landscape character assessment, as shown within **Figure 6.1**.

6.3.15 The assessment of the effects on views considers the indirect effects of the Proposed Development on the appreciation of the local landscape as experienced by key visual receptors associated with settlements, transport routes and Public Rights of Way (PRoWs) as shown on **Figure 6.2**. Representative and illustrative viewpoints have been agreed with Lincolnshire County Council and North Kesteven District Council through the Scoping Report submitted to the Planning Inspectorate in order to present the 'worse case scenario' views of the Proposed Development in the landscape. The 'worse case scenario' is defined as the most sensitive landscape and visual receptors with the highest visibility of the Proposed Development. Further consultation with the landscape advisor acting on behalf of Lincolnshire County Council, and Officers and landscape advisors at North Kesteven District Council and Boston Borough Council is currently ongoing and will inform the final **Chapter 6** of the ES.

6.3.16 Various factors in relation to the value and susceptibility of landscape elements, landscape character, visual receptors or representative viewpoints are described in the Methodology (see **Appendix 6.1**) and are cross referenced to determine the overall sensitivity as shown in **Table 6.1.**

Table 6.1 Overall sensitivity of landscape and visual receptors

Term	**Description**			
	Value			
Susceptibility		High	Medium	Low
	High	High	High	Medium
	Medium	High	Medium	Medium
	Low	Medium	Medium	Low

Magnitude of Change– General Comments

6.3.17 Magnitude of change is defined in GLVIA3 as

> **"a term that combines judgements about the size and scale of the effect, the extent over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration."**[1]

6.3.18 Various factors contribute to the magnitude of change on landscape elements, landscape character, visual receptors and representative viewpoints as set out in **Appendix 6.1.**

Nature of Effects – General Comments

6.3.19 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that an application for an order granting development consent for EIA development must be accompanied by an environmental statement, and such environmental statement shall include description of the likely significant effects of the development on the receiving environment and description of any features of the development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment.

6.3.20 GLVIA3 includes an entry that states **"effects can be described as positive or negative (or in some cases neutral) in their consequences for views and visual amenity."** GLVIA3 does not, however, state how negative or positive effects should be assessed, and this therefore becomes a matter of subjective judgement rather than reasoned criteria. Due to inconsistencies with the assessment of negative or positive

[1] Glossary, Page 158, GLVIA, 3rd Edition

effects a precautionary approach is applied to this **Chapter 6** that assumes all landscape and visual effects are considered to be negative or adverse unless otherwise stated.

6.3.21 The approach to this (and the interpretation of positive, negative, or neutral effects) in the context of GLVIA3 and this **Chapter 6** is set out in detail in **Appendix 6.1.**

Duration of Effects

6.3.22 The duration of the effects of the Proposed Development would vary. The construction phase of the Proposed Development would last up to 18 months from commencement with construction activities expected to be limited to typical working hours, and likely to include Saturdays.

6.3.23 The operational phase of the Proposed Development is 40 years. The Proposed Development would be continuously operational throughout its lifecycle except for planned maintenance. At this stage the Proposed Development is proposed to be decommissioned at the end of its operational life. At this stage, the indicative decommissioning period is likely to commence in 2067 or 2068.

6.3.24 During the operational stage, the built elements including the solar modules, 132kV and 400kV substations and extension to the existing substation at Bicker Fen, overhead electricity cables on 30m high poles within the Energy Park, ancillary features such as inverters / transformer stations, energy storage system (transformers and batteries) would be visible in the long term. The majority of the grid connection running south from the Energy Park to the existing Bicker Fen National Grid Substation, and its extension, would be underground and would not be visible during the operational stage and this will be further investigated in the ES. The extension to the existing Bicker Fen National Grid Substation forms part of the Proposed Development and would be visible during the operational stage.

6.3.25 Other activities and movement including construction traffic including cranes and excavators, and compound areas, which would only be visible in the construction and decommissioning stages and are considered to be short term temporary effects. The lighting associated with the construction and decommissioning phases would be limited where practical, subject to timing of the construction activities and time of the year, and is considered to be short term effect. There is no permanent lighting proposed as part of the Proposed Development except for localised emergency security lighting in proximity to the substations and control buildings. Such lighting would be triggered by movement only and so would not be active for all hours of darkness. CCTV to be installed along the security fencing and onsite would utilise infrared technology. Further details and assessment of effects will be provided in the subsequent **Chapter 6** of the ES.

Graphic Techniques

6.3.26 Computer modelling is used to assist in the assessment process and to illustrate the effects of the Energy Park through the production of screened zone of theoretical visibility (SZTV). The SZTV plans illustrate the theoretical extent of where the Proposed Development (the solar modules, substations, and energy storage facilities) may be visible from, assuming 100% atmospheric visibility and includes the screening effect from vegetation and buildings, based on the following assumptions:

- Indicative woodland and building heights are modelled at 15m and 8m respectively.
- National Tree data, vegetation height based on the survey data.
- Viewer height set at 1.7m.
- Calculations include earth curvature and light refraction.

6.3.27 The SZTV plans have been generated using Digital Terrain Model of OS Terrain 5 combined with OS Open Map Local data for woodland and buildings, and National Tree data to create a Digital Surface Model (DSM).

6.3.28 Weather conditions and visibility were considered an important aspect of the site visits for the photography. Where possible, visits were planned around clear sunny days with good visibility. Viewpoint locations were then, where possible, visited according to the time of day and the orientation of the sun to avoid front lit scenes. Photographs facing into the sun were avoided where possible to prevent the silhouette effect. Adjustments to lighting were made in the rendering software to allow the Proposed Development to appear realistic in the view under the particular lighting and atmospheric conditions present at that time.

6.3.29 A number of guidance documents have been published that deal with site photography and photomontage techniques in general, with the Landscape Institute's *Technical Guidance Note 06/19 Visual Representation of Development Proposals* (2019), being the most recent one. Specific guidance in relation to wind farms has been available from the Scottish Natural Heritage since the early 2000s, but there is lack of similar guidance for solar energy developments. In the absence of such guidance Pegasus has developed its own guidance with regard to the published documents.

6.3.30 The Photoviews and Photomontages were produced in the following way:

- The photograph locations were GPS recorded. These single photographs were then stitched together using *PTGui* to create a panoramic image of 75 degrees in planar projection.
- The details of the development were modelled in *3d Studio Max* from elevation and site layout plans provided by the client.
- The stitched photograph was then used as a backdrop within *3d Studio Max* at full resolution. Using the known photograph location and then picking out features on the photograph these where cross-referenced with the same points taken from a number of sources including aerial imagery, Mastermap base mapping and survey points to accurately create a camera with *3d Studio Max* and *Vray* to match the camera height, location and image field of view and resolution, a process known as camera matching. These 'survey' points are taken across the image both foreground and distant in order to allow for increased accuracy. Where necessary additional features were created as 3d models within *3d Studio Max* to allow for better alignment.
- Once the alignment was correct the completed 3d model was then rendered onto the photography to complete a seamless image.
- For the images produced as photomontages these were taken into *Photoshop* in order to apply the masking. Masking is where the foreground objects and features or features which may 'mask' the development within the original photography are redrawn in front of the rendered image in order to simulate how the development will look within the existing landscape.
- Once all the masking has been applied the image is then placed into the template within *InDesign* and the final pdf output is produced.

6.3.31 The precise location of each photograph is recorded using a hand-held GPS device and bearings from this location to prominent vertical features within the view (such as transmission masts) are also recorded using Google Earth software.

6.3.32 Whilst every effort has been made to ensure the accuracy of the photomontages, it must be appreciated that no photomontage could ever claim to be 100% accurate as there are a number of technical limitations in the model relating to the accuracy of information available from Ordnance Survey and from the GPS. For a detailed discussion regarding the limitations of photomontages, please refer to *Visual Representation of Wind farms – Good Practice Guidance* (SNH commissioned report FO3 AA 308/2). The photographs and photomontages used in this assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what will be apparent to the human eye. The assessments are carried out from observations in the field rather than from photographs.

Assessment of Significance

6.3.33 The purpose of an LVIA when produced in the context of an EIA is to identify any significant effects on landscape and visual amenity arising from the Proposed Development.

6.3.34 The likely significance of effects is dependent on all of the factors considered in the sensitivity and the magnitude of change, upon the relevant landscape and visual receptors. These factors are assimilated to assess whether or not the Proposed Development will have a likely significant or not significant effect. The variables considered in the evaluation of the sensitivity and the magnitude of change is reviewed holistically to inform the professional judgement of significance.

6.3.35 The sensitivity of the landscape and visual receptor and the magnitude of change arising from the Proposed Development are cross referenced in **Table 6.2** to determine the overall degree and significance of landscape and visual effects. This deviates from **Table 2.5** in **Chapter 2**.

Table 6.2: Significance Matrix

	Sensitivity of Receptor			
Magnitude of Change		**High**	**Medium**	**Low**
	High	Major	Major	Moderate
	Medium	Major	Moderate	Minor
	Low	Moderate	Minor	Minor
	Negligible	Negligible	Negligible	Negligible

6.3.36 It is important to note that the matrix above is intended to act as a guide to the assessment rather than a formulaic approach. The level (relative significance) of the landscape and visual effects is determined by combining judgements regarding sensitivity of the landscape or view, magnitude of change, duration of effect and the reversibility of the effect. In LVIA, any judgement about what constitutes a significant effect is ostensibly a subjective opinion expressed as in this case by a competent and appropriately qualified professional assessor.

6.3.37 The level (relative significance) of effect is described as **Major, Moderate, Minor, or Negligible.** No Effect may also be recorded as appropriate where there are no effects.

6.3.38 In the LVIA, those effects described as **Major** may be regarded as material in the decision making process as required by the EIA Regulations It should be noted that whilst an individual effect may be significant, it does not necessarily follow that the Proposed Development would be unacceptable in the planning balance.

6.3.39 In determining the level of residual effects, all mitigation measures are taken into account.

Significance of cumulative effects

6.3.40 As with the assessment of effects of the Proposed Development, the significance of cumulative effects is determined through a combination of the sensitivity of the landscape receptor or view and the magnitude of change upon it. The sensitivity of landscape receptors and views is the same in the cumulative assessment as in the assessment of the Application Site itself. However, the definition of a significant cumulative effect is different from a significant effect in the assessment of the Proposed Development itself, and this means that the magnitude of change is also assessed in a different way as described in **Appendix 6.1**.

Legislative and Policy Framework

6.3.41 A review of the planning and legislative context, as they relate to the landscape and visual effects of the Proposed Development has been carried out. The Planning Statement details the overall planning policy context. Those policies that are relevant in terms of landscape and visual issues are described in the following paragraphs.

6.3.42 The energy generating technology introduced as part of the Proposed Development is not specifically referenced by the current *Overarching National Policy Statement for Energy (EN-1)* and indeed the *National Policy Statement for Renewable Energy Infrastructure (EN-3).* Due to the lack of solar (photovoltaic) specific NPSs, this PEIR **Chapter 6**, reviews the current NPSs with the focus on their current drafts, which are considered to be matters that will be important and relevant to the Secretary of State's decision as to whether to grant a DCO for the Proposed Development.

6.3.43 The current *Overarching National Policy Statement for Energy (EN-1)* acknowledges (in its paragraph 5.9.8) that: **"Virtually all nationally significant energy infrastructure projects will have effects on the landscape."** At the same time, it provides the following advice: **"Projects need to be designed carefully, taking account of the potential impact on the landscape. Having regard to siting, operational and other relevant constraints the aim should be to minimise harm to the landscape, providing reasonable mitigation where possible and appropriate."** The *EN-1* advises on the structure of environmental assessments and that all phases of the development should be assessed, having regard to the published landscape character assessments and associated studies, and **"…take account of any relevant policies based on these assessments in local development documents in England…"**, and visual effects. The stipulated structure of the assessment is adhered to in this PEIR **Chapter 6**. Most importantly the *EN-1* acknowledges that the temporary nature of some forms of development is a consideration (paragraph 5.9.16): **"In reaching a judgment, the IPC should consider whether any adverse impact is temporary, such as during construction, and/or whether any adverse impact on the landscape will be capable of being reversed in a timescale that the IPC considers reasonable."**

6.3.44 With regard to the published *EN-3,* this *Overarching National Policy Statement* does not provide any advice with regard to solar energy generating or energy storage facilities, or substation infrastructure. The *EN-3* provides the following advice:

> **"2.5.50 Good design that contributes positively to the character and quality of the area will go some way to mitigate adverse landscape/visual effects. Development proposals should consider the design of the generating station, including the materials to be used in the context of the local landscape.**
>
> **2.5.51 Mitigation is achieved primarily through aesthetic aspects of site layout and building design including size and external**

> **finish and colour of the generating station to minimise intrusive appearance in the landscape as far as engineering requirements permit. The precise architectural treatment will need to be site-specific.**
>
> **2.5.52 The IPC should expect applicants to seek to landscape (…) sites to visually enclose them at low level as seen from surrounding external viewpoints. This makes the scale of the generating station less apparent, and helps conceal its lower level, smaller scale features. Earth bunds and mounds, tree planting or both may be used for softening the visual intrusion and may also help to attenuate noise from site activities."**

6.3.45 Whilst the above quote relates to biomass and waste combustion generating stations, the provided design advice is informative to the Proposed Development and has guided the development of the proposed mitigation planting (see **Figure 2.1**).

6.3.46 The relevant landscape planning policies are also detailed within the *Draft Overarching National Policy Statement for Energy (EN-1)* and *Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)*.

6.3.47 The draft *EN-1* explains that the Government's objective is to ensure the UK's supply of energy always remains secure, reliable, affordable and consistent with meeting the target to cut greenhouse gas emissions to net zero by 2050. It states (paragraph 2.3.2) that **"…this will require a step change in the decarbonisation of our energy system."**.

6.3.48 With fossil fuels still accounting for around 80% of the UK's energy supply in 2019, the draft *EN-1* states that the country **"…will need to dramatically increase the volume of energy supplied from low carbon sources and reduce the amount provided by fossil fuel."** (paragraph. 2.3.4), recognising in its paragraph 3.3.20 that **"There is an urgent need for new generating capacity to meet our energy objectives."**, with wind and solar as the lowest cost ways of generating electricity, the draft *EN-1* concludes in its paragraph 3.3.21 that **"…a secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar."**

6.3.49 With regard to the *Draft EN-1*, the advice provided with regard to landscape and visual issues is largely similar to that of the current *EN-1*, thus is not reviewed in detail at this stage.

6.3.50 *The Draft EN-3*, however, has been expanded to include solar photovoltaic schemes emphasising the Government's commitment to sustained growth in solar capacity to ensure that the UK is 'on a pathway' that allows it to meet net zero emissions. The document affirms at paragraph 2.47.1 that:

> **"Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. Solar farms can be built quickly and, coupled with consistent reductions in the cost of materials and improvements in the efficiency of panels, large-scale solar is now viable in some cases to deploy subsidy-free and at little to no extra cost to the consumer… As such solar is a key part of the government's strategy for low-cost decarbonisation of the energy sector."**

6.3.51 Section 2.51 of the *Draft EN-3* provides advice on landscape, visual and residential amenity issues brought about by such form of energy generation schemes. It has to be noted that energy storage facilities are not covered by the draft *EN-1* and *EN-3*, but for the purpose of this PEIR **Chapter 6** and subsequent ES, the provided advice is also applied to other elements of infrastructure associated with the Proposed Development.

6.3.52 With regard to landscape and visual issues the *Draft EN-3* states in its paragraph 2.51.2: **"Solar farms are likely to be in low lying areas of good exposure and as such may have a wider zone of visual influence than other types of onshore energy infrastructure."** It also recognises that **"…whilst it may be the case that the development covers a significant surface area, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero."**

6.3.53 Following on from this the *Draft EN-3* recognises the importance of good layout designs and its relationship to the landscape features present within the developable area, and mitigation measures:

> **"2.51.5 The applicant should have regard in both the design layout of the solar farm, and future maintenance plans, to the retention of growth of vegetation on boundaries, including the opportunity for individual trees within the boundaries to grow on to maturity. The landscape and visual impact should be considered carefully at the pre-application stage. Existing hedges and established vegetation, including mature trees, should be retained wherever possible. Trees and hedges should be protected during construction. The impact of the proposed development on established trees and hedges should be informed by a tree survey or a hedge assessment as appropriate.**
>
> **2.51.6 Applicants should consider the potential to mitigate landscape and visual impacts through, for example, screening with native hedges. Efforts should be made to minimise the use and height of security fencing. Where possible projects should utilise existing features, such as hedges or landscaping, to screen security fencing and use natural features, such as vegetation planting, to assist in site security. Projects should minimise the use of security lighting. Any lighting should utilise a passive infra-red (PIR) technology and should be designed and installed in a manner which minimises impact."**

6.3.54 The Government published the *Draft National Policy Statement for Electricity Networks Infrastructure (EN-5)* in September 2021. The *Draft EN-5*, taken together with the current *EN-1* and *Draft EN-1*, provides the primary policy for decisions taken by the Secretary of State on applications it receives for electricity networks infrastructure.

<u>NPPF</u>

6.3.55 Whilst the above quoted *National Policy Statements* are the overarching policy, in the context of the Proposed Development, it was considered prudent to review the current *National Planning Policy Framework* (*NPPF*). The *NPPF* was revised and published on 20th July 2021 and sets out the Government's planning policies for England and how these are expected to be applied. *NPPF* paragraph 10 advises that:

> **"So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development."**

6.3.56 It is important to note that the updated *NPPF* identifies solar farms as 'essential infrastructure' albeit in flood risk areas only.

6.3.57 Section 12 'Achieving well-designed places', paragraph 130, on pages 38 and 39, states that:

> **"Planning policies and decisions should ensure that developments:**
>
> **…b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;**
>
> **c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);**
>
> **d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit…"**

6.3.58 Section 15 of the *NPPF* is concerned specifically with conserving and enhancing the natural environment. Paragraph 174 on page 50 states that:

> **"Planning policies and decisions should contribute to and enhance the natural and local environment by:**
>
> **a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);**
>
> **b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland…**
>
> **d) minimising impacts and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures…"**

6.3.59 Section 15 'Conserving and enhancing the natural environment', paragraph 175 on page 50 states that:

> **"Plans should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework; take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries."**

6.3.60 This establishes the principle of hierarchy between designated and non-designated countryside. This is further reinforced by the *Planning Practice Guidance* (its section 'Natural Environment') which puts more emphasis on protected landscapes such as National Parks and Areas of Outstanding Natural Beauty (AONBs).

Planning Policy Guidance

6.3.61 The *Planning Practice Guidance* (PPG) provides further advice in relation to developments. Section Design refers to the local character in townscape and landscape **"…reinforcing locally distinctive patterns of development, local man-made and natural heritage and culture."** It also refers to landscape features such as landform but also views in and out. Section 'Natural Environment' also refers to landscape elements and landscape character putting more emphasis on protected trees and landscapes such as National Parks and Areas of Outstanding Natural Beauty (AONBs).

6.3.62 The *PPG* also states (Paragraph 013, reference ID: 5-013-20150327, revision date: 27 03 2015), similarly to the *Draft EN-3*, that:

> **"The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively. (…) However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero."**

Central Lincolnshire Local Plan 2012 – 2036 (April 2017)

6.3.63 According to the Central Lincolnshire Local Plan 2012 – 2036 interactive Polices Map the Energy Park is not covered by any specific policies that would relate to landscape quality, character or natural beauty. It falls outside of the identified Areas of Outstanding Natural Beauty and Areas of Great Landscape Value, both covered by Policy LP17. Policy LP17 Landscape, Townscape and Views, however, applies to the undesignated parts of the Central Lincolnshire area as well, and states:

> **"Character and setting**
>
> **To protect and enhance the intrinsic value of our landscape and townscape, including the setting of settlements, proposals should have particular regard to maintaining and responding positively to any natural and man-made features within the landscape and townscape which positively contribute to the character of the area, such as (but not limited to) historic buildings and monuments, other landmark buildings, topography, trees and woodland, hedgerows, walls, water features, field patterns and intervisibility between rural historic settlements. Where a proposal may result in significant harm, it may, exceptionally, be permitted if the overriding benefits of the development demonstrably outweigh the harm: in such circumstances the harm should be minimised and mitigated.**
>
> **Creating and protecting views**
>
> **All development proposals should take account of views in to, out of and within development areas: schemes should be designed (through considerate development, layout and design) to preserve or enhance key local views and vistas, and create new public views where possible. Particular consideration should be**

given to views of significant buildings and views within Central Lincolnshire | Local Plan - Adopted April 2017 A Quality Central Lincolnshire 5 49 landscapes which are more sensitive to change due to their open, exposed nature and extensive intervisibility from various viewpoints. (…)

Cumulative impacts

In considering the impacts of a proposal, the cumulative impacts as well as the individual impacts will be considered.”

6.3.64 With regard the development of renewable energy projects policy LP19 Renewable Energy Proposals is informative:

Proposals for non-wind renewable energy development

Proposals for non-wind renewable technology will be assessed on their merits, with the impacts, both individual and cumulative, considered against the benefits of the scheme, taking account of the following:

- **The surrounding landscape and townscape;**
- **Heritage assets;**
- **Ecology and diversity;**
- **Residential and visual amenity;**
- **Safety, including ensuring no adverse highway impact; MoD operations, including having no unacceptable impact on the operation of aircraft movement or operational radar; and**
- **Agricultural Land Classification (including a presumption against photovoltaic solar farm proposals on the best and most versatile agricultural land).”**

6.3.65 The Energy Park falls outside of the identified ‘Designated rural areas’, albeit the grid connection to the existing Bicker Fen Substation is located within this area. Furthermore, the Application Site is not covered by the Strategic Green Access Links or Strategic Green Corridors. It does include, however, a number of habitats in the south eastern part of the Energy Park, which form part of the ecological network with the ‘opportunity for management’, as identified on the aforementioned interactive Polices Map.

6.3.66 The North Kesteven District Council’s website does not refer to any Supplementary Planning Documents (SPDs) or other evidence base that would be informative to solar energy or other energy infrastructure developments.

Scoping Criteria

6.3.67 The proposed scope of work including the approach to the landscape and visual assessment, and preliminary viewpoint selection, were submitted for comments as part of the Environmental Impact Assessment Scoping Report, submitted to the Planning Inspectorate on 07 January 2022. In addition, a discussion has taken place with a landscape consultant acting on behalf of Lincolnshire County Council with feedback provides by officers at North Kesteven District Council and Boston Borough Council.

Additional locations have been suggested as part of this process, and this is further explained later in this PEIR **Chapter 6**. Further discussion with the landscape consultants appointed by Lincolnshire County Council and North Kesteven District Council will take place over the next few months, following the submission of this PEIR, and their feedback will be captured in the ES. The subsequent **Chapter 6** of the ES will provide a tabular review of the scoping stage, and the requests made, and will identify how these requirements have been met.

6.3.68 In accordance with best practice, the assessment considers the following potential effects:

- Construction Phase – landscape elements within the Application Site; effects on landscape character of the study area; and effects on visual receptors associated with the study area.
- Operational Phase – landscape elements within the Application Site; effects on landscape character of the study area; effects on visual receptors associated with the study area.
- Decommissioning Phase.

<u>Summary of Consultation</u>

6.3.69 The Scoping Opinion was adopted by the Secretary of State on 17 February 2022 with the following feedback provided, with regard the landscape and visual issues:

- the ES should give consideration to the worst-case impact of the panel types, as well as considering the maximum parameters of development.
- The ES should consider the impact of both overhead lines and undergrounding where this remains uncertain.
- The ES should include an assessment which is based on the worst-case scenario, recognising all components of the Proposed Development and their potential locations.
- The ES should explain how the lighting design has been developed to minimise light spill and avoid direct intrusion into nearby properties.

6.3.70 Similar comments have been provided by Lincolnshire County Council specifically referring to the proposed cabling; lighting; dimensions and potential effects of the energy storage element of the Proposed Development; substation; construction compound; cumulative schemes; and separate Zone of Theoretical Visibility mapping for solar modules and other taller elements of the Proposed Development.

6.3.71 Similar comments have been provided by North Kesteven District Council with the request for additional two viewpoints: on the edge of South Kyme and Heckington.

<u>Limitations to the Assessment</u>

6.3.72 In undertaking the landscape and visual assessment in relation to the Proposed Development, there are limitations and constraints affecting the outputs from this work. These include:

- Photography for the selected viewpoints were taken from publicly accessible places and not private land.
- The baseline assessment has been based on information readily available at the time of undertaking the assessment.
- The Screened Zone of Theoretical Visibility plans (SZTVs) have been used to understand the extent of potential visibility to identify receptors. The SZTVs do not demonstrate absolute visibility and are therefore refined through field work with the assessed potential visibility of the Proposed Development.

- During site visits, weather conditions, the time of day, and seasonal factors have influenced the visual assessment and photographic record of the Application Site and its surroundings.
- Baseline views were taken in April with some of the broadleaved structural vegetation coming into leaf, but are considered appropriate to assess the worst case scenario of visibility.
- Access to assess the predicted visual effects from private individual properties outside the Application Site has been obtained. As a result, separate Residential Visual Amenity Assessment has been prepared as part of the PEIR (see **Chapter 7**), and will be detailed in the subsequent ES.
- The assessed Proposed Development is based on application drawings that accompany this PEIR and is assessed on the assumption that the Proposed Development is delivered in line with these drawings and associated timescales.
- All effects are assumed to be temporary unless otherwise stated.

6.4 BASELINE CONDITIONS

Site Description and Context

6.4.1 The Energy Park is bound by Head Dike to the north, Holland Dike to the east, the A17 Sleaford to Holbeach road to the south and B1395 Sidebar Lane/agricultural land to the west. The Energy Park lies wholly within North Kesteven District Council, abutting Boston Borough Council's boundary along the eastern edge, where the remaining part of the Proposed Development: grid connection and substation upgrade, is located. A small section of the grid connection is within North Kesteven's boundary.

6.4.2 Land within the Energy Park is in arable use and is subdivided into rectilinear parcels by long linear drainage ditches that lie principally north-south, connected east-west by shorter ditches including Labour in Vain Drain. The ditches have an engineered profile, colonised in part by emerging aquatic plant species. Topographically, the Proposed Development is level and low-lying at between 1m and 3m above Ordnance Datum (AOD) and is predominantly within Flood Zone 3.

6.4.3 According to the North Kesteven District Council's online mapping the vegetation within the Application Site boundary is not subject to any Tree Preservation Orders (TPO).

6.4.4 Six Hundreds Farm lies in the eastern third of the Energy Park, with access gained from Six Hundreds Drove, which lies within the Energy Park, and connects to the south with the A17. Two further access tracks lie off the A17 adjacent to Rectory Farm and at Elm Grange in the southwest corner, these in turn connect to Crab Lane toward the north western corner of the Site, and then to Sidebar Lane. The access tracks follow ditch alignments.

6.4.5 One Public Right of Way (PRoW) Public Footpath Heck/15/1 runs along the northern boundary, crossing a small part (approximately 280m) of the Energy Park on the north western boundary. The PRoW, however, when investigated through the site visit, terminates at Head Dike with no continuation further east, despite the OS Explorer map 1:25,000 indicating otherwise. Through discussions with the Black Sluice Drainage Board (IDB) we have been informed that the footbridge that crossed Head Dike was removed in 2005 due to concerns they had over its presence impeding flood water. IDB have not plans to reinstate this footbridge. There are no other PRoWs present within or that abut the Energy Park. With regard the southern part of the Application Site, there are a number of PRoWs that cross the grid connection area or abut its preliminary boundaries: Public Footpath Swhd/14/1 leading from Swineshead Bridge along the railway lie and then the South Forty Foot Drain; Public Bridleways: Swhd/13/1, Bick/1/1, and Doni/16/2 that follow the South Forty Foot Drain; and Public Footpaths Bick/2/1 and Doni/20/2 along Hammond Beck.

6.4.6 Overhead lines supported on wooden poles criss-cross the site, running parallel to Six Hundreds Drove and the A17. An underground gas pipeline bisects the Energy Park, extending south-north to the east of Rectory Farm. The locations of these assets can be seen on Figure 4.1a Current Assets.

6.4.7 Intermittent shrubs/hedgerows occur within or along the boundary of the Application Site, with tree cover limited to small woodland blocks and tree lines in the eastern third of the Energy Park Site.

Surrounding Area

6.4.8 Sporadic linear residential (2-storey houses and bungalows) and commercial development (Elm Grange Studios, Wilson Prestige Vehicle Repairs, Mountain's Abbey Parks Farm Shop, Four Winds Service Station, and Shell Service Station) and farms (Rakes Farm, Maize Farm, Rectory Farm, Piggery, Poplars Farm and Glebe Farm) occur at East Heckington, along the A17 and Sidebar Lane to the south of the Energy Park.

6.4.9 Street lights (approximately 10m high) flank the A17 through East Heckington.

Visual Context

6.4.10 With regard to the Energy Park, the closest visual receptors include residential properties and farmhouses along the A17 and Sidebar Lane, farmhouses to the north of Head Dike and east of Holland Dike; PRoW users of footpath Heck/15/1; and road users travelling along the A17 and Sidebar Lane.

6.4.11 Locally occurring built form and trees/shrubs screen or interrupt views toward the Application Site, and indeed the Energy Park. The level landform and general low tree cover allows open views into and across the Application Site from the much of the surrounding transport routes and publicly accessible locations. Views from nearby residential and commercial properties are partly screened by tree and shrub planting within the curtilage of those properties.

Baseline Survey Information

6.4.12 The purpose of this section is to identify the baseline condition of landscape character and views within the study area to enable the assessment of effects of the Proposed Development.

Baseline Landscape Designations

6.4.13 The Proposed Development is not located within any national statutory protected landscape designations. It does not lie within any regional or local non-statutory landscape designations, either.

Landscape Character

6.4.14 The character of the landscape within the study area has been analysed and described on two levels:

- National level assessment provided by Natural England.
- Local level based on the two separate assessments published by North Kesteven District Council and Boston Borough Council.

National Landscape Character Areas

6.4.15 The Application Site falls within National Character Area 46 The Fens. Key characteristics of relevance to the Application Site are described as follows:

- **"Expansive, flat, open, low-lying wetland landscape influenced by the Wash estuary, and offering extensive vistas to level horizons and huge skies throughout, provides a sense of rural remoteness and tranquillity…**

- **Overall, woodland cover is sparse, notably a few small woodland blocks, occasional avenues alongside roads, isolated field trees and shelterbelts of poplar, willow and occasionally leylandii hedges around farmsteads, and numerous orchards around Wisbech. Various alders, notably grey alder, are also used in shelterbelts and roadside avenues.**

- **The predominant land use is arable – wheat, root crops, bulbs, vegetables and market gardening made possible by actively draining reclaimed land areas. Associated horticultural glasshouses are a significant feature. Beef cattle graze narrow enclosures along the banks of rivers and dykes and on parts of the salt marsh and sea banks.**

- **Open fields, bounded by a network of drains and the distinctive hierarchy of rivers (some embanked), have a strong influence on the geometric/rectilinear landscape pattern. The structures create local enclosure and a slightly raised landform, which is mirrored in the road network that largely follows the edges of the system of large fields. The drains and ditches are also an important ecological network important for invertebrates, fish including spined loach, and macrophytes…**

- **Settlements and isolated farmsteads are mostly located on the modestly elevated 'geological islands' and the low, sinuous roddon banks (infilled ancient watercourses within fens). Elsewhere, villages tend to be dispersed ribbon settlements along the main arterial routes through the settled fens, and scattered farms remain as relics of earlier agricultural settlements. Domestic architecture mostly dates from after 1750 and comprises a mix of late Georgian-style brick houses and 20th-century bungalows."**

North Kesteven Landscape Character Assessment

6.4.16 The *North Kesteven Landscape Character Assessment*, prepared by David Tyldesley and Associates for North Kesteven District Council, and dated September 2007, states in its paragraph 1.6: **"There are no nationally designated landscape areas within North Kesteven."**

6.4.17 The published assessment identifies three broad landscape character types within the district running north-south. The Application Site falls within The Fens Regional Landscape Character Type in the east of the district, and the Fenland Landscape Character Sub-Area. The Key Characteristics, identified at paragraph 9.1 of the published assessment are:

- **"The Fenland landscape sub-area occupies the whole of the eastern part of the District from the Lincoln gap to the boundary with south Kesteven near Swanton.**
- **Low lying very flat relief.**
- **Occasional small islands of slightly higher land.**
- **Very large, rich arable fields divided up by drainage channels.**
- **A hierarchy of rivers and drains and ditches creating linear patterns across the landscape.**
- **The geometric road pattern follows the drainage pattern with small roads raised above the level of the fields, running from east to west.**
- **Generally extensive vistas to level horizons and huge skies, apart from the north easterly direction where the Lincolnshire Wolds provide a marked "Upland" horizon.**
- **Sparse woodland cover though some occasional trees surrounding farmsteads and some shelter belts, particularly poplars.**
- **Intensively farmed and managed it is almost entirely a man-made landscape.**
- **Except for scattered farmsteads and farm buildings the sub-area is unsettled.**
- **Prominent power lines and large-scale agricultural buildings"**

Landscape Character Assessment of Boston 2009

6.4.18 The grid connection area falls within Boston Borough Council's area and is covered by its own *Landscape Character Assessment of Boston* (2009). This published assessment identifies that the grid connection falls entirely within the Landscape Type (LT) A Reclaimed Fen and more specifically its Landscape Character Area (LCA) A1 Holland Reclaimed Fen.

6.4.19 The Key Characteristics of the LCA A1 Holland Reclaimed Fen, as identified in the published assessment are:

- **"Flat and low-lying reclaimed fenland.**
- **Open and expansive views with big skies and dark night skies with some views semi-enclosed at ground level by large embankments.**
- **More distant views to Boston Stump and to the Lincolnshire Wolds in East Lindsey District to the north.**

- **A man-made intensive arable landscape laid out in a regular, geometric pattern with narrow roads and trackways alongside drains, dykes and ditches.**
- **The large North Forty Foot Drain and South Forty Foot Drain are key dominating features of the area.**
- **Field boundaries are typically open with wet ditches, dykes and drains and the occasional hedgerow.**
- **Occasional large scale horticultural glasshouses, and packing or processing plants occur near the southern boundary of the area.**
- **Sparsely populated with occasional small hamlets, scattered farmsteads, and occasional rows of former workers' cottages.**
- **Occasional derelict farm cottages and field buildings.**
- **Sparse tree cover confined to shelterbelts, with occasional hedgerows and small blocks of mixed woodland with shrubby edges.**
- **Bicker windfarm and large scale pylons on the south western tip are modern landmark features.**
- **A semi-remote, tranquil and intact working agricultural landscape."**

<u>Visual Baseline Survey Information</u>

6.4.20 A visual appraisal has been conducted to determine the relationship of the Application Site with its surroundings and its approximate extent of visibility within the wider landscape from publicly accessible locations. The landscape and visual surveys were undertaken in April and May 2022.

6.4.21 As part of the desk-top study for this PEIR Chapter 6, three separate detailed Screened Zone of Theoretical Visibility (SZTV) plans have been prepared, based upon the height of the proposed solar modules, energy storage facilities, and proposed substations as requested by the consultees during the scoping stage. To provide a more refined grain of the SZTVs National Tree data has been purchased and included in the modelling to aid the assessment and identification of viewpoints and other relevant visual receptors by illustrating the potential visibility of the Energy Park. The SZTVs represent the so-called 'screened' ZTV whereby existing built form and areas of vegetation are assigned certain heights, or are based on the height specified in the National Tree data , and used to model a more realistic representation of the theoretical visibility. Therefore, the current SZTV plans (see **Figure 6.3**) differ from and are more refined that the SZTV plan submitted as part of the Scoping Report.

6.4.22 It is worth reiterating that small building groups or isolated buildings, or small areas of vegetation below 3m in height are not accounted for and therefore such SZTVs still represent a theoretical visibility, as unmapped features can control or prevent views locally. The actual extent of the visibility of the Energy Park, however, is likely to be smaller than this shaded area. The SZTVs are reflective of the level landform of the local Fenland landscape (see **Figure 6.3**).

Settlements

6.4.23 Based on the OS Explorer map 1:25,000 and site surveys it has been determined that the settlements of Heckington, East Heckington, Swineshead Bridge, and South Kyme are relevant to this **PEIR Chapter 6**.

Transport Routes

6.4.24 The A17 and Sidebar Lane / the B1395 are the only two transport corridors considered informative to this **PEIR Chapter 6**. The proposed cable route crosses the A17 corridor. The subsequent **Chapter 6** of the ES will provide further details.

Railways

6.4.25 The railway line between Heckington to the west and Boston to the east is the only railway line in the local area. The proposed cable route crosses the railway corridor, and the subsequent **Chapter 6** of the ES will provide further details with regard to the potential landscape and visual effects.

SUSTRANS Cycle Network

6.4.26 SUSTRANS Cycle Route No. 1 is located to the north-east of the Energy Park, approximately 3.9km away at its closest point. It coincides with North Forty Foot Bank.

Long Distance Trails

6.4.27 The review of OS Explorer map 1:25,000 did not reveal any promoted long distance walking routes or National Trails in the study area

Public Rights of Way

6.4.28 As described in paragraph 6.4.5 there are a number of PRoWs in the vicinity of the Application Site. These have been analysed during the site surveys to establish the level of inter-visibility between these linear receptors and the Application Site. With regard the Energy Park, Public Footpath Heck/15/1 is the most relevant albeit it is a dead end route with no connectivity further east, see Viewpoint 2.

6.4.29 With regard to the southern part of the Application Site, south of the A17, there are a number of PRoWs that cross the grid connection area or abut its preliminary boundaries: Public Footpath Swhd/14/1 leading from Swineshead Bridge along the railway line and then the South Forty Foot Drain; Public Bridleways: Swhd/13/1, Bick/1/1, and Doni/16/2 that follow the South Forty Foot Drain; and Public Footpaths Bick/2/1 and Doni/20/2 along Hammond Beck. These will be analysed in the subsequent **Chapter 6** of the ES, but receptors associated with these routes are unlikely to be subject to any long term significant effects.

6.4.30 Further away there are a number of PRoWs in the western, northern, and eastern part of the study area. Views from these PRoWs are illustrated by the selected viewpoints, see below. Some of the PRoWs located to the west of the Energy Park form part of the promoted Heckington Fen Walk, and the potential visual effects upon the users of this route will be clarified in the subsequent **Chapter 6** of the ES. Based on the site survey it has been considered that the most informative PRoWs are:

- Public Footpaths Heck/1/1, Heck/2/1, Heck/2/2 and Heck/1033/1 on the eastern edge of Heckington, see Viewpoint 16.
- Public Footpaths Heck/3/1 and Heck/2/4 near Hall Farm and Littleworth Drove, connecting to Heckington, and forming part of the promoted Heckington Fen Walk, see Viewpoint 17.

- Public Footpaths Heck/13/1, SKym/2/1, and SKym/1/1 that cross the eastern part of Howell Fen, near Fenside and connect to Sidebar Lane and South Kyme, see Viewpoint 1.
- Public Footpath SKym/8/1 on the southern edge of South Kyme, see Viewpoint 19.
- Public Footpath Ambe/5/1 near Chestnut House Farm, see Viewpoint 11.
- Other Routes with Public Access coincide with Harrison's Drove in the southern part of Algarkirk Fen, see Viewpoint 13.
- Bicker Drove located near Public Bridleway Bick/1/1, see Viewpoint 9.

Representative and Illustrative Viewpoints

6.4.31 A series of representative and illustrative views surrounding the Application Site have been identified through desk-top, field studies, and liaison with the landscape advisor working on behalf of Lincolnshire County Council and officers at North Kesteven District Council and Boston Borough Council. These incorporate the viewpoints proposed as part of the Scoping Report with the additional viewpoints selected following detailed site surveys carried out by a chartered landscape architect (see **Figure 6.3**) and feedback from the above mentioned consultees. The selected viewpoints are listed in **Table 6.3** below.

6.4.32 The selected viewpoints are not intended to cover every possible view of the Proposed Development, but rather they are representative of a range of receptor types. Due to the extent of the SZTVs and availability of public vantage points their distribution is concentrated in certain parts of the local landscape to capture more than just one type of receptor. A total of 19 no. of viewpoints have been selected and they include locations discussed with the Councils during the consultation process through the Scoping Report. The viewpoints represent views experienced by a range of receptor groups such as:

- Residents/local community.
- PRoW users.
- Road users.

6.4.33 In order to focus on those viewpoints that are potentially affected to a significant degree, a preliminary review of the identified 19no viewpoints will be conducted in **Chapter 6** of the ES.

6.4.34 The subsequent **Chapter 6** of the ES will also include the detailed description of the shortlisted viewpoints, their baseline views and sensitivity of associated visual receptors.

Table 6.3 Selected viewpoints

No.	Viewpoint name	Relevant part of the Proposed Development	Rationale
1.	Public Footpath SKym/2/1 and Sidebar Lane overbridge at Head Dike.	Energy Park	Close range views. PRoW receptor with the Public Footpath leading west along Head Dike, road receptors.
2.	Public Footpath Heck/15/1, near the north eastern edge of the Energy Park	Energy Park	Very close range views. PRoW receptor with the Public Footpath following the edge of the Energy Park.
3.	Littleworth Drove, near White House Farm and The Barns.	Energy Park	Close range views from the west.

4.	Sidebar Lane, near telecommunication mast	Energy Park	Close range view from the open section of Sidebar Lane.
5.	Lay by along the A17, near Garwick Cottage.	Energy Park	Medium range views, representative of road receptors.
6.	Footway in East Heckington, near Six Hundred Farm House.	Energy Park	Close range view from the open section of the A17, illustrative for views from the settlement.
7.	Lay by along the A1121 near Skerth Bridge.	Energy Park	Long range view from the south east, road receptors.
8.	Claydike Bank, Amber Hill	Energy Park	Medium range view from the east, residential receptors and nearby PRoWs.
9.	Bicker Drove at Bicker Fen	Energy Park and Grid Connection	Long range view towards the Energy Park from the south and close to medium range views of the grid connection east, nearby PRoW.
10.	Sutterton Drove near Sheperds Farm	Energy Park	Long range view from the north, road and PRoW users, residential receptors.
11.	Public Footpath Ambe/5/1 near Chestnut House Farm	Energy Park	Long range view from the north, road and PRoW users, residential receptors.
12.	Sutterton Drove near Sutterton Bridge	Energy Park	Long range view from the north east, near Public Footpath Ambe/4/1, road receptors. Views on the approach to Old Amber Hill.
13.	Harrison's Drove, Other Route with Public Access	Energy Park	Long range view from the south east, road and recreational users, residential receptors.
14.	Junction of Timm's Drove and Tilebarn Lane, West Low Grounds	Grid Connection	Medium to very close range views, road users.
15.	Junction of Bicker Drove and Vicarage Drove along Mill Drain	Grid Connection	Medium to very close range views, road users.
16.	Public Footpath Heck/2/2, east of Heckington	Energy Park	Long range view from the west, PRoW and residential receptors
17.	Public Footpath Heck/3/1 near Littleworth Drove and Holme House	Energy Park	Long range view from the west, PRoW users.
18.	Public Footpath SKym/1/1 and Cow Drove near Whitehouse Farm	Energy Park	Long range view from the north west, PRoW and road users, residential receptors.
19.	Public Footpath SKym/8/1, south western edge of South Kyme near Kyme Tower.	Energy Park	Long range view from the north west, PRoW users, residential receptors.

<u>Implications of Climate Change</u>

6.4.35 This will be discussed in the subsequent **Chapter 6** of the ES.

6.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

6.5.1 **Table 6.9**, included at the end of this report, outlines the potential landscape and visual effects based upon the results of baseline surveys and data collection and the information available regarding the Proposed Development, as outlined at the beginning of this **PEIR Chapter 6**.

<u>Construction</u>

<u>Landscape Elements within the Application Site</u>

6.5.2 It is predicted that the construction of the Proposed Energy Park and extension to the existing 400kV Bicker Substation will bring about major adverse and significant effects upon the ground cover. With regard to the structural vegetation: trees and hedgerows within the Application Site, the Proposed Development would not result in any significant adverse effects. The residual effects, following the implementation and establishment of the proposed mitigation planting is likely to result in beneficial significant effects upon the hedgerow resource. With regard to the topography of the Application Site, whilst some ground levelling may be required, the overall level character of the local topography would not be significantly affected. Similarly, none of the water features are predicted to be significantly affected. The existing public access would be maintained with additional permissive paths established post the construction phase. The subsequent Chapter 6 of the ES will provide a detailed assessment of the above mentioned elements and features associated with the Application Site.

<u>Landscape Character Effects</u>

<u>National Character Area 46 The Fens</u>

6.5.3 It is predicted that the construction stage would cause some limited adverse effects, but such effects would not be significant given the geographical extent of this NCA 46 The Fens, its characteristics, and temporary nature of the construction phase. Detailed assessment will be provided in the consequent **Chapter 6** of the ES.

<u>North Kesteven Landscape Character Assessment</u>

6.5.4 The published assessment identifies that the Energy Park and northern part of the grid connection route fall within The Fens Regional Landscape Character Type and the Fenland Landscape Character Sub-Area. The construction phase will cause some limited and temporary, and geographically localised effects upon the landscape of the host The Fens Regional Landscape Character Type and associated Fenland Landscape Character Sub-Area. Such effects are likely to be significant given the footprint of the Energy Park and linear nature of the grid connection, and predicted construction work. Detailed assessment will be provided in the consequent **Chapter 6** of the ES.

<u>Landscape Character Assessment of Boston</u>

6.5.5 The majority of the grid connection part of the Proposed Development and extension to the existing 400kV Bicker Substation fall within the Landscape Type (LT) A Reclaimed Fen and its associated LCA A1 Holland Reclaimed Fen.

6.5.6 The construction phase will cause some limited and temporary, and highly localised effects upon parts of the host landscape. Such effects are likely to be significant given the linear nature of the grid connection, duration of the construction work, and work associated with the extension to the existing Bicker Fen National Grid Substation. Detailed assessment will be provided in the consequent **Chapter 6** of the ES.

Visual Receptors

6.5.7 The assessment of temporary effects brough about by the construction phase is based on the assessment carried out *in situ* and assessment of the selected viewpoints. For ease of reading the viewpoint assessment, however, is included at the end of this Section 6.4. Where appropriate reference to the relevant viewpoints has been made.

Settlements

6.5.8 Based on the SZTV plans (see **Figure 6.3**) and site surveys it is noted that the settlement of Heckington is enclosed by a strong line of vegetation that follows the A17, thus views towards the Application Site are not available. Views from this part of the study area were requested in the Scoping Opinion, and to prove this lack of inter-visibility Viewpoint 16 is provided to this **Chapter 6**. It is predicted that receptors within the settlement of Heckington will not be subject to any significant effects.

6.5.9 Views from within East Heckington, the closest settlement to the Energy Park, are available, as illustrated by Viewpoint 6 (see **Figure 6.3** and **Figure 6.4**). Given the presence of built form, movement, and intervening vegetation it is likely that receptors within certain parts of this settlement will be subject to a high magnitude of change, reducing locally to low and negligible. Residential receptors are taken as being of high sensitivity. On that basis, it is predicted that the effects would be major adverse and significant. Where vegetation is present and restricts or screens views, such effects are predicted to reduce to moderate adverse and negligible neutral. This is applicable to a number of dwellings along the southern side of the A17 or those that form enclosed, tight and small clusters. Similarly, some dwellings in Amber Hill may be subject to significant adverse effects.

6.5.10 With regard to the settlement of Swineshead Bridge, whilst the SZTV plans indicate that the Energy Park will be theoretically visible, views from its central and southern parts are either screened or heavily restricted. Views towards the construction stage associated with the grid connection and substation are unlikely to be gained or evident, given the distance and intervening features. It is predicted that the construction stage of the Proposed Development would not result in any significant effects, albeit some individual properties along its northern end (along Brown’s Drove) may experience a high degree of change upon their views and be subject to temporary short term significant effects.

Transport Routes

6.5.11 Views from the A17 are generally curtailed or restricted by the intervening roadside vegetation and built form. This restricted nature of views prevails along the majority of this route, both in the wider study area and in close proximity. There are short sections of this route, however, where views towards the Energy Park are open or less restricted. This is particularly the case near the junction with Sidebar Lane, near the south western corner of the Energy Park; and along its southern edge, as receptors travel through East Heckington, near the Four Winds Service Station and on the eastbound approach to Six Hundreds Drove.

6.5.12 It is predicted that the overall user experience along the A17 would not be significantly affected. The above identified sections of the highway within East Heckington would offer close range views of the construction phase associated with the Energy Park.

Given the speed of travel, variety of views gained by such low sensitivity receptors, and oblique nature of views, such effects are unlikely to be significant.

6.5.13 With regard the users along Sidebar Lane, it is likely that the southern and central section of this minor road would offer clear and relatively unrestricted views of the construction phase associated with the Energy Park, albeit such views would be oblique to very oblique. In such views the construction activities within the Energy Park are likely to form new and easily recognisable elements in the view, with additional movement and activities present in the otherwise static landscape. Such effects are likely to be significant.

6.5.14 In summary, views from the A17 and Sidebar Lane are likely to include the construction activities associated with the Energy Park only. Views of the construction phase in the southern part of the Proposed Development: grid connection and extension to the existing Bicker Fen National Grid Substation are unlikely to be gained or effect would not be significant.

Railways

6.5.15 The site surveys revealed that the northern part of the Proposed Development: the Energy Park, is not perceptible in views from the landscape to the south of the A17. Therefore, it is predicted that receptors travelling along the railway line would not be subject to any significant views.

6.5.16 With regard the grid connection route, the railway line crosses the development zone to the west of Swineshead Bridge. It is predicted that the temporary construction activities are likely to be experienced along the approximately 3.5km long route west of the settlement with the railway line largely devoid of any substantial amount of vegetation. Further west, across the Great Hale Fen, the intervening tree vegetation serves to reduce the magnitude of change with the effects unlikely to be significant.

6.5.17 In terms of the proposed extension to the existing Bicker Fen National Grid Substation, the construction activities are unlikely to be easily identifiable given the distance of approximately 4km and intervening vegetation.

SUSTRANS Cycle Network

6.5.18 The site surveys did not reveal any direct or open views towards the Application Site, which would be significantly affected by the proposed construction phase. Further details will be provided in the subsequent **Chapter 6** of the ES.

Public Rights of Way

6.5.19 As described in paragraphs 6.3.27 – 6.3.29 a number of PRoWs have been identified as being informative to this PEIR **Chapter 6**. The following **Table 6.4** provides a succinct assessment of the predicted effects.

Table 6.4 Preliminary assessment of ProWs users – construction phase

ProW	Corresponding Viewpoint	Are the predicted effects significant?
Public Footpath Heck/15/1, northern edge of the Energy Park	Viewpoint 2	Yes, very close range and open views – Energy Park only.
Public Footpath Swhd/14/1, Swineshead Bridge along the railway line and the South Forty Foot Drain	~	Yes, but only along the approximately 1.2km long section as the PRoW crosses the proposed grid connection route, west of Swineshead Bridge.

		The construction phase associated with the Energy Park, majority of the grid connection route and extension to the existing Bicker Fen National Grid Substation not visible or unlikely to be significant.
Public Bridleways: Swhd/13/1, Bick/1/1, and Doni/16/2 along the South Forty Foot Drain; and Public Footpaths Bick/2/1 and Doni/20/2 along Hammond Beck	~	Views are likely to be screened or not significant given the enclosed nature of views – the South Forty Foot Drain is enclosed by manmade banks.
Public Footpaths Heck/1/1, Heck/2/1, Heck/2/2 and Heck/1033/1 on the eastern edge of Heckington	Viewpoint 16	No inter-visibility, no significant effects.
Public Footpaths Heck/3/1 and Heck/2/4 near Hall Farm and Littleworth Drove, connecting to Heckington	Viewpoint 17	No inter-visibility, no significant effects.
Public Footpaths Heck/13/1, Skym/2/1, and Skym/1/1 eastern part of Howell Fen, Fenside and connecting to Sidebar Lane	Viewpoint 1	Yes, very close range and open views – Energy Park only.
Public Footpath Skym/8/1 on the southern edge of South Kyme	Viewpoint 19	No, distance of approximately 3.5km, with views interrupted and / or screened by the intervening belts of trees.
Public Footpath Ambe/5/1 near Chestnut House Farm	Viewpoint 11	No, the construction activities will be visible as part of the medium to long range landscape, with movement identifiable on the horizon. The effects are unlikely to be significant.
Other Route with Public Access that coincides with Harrison's Drove in the southern part of Algarkirk Fen	Viewpoint 13	No, the intervening vegetation and built form would interrupt views of the construction phase associated with the Energy Park.
Other Route with Public Access that coincides with Bicker Drove and is located near Public Bridleway Bick/1/1	Viewpoint 9	Yes, localised effects associated with the extension to the existing Bicker Fen National Grid Substation. The construction activities associated with the Energy Park and majority of the grid connection are unlikely to case any significant effects.

Representative and Illustrative Viewpoints

6.5.20 The following **Table 6.5** provides a succinct assessment of the predicted effects experienced by static visual receptors at Viewpoints 1 – 19. Detailed assessment will be provided in **Chapter 6** of the ES.

Table 6.5 Preliminary assessment of the selected viewpoints – construction phase

No.	Viewpoint name	Relevant part of the Proposed Development	Are the predicted effects significant?
1.	Public Footpath Skym/2/1 and Sidebar Lane overbridge at Head Dike.	Energy Park	Yes, very close range and open views.
2.	Public Footpath Heck/15/1, near the north eastern edge of the Energy Park	Energy Park	Yes, very close range and open views.
3.	Littleworth Drove, near White House Farm and The Barns.	Energy Park	Potentially yes, views would be gained across the central and southern parts.
4.	Sidebar Lane, near telecommunication mast	Energy Park	Yes, very close range and open views.
5.	Lay by along the A17, near Garwick Cottage.	Energy Park	No, unlikely to be significant given the sensitivity of the visual receptor and gained views.
6.	Footway in East Heckington, near Six Hundred Farm House.	Energy Park	Yes, very close range and open views.
7.	Lay by along the A1121 near Skerth Bridge.	Energy Park	No, unlikely to be significant given the intervening vegetation and built form, and sensitivity of the visual receptor.
8.	Claydike Bank, Amber Hill	Energy Park	Potentially yes, the construction phase will be identifiable above the banks of the Skerth Drain.
9.	Bicker Drove at Bicker Fen	Energy Park and Grid Connection	Yes, localised effects associated with the extension to the existing Bicker Fen National Grid Substation. The construction activities associated with the Energy Park and majority of the grid connection are unlikely to case any significant effects.
10.	Sutterton Drove near Sheperds Farm	Energy Park	No, some elements of the construction phase may be identifiable, but views are unlikely to be significantly affected.
11.	Public Footpath Ambe/5/1 near Chestnut House Farm	Energy Park	No, the construction activities will be visible as part of the medium to long range landscape, with movement identifiable on the horizon. The

			effects are unlikely to be significant.
12.	Sutterton Drove near Sutterton Bridge	Energy Park	No, the roadside hedgerow along Claydike Bank restricts views. Effects are unlikely to be significant.
13.	Harrison's Drove, Other Route with Public Access	Energy Park	No, the intervening vegetation and built form would interrupt views of the construction phase associated with the Energy Park.
14.	Junction of Timm's Drove and Tilebarn Lane, West Low Grounds	Grid Connection	Yes, very close to close range views of the construction activities associated with the northern and central section of the grid connection.
15.	Junction of Bicker Drove and Vicarage Drove along Mill Drain	Grid Connection	Yes, very close to close range views of the construction activities associated with the central and southern section of the grid connection.
16.	Public Footpath Heck/2/2, east of Heckington	Energy Park	No inter-visibility, no significant effects.
17.	Public Footpath Heck/3/1 near Littleworth Drove and Holme House	Energy Park	No inter-visibility, no significant effects.
18.	Public Footpath Skym/1/1 and Cow Drove near Whitehouse Farm	Energy Park	No, some elements of the construction phase may be identifiable, but views are unlikely to be significantly affected.
19.	Public Footpath Skym/8/1, south western edge of South Kyme near Kyme Tower.	Energy Park	No, distance of approximately 3.5km, with views interrupted and / or screened by the intervening belts of trees.

Operation

Landscape Character Effects

National Character Area 46 The Fens

6.5.21 The Proposed Development would influence the character of the NCA 46 The Fens to a degree. Whilst being long term the temporary nature of the Proposed Development is unlikely to alter the pattern, scale and its other characteristics to any significant degree. Detailed assessment will be provided in the consequent **Chapter 6** of the ES.

North Kesteven Landscape Character Assessment

6.5.22 The Proposed Development is likely to cause geographically limited yet significant effects upon the character of The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area. A detailed assessment will be provided in the consequent **Chapter 6** of the ES.

Landscape Character Assessment of Boston

6.5.23 The operational stage of the Proposed Development is unlikely to bring about any significant effects upon the Landscape Type (LT) A Reclaimed Fen and its associated LCA A1 Holland Reclaimed Fen, identified in the published *Landscape Character Assessment of Boston* (2009). This is due to the grid connection being largely underground, the extension to the existing Bicker Fen National Grid Substation being contextually justifiable, and the Energy Park not exerting any evident visual influence over this landscape. A detailed assessment will be provided in the consequent **Chapter 6** of the ES.

Visual Receptors

6.5.24 The below assessment of the operational stage of the Proposed Development takes into account the predicted preliminary effects identified during the construction phase, as described above. Therefore, the narrative assessment presented below is brief. Some of the previously identified visual receptors have been judged not to be significantly affected during the construction phase, thus have been omitted from further assessment work. Further details will be provided in the consequent **Chapter 6** of the ES.

Settlements

6.5.25 It is predicted that receptors within East Heckington will be subject to significant visual effects. Such effects will be experienced largely by the receptors along the northern settlement edge, which offers very close range and unrestricted views of the Energy Park. With regard the residents at Heckington, South Kyme and Bicker the visual effects are unlikely to be significant. In terms of residential receptors at Amber Hill, it is likely that the Energy Park will result in significant effects upon some individual properties but on the whole the settlement, as a visual receptor, would not be significantly affected. Further details will be provided in the consequent **Chapter 6** of the ES.

Transport Routes

6.5.26 With regard the users of the A17, it is predicted that the operation stage of the Energy Park will bring about some visual effects, but they would not be significant.

6.5.27 Users of Sidebar Lane, its central and southern section, will be subject to significant visual effects.

6.5.28 Receptors travelling along the minor roads that traverse the landscape around the existing Bicker Fen National Grid Substation are unlikely to experience significant visual effects due to the existing context.

Railways

6.5.29 The operational stage of the Proposed Development is unlikely to cause any significant visual effects.

SUSTRANS Cycle Network

6.5.30 The operational stage of the Proposed Development is unlikely to cause any significant visual effects.

Public Rights of Way

6.5.31 The below **Table 6.6** provides a succinct assessment of the predicted effects experienced by PRoW users during the operation phase of the Proposed Development. Further details will be provided in **Chapter 6** of the ES.

Table 6.6 Preliminary assessment of PRoWs users – operational phase

PRoW	Corresponding Viewpoint	Are the predicted effects significant?
Public Footpath Heck/15/1, northern edge of the Energy Park	Viewpoint 2	Yes, very close range and open views – Energy Park only.
Public Footpath Swhd/14/1, Swineshead Bridge along the railway line and the South Forty Foot Drain	~	No, grid connection would be largely underground. Any overhead cables, poles, or other overground elements of the Proposed Development would be distant, screened or views restricted.
Public Bridleways: Swhd/13/1, Bick/1/1, and Doni/16/2 along the South Forty Foot Drain; and Public Footpaths Bick/2/1 and Doni/20/2 along Hammond Beck	~	No, the bank that encloses the South Forty Foot Drain screens views out.
Public Footpaths Heck/1/1, Heck/2/1, Heck/2/2 and Heck/1033/1 on the eastern edge of Heckington	Viewpoint 16	No inter-visibility, no significant effects.
Public Footpaths Heck/3/1 and Heck/2/4 near Hall Farm and Littleworth Drove, connecting to Heckington	Viewpoint 17	No inter-visibility, no significant effects.
Public Footpaths Heck/13/1, SKym/2/1, and SKym/1/1 eastern part of Howell Fen, Fenside and connecting to Sidebar Lane	Viewpoint 1	Yes, very close range and open views.
Public Footpath SKym/8/1 on the southern edge of South Kyme	Viewpoint 19	No, some small parts of the Energy Park may be identifiable on the horizon as part of the low lying and distant landscape. Distance of approximately 3.5km, with views interrupted and / or screened by the intervening belts of trees.
Public Footpath Ambe/5/1 near Chestnut House Farm	Viewpoint 11	Potentially yes, the upper parts of the solar modules (up to 4.5m high) would be visible across the horizon. The taller 400kV substation in the south eastern

		part of the Energy Park is unlikely to be visible or easily identifiable.
Other Route with Public Access that coincides with Harrison's Drove in the southern part of Algarkirk Fen	Viewpoint 13	No, the intervening vegetation and built form would interrupt views of the Energy Park.
Other Route with Public Access that coincides with Bicker Drove and is located near Public Bridleway Bick/1/1	Viewpoint 9	No, the existing Bicker Fen National Grid Substation to the south, substation to the north, and wind turbines provide context and reduce the effects upon the visual amenity.

Representative and Illustrative Viewpoints

6.5.32 The below **Table 6.7** provides a succinct assessment of the predicted effects experienced by static receptors during the operation phase of the Proposed Development. Further details will be provided in **Chapter 6** of the ES

Table 6.7 Preliminary assessment of the selected viewpoints – operational phase

No.	Viewpoint name	Relevant part of the Proposed Development	Are the predicted effects significant?
1.	Public Footpath SKym/2/1 and Sidebar Lane overbridge at Head Dike.	Energy Park	Yes, very close range and open views.
2.	Public Footpath Heck/15/1, near the north eastern edge of the Energy Park	Energy Park	Yes, very close range and open views.
3.	Littleworth Drove, near White House Farm and The Barns.	Energy Park	Yes, close range views.
4.	Sidebar Lane, near telecommunication mast	Energy Park	Yes, very close range and open views.
5.	Lay by along the A17, near Garwick Cottage.	Energy Park	No, unlikely to be significant given the sensitivity of the visual receptor and nature of gained views.
6.	Footway in East Heckington, near Six Hundred Farm House.	Energy Park	Yes, very close range and open views.
7.	Lay by along the A1121 near Skerth Bridge.	Energy Park	No, the intervening vegetation and built form would screen large parts of the Energy Park.
8.	Claydike Bank, Amber Hill	Energy Park	Yes, medium range and open views.
9.	Bicker Drove at Bicker Fen	Energy Park and Grid Connection	No, the existing Bicker Fen National Grid Substation to the south, substation to the north, and wind turbines provide

			context and reduce the effects upon the visual amenity.
10.	Sutterton Drove near Sheperds Farm	Energy Park	No, the upper parts of the solar modules within the Energy Park may appear in the distance but the overall character and nature of the view would not be significantly changed.
11.	Public Footpath Ambe/5/1 near Chestnut House Farm	Energy Park	No, the bank associated with Head Dike would screen the lower parts of the solar modules and other infrastructure. Thus, the proposed solar modules would appear as a narrow and linear element seen against the low lying horizon. Taller elements associated with the Energy Park such as overhead cables and poles, and 400kV substation would be more distant and their scale reduced.
12.	Sutterton Drove near Sutterton Bridge	Energy Park	No, the roadside hedgerow along Claydike Bank restricts views. Effects are unlikely to be significant.
13.	Harrison's Drove, Other Route with Public Access	Energy Park	No, the intervening vegetation and built form would interrupt views of the Energy Park.
14.	Junction of Timm's Drove and Tilebarn Lane, West Low Grounds	Grid Connection	No, the below ground elements associated with the grid connection would not be visible. Other elements of the Proposed Development: the Energy Park and extension to the existing Bicker Fen National Grid Substation would not be visible or easily identifiable.
15.	Junction of Bicker Drove and Vicarage Drove along Mill Drain	Grid Connection	No, the below ground elements associated with the grid connection would not be visible. Other elements of the Proposed Development: the Energy Park and extension to the existing Bicker Fen National Grid Substation would not be visible or easily identifiable.
16.	Public Footpath Heck/2/2, east of Heckington	Energy Park	No inter-visibility, no significant effects.
17.	Public Footpath Heck/3/1 near Littleworth Drove and Holme House	Energy Park	No inter-visibility, no significant effects.

18.	Public Footpath SKym/1/1 and Cow Drove near Whitehouse Farm	Energy Park	No, the bank associated with Head Dike would screen the lower parts of the solar modules and other infrastructure. Thus, the proposed solar modules would appear as a narrow and linear element seen against the low lying horizon. Taller elements associated with the Energy Park such as overhead cables and poles, and 400kV substation would be more distant and their scale reduced.
19.	Public Footpath SKym/8/1, south western edge of South Kyme near Kyme Tower.	Energy Park	No, whilst some elements of the Energy Park may appear in the view as part of the distant landscape, the introduced change is unlikely to cause any significant effects.

Decommissioning

6.5.33 It is predicted that the decommissioning stage of the Proposed Development is likely to bring about similar and comparable effects to those assessed at the construction stage. Further details will be provided in the consequent **Chapter 6** of the ES supporting the DCO application.

6.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

6.6.1 The proposed layout incorporates a number of built-in mitigation measures such as reduction in the extent of the proposed solar modules and refinements to the layout to provide physical separation from nearby residential and commercial properties.

6.6.2 Footpath Heck/15/1 would remain open and useable throughout construction and operation and decommissioning of the Proposed Development. Land to the north of footpath Heck/15/1 would remain open, with proposed solar panels limited to land to the south. It is proposed to establish a permissive path from Heck/15/1 to create a circular route, which would be seeded and managed to promote biodiversity. The new permissive path would result in a 5km route around the Energy Park, looping back to join Crab Lane.

6.6.3 Offsets from internal and boundary watercourses and vegetation are proposed to safeguard these features and to ensure continued maintenance access. Existing trees are relatively sparse within the Application Site, but these would be protected throughout construction and operation of the Proposed Development.

6.6.4 The proposed 400kV substation compound and energy storage area are proposed to be located toward the south eastern corner of the Energy Park to maximise visual screening provided by the existing blocks of woodland and tree lines.

Additional Mitigation

6.6.5 Existing hedgerows and lines of trees within the Energy Park would be protected and enhanced with gapping-up using appropriate species. New hedgerows would be established along the southern and western edges of the solar modules, and within the

Energy Park (see **Figure 3.2**). The proposed planting would equate to approximately 10.9km of enhanced and new hedgerow planting.

6.6.6 Further design options for mitigation measures, and species selection, are currently being considered and this will be clarified in the subsequent **Chapter 6** of the ES.

Enhancements

6.6.7 As part of the Proposed Development a new community orchard (1.8ha) is being proposed in the south western corner of the Energy Park. This would be located immediately to the north of the Elm Grange School, which is shortly due to open.

6.7 CUMULATIVE AND IN-COMBINATION EFFECTS

6.7.1 With respect to cumulative effects on landscape resources the GLVIA3 states in its paragraph 7.19:

> **"Cumulative landscape effects may result from adding new types of change or from increasing or extending the effects of the main project when it is considered in isolation. For example, the landscape effects of the main project may be judged of relatively low significance when taken on their own, but when taken together with the effects of other schemes, usually of the same type, the cumulative landscape effects may become more significant."**

6.7.2 With respect to visual matters, cumulative effects arise where the visibility of other proposals overlaps with that of the Proposed Development to incur an incremental effect. Cumulative effects relate to landscape character and visual amenity. Within cumulative assessment, the proposals may be viewed in combination, in succession, or sequentially.

6.7.3 During the Scoping Report stage a number of solar energy schemes were identified but the Scoping Opinion stated (its Section 2.2, page 5) **"The ES should set out how projects included in the assessment were identified and, where possible, agreed with the local authority. The assessments should consider all relevant types of development and not be limited to solar farm projects. The Inspectorate also notes that Table 6.4 does not include any of the solar farms currently registered with the Inspectorate's National Infrastructure Team."** In addition, the Scoping Opinion identified a number of cumulative schemes with the feedback provided by the consultees. The below list rectifies the earlier omission.

6.7.4 With reference to the cumulative sites plans (see **Figure 6.5** and **Figure 6.6**) the following solar energy developments have been identified, as listed in **Table 6.8** below:

Table 6.8 Preliminary list of cumulative solar energy schemes

Name	Application number	Status
Land at Ewerby Thorpe	14/1034/EIASCR	Screening
Land at Little Hale Fen	21/1337/EIASCR	Screening
Land South of Gorse Lane Silk Willoughby	19/0060/FUL	Approved
Land to the North of White Cross Lane	19/0863/FUL	Approved

Vicarage Drove	B/21/0443	Approved
Cottam Solar Project (3 separate areas)	PINS Reference: EN010133	Scoping. The statutory consultation stage is anticipated to last Summer through to Autumn 2022.
Gate Burton Energy Park	PINS Reference: EN010131	Scoping. No further information was available at the time of writing.
West Burton Solar Project (3 separate areas)	PINS Reference: EN010132	Scoping. The statutory consultation stage is anticipated to last Summer through to Autumn 2022.
Mallard Pass Solar Farm	PINS Reference: EN010127	Scoping. No further information was available at the time of writing.

6.7.5 The Scoping Report stated in its paragraph 6.19 that **"...there are no known major developments within 5km of the Development site that are not solar farm developments. As stated above, if by the time of submission any major applications, which are not solar, come forward to planning they will be included within the cumulative assessment."** Further cumulative search will be conducted as part of the work on the subsequent **Chapter 6**, and any major developments that may be relevant to the assessment, regardless of the typology, will be reviewed and analysed if appropriate. At this stage there are no other known major developments except to those listed above.

Landscape Character Receptors

6.7.6 It is likely that significant cumulative landscape effects will occur within the host The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area with the approved Vicarage Drove Solar Farm, Land at Little Hale Fen Solar Farm (screening stage), and Land at Ewerby Thorpe (screening stage), located in the same landscape as the Proposed Development.

6.7.7 With regard the remaining identified solar schemes in the locale, and indeed the distant NSIP schemes: Cottam Solar Project, Gate Burton Energy Park, West Burton Solar Project, and Mallard Pass Solar Farm these are not located in the same landscape, neither at a national nor local level. Therefore, significant landscape character effects are unlikely to occur.

Visual Receptors

6.7.8 Based on the location of the identified cumulative solar schemes, separation distance, and different direction of views, it is unlikely that any of the identified visual receptors would experience significant visual effects. This will be further explained in the subsequent **Chapter 6** of the ES.

6.8 SUMMARY

6.8.1 This PEIR **Chapter 6** contains a preliminary assessment of the potential effects upon the landscape elements associated with the Application Site, landscape character and visual amenity brought about by the Proposed Development. In line with best practice and requirements of the *EN-1* and *EN-3* it considers the effects during the construction, operation, and decommissioning stages. It does not describe the residual magnitude of change or predicted residual effects, but rather provides a summary table, see below **Table 6.9**, which outlines the predicted residual effects. Detailed assessment will be provided in Chapter 6 of the ES.

6.8.2 The Proposed Development encompasses the Energy Park, off site cable route and above ground works at the National Grid Bicker Fen substation. The Energy Park, comprises solar modules infrastructure, onsite cabling, and energy storage infrastructure, located to the north of the A17. This PEIR **Chapter 6** considers the Proposed Development in terms of its maximum parameters: the extent and height of the solar modules, substation elements, overhead power cables, and fencing, as described within PEIR **Chapter 4**. The typology and height parameters of the proposed solar modules, and exact design of the substation elements have not yet been finalised and will be confirmed in the Environmental Statement.

6.8.3 This PEIR **Chapter 6** also sets out the main policies and guidance relevant to landscape and visual matters based on the *Overarching National Policy Statement for Energy (EN-1)* and *National Policy Statement for Renewable Energy Infrastructure (EN-3)* and their current drafts. In addition, policies provided in the *National Planning Policy Framework* (*NPPF*) and *Planning Practice Guidance* (*PPG*) have also been reviewed to inform the approach and assessment work. The provided assessment is based on established best practice methodologies.

6.8.4 The following **Table 6.9** Table of Summary Effects, Mitigation and Residual Effects identifies only those receptors that have been assessed a subject to preliminary significant effects, taking into account the proposed mitigation measures.

<u>Baseline Conditions</u>

6.8.1 The Proposed Development is not located within any national statutory protected landscape designations. It does not lie within any regional or local non-statutory landscape designations, either.

6.8.2 The Application Site falls within National Character Area 46 The Fens

6.8.3 The *North Kesteven Landscape Character Assessment*, prepared by David Tyldesley and Associates for North Kesteven District Council, identifies that the Application Site falls within The Fens Regional Landscape Character Type in the east of the district, and the Fenland Landscape Character Sub-Area.

6.8.4 The grid connection area falls within Boston Borough Council's area and is covered by its own *Landscape Character Assessment of Boston* (2009). This published assessment identifies that the grid connection falls entirely within the Landscape Type (LT) A Reclaimed Fen and more specifically its Landscape Character Area (LCA) A1 Holland Reclaimed Fen.

6.8.5 With regard to the visual receptors, based on the OS Explorer map 1:25,000 and site surveys it has been determined that the settlements of Heckington, East Heckington, Swineshead Bridge, and South Kyme are relevant to the assessment. Similarly, the site survey work has helped to determine that the A17 and Sidebar Lane / the B1395 are the only two transport corridors considered informative to this PEIR **Chapter 6**. In addition, the railway line between Heckington to the west and Boston to the east is the only railway line in the local area. The proposed cable route crosses the railway corridor, and thus has been included.

6.8.6 SUSTRANS Cycle Route No. 1, located to the north-east of the Energy Park approximately 3.9km away at its closest point, has bene excluded from further assessment due to the distance and intervening vegetation.

6.8.7 There are a number of Public Rights of Way (PRoWs) within the local landscape that have been identified as potentially offering close to medium range views, and being relevant to the Proposed Development:

- Public Footpaths Heck/1/1, Heck/2/1, Heck/2/2 and Heck/1033/1 on the eastern edge of Heckington.
- Public Footpaths Heck/3/1 and Heck/2/4 near Hall Farm and Littleworth Drove, connecting to Heckington, and forming part of the promoted Heckington Fen Walk.
- Public Footpaths Heck/13/1, SKym/2/1, and SKym/1/1 that cross the eastern part of Howell Fen, near Fenside and connect to Sidebar Lane and South Kyme.
- Public Footpath SKym/8/1 on the southern edge of South Kyme.
- Public Footpath Ambe/5/1 near Chestnut House Farm.
- Other Routes with Public Access coincide with Harrison's Drove in the southern part of Algarkirk Fen.
- Bicker Drove located near Public Bridleway Bick/1/1.

6.8.8 Based on the preliminary works and further desktop and field work a total of 19 no. of viewpoints have been selected and they include locations discussed with the Councils during the consultation process through the Scoping Report, and subsequent consultation with their landscape consultant and officers. The identified viewpoints are not intended to cover every possible view of the Proposed Development, but rather they have been selected to be representative of a range of receptor types.

Likely Significant Effects

Construction Phase

6.8.9 This PEIR Chapter 6 has concluded that the construction of the Proposed Energy Park and extension to the existing 400kV Bicker Substation will bring about major and significant adverse effects upon the ground cover. With regard to the structural vegetation: trees and hedgerows within the Application Site, the Proposed Development would not result in any significant adverse effects. The residual effects, following the implementation and establishment of the proposed mitigation planting is likely to result in beneficial significant effects upon the hedgerow resource. No other landscape elements or features associated with the Application Site would be significantly affected by the Proposed Development during its construction phase.

6.8.10 In terms of landscape character, it has been assessed that the construction stage may result in temporary short term significant adverse effects upon the local landscape of The Fens Regional Landscape Character Type and the Fenland Landscape Character Sub-Area (identified in the published *North Kesteven Landscape Character Assessment*) and Landscape Type (LT) A Reclaimed Fen and its associated LCA A1 Holland Reclaimed Fen, (identified in the published *Landscape Character Assessment of Boston*).

6.8.11 With regard to the southern part of the Application Site, south of the A17, there are a number of PRoWs that cross the grid connection area or abut its preliminary boundaries. Receptors associated with these routes are unlikely to be subject to any long term significant effects.

6.8.12 The construction phase is also likely to bring about significant adverse effects upon the receptors associated with the settlement of East Heckington, and individual properties in Swineshead Bridge, located along Brown's Drove, and in Amber Hill. With regard the road users travelling along Sidebar Lane, significant adverse effects are like to occur due to the proximity to the proposed Energy Park and openness of the views. Users associated with the railway line are also likely to be subject to significant adverse effects brought about by the construction phase of the grid connection, south of the A17.

6.8.13 In terms of PRoWs, users along the following routes have been assessed as potentially subject to significant adverse effects during the construction phase of the Proposed Development:

- Public Footpath Heck/15/1.
- Public Footpath Swhd/14/1, Swineshead Bridge.
- Public Footpaths Heck/13/1, Skym/2/1, and Skym/1/1.
- Other Route with Public Access that coincides with Bicker Drove.

6.8.14 In terms of static receptors, the following viewpoints have been assessed as potentially experiencing significant adverse effects during the construction phase of the Proposed Development:

- Viewpoint 1.
- Viewpoint 2.
- Viewpoint 3.
- Viewpoint 4.
- Viewpoint 6.
- Viewpoint 8.
- Viewpoint 9.
- Viewpoint 14.
- Viewpoint 15.

<u>Operational Phase</u>

6.8.15 The Energy Park of the Proposed Development has been assessed as potentially causing geographically limited yet significant adverse effects upon the character of The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area (identified in the published *North Kesteven Landscape Character Assessment*).

6.8.16 No other landscape character receptors have been assessed as subject to significant adverse effects during the operational phase of the Proposed Development.

6.8.17 With regard to the visual receptors, the operational stage of the Proposed Development has been considered to bring about significant adverse effects upon the receptors within East Heckington, and specific residential receptors at Amber Hill.

6.8.18 Similarly to the construction phase, road users travelling along the central and southern section of Sidebar Lane, will be subject to significant visual effects during the operational phase of the Proposed Development.

6.8.19 In terms of PRoWs, users along the following routes have been assessed as potentially subject to significant adverse effects during the operational phase of the Proposed Development:

- Public Footpath Heck/15/1.
- Public Footpaths Heck/13/1, Skym/2/1, and Skym/1/1.
- Public Footpath Ambe/5/1 near Chestnut House Farm

6.8.20 In terms of static receptors, the following viewpoints have been assessed as potentially experiencing significant adverse effects during the operational phase of the Proposed Development:

- Viewpoint 1.

- Viewpoint 2.
- Viewpoint 3.
- Viewpoint 4.
- Viewpoint 6.
- Viewpoint 8.

6.8.21 No other visual receptors have been assessed as experiencing significant adverse effects during the operational phase of the Proposed Development.

Mitigation and Enhancements

6.8.22 At this stage the proposed mitigation measures constitute designed-in mitigation measures such as reduction in the extent of the proposed solar modules and refinements to the layout to provide physical separation from nearby residential and commercial properties.

6.8.23 The existing landscape elements and features within the Application Site have been considered with offsets from internal and boundary watercourses and vegetation proposed to safeguard these features and to ensure continued maintenance access.

6.8.24 During the preliminary design, the proposed 400kV substation compound and energy storage area have been located within the south eastern corner of the Energy Park to maximise visual screening provided by the existing blocks of woodland and tree lines. Further landscape and visual assessment work will determine the appropriateness of such layout.

6.8.25 Existing hedgerows and lines of trees within the Energy Park would be protected and enhanced with gapping-up using appropriate species. New hedgerows would be established along the southern and western edges of the solar modules, and within the Energy Park. Further design options for mitigation measures, and species selection, are currently being considered.

6.8.26 As part of the Proposed Development a new community orchard is being proposed in the south western corner of the Energy Park. This would be located immediately to the north of the Elm Grange School.

Cumulative Effects

6.8.27 The following cumulative schemes have been considered in this PEIR Chapter 6:

- Land at Ewerby, Thorpe.
- Land at Little Hale Fen.
- Land South of Gorse Lane Silk, Willoughby.
- Land to the North of White Cross Lane.
- Vicarage Drove.
- Cottam Solar Project (3 separate areas).
- Gate Burton Energy Park.
- West Burton Solar Project (3 separate areas).
- Mallard Pass Solar Farm.

6.8.28 This PEIR **Chapter 6** has concluded that it is likely that significant cumulative landscape effects will occur within the host The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area with the approved Vicarage Drove Solar Farm, Land at Little Hale Fen Solar Farm (screening stage), and Land at

Ewerby Thorpe (screening stage), located in the same landscape as the Proposed Development.

6.8.29 With regard the remaining identified solar schemes in the locale, and indeed the distant NSIP schemes: Cottam Solar Project, Gate Burton Energy Park, West Burton Solar Project, and Mallard Pass Solar Farm the assessment work has concluded that significant landscape character effects are unlikely to occur as the cumulative schemes are not located in the same landscape, neither at a national nor local level.

6.8.30 Based on the location of the identified cumulative solar schemes, separation distance, and different direction of views, this PEIR **Chapter 6** has concluded that it is unlikely that any of the identified visual receptors would experience significant visual effects.

Conclusion

6.8.31 It is important to acknowledge that significant effects on landscape character and visual amenity are an inherent consequence of a new development of this type and scale. However, in this case, any potential for adverse effects have been judged to be limited by the existing vegetation that characterises the close to medium range landscape. The proposed mitigation planting has the potential to considerably reduce such significant effects, which would be geographically highly limited, both in character and visual terms. Whilst certain elements of the Proposed Development would, inevitably, be more visible, for a scheme of its scale the residual landscape and visual effects arising are considered to be highly limited. Those effects which have been identified as being significant should therefore be balanced against the benefits of the Proposed Development.

Table 6.9: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction / Decommissioning								
The Fens Regional Landscape Character Type and associated Fenland Landscape Character Sub-Area	Change to landscape character	Temporary Short Term and Direct	Medium	High	Regional and District	Major	Mitigation by Design	Major
Landscape Type A Reclaimed Fen and its associated Landscape Character Area A1 Holland Reclaimed Fen	Change to landscape character	Temporary Short Term and Direct	Medium	High	Borough	Major	Mitigation by Design	Major
East Heckington	Change to views	Temporary Short Term and Indirect	High	High (localised)	Local	Major	Mitigation by Design	Major
Sidebar Lane	Change to views	Temporary Short Term and Indirect	Medium	High (localised)	Local	Major	Mitigation by Design	Major
Public Footpath Heck/15/1	Change to views	Temporary Short Term and Indirect	High	High	Local	Major	Mitigation by Design	Major

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Public Footpath Swhd/14/1	Change to views	Temporary Short Term and Indirect	High	High	Local	Major	Mitigation by Design	Major
Public Footpaths Heck/13/1, SKym/2/1, and SKym/1/1	Change to views	Temporary Short Term and Indirect	High	Medium to High	Local	Major	Mitigation by Design	Major
Other Route with Public Access that coincides with Bicker Drove, located near Public Bridleway Bick/1/1	Change to views	Temporary Short Term and Indirect	High	High	Local	Major	Mitigation by Design	Major
Viewpoint 1 Public Footpath SKym/2/1 and Sidebar Lane overbridge at Head Dike.	Change to views	Temporary Short Term and Indirect	High	High	Local	Major	Mitigation by Design	Major
Viewpoint 2 Public Footpath Heck/15/1, near the north eastern edge of the Energy Park	Change to views	Temporary Short Term and Indirect	High	High	Local	Major	Mitigation by Design	Major

Receptor/ Receiving Environment	**Description of Effect**	**Nature of Effect ***	**Sensitivity Value ****	**Magnitude of Effect ****	**Geographical Importance *****	**Significance of Effects ******	**Mitigation/ Enhancement Measures**	**Residual Effects ******
Viewpoint 3 Littleworth Drove, near White House Farm and The Barns	Change to views	Temporary Short Term and Indirect	Medium	High	Local	Major	Mitigation by Design	Major
Viewpoint 4 Sidebar Lane, near telecommunic ation mast	Change to views	Temporary Short Term and Indirect	Medium	High	Local	Major	Mitigation by Design	Major
Viewpoint 6 Footway in East Heckington, near Six Hundred Farm House	Change to views	Temporary Short Term and Indirect	High / Low	High	Local	Major / Moderate	Mitigation by Design	Major / Moderate
Viewpoint 8 Claydike Bank, Amber Hill	Change to views	Temporary Short Term and Indirect	Medium	High	Local	Major	Mitigation by Design	Major
Viewpoint 9 Bicker Drove at Bicker Fen	Change to views	Temporary Short Term and Indirect	High	High	Local	Major	Mitigation by Design	Major
Viewpoint 14 Junction of Timm's Drove and Tilebarn Lane, West Low Grounds	Change to views	Temporary Short Term and Indirect	Medium	High	Local	Major	Mitigation by Design	Major

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Viewpoint 15 Junction of Bicker Drove and Vicarage Drove along Mill Drain	Change to views	Temporary Short Term and Indirect	Medium	High	Local	Major	Mitigation by Design	Major
Operation								
The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area	Change to landscape character	Temporary Long Term and Direct	Medium	High	Regional and District	Major	Hedgerow planting and enhancement	Moderate
East Heckington	Change to views	Temporary Long Term and Indirect	High	Medium to High	Local	Major	Hedgerow planting and enhancement	Moderate
Sidebar Lane	Change to views	Temporary Long Term and Indirect	Medium	Medium to High	Local	Major	Hedgerow planting and enhancement	Moderate
Public Footpath Heck/15/1	Change to views	Temporary Long Term and Indirect	High	High	Local	Major	~	Major
Public Footpaths Heck/13/1, SKym/2/1, and SKym/1/1	Change to views	Temporary Long Term and Indirect	High	Medium to High	Local	Major	Hedgerow planting and enhancement	Moderate

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Public Footpath Ambe/5/1 near Chestnut House Farm	Change to views	Temporary Long Term and Indirect	High	Medium to High	Local	Major	Hedgerow planting and enhancement	Moderate
Viewpoint 1 Public Footpath SKym/2/1 and Sidebar Lane overbridge at Head Dike.	Change to views	Temporary Long Term and Indirect	High	High	Local	Major	Hedgerow planting and enhancement	Major
Viewpoint 2 Public Footpath Heck/15/1, near the north eastern edge of the Energy Park	Change to views	Temporary Long Term and Indirect	High	High	Local	Major	Hedgerow planting and enhancement	Major
Viewpoint 3 Littleworth Drove, near White House Farm and The Barns	Change to views	Temporary Long Term and Indirect	Medium	High	Local	Major	Hedgerow planting and enhancement	Moderate
Viewpoint 4 Sidebar Lane, near telecommunication mast	Change to views	Temporary Long Term and Indirect	Medium	High	Local	Major	Hedgerow planting and enhancement	Moderate

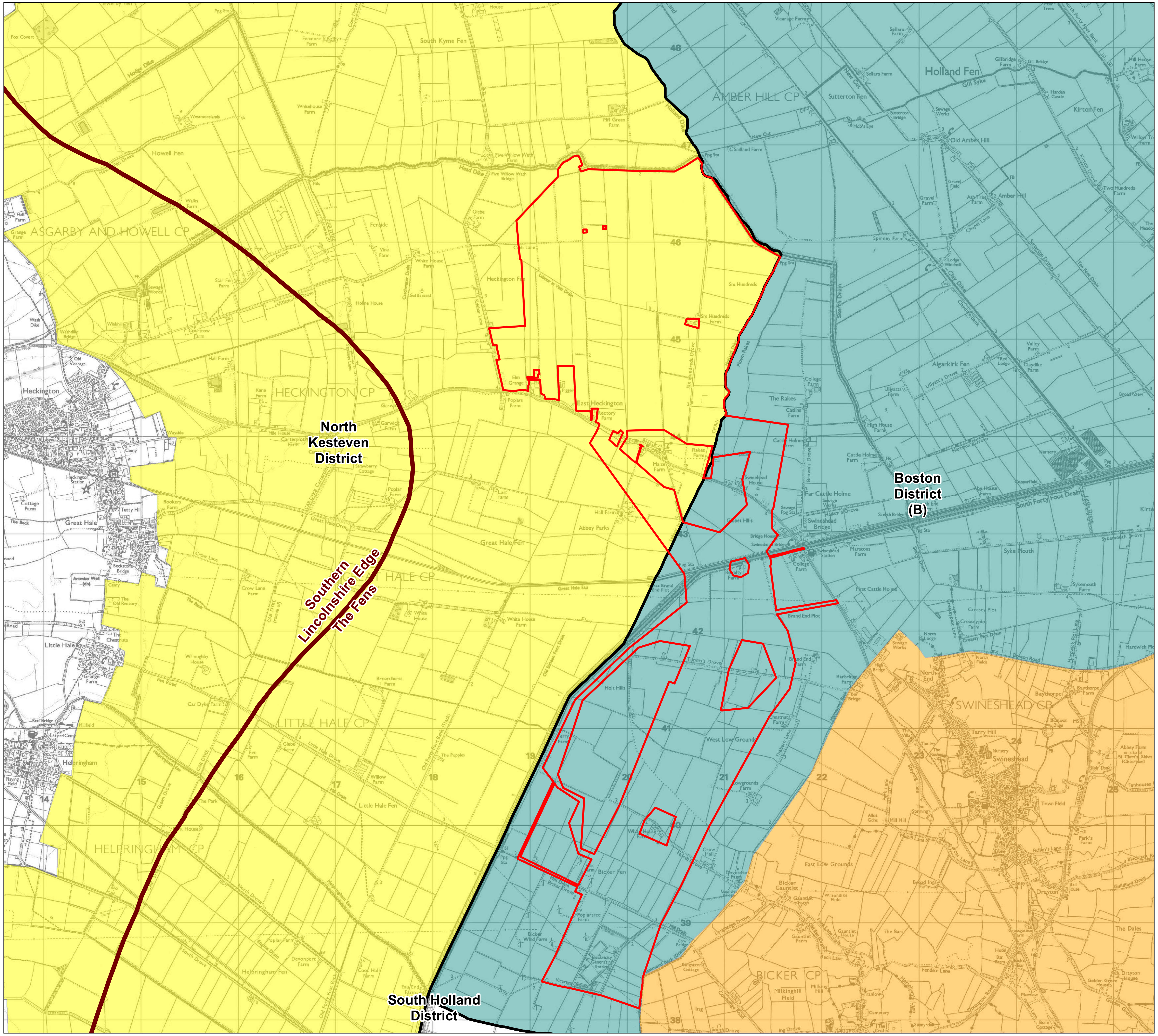
Receptor/ Receiving Environment	**Description of Effect**	**Nature of Effect ***	**Sensitivity Value ****	**Magnitude of Effect ****	**Geographical Importance *****	**Significance of Effects ******	**Mitigation/ Enhancement Measures**	**Residual Effects ******
Viewpoint 6 Footway in East Heckington, near Six Hundred Farm House	Change to views	Temporary Long Term and Indirect	High / Low	High	Local	Major / Moderate	Hedgerow planting and enhancement	Major / Moderate
Viewpoint 8 Claydike Bank, Amber Hill	Change to views	Temporary Long Term and Indirect	Medium	High	Local	Major	Hedgerow planting and enhancement	Moderate
Cumulative and In-combination (operational stage)								
The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area	Change to landscape character	Temporary Long Term and Direct	Medium	High	Regional and District	Major	Hedgerow planting and enhancement	Moderate

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 6.1- Landscape Character Plan

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



0 2 km

N

KEY

Site Boundary

National Character Areas

Local Authority Boundary

North Kesteven Landscape Character Assessment 2007

The Fens - 13: Fenland

Landscape Character Assessment of Boston 2009

A1 - Holland Reclaimed Fen

B1 - Bicker to Wyberton Settled Fen

FIGURE 6.1

Landscape Character Plan

DRWG No: **P20-2370_07** Sheet No: **-** REV: **C**

Date: 09/06/2022

Scale: 1:40,000 @ A3

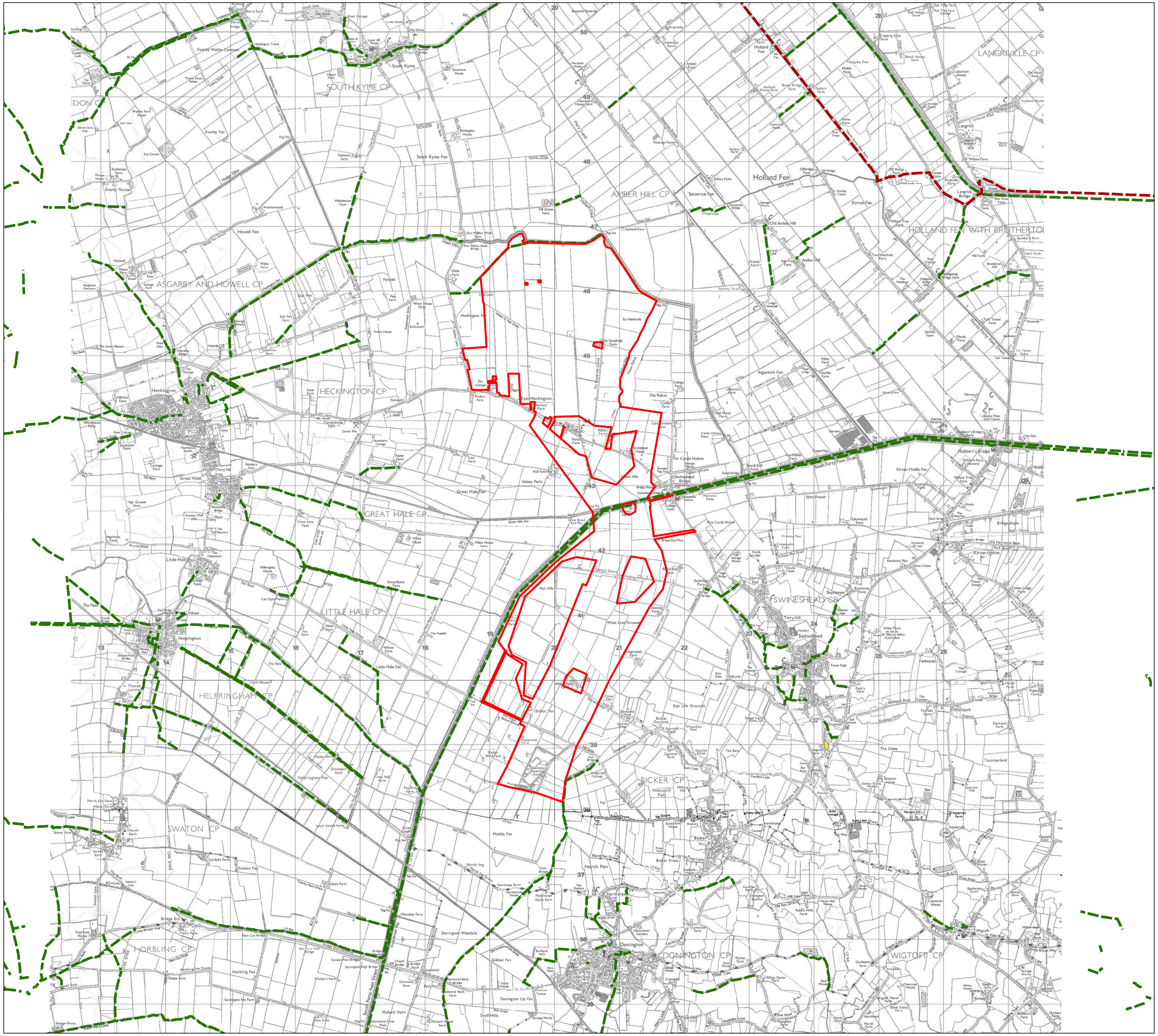
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 6.2- Visual Receptors Plan

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- SUSTRANS National Route
- Public Right of Way
- Open Access Land / Registered Common Land

0 3 km

N

FIGURE 6.2

Visual Receptors Plan

DRWG No: **P20-2370_26** Sheet No: - REV: _

Date: 26/05/2022

Scale: 1:60,000 @ A3

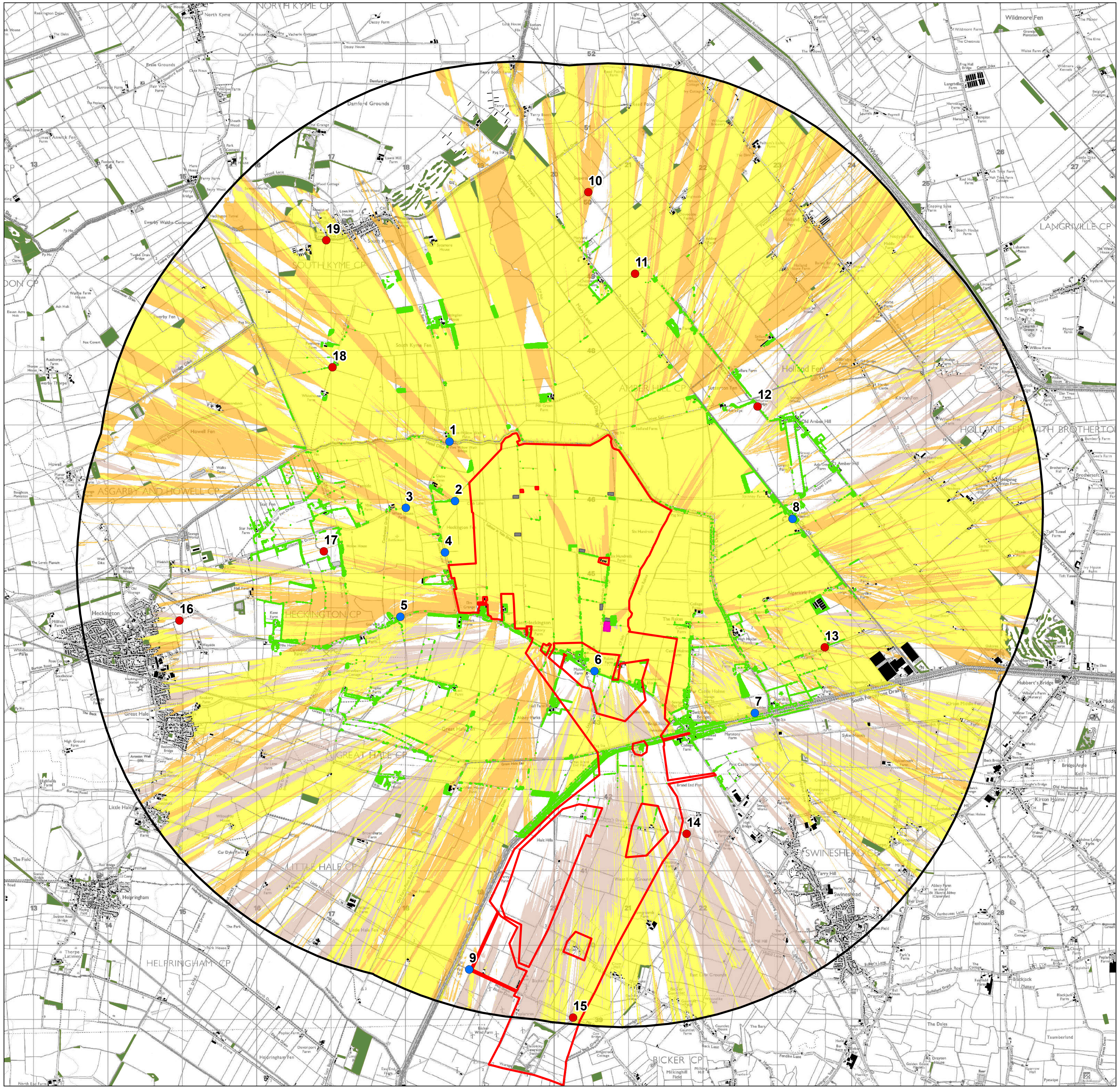
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 6.3- Screened Zone of Theoretical Visibility and Proposed Viewpoint Locations

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- 5km Search Area
- 132 kV Substation
- 400 kV Substation
- OS Local Woodland
- OS Local Buildings
- National Tree Dataset
- Zone of Theoretical Visbility 400 kV Substation - 15m Development Height
- Zone of Theoretical Visbility 132 kV Substation - 10m Development Height
- Zone of Theoretical Visbility - 132 kV and 400 kV Substations Visible
- Proposed Viewpoint Location
- Additional Viewpoints

Screened ZTV Production Information -
The ZTV has been produced using multiple datasets to create a DSM (Digital Surface Model). These have been combined together accurately using ESRI GIS software. The following datsets have been used to create the DSM-

- OS Terrain 5 data
- OS Local Woodland and Buildings modelled at 15m and 8m respectively.
- Bluesky's National Tree Map (NTM) This is a detailed dataset covering England and Wales. It provides a comprehensive database of location, height and canopy spread for every single tree 3m and above in height. This is created from stereo aerial photography. Heights used within the model are the MAXIMUM heights supplied with the dataset.
- Viewer height set at 1.7m (in accordance with para 6.11 of GLVIA Third Edition)
- Calculations include earth curvature and light refraction

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where the development may be visible from, assuming 100% atmospheric visibility, and includes the screening effect from vegetation and buildings, based on the assumptions stated above.

0 2.75 km

N

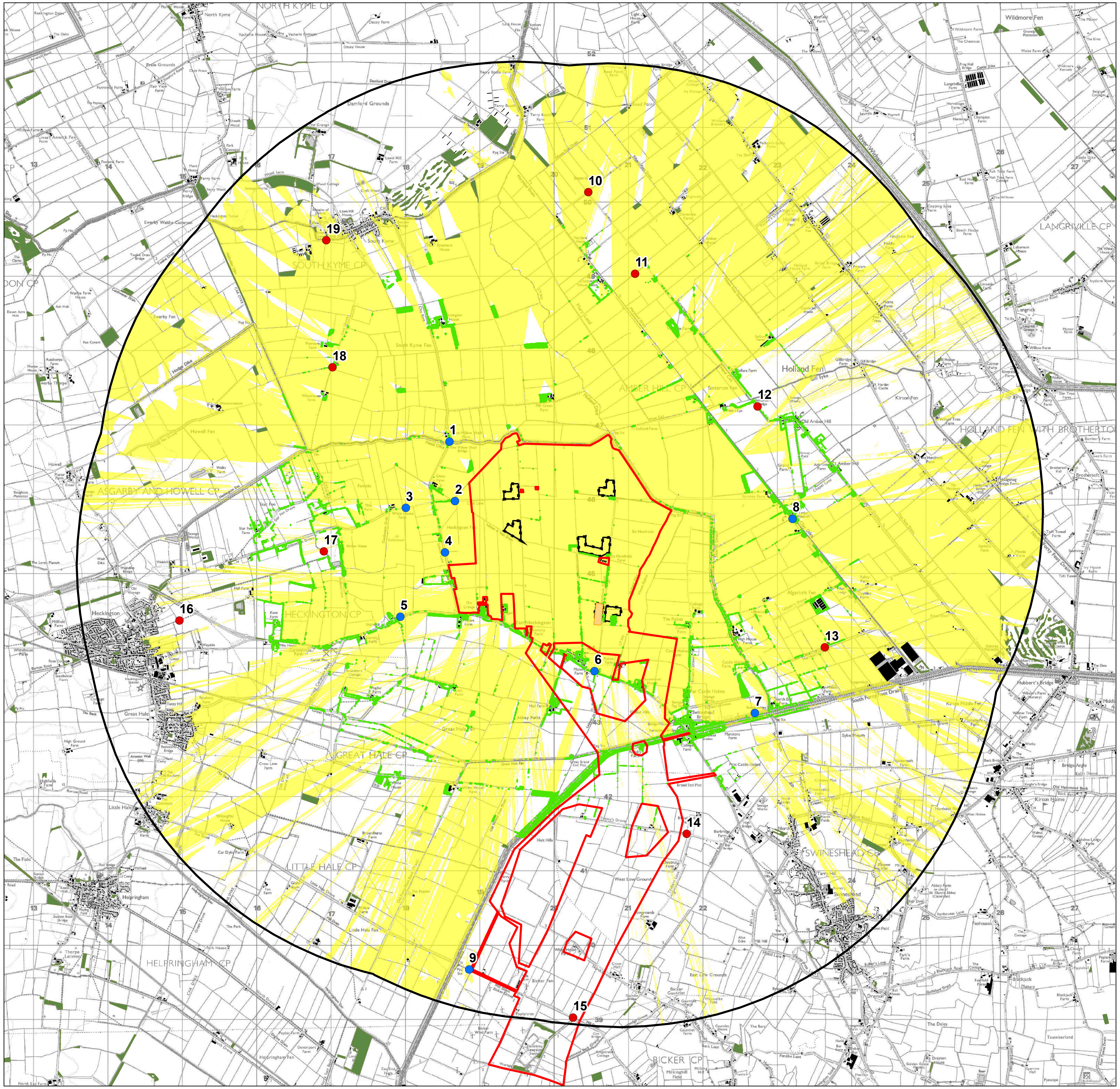
FIGURE 6.3a

Screened Zone of Theoretical Visibility- Substation Locations

DRWG No: **P20-2370_12** Sheet No: **-** REV: **B**

Date: 13/05/2022

Scale: 1:55,000 @ A3



0 2.5 km

N

KEY

- Site Boundary
- 5km Search Area
- 132kV Substation and Energy Storage Zone
- Storage Area
- OS Local Woodland
- OS Local Buildings
- National Tree Dataset
- Zone of Theoretical Visbility Storage Area- 6m Development Height
- Proposed Viewpoint Location
- Additional Viewpoints

Screened ZTV Production Information -
The ZTV has been produced using multiple datasets to create a DSM (Digital Surface Model). These have been combined together accurately using ESRI GIS software. The following datsets have been used to create the DSM-

- OS Terrain 5 data
- OS Local Woodland and Buildings modelled at 15m and 8m respectively.
- Bluesky's National Tree Map (NTM) This is a detailed dataset covering England and Wales. It provides a comprehensive database of location, height and canopy spread for every single tree 3m and above in height. This is created from stereo aerial photography. Heights used within the model are the MAXIMUM heights supplied with the dataset.
- Viewer height set at 1.7m (in accordance with para 6.11 of GLVIA Third Edition)
- Calculations include earth curvature and light refraction

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where the development may be visible from, assuming 100% atmospheric visibility, and includes the screening effect from vegetation and buildings, based on the assumptions stated above.

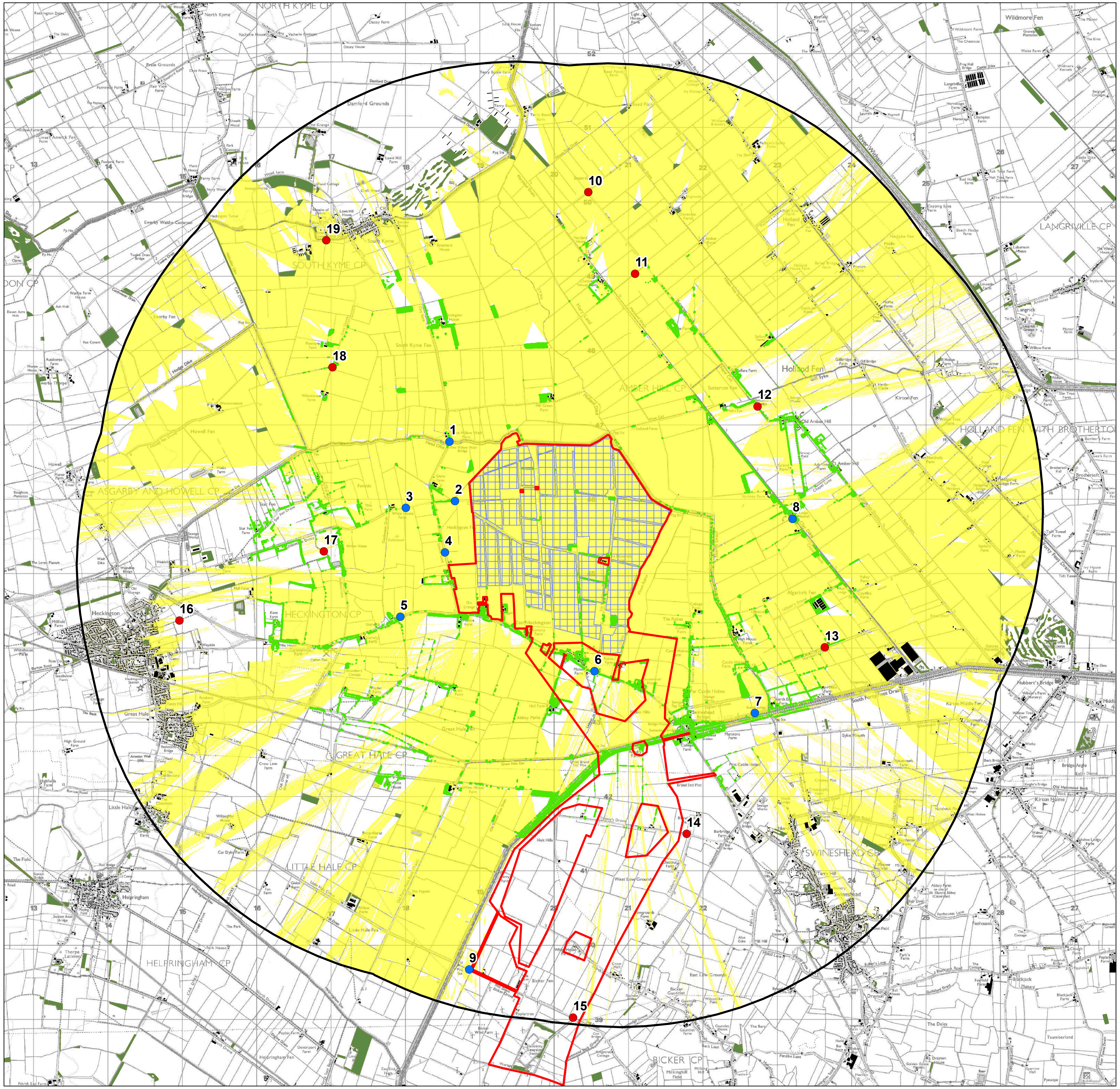
FIGURE 6.3b

Screened Zone of Theoretical Visibility- Storage Areas

DRWG No: **P20-2370_12** Sheet No: **-** REV: **B**

Date: 13/05/2022

Scale: 1:55,000 @ A3



0 2.75 km

N

KEY

- Site Boundary
- 5km Search Area
- Solar Area
- OS Local Woodland
- OS Local Buildings
- National Tree Dataset
- Zone of Theoretical Visbility Solar Areas - 4.5m Development Height
- Proposed Viewpoint Location
- Additional Viewpoints

Screened ZTV Production Information -
The ZTV has been produced using multiple datasets to create a DSM (Digital Surface Model). These have been combined together accurately using ESRI GIS software. The following datsets have been used to create the DSM-

- OS Terrain 5 data
- OS Local Woodland and Buildings modelled at 15m and 8m respectively.
- Bluesky's National Tree Map (NTM) This is a detailed dataset covering England and Wales. It provides a comprehensive database of location, height and canopy spread for every single tree 3m and above in height. This is created from stereo aerial photography. Heights used within the model are the MAXIMUM heights supplied with the dataset.
- Viewer height set at 1.7m (in accordance with para 6.11 of GLVIA Third Edition)
- Calculations include earth curvature and light refraction

N.B. This Zone of Theoretical Visibility (ZTV) image illustrates the theoretical extent of where the development may be visible from, assuming 100% atmospheric visibility, and includes the screening effect from vegetation and buildings, based on the assumptions stated above.

FIGURE 6.3c

Screened Zone of Theoretical Visibility- Solar Area

DRWG No: **P20-2370_12** Sheet No: **-** REV: **B**

Date: 13/05/2022

Scale: 1:55,000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

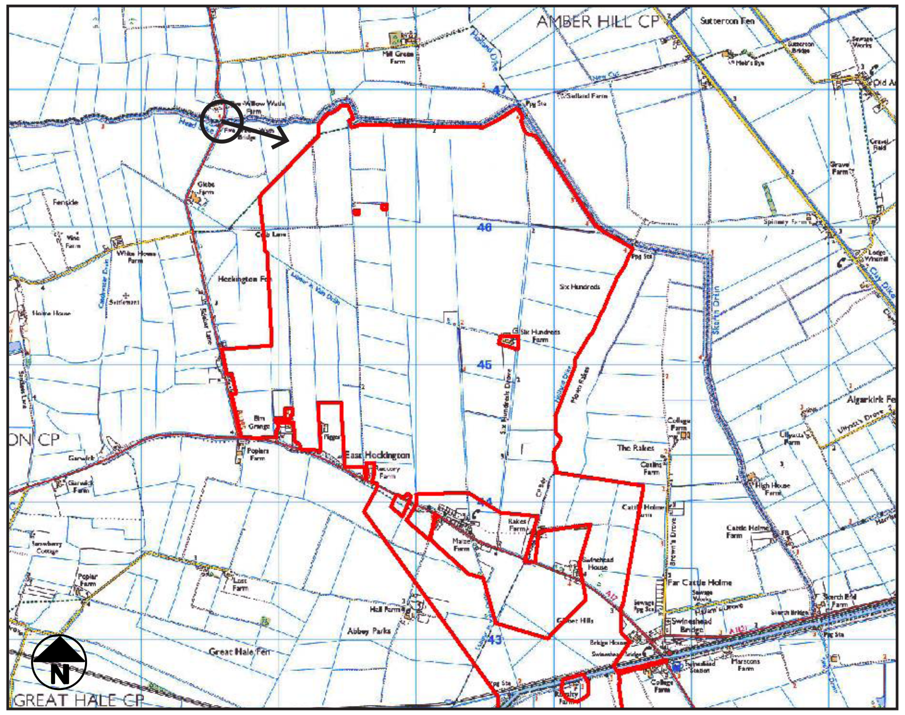
Preliminary Environmental Information Report
Figure 6.4- Context Baseline Views

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

CONTEXT BASELINE VIEWPOINT 1A

Public Footpath SKym/2/1 and Side Bar Lane overbridge at Head Dike.



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 05/04/2022 @ 13:41
OS grid reference - 518591, 346778

Viewpoint height (AOD) - 4m
Distance from Energy Park - 600m

FIGURE 6.4

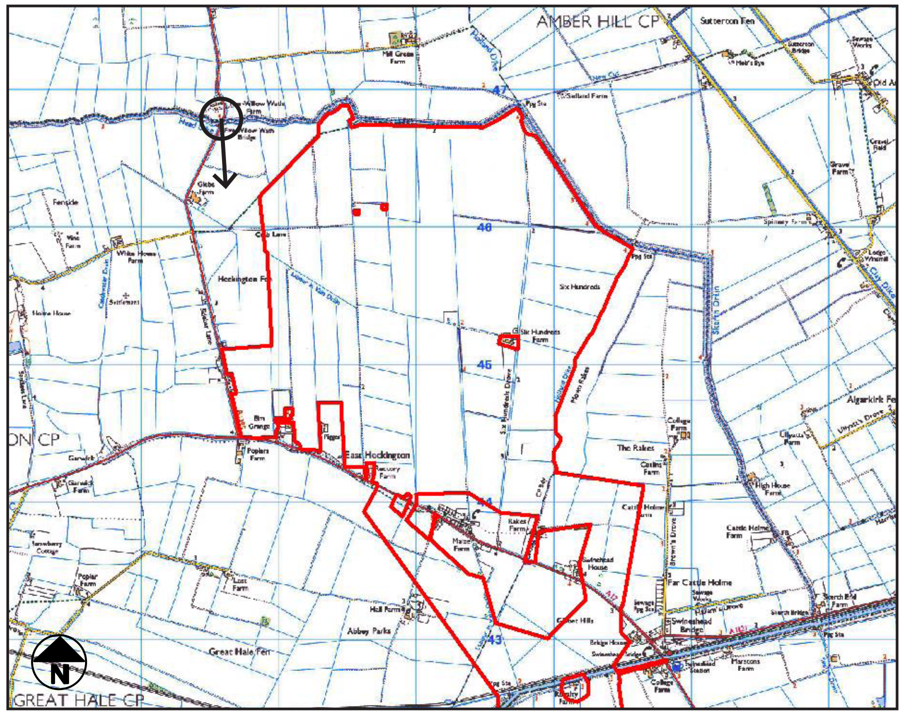
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 1B

Public Footpath SKym/2/1 and Side Bar Lane overbridge at Head Dike.



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 05/04/2022 @ 13:41
OS grid reference - 518591, 346778

Viewpoint height (AOD) - 4m
Distance from Energy Park - 600m

FIGURE 6.4

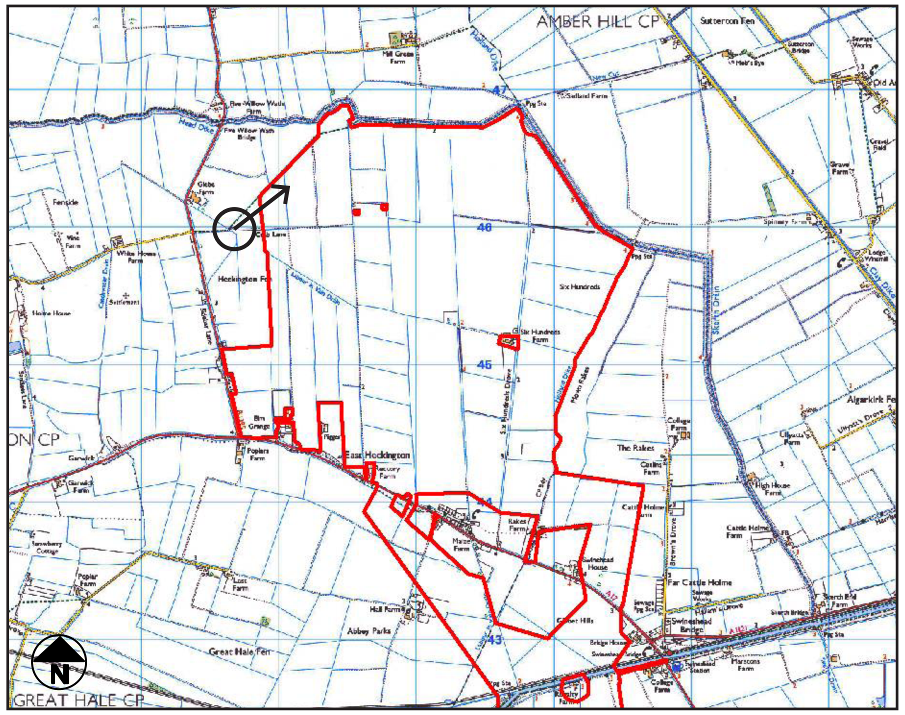
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 2A

Public Footpath Heck/15/1, near the north eastern edge of the Energy Park



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 19/05/2022 @ 13:03
OS grid reference - 518669, 345978

Viewpoint height (AOD) - 2m
Distance from Energy Park - 220m

FIGURE 6.4

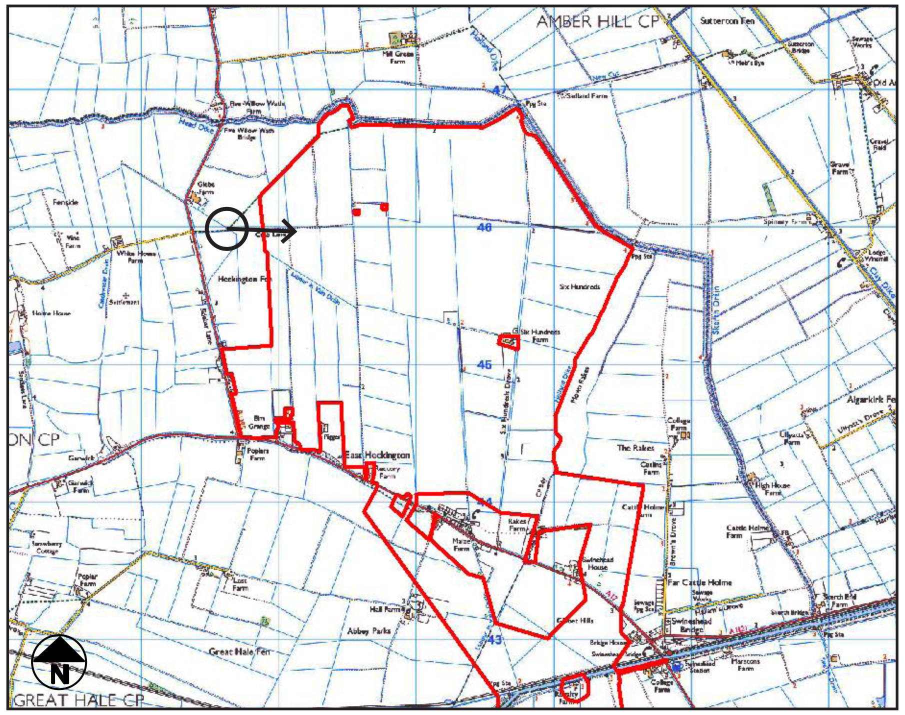
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 2B

Public Footpath Heck/15/1, near the north eastern edge of the Energy Park



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 19/05/2022 @ 13:03
OS grid reference - 518669, 345978

Viewpoint height (AOD) - 2m
Distance from Energy Park - 220m

FIGURE 6.4

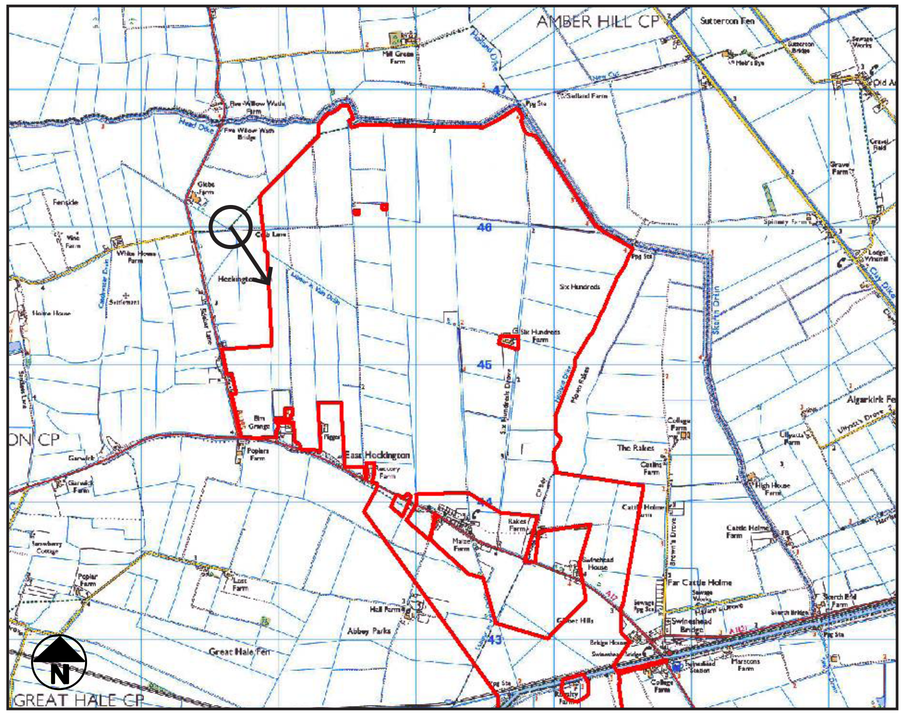
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 2C

Public Footpath Heck/15/1, near the north eastern edge of the Energy Park



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 19/05/2022 @ 13:03
OS grid reference - 518669, 345978

Viewpoint height (AOD) - 2m
Distance from Energy Park - 220m

FIGURE 6.4

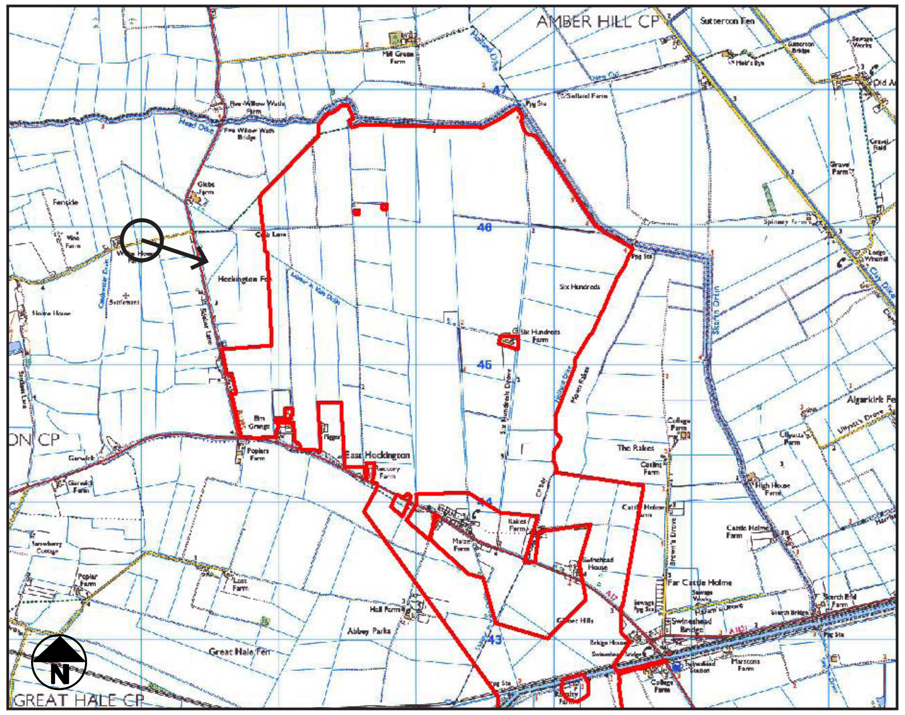
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 3

Littleworth Drove, near White House Farm and The Barns.



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 05/04/2022 @ 13:30
OS grid reference - 518005, 345886

Viewpoint height (AOD) - 3m
Distance from Energy Park - 860m

FIGURE 6.4

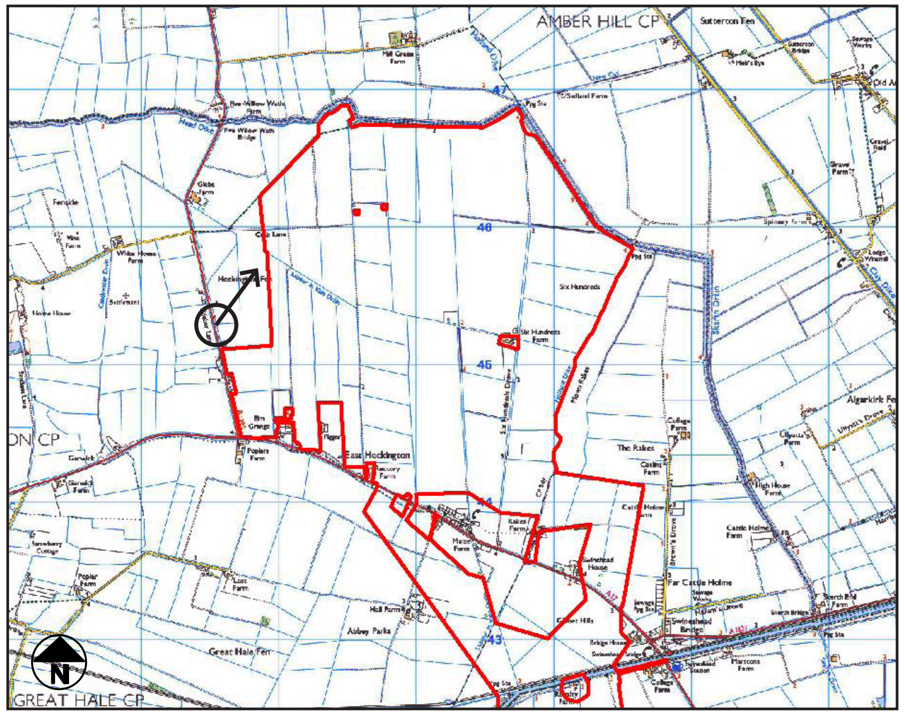
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 4A

Side Bar Lane, near telecommunication mast



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 19/05/2022 @ 15:14	Distance from Energy Park	- 400m
OS grid reference	- 518533, 345288		

FIGURE 6.4

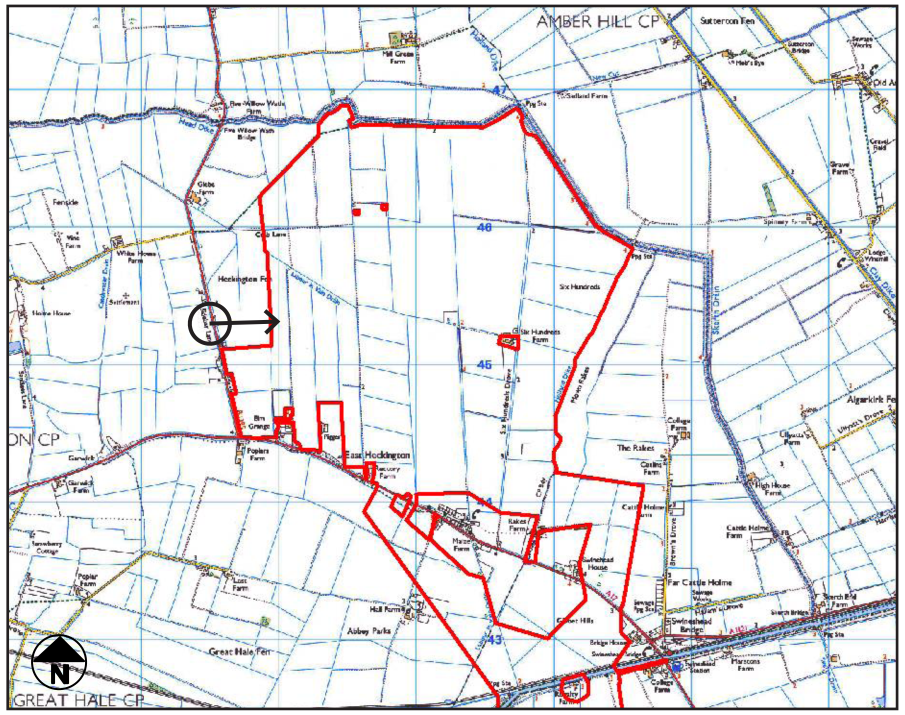
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 4B

Side Bar Lane, near telecommunication mast



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 19/05/2022 @ 15:14
OS grid reference - 518533, 345288

Viewpoint height (AOD) - 3m
Distance from Energy Park - 400m

FIGURE 6.4

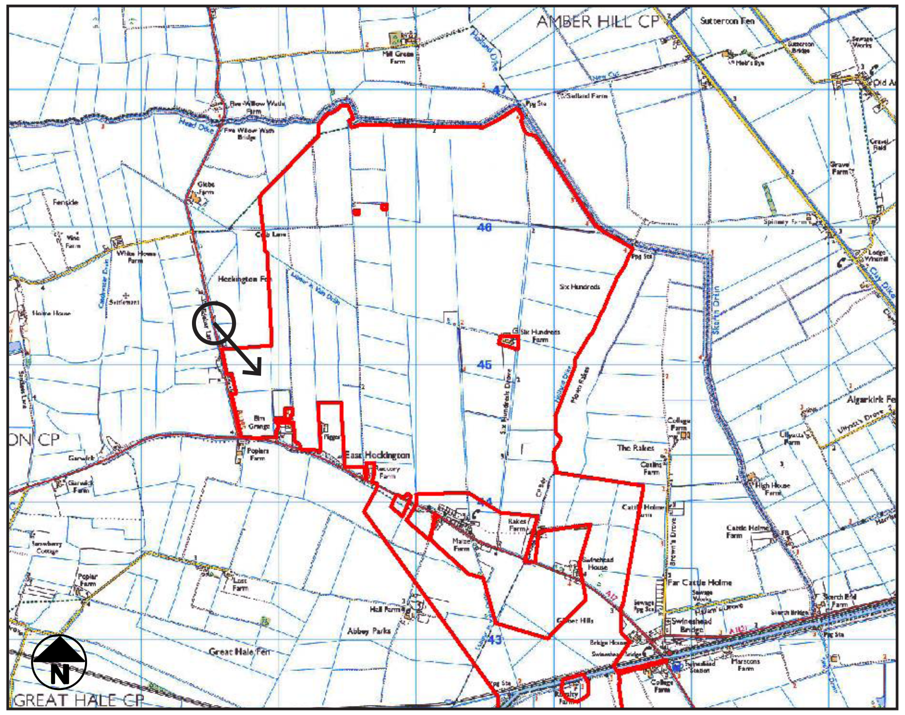
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 4C

Side Bar Lane, near telecommunication mast



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 19/05/2022 @ 15:14	Distance from Energy Park	- 400m
OS grid reference	- 518533, 345288		

FIGURE 6.4

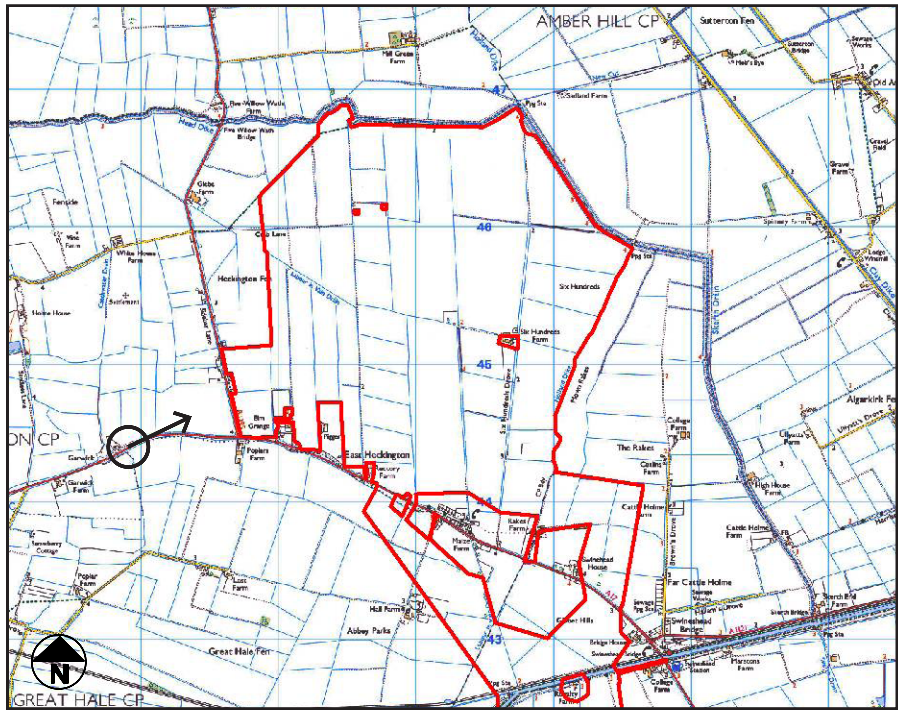
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 5

Lay by along the A17, near Garwick Cottage.



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 19/05/2022 @ 15:21	Distance from Energy Park	- 780m
OS grid reference	- 517931, 344421		

FIGURE 6.4

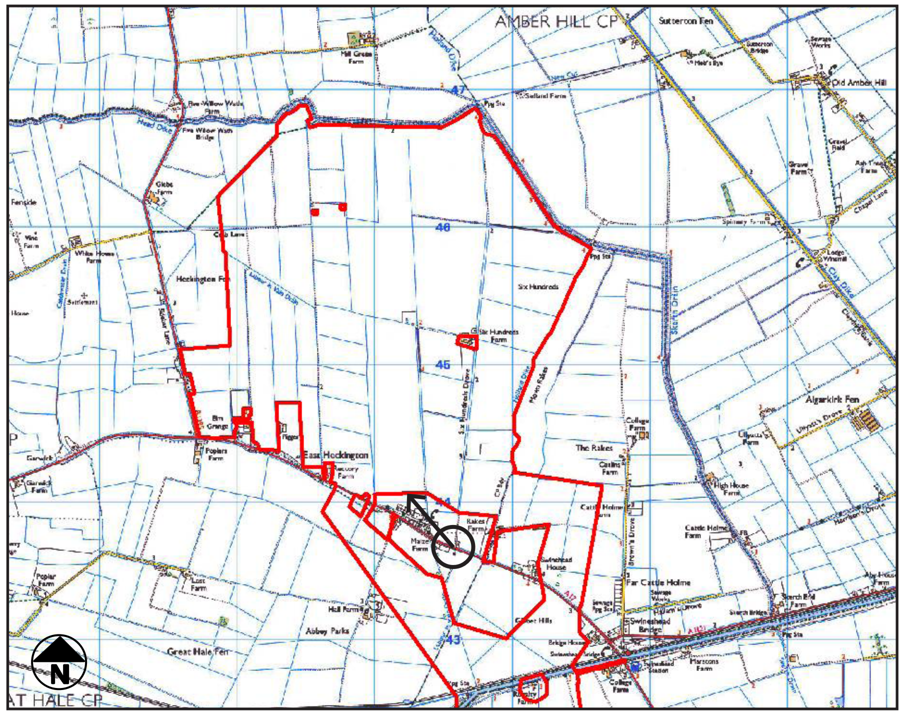
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 6A

Footway in East Heckington, near Six Hundred Farm House.



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 10:48	Distance from Energy Park	- 250m
OS grid reference	- 520544, 343690		

FIGURE 6.4

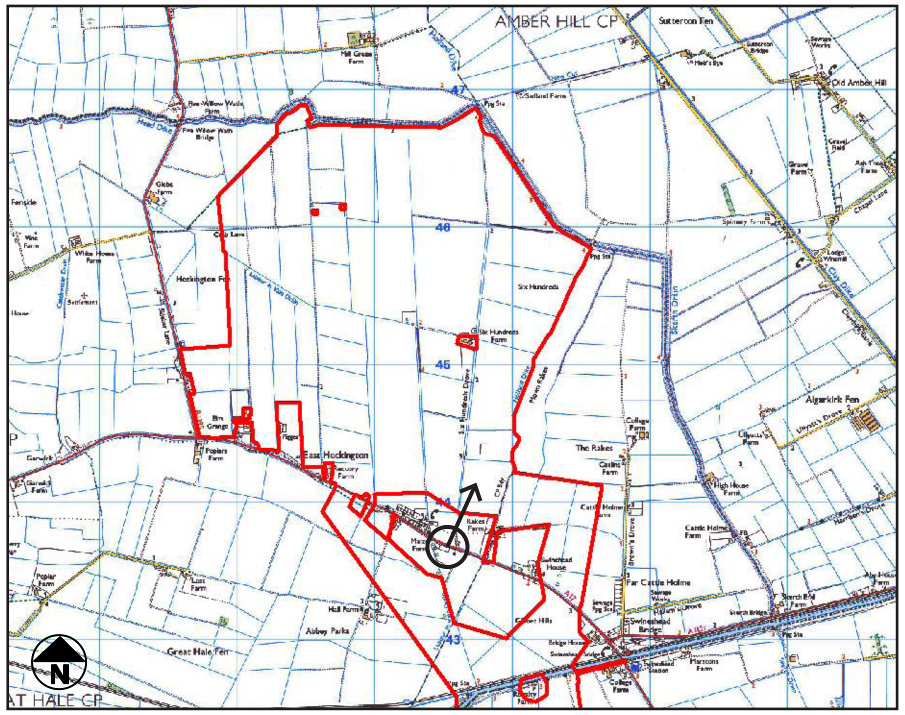
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 6B

Footway in East Heckington, near Six Hundred Farm House.



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 08/04/2022 @ 10:48
OS grid reference - 520544, 343690

Viewpoint height (AOD) - 3m
Distance from Energy Park - 250m

FIGURE 6.4

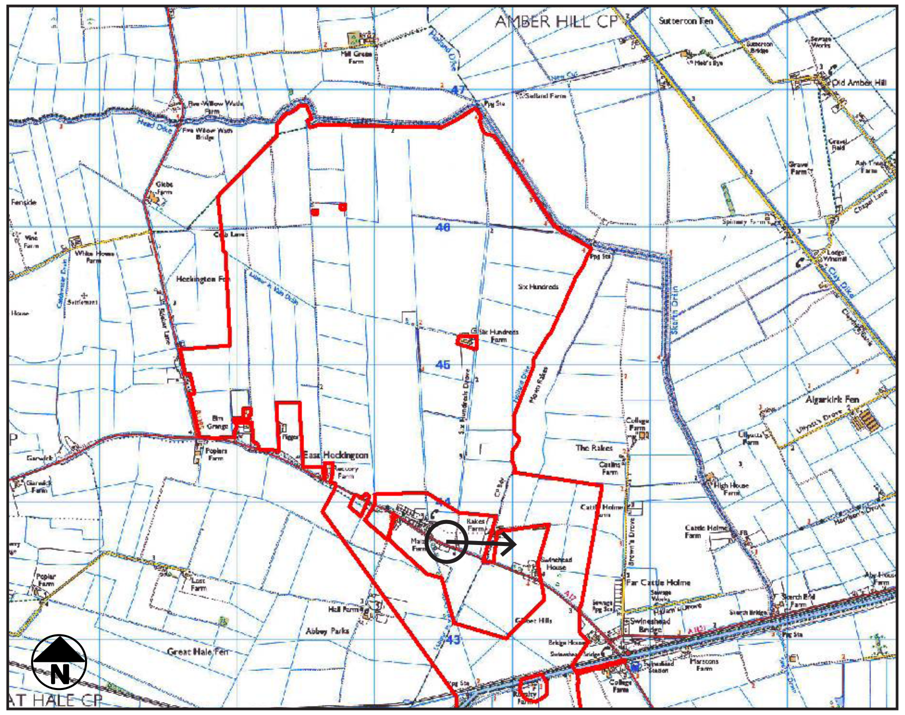
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 6C

Footway in East Heckington, near Six Hundred Farm House.



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 10:48	Distance from Energy Park	- 250m
OS grid reference	- 520544, 343690		

FIGURE 6.4

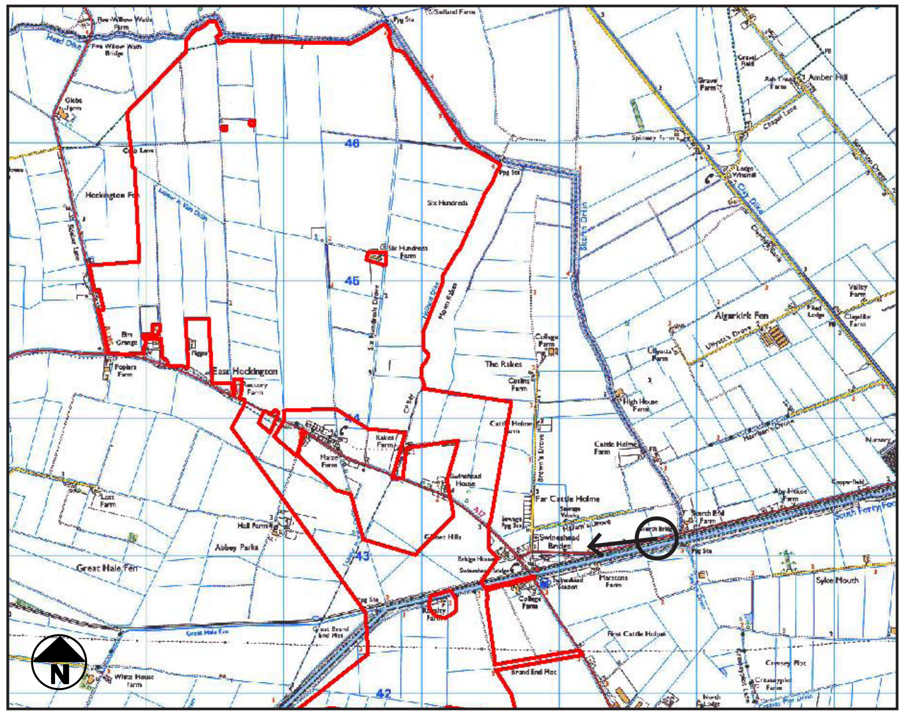
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 7A

Lay by along the A1121 near Skerth Bridge.



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 08/04/2022 @ 10:33	Distance from Energy Park	- 1970m
OS grid reference	- 522700, 343127		

FIGURE 6.4

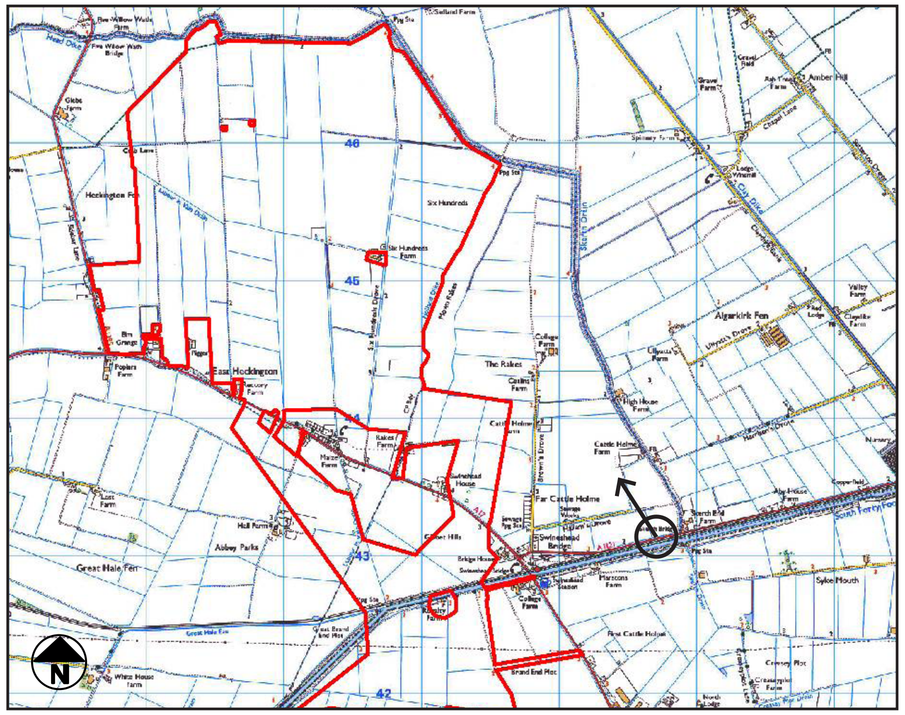
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 7B

Lay by along the A1121 near Skerth Bridge.



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 08/04/2022 @ 10:33	Distance from Energy Park	- 1970m
OS grid reference	- 522700, 343127		

FIGURE 6.4

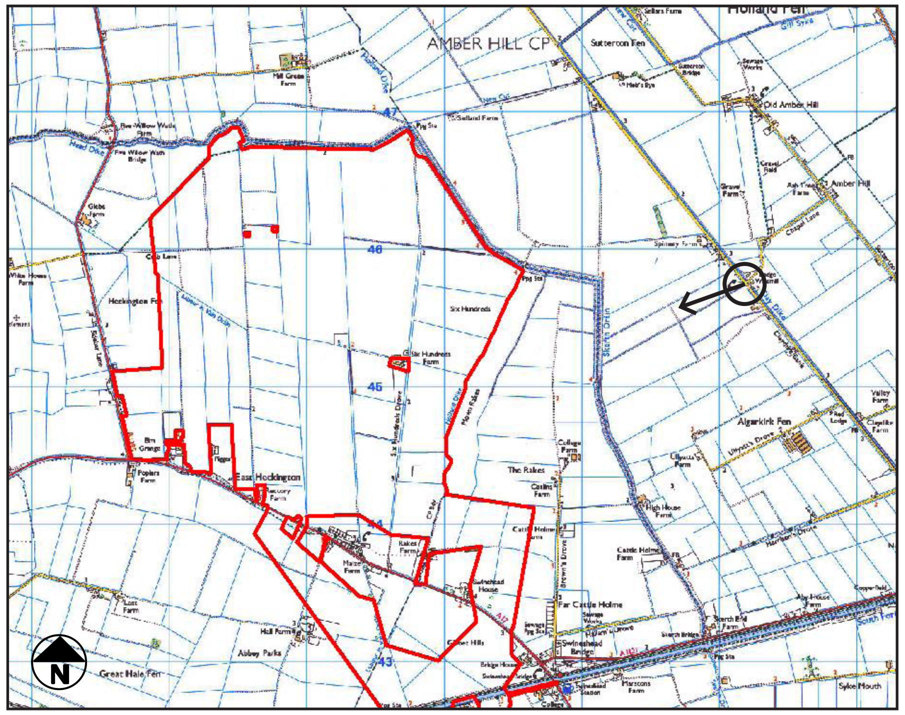
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 8

Claydike Bank, Amber Hill



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 08/04/2022 @ 09:51	Distance from Energy Park	- 1620m
OS grid reference	- 523207, 345738		

FIGURE 6.4

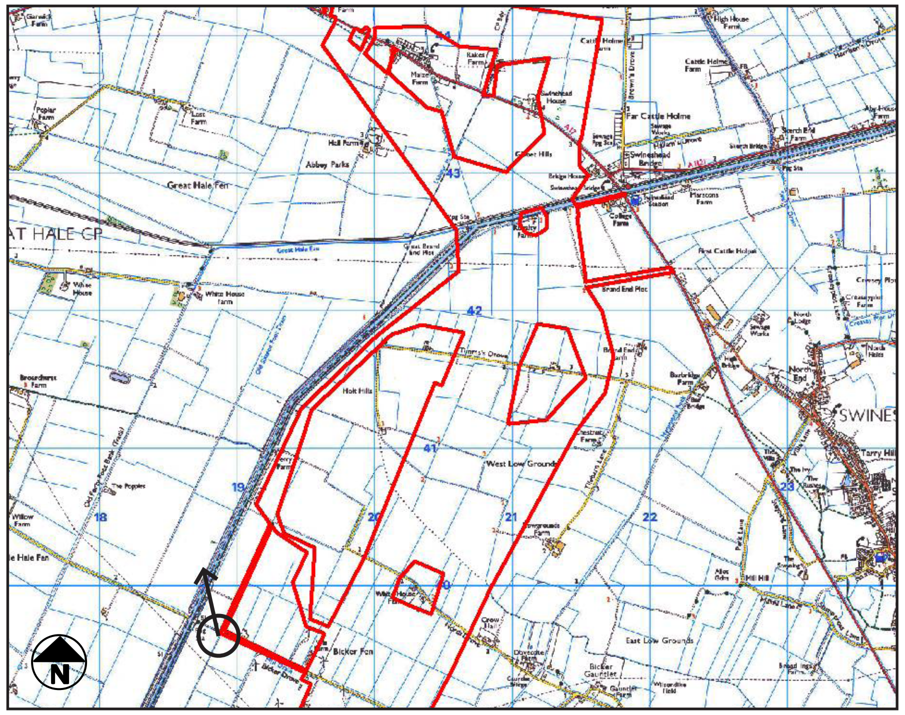
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 9A

Bicker Drove at Bicker Fen



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 08/04/2022 @ 16:01
OS grid reference - 518856, 339677

Viewpoint height (AOD) - 3m
Distance from Energy Park - 4470m

FIGURE 6.4

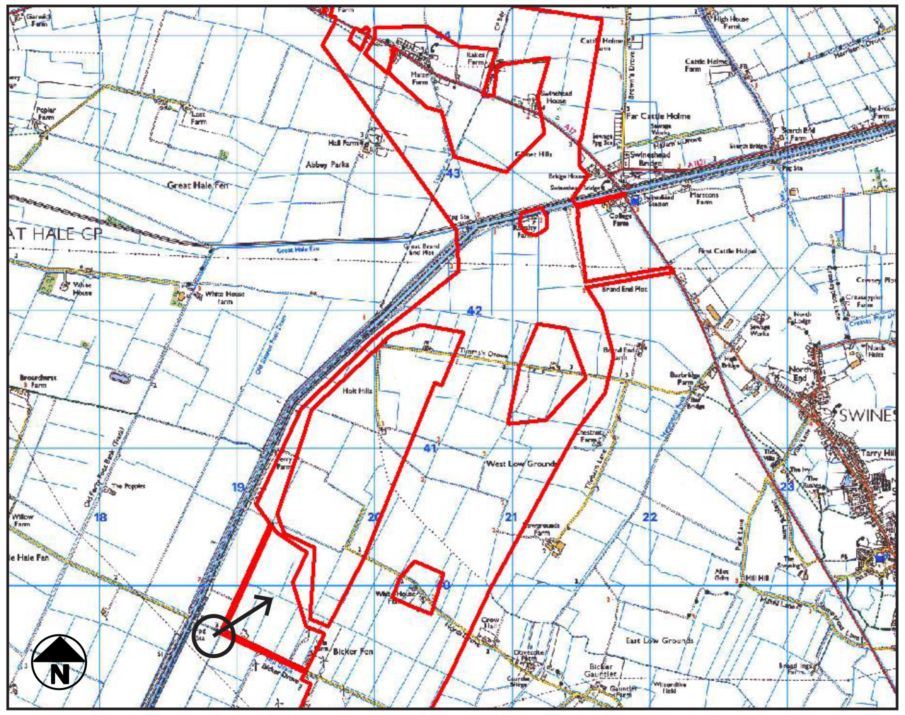
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 9B

Bicker Drove at Bicker Fen



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 16:01	Distance from Energy Park	- 4470m
OS grid reference	- 518856, 339677		

FIGURE 6.4

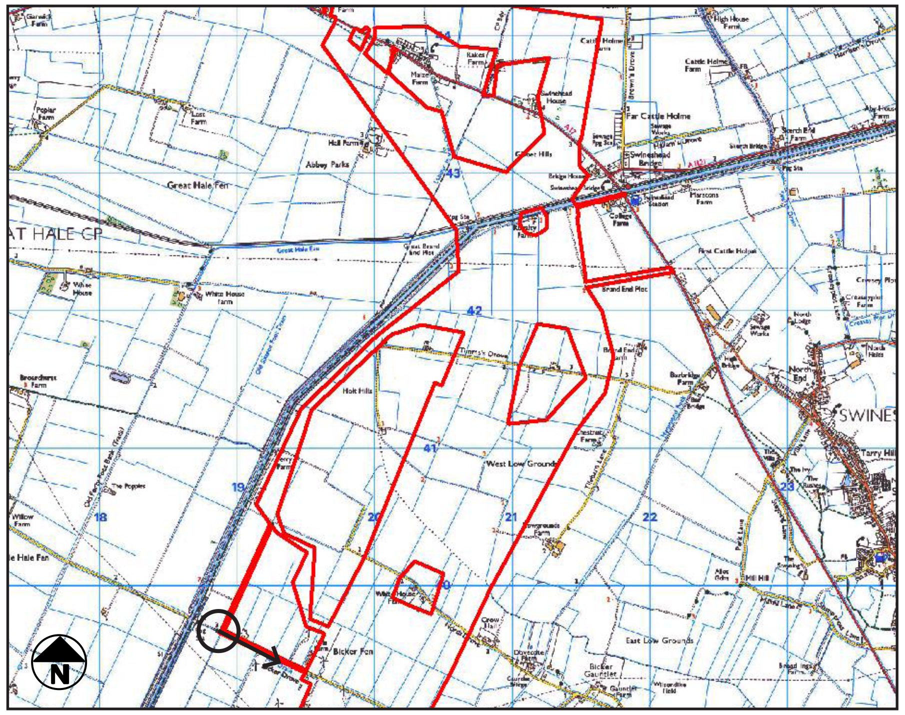
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 9C

Bicker Drove at Bicker Fen



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 16:01	Distance from Energy Park	- 4470m
OS grid reference	- 518856, 339677		

FIGURE 6.4

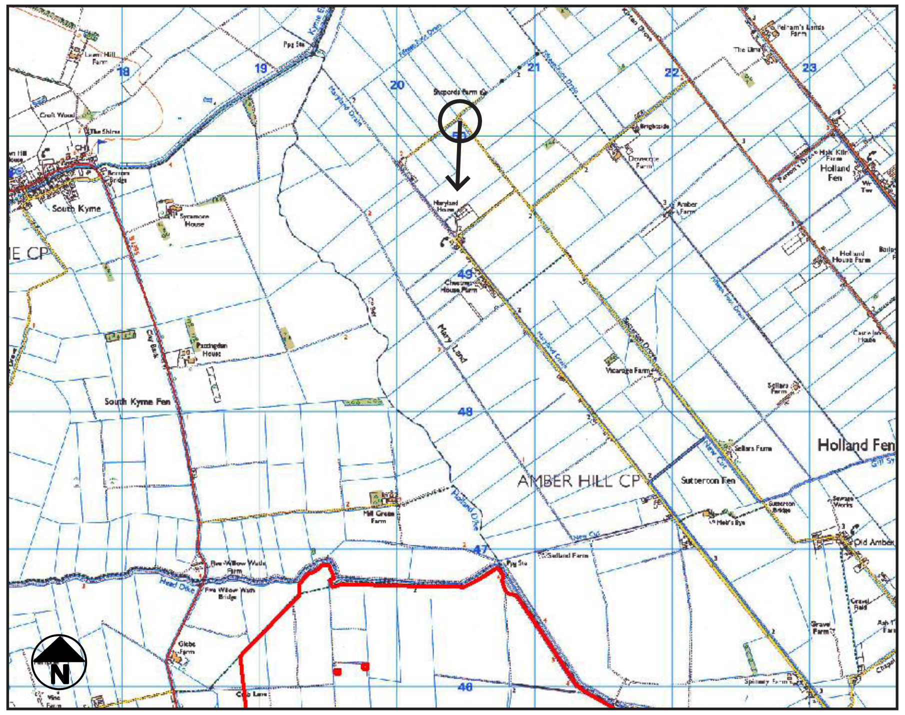
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 10

Sutterton Drove near Sheperds Farm



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 1m
Date & time of photograph	- 08/04/2022 @ 08:49	Distance from Energy Park	- 3240m
OS grid reference	- 520459, 350134		

FIGURE 6.4

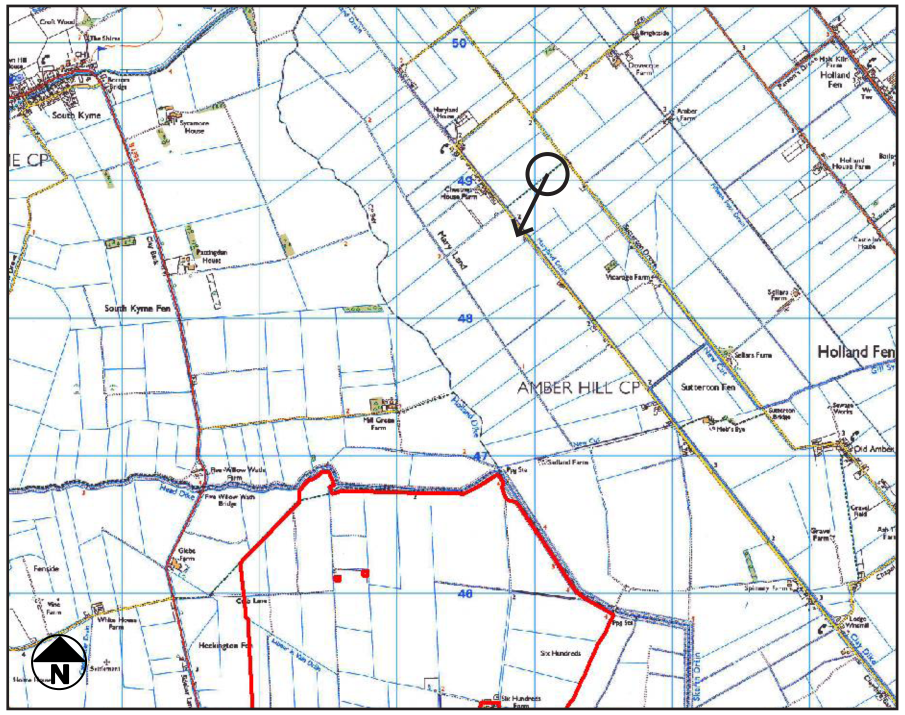
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 11

Public Footpath Ambe/5/1 near Chestnut House Farm



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 08/04/2022 @ 09:05	Distance from Energy Park	- 2120m
OS grid reference	- 521088, 349037		

FIGURE 6.4

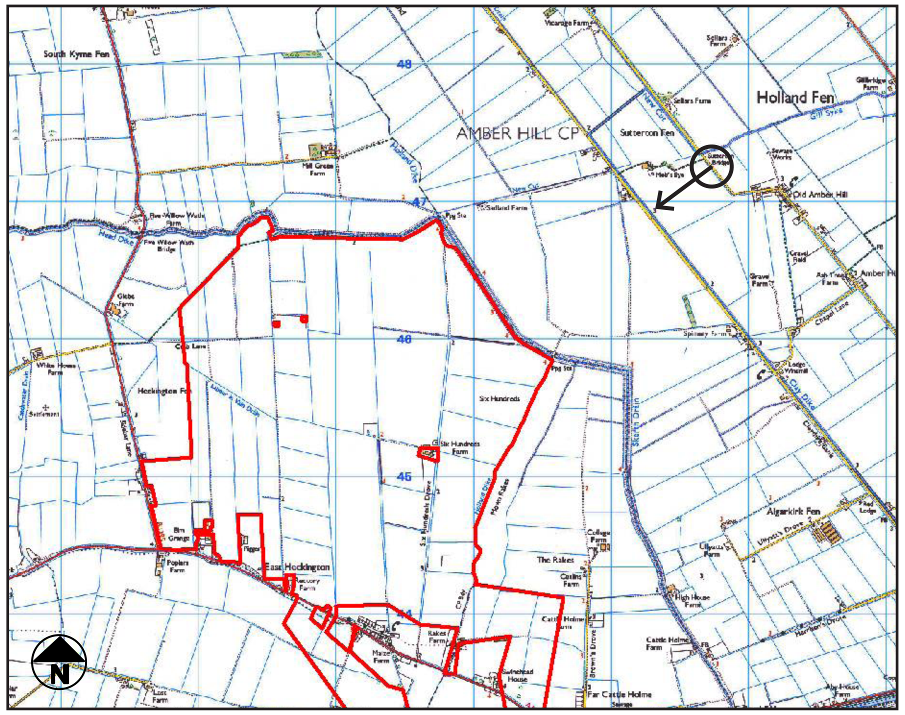
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 12

Sutterton Drove near Sutterton Bridge



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 08/04/2022 @ 09:18
OS grid reference - 522736, 347253

Viewpoint height (AOD) - 1m
Distance from Energy Park - 1880m

FIGURE 6.4

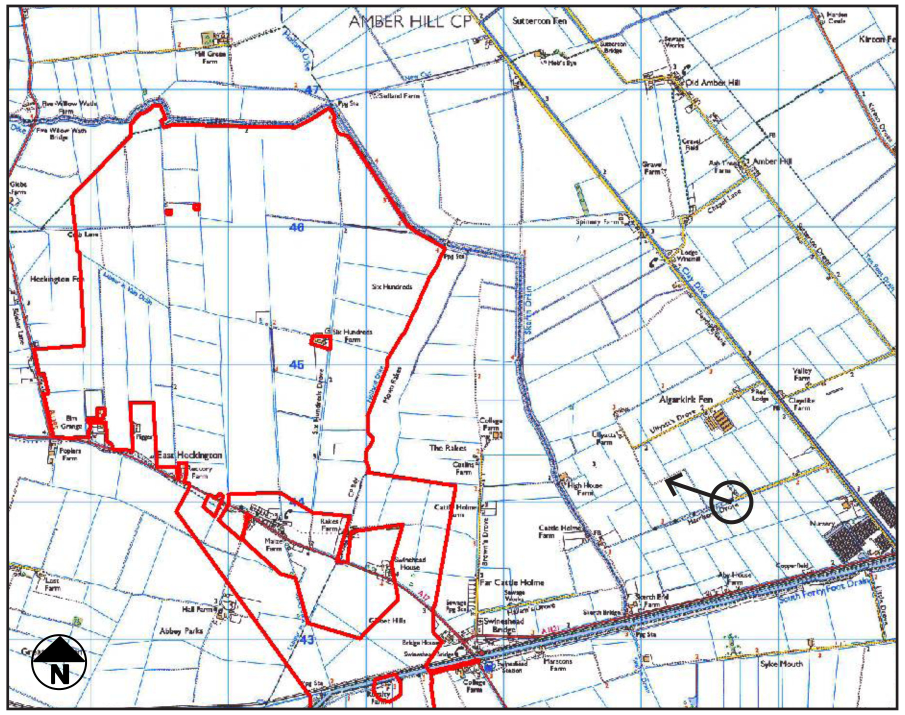
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 13

Harrison's Drove, Other Route with Public Access



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 08/04/2022 @ 10:14
OS grid reference - 523638, 344011

Viewpoint height (AOD) - 2m
Distance from Energy Park - 2620m

FIGURE 6.4

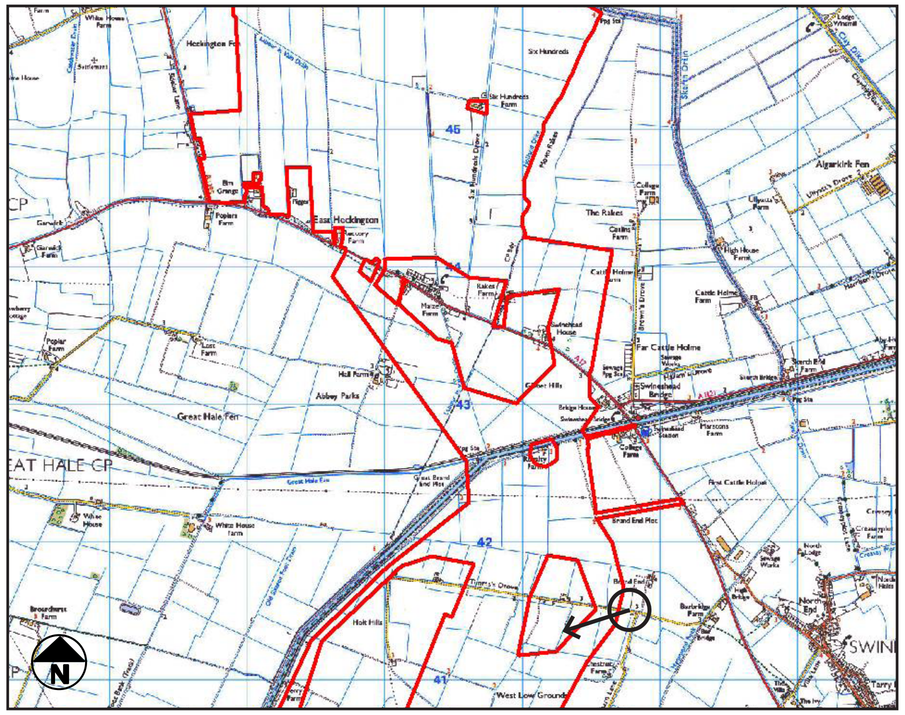
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 14A

Junction of Timm's Drove and Tilebarn Lane, West Low Grounds



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 15:33	Distance from Energy Park	- 2560m
OS grid reference	- 521781, 341502		

FIGURE 6.4

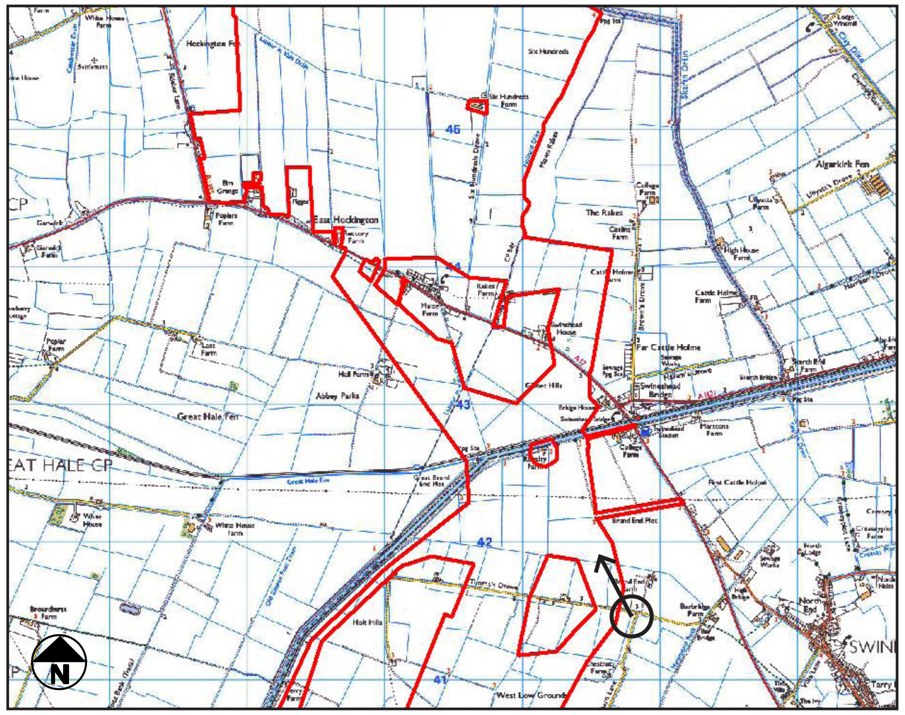
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 14B

Junction of Timm's Drove and Tilebarn Lane, West Low Grounds



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 15:33	Distance from Energy Park	- 2560m
OS grid reference	- 521781, 341502		

FIGURE 6.4

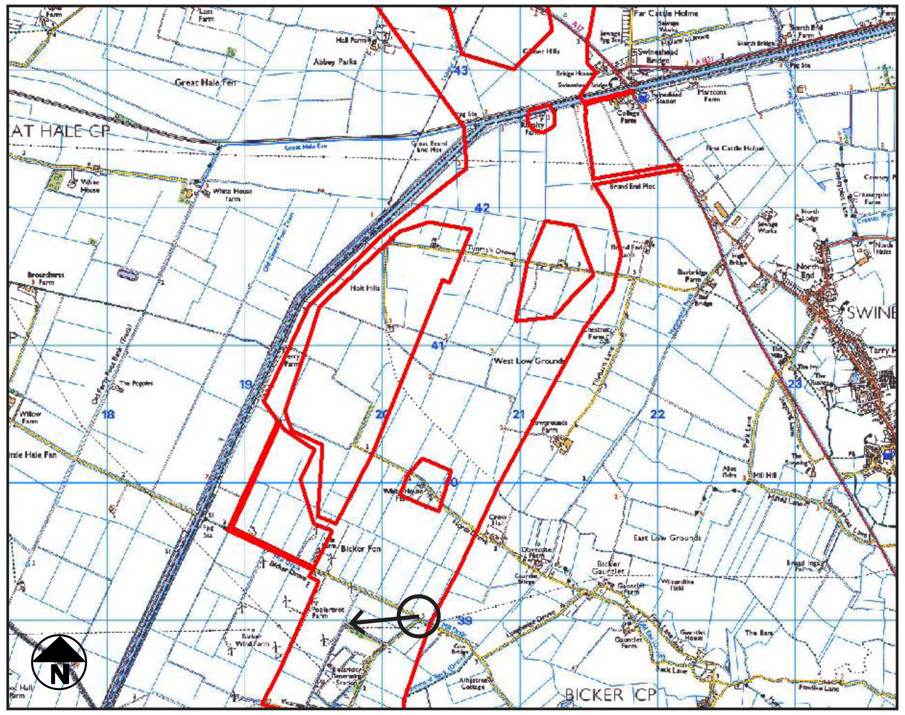
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 15A

Junction of Bicker Drove and Vicarage Drove along Mill Drain



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 08/04/2022 @ 15:49	Distance from Energy Park	- 4970m
OS grid reference	- 520257, 339031		

FIGURE 6.4

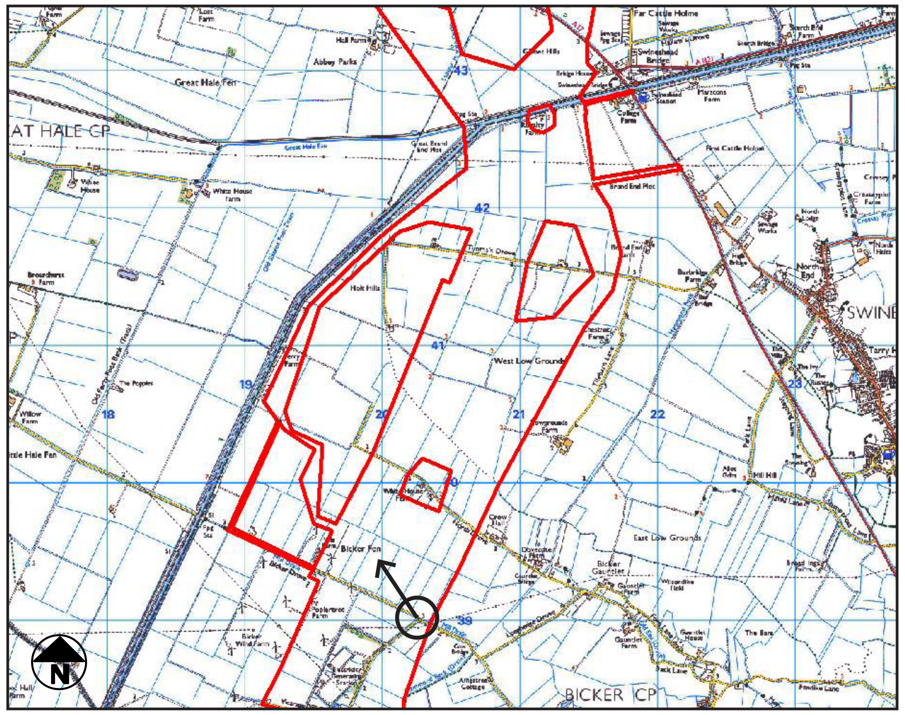
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 15B

Junction of Bicker Drove and Vicarage Drove along Mill Drain



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 08/04/2022 @ 15:49	Distance from Energy Park	- 4970m
OS grid reference	- 520257, 339031		

FIGURE 6.4

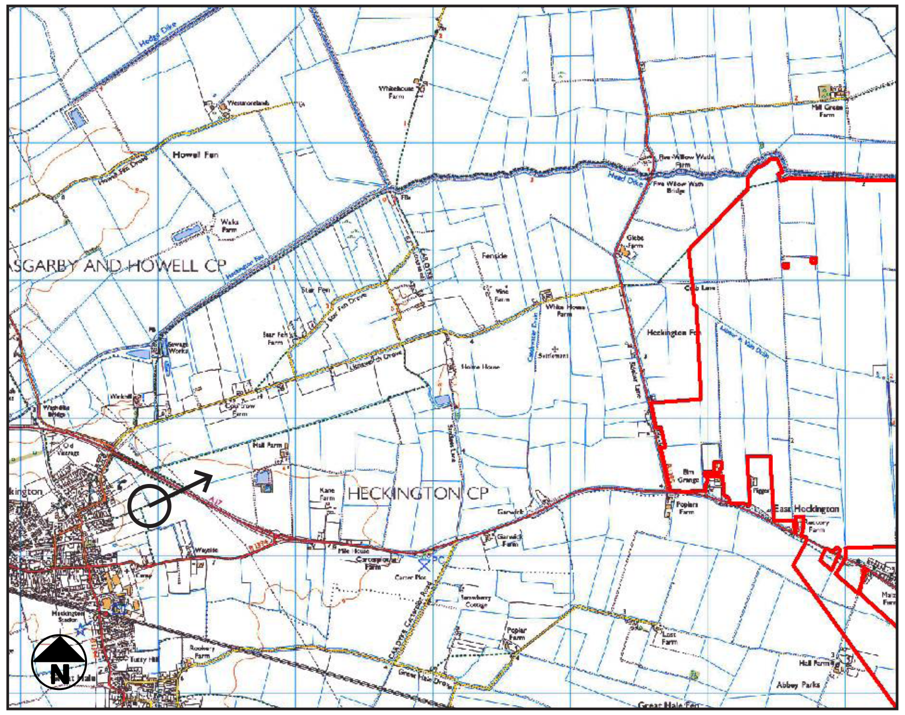
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 16

Public Footpath Heck/2/2, east of Heckington



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 19/05/2022 @ 11:12
OS grid reference - 514961, 344371

Viewpoint height (AOD) - 8m
Distance from Energy Park - 3700m

FIGURE 6.4

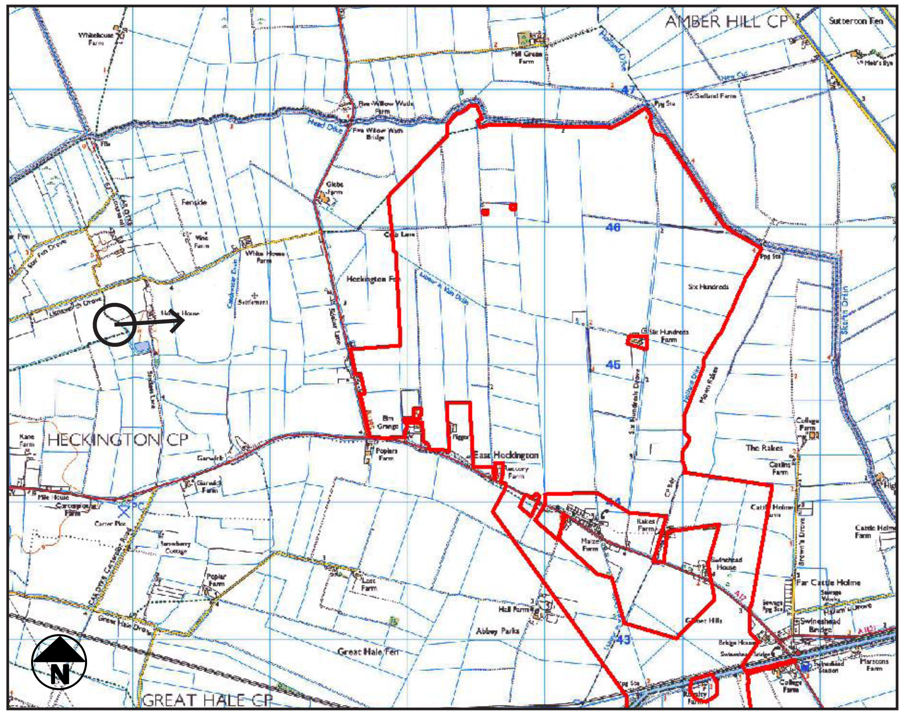
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 17

Public Footpath Heck/3/1 near Littleworth Drove and Holme House



Camera make & model	- Canon EOS 5D, FFS
Date & time of photograph	- 19/05/2022 @ 12:03
OS grid reference	- 516903, 345299
Viewpoint height (AOD)	- 4m
Distance from Energy Park	- 1700m

FIGURE 6.4

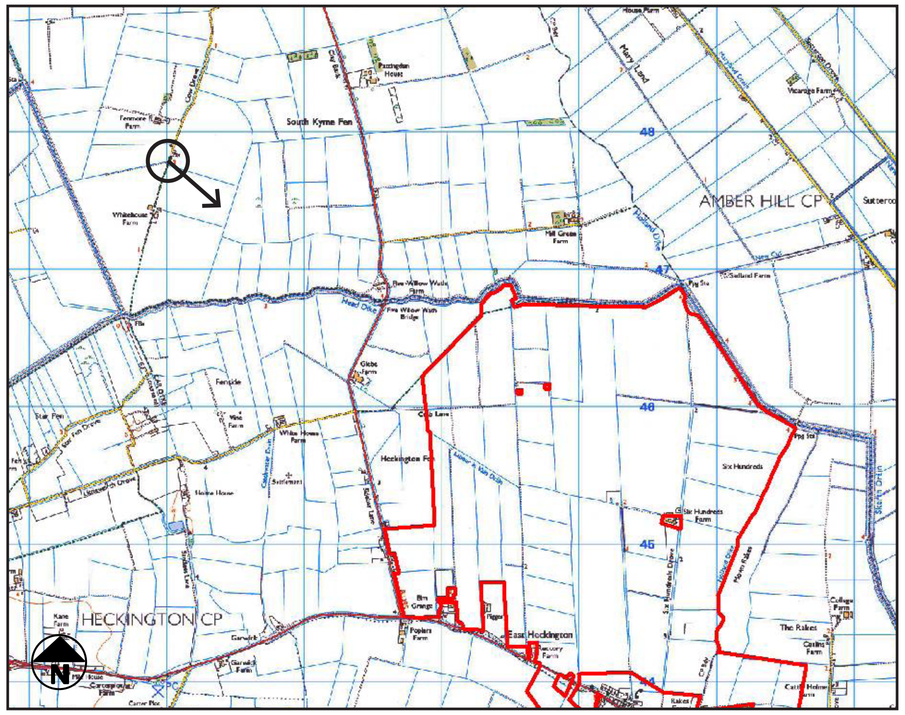
Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 18

Public Footpath SKym/1/1 and Cow Drove near Whitehouse Farm



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 1m
Date & time of photograph	- 19/05/2022 @ 13:44	Distance from Energy Park	- 2480m
OS grid reference	- 517017, 347777		

FIGURE 6.4

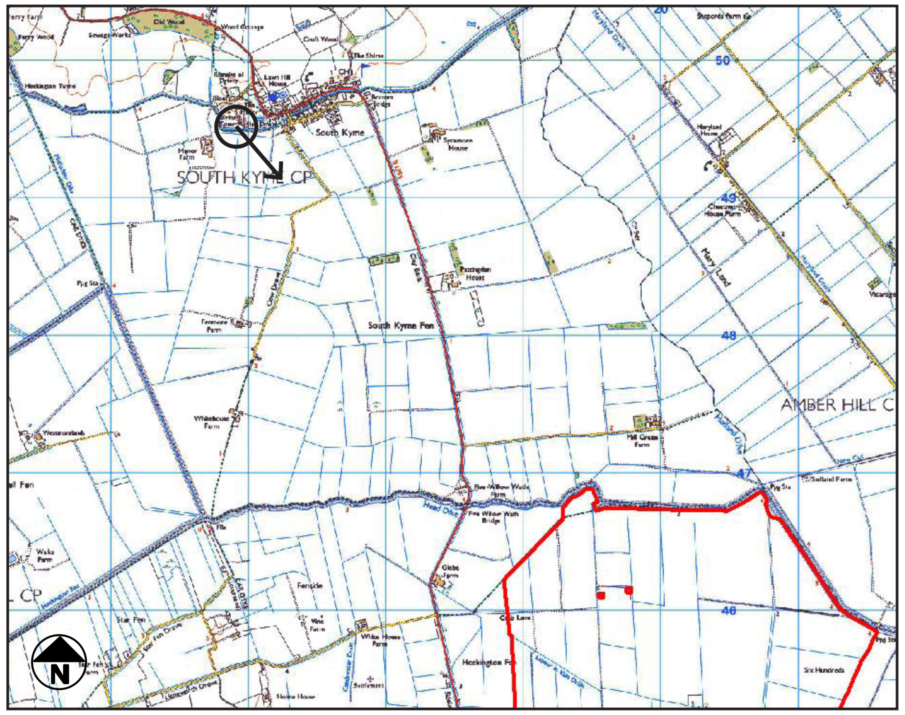
Context Baseline Views

DRWG No: **P20-2370_23** REV: _

Date: 26/05/2022

CONTEXT BASELINE VIEWPOINT 19

Public Footpath SKym/8/1, south western edge of South Kyme near Kyme Tower.



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m
Date & time of photograph	- 19/05/2022 @ 13:26	Distance from Energy Park	- 3530m
OS grid reference	- 516934, 349486		

FIGURE 6.4

Context Baseline Views

DRWG No: **P20-2370_23** REV: **_**

Date: 26/05/2022

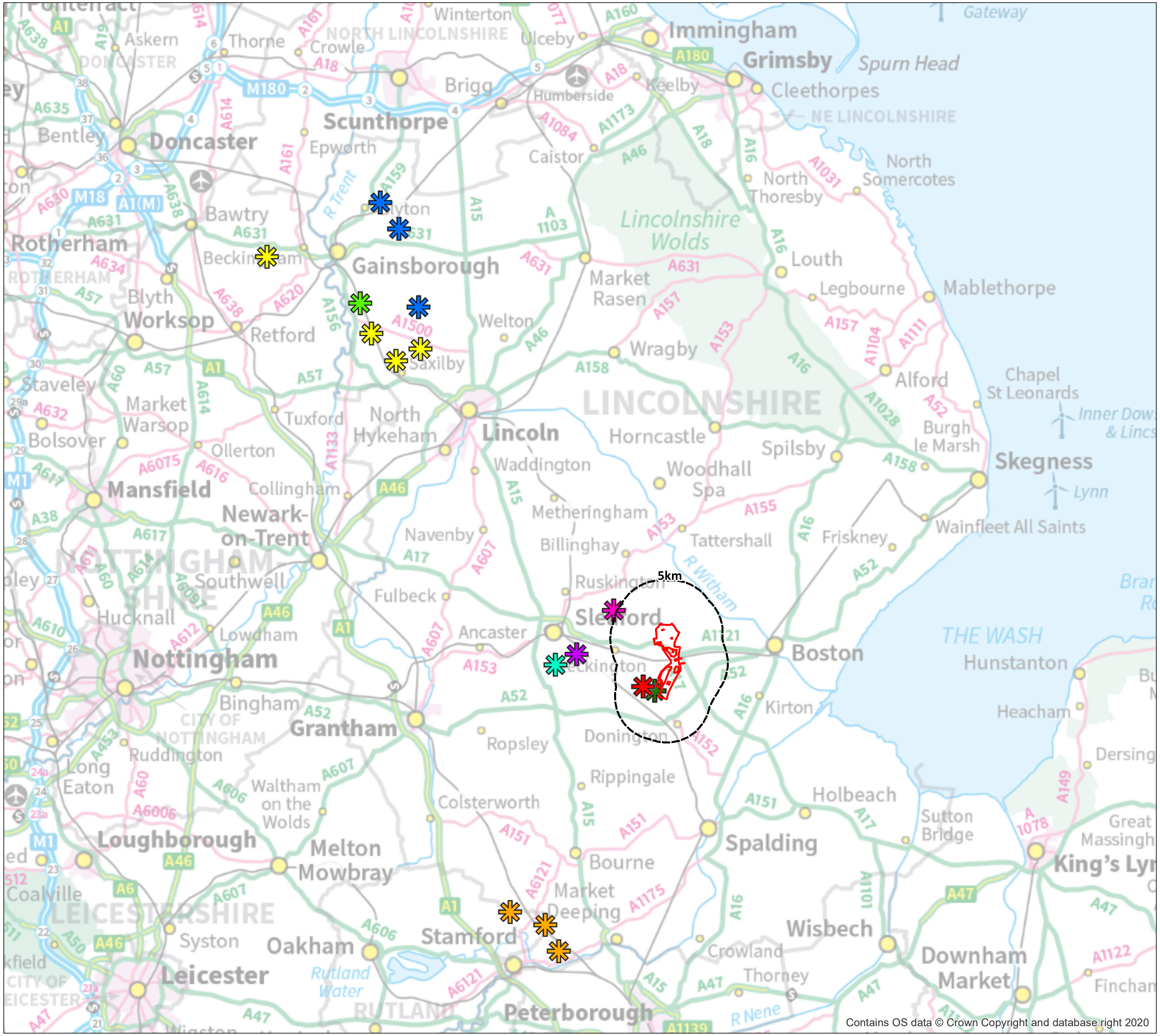
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 6.5- Cumulative Sites- Regional Context

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- 5km buffer
- Cottam Solar Project (Cottam 1,2 & 3)
- Land at Ewerby Thorpe - Screening 14/1034/EIASCR
- Gate Burton Energy Park
- Land South Of Gorse Lane Silk Willoughby Approved - 19/0060/FUL
- Land at Little Hale Fen - Screening 21/1337/EIASCR
- Mallard Pass Solar Farm
- West Burton Solar Project (Sites 1,2,3 & 4)
- Land to the North of White Cross Lane - Approved 19/0863/FUL
- Vicarage Drove [B/21/0443]

0 25 km

N

FIGURE 6.5

Cumulative Sites – Regional Context

DRWG No: **P20-2370_20** Sheet No: - REV: -

Date: 25/05/2022

Scale: 1:450,000 @ A3

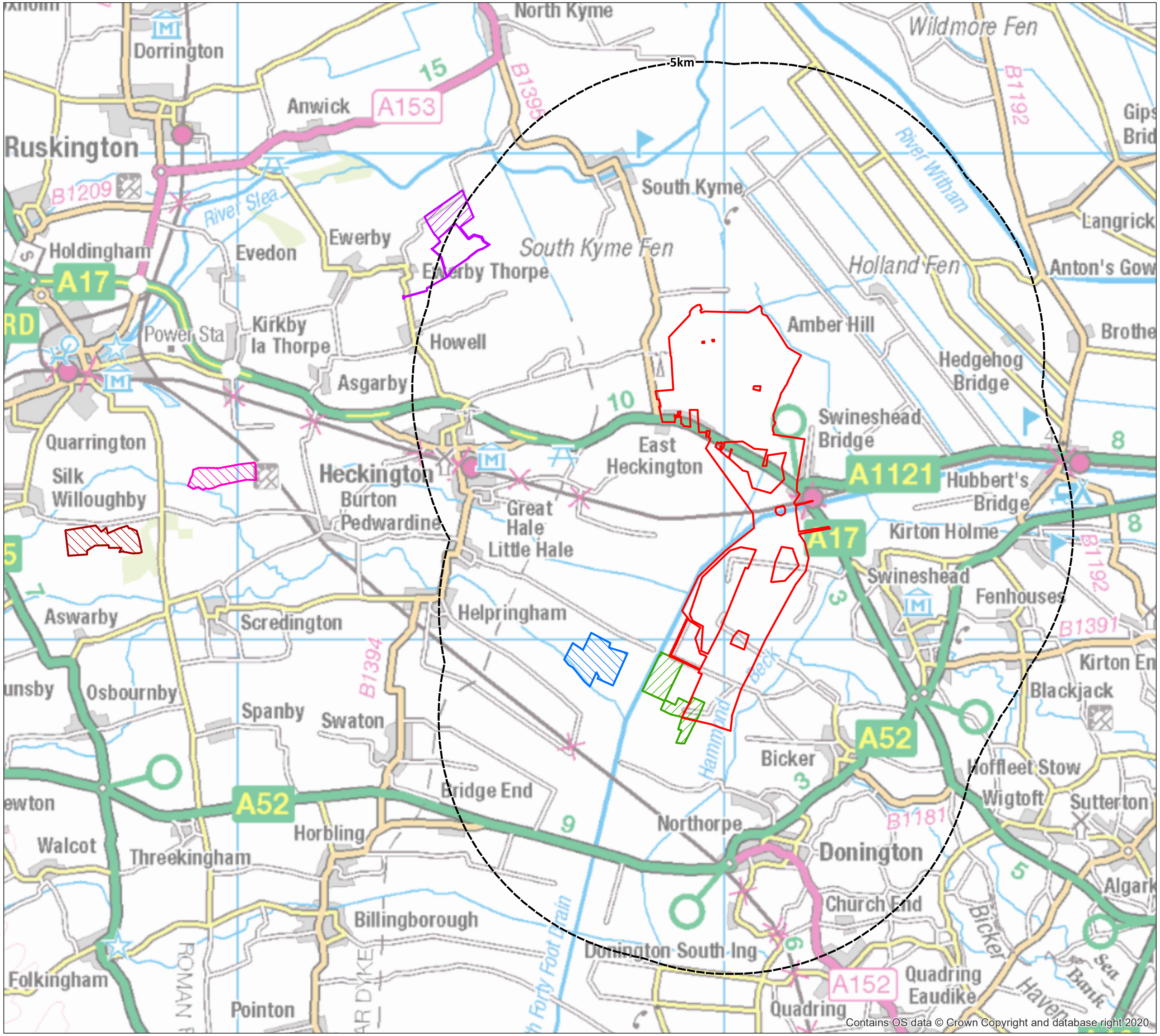
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 6.6- Cumulative Sites- Local Context

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- 5km buffer
- Land at Ewerby Thorpe - Screening 14/1034/EIASCR
- Land at Little Hale Fen - Screening 21/1337/EIASCR
- Land South Of Gorse Lane Silk Willoughby Approved - 19/0060/FUL
- Land to the North of White Cross Lane - Approved 19/0863/FUL
- Vicarage Drove [B/21/0443]

0 5 km

N

FIGURE 6.6

Cumulative Sites – Local Context

DRWG No: **P20-2370_21** Sheet No: - REV: -

Date: 25/05/2022

Scale: 1:80,000 @ A3

DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 6.7- Photomontages

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

Camera make & model	- CANON EOS 6D MkII	**Viewpoint height (AOD)**	- 3m	**Visualisation Type**	- Type 3
Lens make & focal length	- Canon EF 50mm, f/11 USM	**Distance from site**	- 150m	**Horizontal Field of View**	- 75˚
Date & time of photograph	- 08/04/2022 @ 10:48	**Projection**	- Cylindrical	**Height of camera AGL**	- 1.5m
OS grid reference	- 520544, 343690	**Sheet Size**	- A1	**Page size / Image size (mm)**	- 841 x 297 / 820 x 260

VIEWPOINT 6 – EXISTING
Footway in East Heckington, near Six Hundred Farm House

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

Camera make & model	- CANON EOS 6D MkII
Lens make & focal length	- Canon EF 50mm, f/11 USM
Date & time of photograph	- 08/04/2022 @ 10:48
OS grid reference	- 520544, 343690

Viewpoint height (AOD)	- 3m
Distance from site	- 150m
Projection	- Cylindrical
Sheet Size	- A1

Visualisation Type	- Type 3
Horizontal Field of View	- 75°
Height of camera AGL	- 1.5m
Page size / Image size (mm)	- 841 x 297 / 820 x 260

Key

- 400kV Substation
- 132kV Substation
- Energy Storage
- Solar Panels

Parameters

- Solar Panel Areas – height 4.5m
- 132KV substations – height 10m
- 400kv substation – height 15m
- Battery storage unit – height 6m

An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the location within the Energy Park Site.

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

VIEWPOINT 6 – PHOTOMONTAGE (YEAR 1)

Footway in East Heckington, near Six Hundred Farm House

DRWG NO: P20-2370 | DATE: 14/06/202

VIEWPOINT 6 – PHOTOMONTAGE (YEAR 10)

Footway in East Heckington, near Six Hundred Farm House

Camera make & model	- CANON EOS 6D MkII
Lens make & focal length	- Canon EF 50mm, f/11 USM
Date & time of photograph	- 08/04/2022 @ 10:48
OS grid reference	- 520544, 343690

Viewpoint height (AOD)	- 3m
Distance from site	- 150m
Projection	- Cylindrical
Sheet Size	- A1

Visualisation Type	- Type 3
Horizontal Field of View	- 75˚
Height of camera AGL	- 1.5m
Page size / Image size (mm)	- 841 x 297 / 820 x 260

Key

- 400kV Substation
- 132kV Substation
- Energy Storage
- Solar Panels

Parameters

Solar Panel Areas – height 4.5m
132KV substations – height 10m
400kv substation – height 15m
Battery storage unit – height 6m

An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the location within the Energy Park Site.

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

DRWG NO: P20-2370 | DATE: 14/06/202

FIGURE 6.7 | PHOTOMONTAGES

Camera make & model	- CANON EOS 6D MkII	**Viewpoint height (AOD)**	- 2m	**Visualisation Type**	- Type 3
Lens make & focal length	- Canon EF 50mm, f/11 USM	**Distance from site**	- 1620m	**Horizontal Field of View**	- 75˚
Date & time of photograph	- 08/04/2022 @ 09:51	**Projection**	- Cylindrical	**Height of camera AGL**	- 1.5m
OS grid reference	- 523207, .345738	**Sheet Size**	- A1	**Page size / Image size (mm)**	- 841 x 297 / 820 x 260

DRWG NO: P20-2370 | DATE: 14/06/202

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

VIEWPOINT 8 – EXISTING
Claydike Bank, Amber Hill

FIGURE 6.7 | PHOTOMONTAGES

Camera make & model	- CANON EOS 6D MkII	**Viewpoint height (AOD)**	- 2m	**Visualisation Type**	- Type 3
Lens make & focal length	- Canon EF 50mm, f/11 USM	**Distance from site**	- 1620m	**Horizontal Field of View**	- 75˚
Date & time of photograph	- 08/04/2022 @ 09:51	**Projection**	- Cylindrical	**Height of camera AGL**	- 1.5m
OS grid reference	- 523207, .345738	**Sheet Size**	- A1	**Page size / Image size (mm)**	- 841 x 297 / 820 x 260

DRWG NO: P20-2370 | DATE: 14/06/202

Key

- 400kV Substation
- 132kV Substation
- Energy Storage
- Solar Panels

Parameters

- Solar Panel Areas – height 4.5m
- 132KV substations – height 10m
- 400kv substation – height 15m
- Battery storage unit – height 6m

An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the location within the Energy Park Site.

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

VIEWPOINT 8 – PHOTOMONTAGE (YEAR 1)

Claydike Bank, Amber Hill

Camera make & model	- CANON EOS 6D MkII
Lens make & focal length	- Canon EF 50mm, f/11 USM
Date & time of photograph	- 08/04/2022 @ 09:51
OS grid reference	- 523207, .345738

Viewpoint height (AOD)	- 2m
Distance from site	- 1620m
Projection	- Cylindrical
Sheet Size	- A1

Visualisation Type	- Type 3
Horizontal Field of View	- 75°
Height of camera AGL	- 1.5m
Page size / Image size (mm)	- 841 x 297 / 820 x 260

DRWG NO: P20-2370 | DATE: 14/06/202

Key

400kV Substation

132kV Substation

Energy Storage

Solar Panels

Parameters

Solar Panel Areas – height 4.5m

132KV substations – height 10m

400kv substation – height 15m

Battery storage unit – height 6m

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the location within the Energy Park Site.

VIEWPOINT 8 – PHOTOMONTAGE (YEAR 10)

Claydike Bank, Amber Hill

Camera make & model	- CANON EOS 6D MkII	Viewpoint height (AOD)	- 1m	Visualisation Type	- Type 3
Lens make & focal length	- Canon EF 50mm, f/11 USM	Distance from site	- 2480m	Horizontal Field of View	- 75˚
Date & time of photograph	- 19/05/2022 @ 13:44	Projection	- Cylindrical	Height of camera AGL	- 1.5m
OS grid reference	- 517017, 347777	Sheet Size	- A1	Page size / Image size (mm)	- 841 x 297 / 820 x 260

VIEWPOINT 18 – EXISTING

Public Footpath SKym/1/1 and Cow Drove near Whitehouse Farm

DRWG NO: P20-2370 | DATE: 14/06/202

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

FIGURE 6.7 | PHOTOMONTAGES

VIEWPOINT 18 – PHOTOMONTAGE (YEAR 1)

Public Footpath SKym/1/1 and Cow Drove near Whitehouse Farm

Camera make & model	- CANON EOS 6D MkII
Lens make & focal length	- Canon EF 50mm, f/11 USM
Date & time of photograph	- 19/05/2022 @ 13:44
OS grid reference	- 517017, 347777
Viewpoint height (AOD)	- 1m
Distance from site	- 2480m
Projection	- Cylindrical
Sheet Size	- A1
Visualisation Type	- Type 3
Horizontal Field of View	- 75°
Height of camera AGL	- 1.5m
Page size / Image size (mm)	- 841 x 297 / 820 x 260

DRWG NO: P20-2370 | DATE: 14/06/202

Key

400kV Substation

132kV Substation

Energy Storage

Solar Panels

Parameters

Solar Panel Areas – height 4.5m

132KV substations – height 10m

400kv substation – height 15m

Battery storage unit – height 6m

An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the location within the Energy Park Site.

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

FIGURE 6.7 | PHOTOMONTAGES

Camera make & model	- CANON EOS 6D MkII
Lens make & focal length	- Canon EF 50mm, f/11 USM
Date & time of photograph	- 19/05/2022 @ 13:44
OS grid reference	- 517017, 347777

Viewpoint height (AOD)	- 1m
Distance from site	- 2480m
Projection	- Cylindrical
Sheet Size	- A1

Visualisation Type	- Type 3
Horizontal Field of View	- 75˚
Height of camera AGL	- 1.5m
Page size / Image size (mm)	- 841 x 297 / 820 x 260

DRWG NO: P20-2370 | DATE: 14/06/202

Key

400kV Substation

132kV Substation

Energy Storage

Solar Panels

Parameters

Solar Panel Areas – height 4.5m

132KV substations – height 10m

400kv substation – height 15m

Battery storage unit – height 6m

An increase in elevation to water sensitive equipment (such as substations and control buildings) may be required following the conclusion of the hydraulic modelling, this is estimated to be up 1.5m depending on the location within the Energy Park Site.

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

VIEWPOINT 18 – PHOTOMONTAGE (YEAR 10)

Public Footpath SKym/1/1 and Cow Drove near Whitehouse Farm

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 7: Residential Visual Amenity

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

7 RESIDENTIAL VISUAL AMENITY

7.1 EXECUTIVE SUMMARY

7.1.1 This Residential Visual Amenity Assessment (RVAA) seeks to determine the preliminary visual effects upon the identified residential receptors and whether or not the Energy Park would result in unacceptable consequences to living conditions such that consent should be refused in the public interest.

7.1.2 The findings of this PEIR Chapter 7: RVAA demonstrate that the Energy Park would cause some localised significant visual effects but such effects would not be overbearing.

7.2 INTRODUCTION

7.2.1 This chapter, prepared by Pegasus Environmental (part of Pegasus Group), constitutes a Residential Visual Amenity Assessment (RVAA). It contains a preliminary assessment of the visual effects upon the nearby residential receptors associated with the settlement of East Heckington and other nearby properties identified within the 1km radii. This **Chapter 7** and its scope of work and methodology reflects the information provided in the Environmental Impact Assessment Scoping Report, submitted to the Secretary of State on 07 January 2022.

7.2.2 This RVAA has been undertaken with regards to the best practice within the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3) and more specifically within the Landscape Institute's Technical Guidance Note 2/19.

7.2.3 It is a widely accepted and long held planning principle that no individual person has a private right to a view. However, there are situations where the effect on the outlook or the visual amenity of a residential property and associated living conditions would be so great that it would not be considered in the public interest to permit such conditions to occur where they did not previously exist. This is a high threshold in terms what would be regarded as unacceptable in terms of residential visual amenity and has to date been associated with the assessment of wind farm developments. The impact for large scale solar PV developments of low vertical elevation is novel and the subject of this assessment.

7.2.4 The requirement for Residential Visual Amenity Assessment (RVAA) has to date been concerned with wind farm planning applications that would potentially give rise to unacceptable effects on residential visual amenity due to their vertical elevation. In this regard, Inspector Lavender within the Carland Cross Appeal Decision (APP/D0840/A/0921030260) summarised within paragraph 23 that:

> **"The planning system is designed to protect public rather than private interests, but both interests coincide here where, for example, a visual intrusion is of such a magnitude as to render a property an unattractive place to live. This is because it is not in the public interest to create such living conditions where they did not exist before. This I do not consider that simply being able to see a turbine or turbines from a particular window or part of a garden of a house is sufficient reason to find the visual impact unacceptable (even though a particular occupier might find it objectionable). However, when turbines are present in such number, size and proximity that they represent an unpleasantly overwhelming and unavoidable presence in main views from a house or garden, there is every**

> **likelihood that the property concerned would come to be widely regarded as unattractive (rather than simply less attractive, but not necessarily unhabitable) place in which to live."**

7.2.5 In recent years residential visual amenity assessments has been conducted for a number of solar energy schemes, which due to the economy of scale become increasingly larger. This is particularly relevant to solar energy developments that fall within the definition of major infrastructure projects, taken through the Development Consent Order (DCO) process. The approved Cleve Hill Solar Park is the first DCO solar farm in England and included a separate RVAA as part of this Environmental Statement. In comparison, the Sunnica Energy Park (under consideration) excluded a separate RVAA on the basis that none of the analysed residential receptors were assessed as experiencing significant residual adverse effects.

7.2.6 This threshold regarding the acceptability of visual effects on the living conditions of residential properties in the public interest has become widely known within the renewables sector as the 'Lavender Test'. This RVAA seeks to determine whether or not the Energy Park would give rise to significant visual effects on the surrounding residential properties and whether the proposed infrastructure and new planting of the Energy Park would appear oppressive, overbearing or overwhelming on living conditions as a matter for the public interest.

7.2.7 This RVAA has been undertaken by Chartered Members of the Landscape Institute (CMLI) within Pegasus Group between April and May 2022 and should be read in conjunction with the Landscape and Visual Impact Assessment (see **PEIR Chapter 6**).

7.3 METHODOLOGY

7.3.1 Institute's Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3) and Technical Guidance Note 2/19. The TGN advises in paragraph 1.6 that:

> **"It is not uncommon for significant adverse effects on views and visual amenity to be experienced by people at their place of residence as a result of introducing new development in the landscape. In itself this does not necessarily cause a planning concern. However, there are situations where the effect on the outlook / visual amenity of a residential property is so great that it is not generally considered to be in the public interest to permit such conditions where they did not exist before."**

7.3.2 In accordance with the Technical Guidance Note 2/19, this RVAA comprises a four stage process including:

> **1. Definition of the scope and study area for the assessment – informed by the description of the proposed development, defining the study area extent and scope of the assessment with respect to the properties to be included;**
>
> **2. Evaluation of the baseline visual amenity for the surrounding residential properties – having regard to the landscape and visual context and the development proposed;**
>
> **3. Assessment of the likely change to the visual amenity of the residential properties in accordance with GLVIA3 principles and processes; and**

4. Further assessment in respect of the acceptable threshold for residential visual amenity and living conditions in the public interest.

7.3.3 The process is summarised within the Technical Guidance Note 2/19 as included in **Appendix 7.1**.

Definition of the Scope and Study Area

7.3.4 The scope and study area of residential properties included within this RVAA has been informed by the findings of the LVIA, the Zone of Theoretical Visibility (ZTV) mapping, and post code data. The identified 1km radii study area has been considered appropriate and proportionate, and its appropriateness has been confirmed by North Kesteven District Council in their consultation to the Scoping Opinion:

> **"At this stage the Council consider that the assessment area for the RVAA is likely to be no more than 1km from the site boundary based on the stated dimensions of the plant and equipment proposed."**

7.3.5 The residential properties included within this RVAA are shown on **Figure 7.1**, Site Location Plan and Residential Receptors with views from these properties illustrated on Photoviews **Figure 7.2**.

7.3.6 Given the type and scale of the Energy Park and the dispersed nature of the surrounding residential properties, the likelihood of any significant visual effects is considered to be restricted to those within the immediate surroundings of the Energy Park. This was mainly due to the limited vertical elevation of the proposed solar arrays to a maximum height of +4.5 metres above ground level (agl) and offset between taller elements of the Energy Park and the nearby residential properties.

7.3.7 Letters were sent to each of the identified residential properties based upon post code data to request access to the individual properties, curtilages and private gardens for the assessment. If no response was received, 'proxy viewpoints' have been undertaken from publicly accessible locations as close as possible to the residential property in question. If this was not possible, proxy viewpoints have been undertaken from within the Energy Park Site itself facing back towards the residential property.

7.3.8 A total of 105 no. of letters were sent to the residential properties identified through the post code data.

7.3.9 3 no. of letters that were sent out have been returned by Royal Mail, with the following feedback:

- Hall Farm Cottage – addressee not available.
- Hall Farm – address incomplete.
- Hydeaway – no such address.

7.3.10 The following 9 no. of residential properties have responded to the request, and been included within the scope of this RVAA as shown on **Figure 7.1**:

1. 4 New Cottages.
2. Saona, 1 Sidebar Lane.
3. Elm Grange.
4. The Cottage, East Heckington, PE20 3QF.
5. Home Farm, East Heckington PE20 3QF.
6. 1 Parks Farm Cottage, East Heckington, PE20 3QG.

7. The Lodge, Old Main Road, East Heckington, PE20 3QB.
8. Six Hundred Farm, Six Hundred Drove, East Heckington, PE20 3QA.
9. Cattle Holme Barn, Browns Drove, Swineshead Bridge PE20 3PX.

7.3.11 In addition, residents at 2 Parks Farm Cottage, East Heckington, PE20 3QG, have also responded but were not available to take part in the RVAA.

7.3.12 Distant views of the solar modules and substations may be perceptible beyond the extent of these residential properties within the study area. However, even with clear visibility, the effects on residential visual amenity and living conditions would not be considered significant or unacceptable beyond this identified scope.

7.3.13 This PEIR Chapter 7 only comments on the visual amenity of those residents that have responded to Pegasus' letters.

7.3.14 Due to the very limited number of responses received, and distribution of those that have responded to Pegasus' letters, the subsequent RVAA Chapter 7 of the ES will analyse the residential amenity based on a combination of individual properties and residential clusters.

Evaluation of the Baseline Visual Amenity

7.3.15 The evaluation of baseline visual amenity considers the type, nature, extent and quality of the existing views from the residential properties including building curtilages, private gardens and driveways. Technical Guidance Note 2/19 advises in paragraph 4.11 that:

> **"When evaluating the baseline, it is recommended that the following aspects are considered:**
>
> - **the nature and extent of all potentially available existing views from the property and its garden / domestic curtilage, including the proximity and relationship of the property to surrounding landform, landcover and visual foci. This may include primary / main views from the property or domestic curtilage, as well as secondary / peripheral views; and**
>
> - **views as experienced when arriving at or leaving the property, for example from private driveways / access tracks."**

7.3.16 In accordance with the principles and processes of GLVIA3, the visual effects have been determined by cross-referencing the sensitivity of the visual receptor with the magnitude of change arising from the Energy Park. Residential properties are generally considered to be of high sensitivity within GLVIA3. However, TGN 2/19 advocates a further detailed review and refined survey of the residential properties in question with regards to the potential sensitivities in relation to the proposed Energy Park development.

7.3.17 Higher sensitivity areas of the residential properties might include:

- Views from ground floor windows on principal elevations of the building and are likely to correspond to primary living rooms such as lounge, dining rooms, kitchens or conservatories; and
- Views from rear gardens or heavily frequented parts of a garden where an appreciation of the surrounding landscape is likely to be fundamental to the enjoyment of the space.

7.3.18 Lower sensitivity areas of the residential properties might include:

- Views from upper floor windows on principal elevations of the building likely to correspond to bedrooms and study / office rooms.
- Views from front gardens or parts of the curtilage to the building where it is likely that the focus of attention is on an activity such as gardening rather than on the surrounding landscape.
- Views from windows on side elevations and from windows likely to correspond to utility rooms, bathrooms, etc.
- Views from parts of the garden or building curtilage with a purely functional purpose such as a driveway or storage area, etc or land worked as part of a business.

Assessment of the Magnitude of Change on the Residential Properties

7.3.19 Visual amenity is defined within GLVIA3 as:

> **"The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area."**

7.3.20 Visual effects on the surrounding residential properties would potentially arise through the introduction of the solar arrays, security fencing, CCTV, transformers, access tracks and cabling located within the Energy Park. The solar arrays are typically of low profile but in the case of the Energy Park their upper edge may reach up to 4.5m due to flood risk issue. Visual effects can also arise through the removal of landscape features such as woodlands, hedgerows or trees to expose views of the solar arrays. However, the Applicant has sought to avoid such impacts with no tree and hedgerow removal proposed.

7.3.21 In general terms, the magnitude of change on the residential properties will decrease with distance from the Energy Park and will reduce further once the proposed mitigation planting has established. Other influencing factors affecting the magnitude of change might include:

- Whether the view of the solar arrays is in a direct or oblique angle from the primary orientation or active frontage of the property.
- The extent to which the view is obstructed by vegetation or other built structures.
- The extent to which the current view is influenced by existing built structures (e.g. buildings, roads, pylons and transmission lines, etc).

7.3.22 The magnitude of change on the surrounding residential properties is assessed on the following scale:

- High – a change in the view that on balance has a defining influence on the overall visual amenity of the residential receptor.
- Medium – some change in the view that on balance is clearly visible and forms an important but not a defining influence on the overall visual amenity of the residential receptor.
- Low – some change in the view that on balance is visible although has a subservient influence on the overall visual amenity of the residential receptor.
- Negligible – no change or small to imperceptible visual influence on the overall visual amenity of the residential receptor.

7.3.23 The likely significance of effects is dependent on all of the factors considered in the sensitivity and the magnitude of change upon the residential receptors. These factors are assimilated to assess whether or not the proposed Energy Park will have a likely significant or not significant effect. The variables considered in the evaluation of the sensitivity and the magnitude of change is reviewed holistically to inform the professional judgement of significance.

7.3.24 A likely significant effect will occur where the combination of the variables results in the Energy Park having a definitive effect on the view. A not significant effect will occur where the appearance of the Energy Park is not definitive, and the effect continues to be defined principally by its baseline condition.

7.3.25 The matrix below demonstrates the relationship between sensitivity and magnitude of change based on the specific criteria given. At all times, professional judgement is used to determine the overall significance of visual effects. The major effects highlighted in dark grey are considered to be significant in terms of the EIA Regulations. It should be noted that whilst an individual effect may be significant, it does not necessarily follow that the proposed Energy Park would be unacceptable, either in terms of the public interest test or when considering the planning balance in relation to the other benefits arising from a solar PV/battery energy storage development.

7.3.26 The relationship between sensitivity and magnitude of change is indicated within **Table 7.1** below:

Table 7.1: Significance Matrix

	Sensitivity of Receptor			
Magnitude of Change		**High**	**Medium**	**Low**
	High	Major	Major	Moderate
	Medium	Major	Moderate	Minor
	Low	Moderate	Minor	Minor
	Negligible	Negligible	Negligible	Negligible

Judgement concerning the acceptable threshold for living conditions and residential visual amenity in the public interest

7.3.27 In this final stage, and only for those residential properties identified as experiencing a major significant effect in the previous stage, a further judgement is required to determine whether the visual effect in question has exceeded the Residential Amenity Threshold. TGN 2/19 advises that this is a matter for professional judgment explained in narrative with clear, unambiguous and rational conclusions. The visual effects arising from the proposed Energy Park would need to be of such a degree and significance that the residential property would be uninhabitable due to the effects on living conditions.

7.3.28 This final stage of the RVAA is included in this **PEIR**, as a brief statement without any detailed written assessment, and will be presented in detail in the subsequent **Chapter 7: Residential Amenity** of the ES.

7.4 EFFECTS ON RESIDENTIAL VISUAL AMENITY

7.4.1 It is predicted that the construction and decommissioning stage will bring about similar or lower magnitude of change, and similar effects to those assessed during the operational stage of the Energy Park. Further details will be provided in Chapter 6 of the ES, as they fall outside of the scope of an RVAA – this **PEIR Chapter 7** or **Chapter 7** of the ES, which is concerned with the operational stage of the Energy Park. None of the predicted effects occurring during the construction and decommissioning stage are likely to be overbearing or overwhelming.

7.4.2 The following assessment is written with reference to **Figure 7.1**, with each of the visited and assessed property identified by a separate number.

ID 1: 4 New Cottages, Sidebar Lane

7.4.3 This property is located to the west of the Energy Park. Its western curtilage is enclosed by a row of tall evergreen trees which screen views out views to the Energy Park Site, albeit the lower parts of the canopies are gappy and allow for some limited visual permeability. The northern curtilage is marked by a low post and rail fence with views across the northern part of the Energy Park open and direct, and seen approximately 300m away at its closest point. Views due east from the upper floor would be screened by the aforementioned evergreen trees. Oblique views towards the northern part of the Energy Park will be gained.

7.4.4 The visual effects are likely to be significant but are not considered to be overbearing.

ID 2: Saona, 1 Sidebar Lane

7.4.5 This single storey property is located along the eastern side of Sidebar Lane with its front elevation addressing the road. The rear garden elevation and amenity garden are enclosed by a combination of evergreen vegetation and a number of outbuildings. There is lack of any inter-visibility between this property and the Energy Park.

7.4.6 The visual effects are unlikely to be significant given the enclosed nature of views and lack of inter-visibility with the Energy Park.

ID 3: Elm Grange

7.4.7 This property is located to the north of the A17, in close proximity to the south western corner of the Energy Park.

7.4.8 Views from the ground floor are enclosed by a combination of outbuildings, perimeter planting and garden vegetation. Views from the upper floors are interrupted by mature trees and built form within the curtilage of the property. Views from the eastern end of the curtilage – amenity garden, will include the adjacent area set aside for biodiversity enhancement with views to the north east including the southern parts of the Energy Park.

7.4.9 It is predicted that views from the ground floor would not be affected at all.

7.4.10 Views from the upper floors may include parts of the Energy Park but are unlikely to be significantly affected.

7.4.11 Views from the garden are enclosed and do not offer any views of the Energy Park, albeit views from its eastern most edge. These views would include close range views of fencing and solar modules seen approximately 340m away at its closest point, and in the context of the nearby pig farm at Home Farm, East Heckington PE20 3QF.

7.4.12 Significant effects upon the occupiers of the dwelling and its immediate garden setting are unlikely. The visual effects are unlikely to be overbearing.

ID 4: The Cottage, East Heckington, PE20 3QF

7.4.13 This property is located on the southern side of the A17 near Elm Grange. Views include the movement along the A17 and the neighbouring property Rainbow Cottage and Rose Cottage, which restrict views north towards the Energy Park.

7.4.14 The dwelling itself and the associated garden sit slightly lower than the adjacent A17 thus views are restricted by the gently sloping grassed verge that separates the dwelling from the highway. Direct views from the dwelling can only be gained from its southern side elevation, which includes a single small aperture window on the ground floor and first floor. Views from the garden are further enclosed by vegetation and fencing. Views from the garden appear to be largely internal and not directed to the north.

7.4.15 Views are likely to include the solar modules and associated infrastructure in a relatively narrow angle of view, framed by Rainbow Cottage and Rose Cottage to the left and large scale farm buildings associated with Home Farm to the right.

7.4.16 The visual effects are unlikely to be significant given the context and nature of views and are not considered to be overbearing.

ID 5: Home Farm, East Heckington PE20 3QF

7.4.17 This property is associated with the pig farm at Home Farm and lies to the north of the A17, between the highway and the Energy Park. Views from its northern elevation are enclosed by and substantially influenced by the adjacent farm buildings. Views from its front southern elevation face away from the Energy Park. Views from the side eastern elevation and its front garden, largely laid to lawn, include the southern most part of the Energy Park reserved for biodiversity enhancement measures. Views to the north east would include direct to slight oblique views of the solar modules and fencing, and are likely to include one of the 132kV substations, located in the central part of the Energy Park.

7.4.18 The visual effects are likely to be significant but are not considered to be overbearing.

ID 6: 1 Parks Farm Cottage, East Heckington, PE20 3QG

7.4.19 This property is accessed via a narrow track that serves other neighbouring dwellings, forming a small cluster of built form located immediately to the south of the A17. Views from the property and its curtilage are enclosed by the associated outbuildings, fencing, and adjacent properties. The intervening built form and vegetation along the A17 screen the Energy Park. Views east and west include the wider grid corridor area. In views from the upper floor windows, the intervening trees and buildings are likely to screen views towards the Energy Park.

7.4.20 The visual effects are unlikely to be significant given the context and nature of views and are not considered to be overbearing.

ID 7: The Lodge, Old Main Road, East Heckington, PE20 3QB

7.4.21 This property is located to the north of the A17 and forms part of a cluster of properties that are accessed via an internal street and lead to Ashley House and The Old Church. This single storey property is enclosed by an evergreen hedgerow, of approximately 2m height, and views of the Energy Park from the dwelling and its amenity garden would be screened

7.4.22 The visual effects are unlikely to be significant given the enclosed nature of views and lack of inter-visibility with the Energy Park.

ID 8: Six Hundred Farm, Six Hundred Drove, East Heckington, PE20 3QA

7.4.23 This property is accessed from the A17 and Six Hundreds Drove, and is located in close proximity to the south eastern corner of the Energy Park. Views from the ground floor windows and its garden include and are enclosed by various outbuildings and a mobile home located in the property's north eastern corner. The perimeter fencing, of approximately 1.8m height, interrupts views but allows for views to extended north and towards the eastern part of the Energy Park. Views from the first floor windows would be influenced and restricted by the aforementioned features and the property itself.

7.4.24 Due to the proximity, the visual effects are likely to be significant but are not considered to be overbearing.

ID 9: Cattle Holme Barn, Browns Drove, Swineshead Bridge PE20 3PX

7.4.25 The post code data has indicated that Cattle Holme Barn is located along Brown's Drove to the south east, between the Energy Park and Swineshead Bridge, and within the 1km study area. The response received from the residents, however, clarified that this property lies further east and at the end of Halam's Drove. Whilst outside of the identified and agreed 1km radii study area, this property has been included in this RVAA for completeness.

7.4.26 Views west and north west, from the ground floor windows and curtilage are enclosed in close to mid-range by a combination of vegetation and built form that lines Brown's Drove. Views from the upper floor windows are likely to be less restricted but would continue to be influenced by the aforementioned elements.

7.4.27 The visual effects are unlikely to be significant given the context and nature of views and are not considered to be overbearing.

7.5 SUMMARY

7.5.1 This Residential Visual Amenity Assessment (RVAA) has been prepared as part of the PEIR Chapter 7 and seeks to determine the preliminary visual effects upon the identified residential receptors and whether or not the Energy Park would result in unacceptable consequences to living conditions such that consent should be refused in the public interest.

Study Area and Scope

7.5.2 The scope and study area of the residential properties included within this RVAA has been informed by the findings of the PEIR Chapter 6: LVIA, site surveys, the Zone of Theoretical Visibility (ZTV) mapping, post code data and consultation undertaken through the Scoping Report.

7.5.3 Given the type and scale of the Energy Park and the dispersed nature of the surrounding residential properties, the likelihood of any significant visual effects is considered to be restricted to those within the immediate surroundings of the site.

Effects on Residential Visual Amenity

7.5.4 The findings of this PEIR Chapter 7: RVAA demonstrate that the Energy Park would cause some localised significant visual effects but such effects would not be overbearing. The analysed properties and predicted effects are outlined in **Table 7.2** below.

Table 7.2: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value ** (taken as worst case scenario)	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****	Overbearing Effects?
Operation									
ID 1 4 New Cottages	Change to view	Temporary Long term and Indirect	High	High	Local	Major	Mitigation planting	Major	No
ID 2 Saona, 1 Sidebar Lane	Change to view	Temporary Long term and Indirect	High	No Effects	Local	No Effects	~	No Effects	No
ID 3 Elm Grange	Change to view	Temporary Long term and Indirect	High	No effects to High	Local	Major (highly localised)	Mitigation planting	Major (highly localised)	No
ID 4 The Cottage, East Heckington, PE20 3QF	Change to view	Temporary Long term and Indirect	High	Low to Medium	Local	Moderate to High	Mitigation planting	Moderate	No
ID 5 Home Farm, East Heckington PE20 3QF	Change to view	Temporary Long term and Indirect	High	High	Local	High	Mitigation planting	Major	No
ID 6 1 Parks Farm Cottage, East	Change to view	Temporary Long term and Indirect	High	No Effects	Local	No Effects	~	No Effects	No

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value ** (taken as worst case scenario)	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****	Overbearing Effects?
Heckington, PE20 3Q.									
ID 7 The Lodge, Old Main Road, East Heckington, PE20 3QB.	Change to view	Temporary Long term and Indirect	High	No Effects	Local	No Effects	~	No Effects	No
ID 8 Six Hundred Farm, Six Hundred Drove, East Heckington, PE20 3QA	Change to view	Temporary Long term and Indirect	High	High	Local	Major	Mitigation planting	Moderate	No
ID 9 Cattle Holme Barn, Browns Drove, Swineshead Bridge PE20 3PX	Change to view	Temporary Long term and Indirect	High	No effects to Negligible	Local	No effects to Negligible	~	No effects to Negligible	No

Notes:

* Enter either: Permanent or Temporary / Direct or Indirect

** Only enter a value where a sensitivity v magnitude effects has been used – otherwise 'Not Applicable'

*** Enter either: International, European, United Kingdom, Regional, County, Borough/District or Local

**** Enter either: Major / Moderate / Minor / Negligible AND state whether Beneficial or Adverse (unless negligible)

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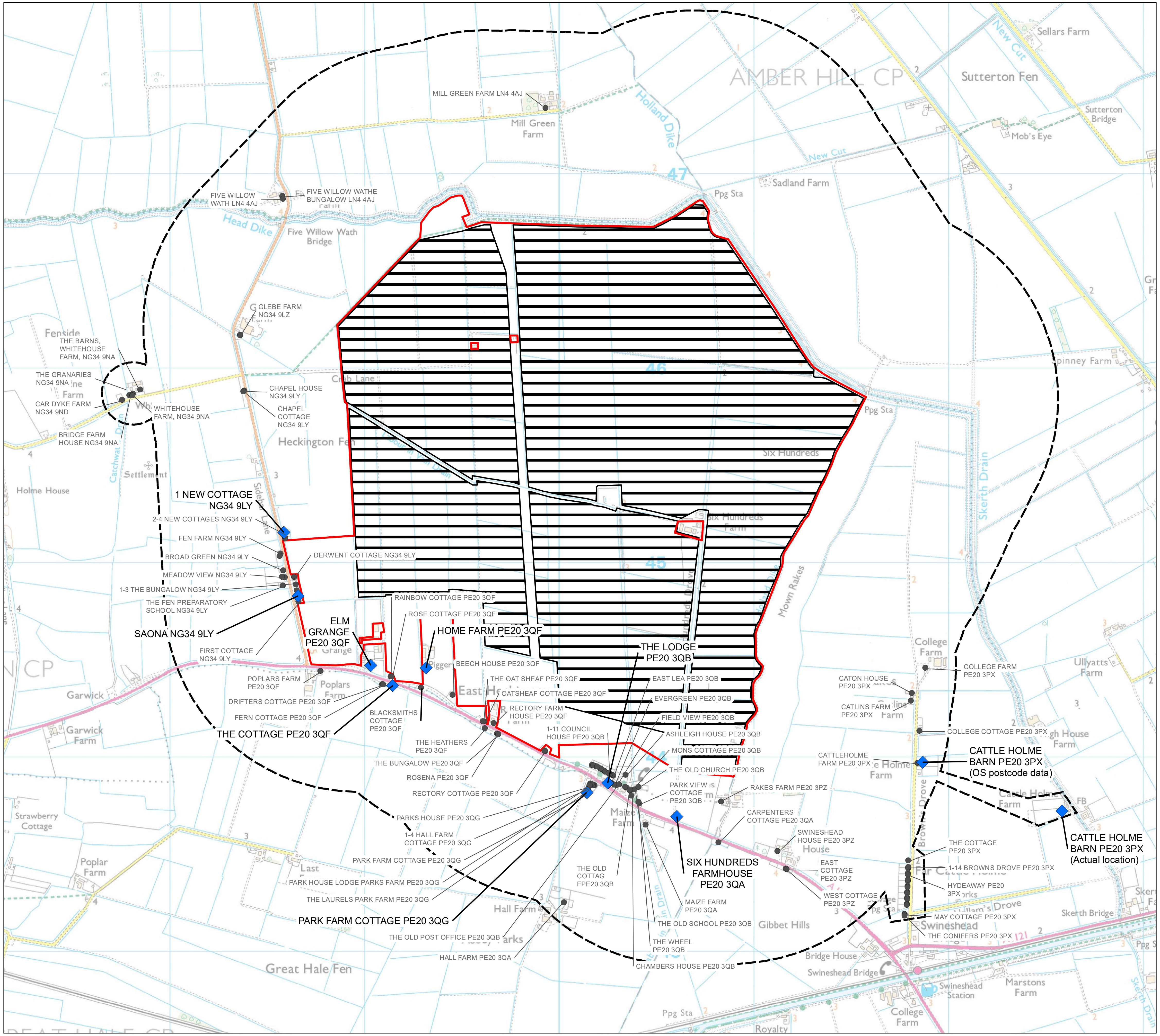
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 7.1- Site Location Plan and Residential Receptors

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



0 1 km

N

KEY

- Site Boundary
- Search Area
- Proposed Area of Development
- Address with no response
- Visited Properties

Note:
Search area expanded to include Cattle Holme Farm

FIGURE 7.1

Site Location Plan and Residential Receptors

DRWG No:	**P20-2370_22**	Sheet No:	-	REV:	**A**
Date:	09/06/2022				
Scale:	1:20,000	@ A3			

ecotricity PEGASUS GROUP

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

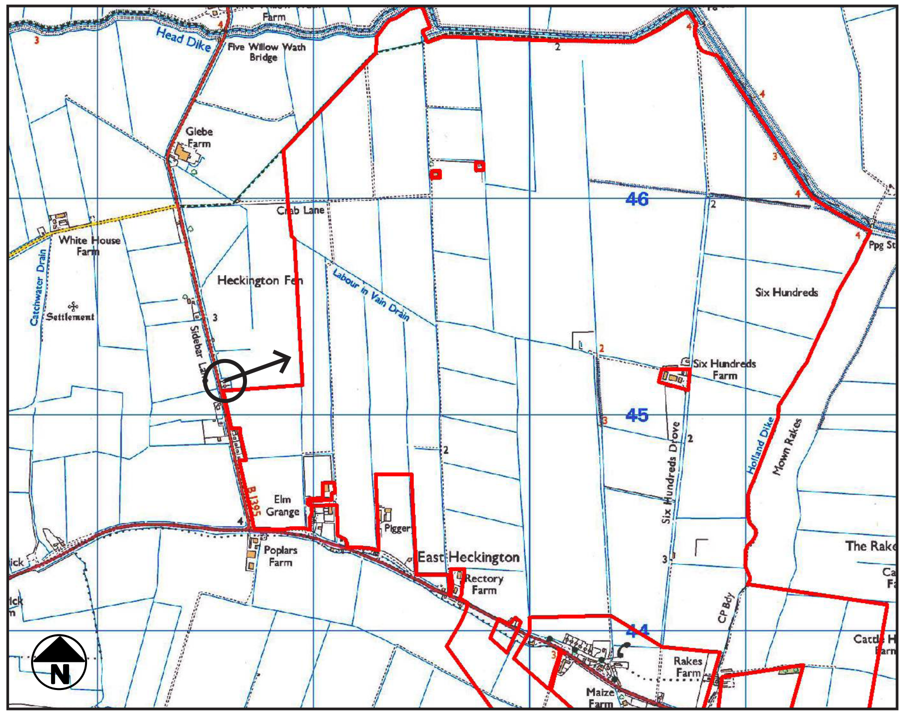
Preliminary Environmental Information Report
Figure 7.2- Photoviews

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

4 NEW COTTAGES

CONTEXT BASELINE VIEW



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 05/04/2022 @ 15:08	Distance from site	- 50m
OS grid reference	- 518597, 345165		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

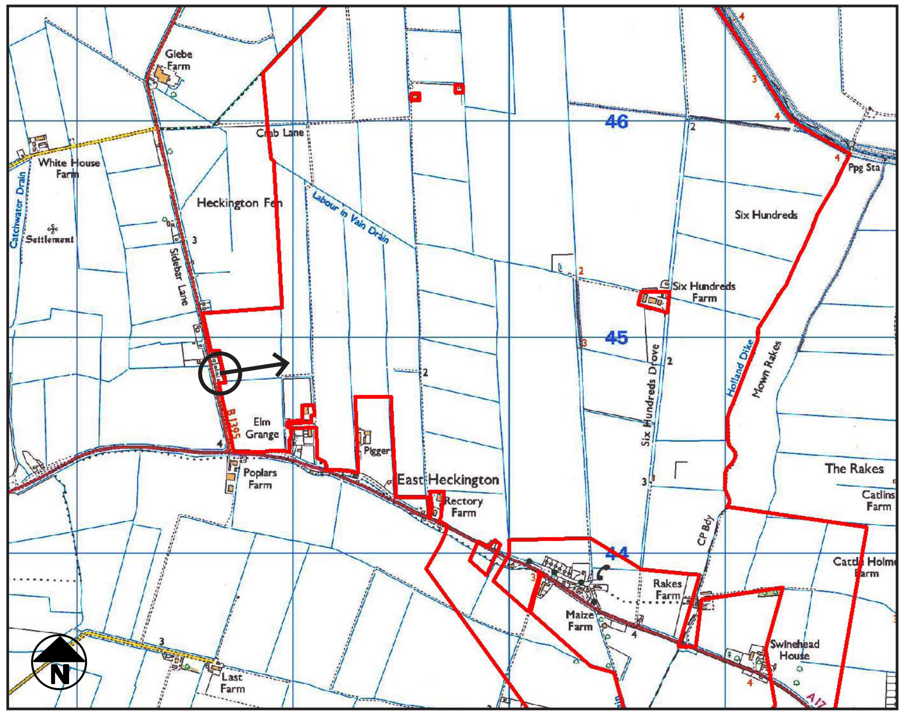
Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 50m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 05/04/2022 @ 15:08	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 518597, 345165	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

4 NEW COTTAGES

SAONA, 1 SIDEBAR LANE

CONTEXT BASELINE VIEW



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 05/04/2022 @ 10:11	Distance from site	- 17m
OS grid reference	- 518661, 344830		

FIGURE 7.2
Photoviews

DRWG No: **P20-2370_39** REV: _

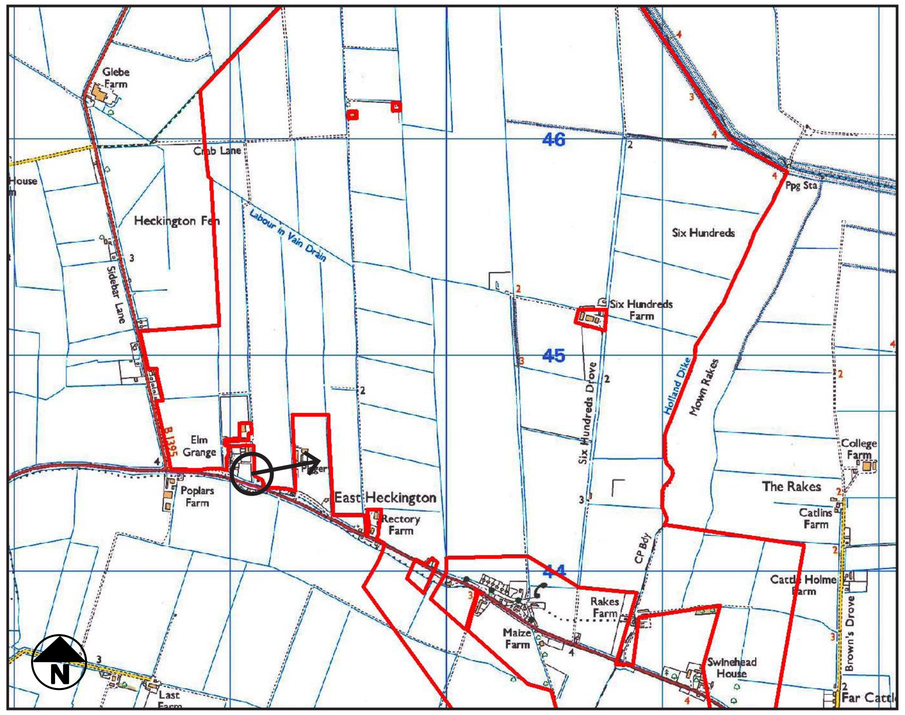
Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 17m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 05/04/2022 @ 10:11	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 518661, 344830	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

SAONA, 1 SIDEBAR LANE

ELM GRANGE

CONTEXT BASELINE VIEW



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 08/04/2022 @ 11:26	Distance from site	- 2m
OS grid reference	- 519107, 344469		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

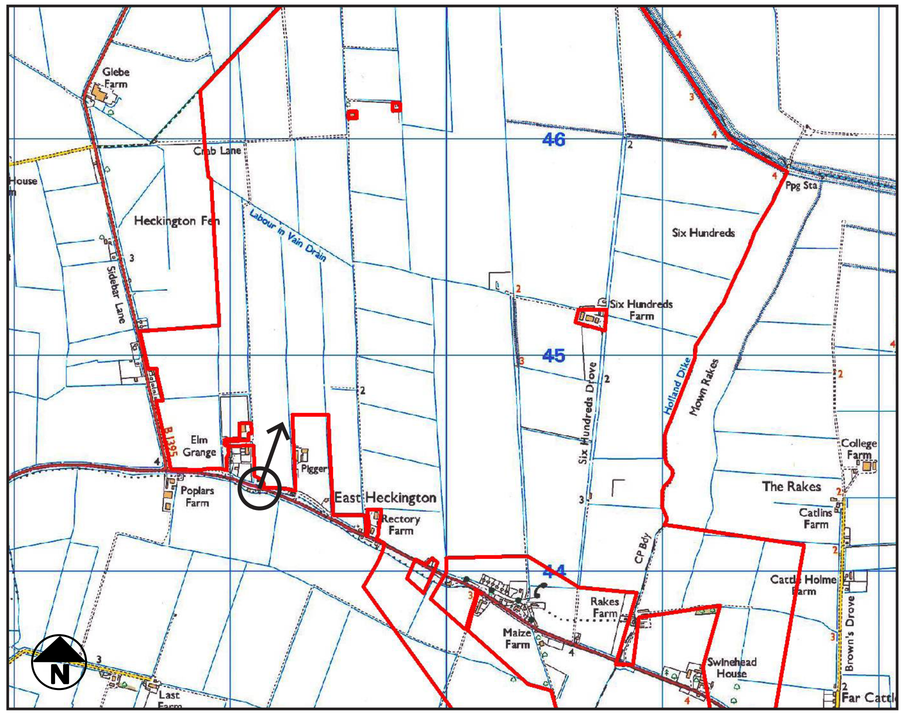
Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 2m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 08/04/2022 @ 11:26	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 519107, 344469	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

ELM GRANGE

THE COTTAGE, EAST HECKINGTON, PE20 3QF

CONTEXT BASELINE VIEW



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m
Date & time of photograph	- 19/05/2022 @ 15:01	Distance from site	- 20m
OS grid reference	- 519136, 344384		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 3m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 20m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 19/05/2022 @ 15:01	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 519136, 344384	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

THE COTTAGE, EAST HECKINGTON, PE20 3QF

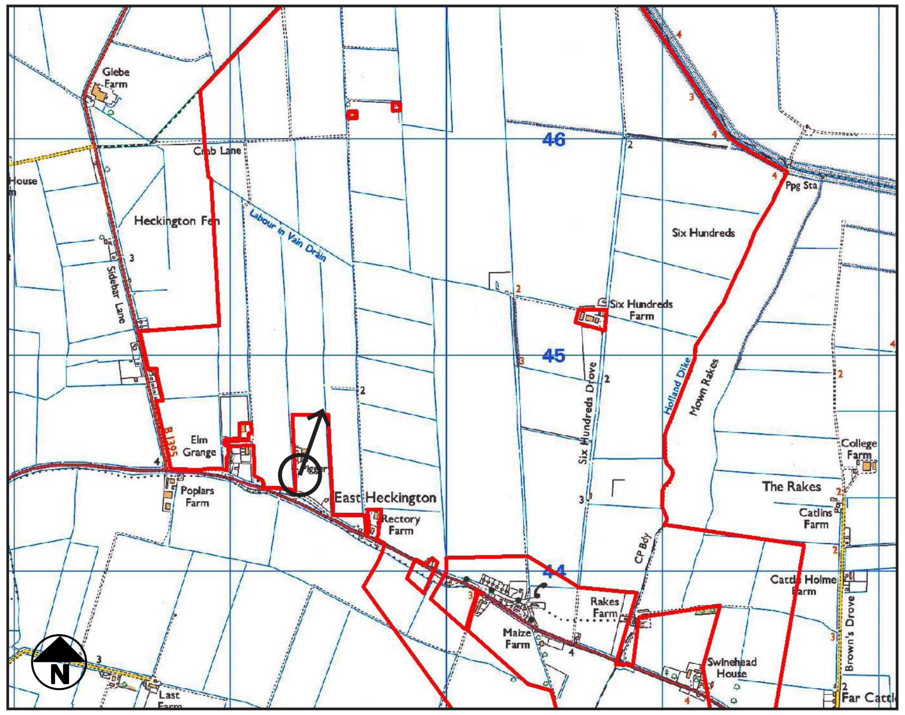
DRWG NO: P20-2370_39 | REV:_ | DATE: 09/06/2022

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH

FIGURE 7.2 | PHOTOVIEWS

HOME FARM, EAST HECKINGTON PE20 3QF

CONTEXT BASELINE VIEW (PART A)



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 05/04/2022 @ 14:10	Distance from site	- 26m
OS grid reference	- 519322, 344453		

FIGURE 7.2

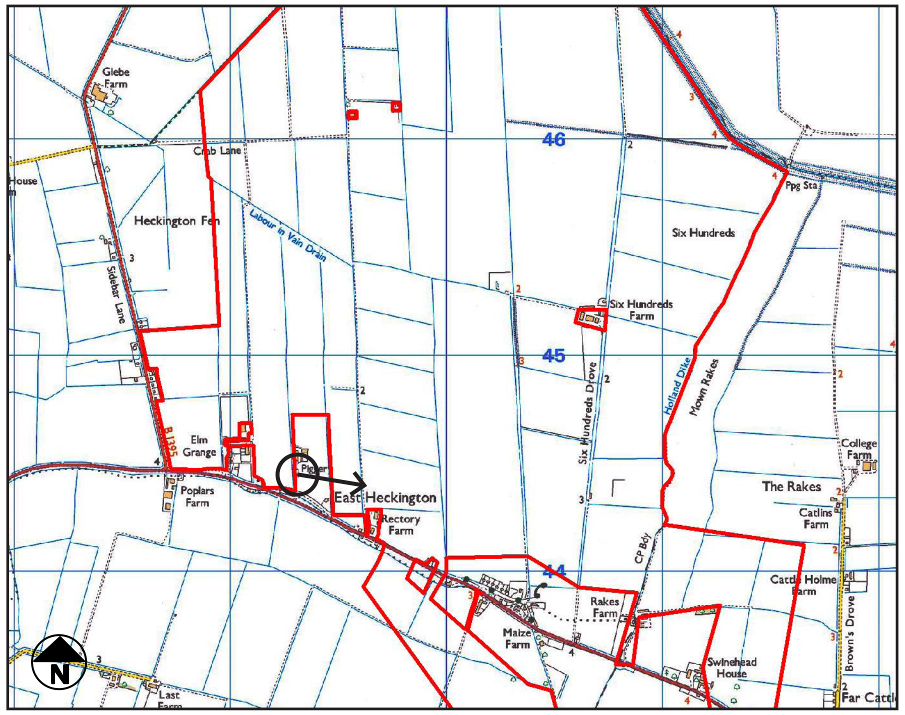
Photoviews

DRWG No: **P20-2370_39** REV: _

Date: 10/06/2022

HOME FARM, EAST HECKINGTON PE20 3QF

CONTEXT BASELINE VIEW (PART A)



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 05/04/2022 @ 14:10	Distance from site	- 26m
OS grid reference	- 519322, 344453		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

Date: 10/06/2022

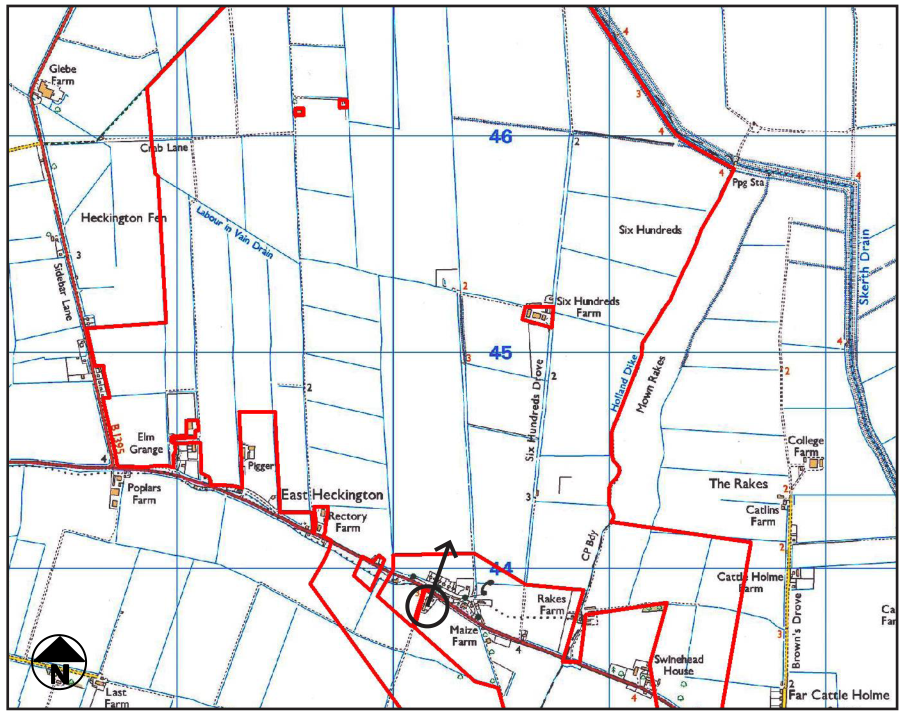
Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 26m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 05/04/2022 @ 14:10	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 519322, 344453	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

HOME FARM, EAST HECKINGTON PE20 3QF

Views towards the
Energy Park are screened

1 PARKS FARM COTTAGE, EAST HECKINGTON

CONTEXT BASELINE VIEW (PART A)



Camera make & model - Canon EOS 5D, FFS
Date & time of photograph - 08/04/2022 @ 16:36
OS grid reference - 520147, 343823
Viewpoint height (AOD) - 4m
Distance from site - 25m

FIGURE 7.2
Photoviews

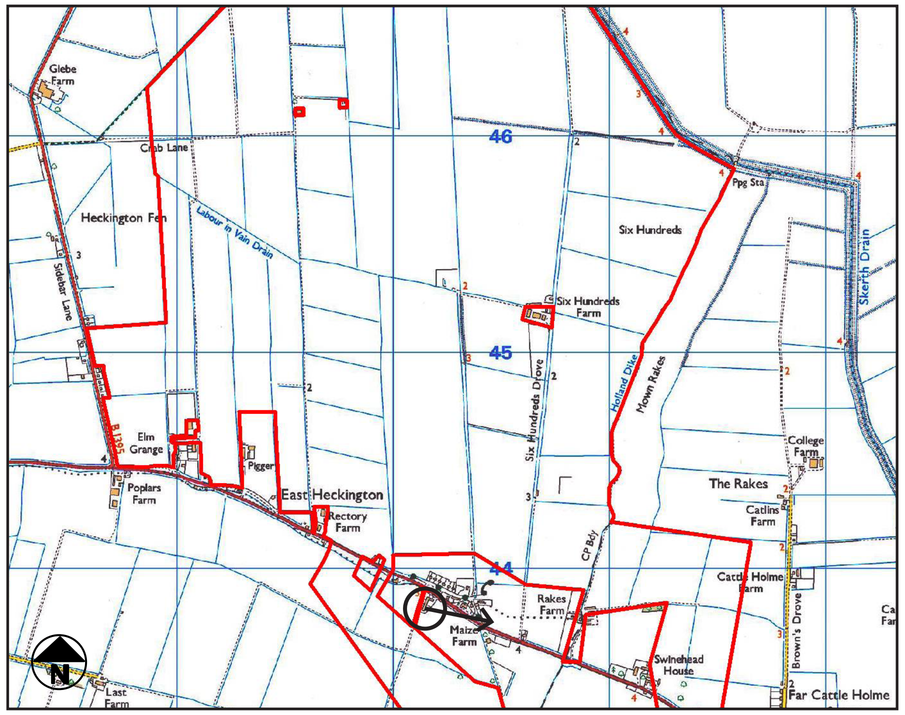
DRWG No: **P20-2370_39** REV: _

Date: 10/06/2022

Views towards the
Energy Park are screened

1 PARKS FARM COTTAGE, EAST HECKINGTON

CONTEXT BASELINE VIEW (PART B)



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m
Date & time of photograph	- 08/04/2022 @ 16:36	Distance from site	- 25m
OS grid reference	- 520147, 343823		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

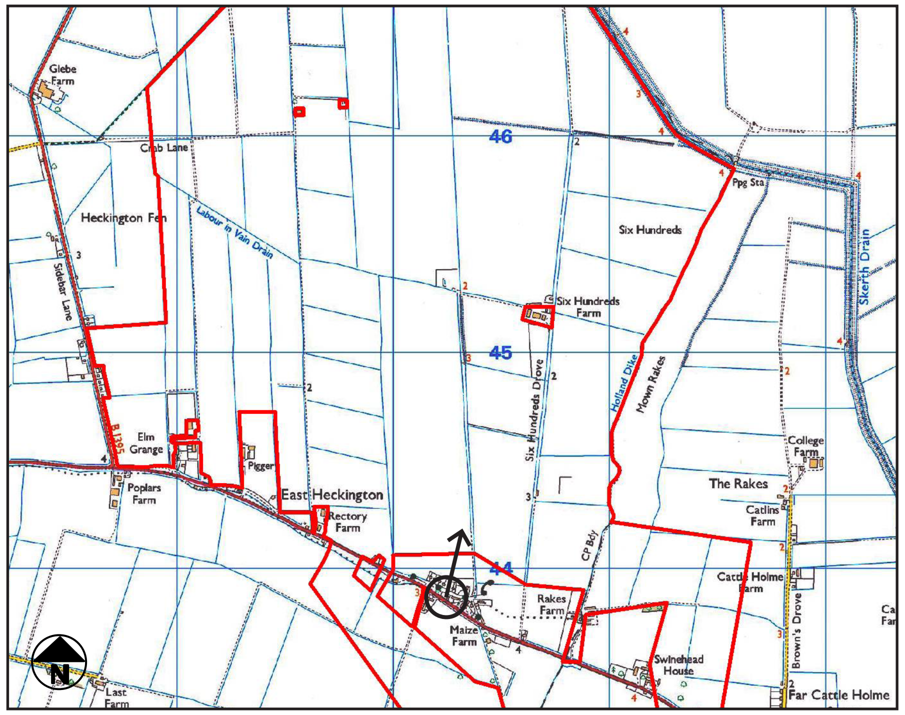
Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 25m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 08/04/2022 @ 16:36	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 520147, 343823	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

1 PARKS FARM COTTAGE, EAST HECKINGTON

THE LODGE, OLD MAIN ROAD, EAST HECKINGTON, PE20 3QB

CONTEXT BASELINE VIEW (PART A)



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m
Date & time of photograph	- 05/04/2022 @ 11:20	Distance from site	- 76m
OS grid reference	- 520236, 343896		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

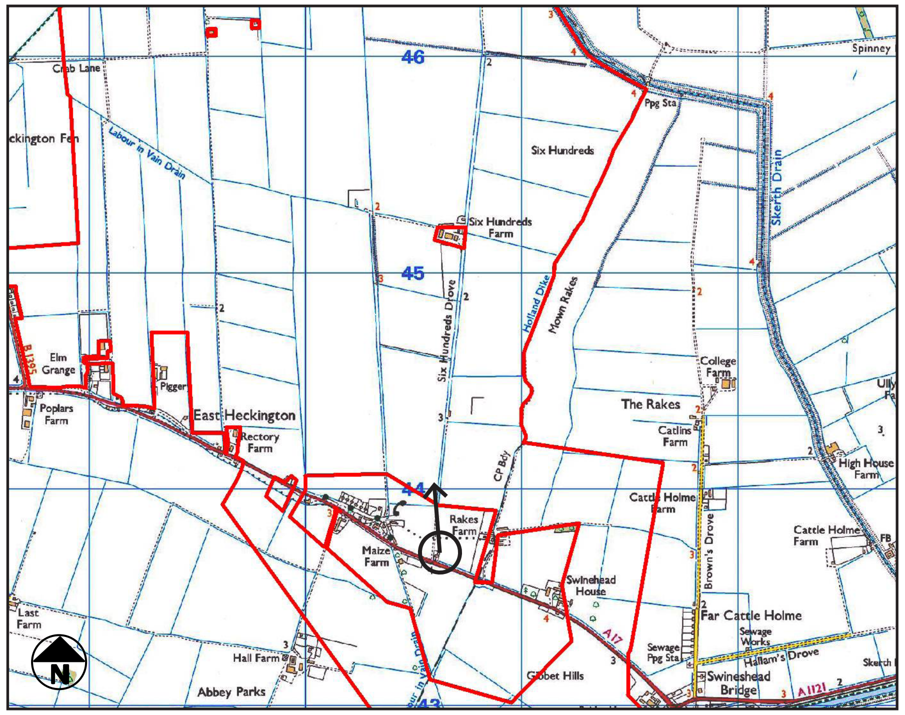
Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 76m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 05/04/2022 @ 11:20	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 520236, 343896	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

THE LODGE, OLD MAIN ROAD, EAST HECKINGTON, PE20 3QB

SIX HUNDRED FARM, SIX HUNDRED DROVE, EAST HECKINGTON, PE20 3QA

CONTEXT BASELINE VIEW (PART A)



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m
Date & time of photograph	- 08/04/2022 @ 13:24	Distance from site	- 201m
OS grid reference	- 520615, 343718		

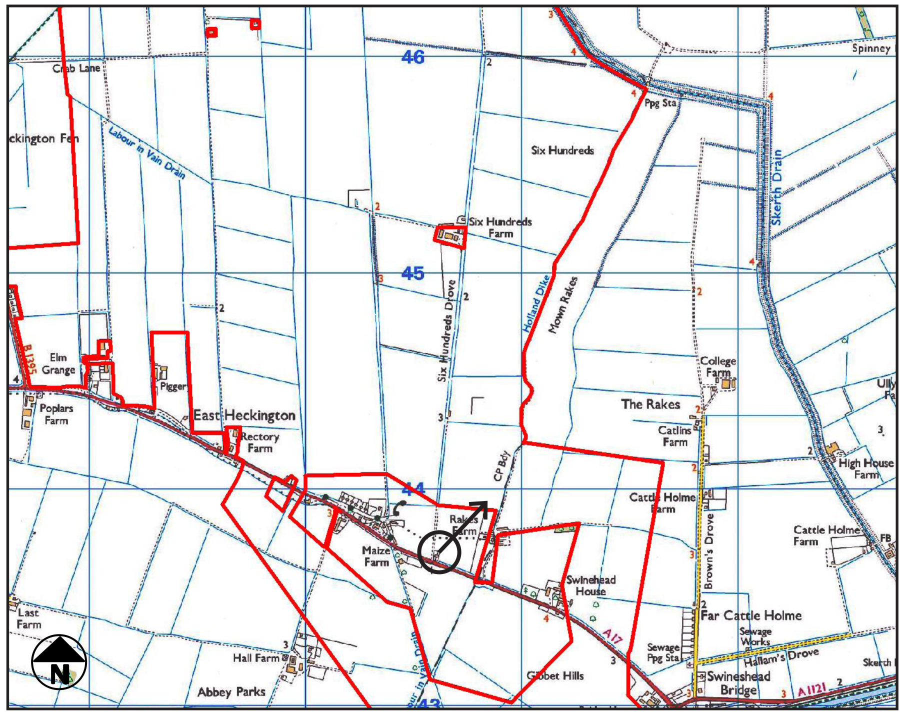
FIGURE 7.2
Photoviews

DRWG No: **P20-2370_39** REV: _

Date: 10/06/2022

SIX HUNDRED FARM, SIX HUNDRED DROVE, EAST HECKINGTON, PE20 3QA

CONTEXT BASELINE VIEW (PART B)



Camera make & model	- Canon EOS 5D, FFS	**Viewpoint height (AOD)**	- 4m
Date & time of photograph	- 08/04/2022 @ 13:24	**Distance from site**	- 201m
OS grid reference	- 520615, 343718		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

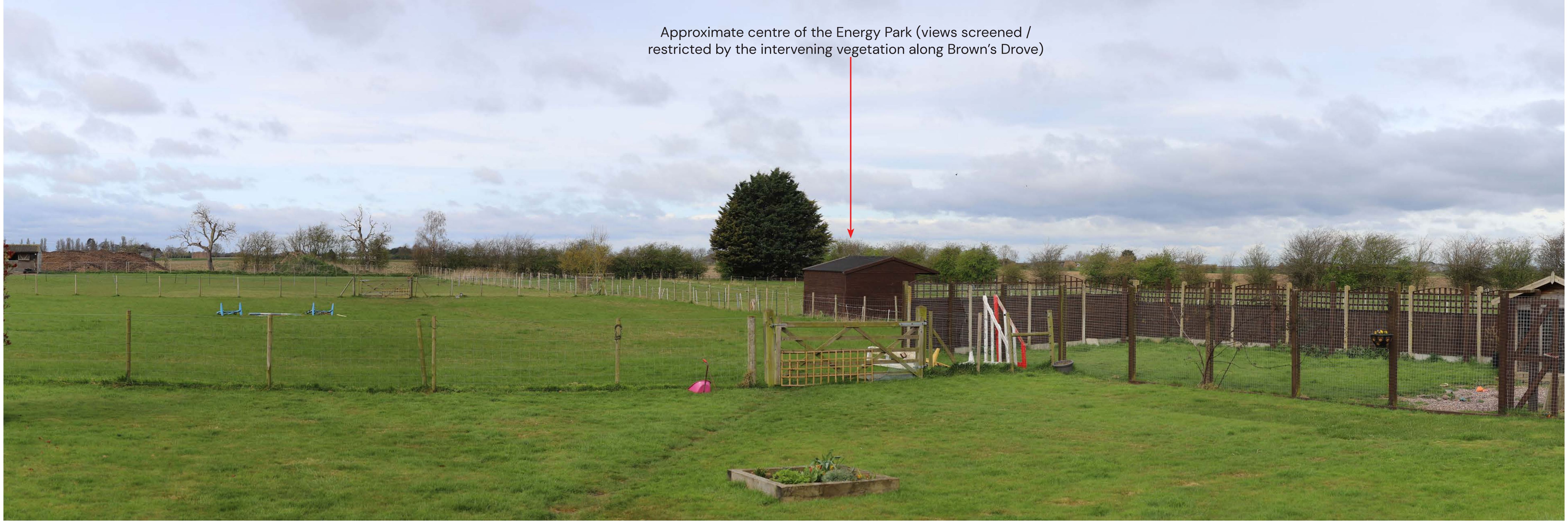
Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 4m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 201m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 08/04/2022 @ 13:24	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 520615, 343718	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

SIX HUNDRED FARM, SIX HUNDRED DROVE, EAST HECKINGTON, PE20 3QA

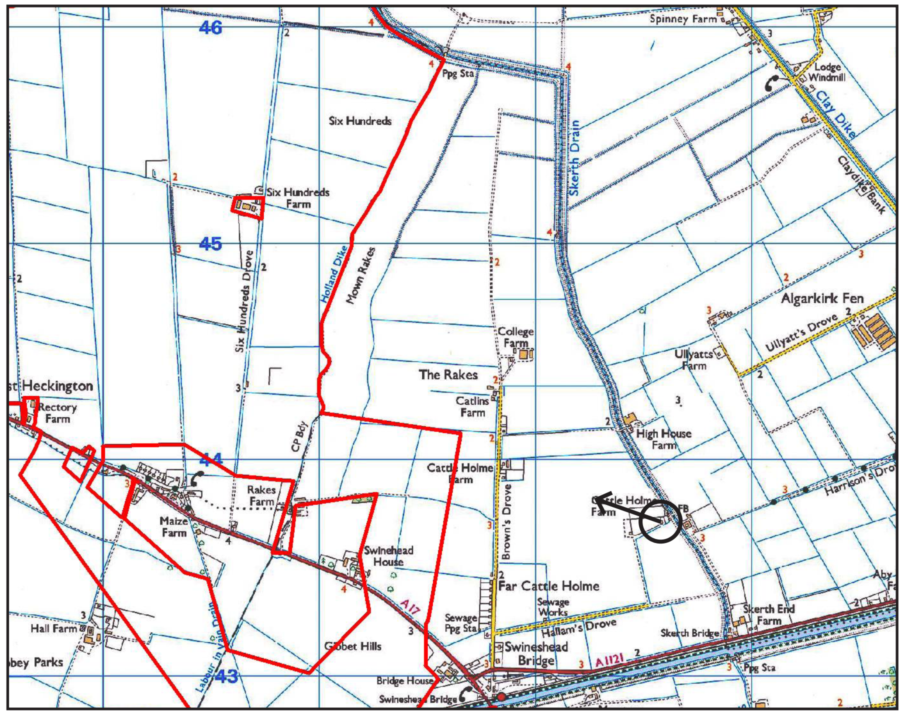
DRWG NO: P20-2370_39 | REV:_ | DATE: 09/06/2022

TO BE VIEWED AT A COMFORTABLE ARM'S LENGTH



CATTLE HOLME BARN, BROWNS DROVE, SWINESHEAD BRIDGE PE20 3PX

CONTEXT BASELINE VIEW



Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m
Date & time of photograph	- 05/04/2022 @ 10:33	Distance from site	- 979m
OS grid reference	- 522575, 343713		

FIGURE 7.2

Photoviews

DRWG No: **P20-2370_39** REV: _

Date: 10/06/2022

Camera make & model	- Canon EOS 5D, FFS	Viewpoint height (AOD)	- 2m	Visualisation Type	- Type 1
Lens make & focal length	- Canon EF 50mm, f/1.4 USM	Distance from site	- 979m	Horizontal Field of View	- 39.6°
Date & time of photograph	- 05/04/2022 @ 10:33	Projection	- Planar	Height of camera AGL	- 1.5m
OS grid reference	- 522575, 343713	Enlargement / Sheet Size	- 100% @ A3	Page size / Image size (mm)	- 420 x 297 / 390 x 260

CATTLE HOLME BARN, BROWNS DROVE, SWINESHEAD BRIDGE PE20 3PX

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 8: Ecology and Ornithology

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

8 ECOLOGY AND ORNITHOLOGY

8.1 EXECUTIVE SUMMARY

8.1.1 Intensive agriculture and climate change have been identified by the UK State of Nature report (Hayhow 2019) as the most significant pressures on wildlife in the UK today. The creation of large areas of renewable energy generation and large area of species rich grassland is likely to lead to a net biodiversity gain as well contributing to reducing the effects of climate on wildlife throughout the UK. Initial ecological surveys on the Energy Park Site have revealed that the area where the solar array will be located is of low biodiversity value. A comprehensive Construction and Environmental Management Plan will ensure the risk of disturbance or injury to farmland birds or mammals can be minimised and will ensure no damage to boundary habitats, woodland, ponds or wet ditches outside the area where the solar array, substations and energy storage facilities will be constructed. There are no designated sites of international, national or local importance within or adjacent to the Energy Park Site. There is one Local Wildlife Site (The South Forty Foot Drain) along the route of the off-site grid connection. Direct drilling under the South Forty Foot Drain will ensure no negative effects on the Local Wildlife Site. The initial design includes the creation of 96ha of species grasslands and 1.8ha of traditional orchard managed specifically for nature conservation. A further 46ha of species rich grassland within the Energy Park Site will be managed to maximise the nature conservation value. Beneath the solar panels 440ha of intensive arable farmland will be converted to low intensity sheep pasture, and this could reduce the runoff of agri-chemicals and topsoil associated with agricultural use into in the Wash SPA. There will be an overall significant residual, locally beneficial effect on biodiversity of area.

8.2 INTRODUCTION

8.2.1 This chapter of this Preliminary Environmental Information Report (PEIR) identifies and proposes measures to address the potential impacts effects of the Proposed Development of a 586.85 ha Energy Park and off-site grid connection cable route and above grounds works at the National Grid Bicker Fen Substation on ecology and nature conservation value (biodiversity features) during construction, operation, and decommissioning. It provides an evaluation of relevant important ecological receptors, including nature conservation designations, priority habitats, protected species and scheduled invasive non-native species (INNS) onsite and offsite with each being assigned a nature conservation value (sensitivity value). The potential direct and indirect effects on ecological receptors and their conservation status, inter-relationships, and their contribution to local, county, regional and national nature conservation value are identified. This assessment considers avoidance design measures and management activities when determining the significance of potential effects. The requirement for any further mitigation measures is then described and mitigation and monitoring measures are also considered in the assessment of potential residual effects.

8.2.2 Consultation responses and scoping opinions, based on the Scoping Report (2022) and the on-going consultation and engagement with statutory and non-statutory bodies have been considered during the preparation of this chapter. Consideration is also given to other known projects and activities and specifically to the potential for interaction between this proposed Energy Park/Grid Connection and other projects resulting in cumulative effects.

8.2.3 This chapter is supported by several appendices including:

- Extended Phase 1 Survey Report (Energy Park) - Appendix 8.1
- Ornithological Survey Methods & Results - Appendix 8.2
- Lincolnshire Environmental Records Centre – Appendix 8.3

- Preliminary Biodiversity Net Gain Calculation - Headline Results – Appendix 8.4
- Confidential Badger Report – Appendix 8.5

8.2.4 There are number of ongoing surveys which will be included in the ES chapter, these include:

- Extended Phase 1 Survey Report (off site)
- Aquatic plant survey report
- Rare arable plant survey report
- Breeding bird surveys report (off site)
- Bat survey report
- Badger survey report (off site)
- Great crested newt survey and results

8.2.5 Full details of the study areas, survey methodologies, survey dates and guidance used for each survey are available in the reports as detailed above. A summary of the methods and survey findings is provided in this chapter.

8.3 ASSESSMENT APPROACH

Methodology

Study area

8.3.1 The Proposed Development is likely to include the following infrastructure: (i) Solar PV modules; (ii) PV module mounting infrastructure; (iii) Inverters; (iv) Transformers; (v) Onsite cabling; (vi) Off-site underground cabling to connect the Energy Park site to National Grid Bicker Fen Substation; (vii) Fencing and security measures; (viii) Access tracks and construction of new access onto the highway; (ix) Electrical substation improvements at Bicker Fen; (x) An electrical compound comprising: An energy storage facility (expected to be formed of batteries storing electrical energy); 132kV substations and control buildings; and Equipment facilitating electrical connection to the Bicker Fen Substation.

8.3.2 A detailed description of the proposed development is provided in Chapter 3: Site Description, Site Selection and Iterative Design Process.

Desk study

8.3.3 A desk study, combined with a review of ecological surveys and assessment carried out as part of the original approved wind park application conducted between 2007/8 - 2017/18 enabled the determination of appropriate study areas, within which all important biodiversity features requiring assessment, as well as biodiversity features that could be directly or indirectly affected by the Proposed Development, were subject to field survey and described in **Table 8.1**.

8.3.4 The desk study included a search for:

- sites of international conservation value (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites) within 10km of the Development;
- statutory designated sites of national nature and geological conservation value, e.g., Sites of Special Scientific Interest (SSSIs) and Local Nature Reserves (LNRs) within 2km of Proposed Development;

- non-statutory designated sites of nature and geological conservation value, e.g., Local Wildlife Sites (LWSs) (which includes ancient woodland), within 5km of the Proposed Development;
- ancient woodland and other notable habitats within 5km of the Proposed Development; and
- records of protected or notable species within 5km of the Proposed Development.

8.3.5 The Lincolnshire Environmental Records Centre (LERC) was used to gain information on pre-existing ecological information (i.e. location of LWSs, records of protected and notable species and habitats within 2km of the Proposed Development as well as any invasive non-native species). This data (in respect of age and coverage) was used to inform the scope and extent of further ecological surveys.

8.3.6 Online data resources that were reviewed included:

- Multi-Agency Geographic Information Centre (MAGIC) for the location (and details) of statutorily designated sites, ancient woodland and notable habitats;
- Joint Nature Conservation Committee (JNCC) website for details of SACs and SPAs, including site information and designation details; and
- National Biodiversity Network (NBN) Gateway for details on any protected and/or notable species.

Field surveys

8.3.7 The requirement for ecological surveys was determined following a Preliminary Ecological Appraisal (PEA) approach. This consisted of a review of the desk study data, a walk over survey of the Energy Park, a review of the ecological surveys carried out as part of the original wind park application conducted between 2007/8 and 2017/18, a review of: Triton Knoll Electrical System ecological surveys; Viking Link ecological surveys; the extended phase 1 of the Energy Park Site carried out in 2021 and the consultation feedback from Natural England, Lincolnshire Wildlife Trust and North Kesteven District Council.

8.3.8 The extended phase 1 survey was carried out on behalf of Ecotricity by Ecologist Neil Bostock MIEEM. The Phase 1 Habitat survey followed the standard method 'Handbook for Phase 1 habitat survey: A technique for environmental audit' (JNCC, 2010). The survey was conducted on four dates between 18th and 23rd August 2021 (where access permitted). The survey also incorporated ecological assessment of the Energy Park Site for Great Crested Newt (*Triturus cristatus*), Otter (*Lutra lutra*), Badger (*Meles meles*), Water Vole (*Arvicola amphibius*) and reptiles. In addition, an evaluation of the buildings adjacent to the Energy Park Site, where permitted for Bat Roosting Potential was carried out; however, this assessment did not examine the buildings internally, or examine any fissures or cracks within the buildings with an endoscope for the presence of roosting bats.

8.3.9 The definition of Survey Areas was developed using a combination of professional judgement and guidance issued by the Chartered Institute of Ecology and Environmental Management (CIEEM), which define the zone of influence as: "…*the area over which biodiversity features may be affected by biophysical changes as a result of the proposed project and associated activities*".

8.3.10 Field surveys were then undertaken to characterise the ecological baseline within the relevant Survey Areas presented in **Figure 8.1**. Further details regarding the definition of these Survey Areas and any limitations are presented in the associated survey reports within **Appendices 8.1 and 8.2** of this PEIR. The Survey Areas vary according to the spatial characteristics of each species or habitat potentially impacted but reflect standard professional good practice and the distances that statutory consultees would typically expect to be considered for identification of features external to the Proposed Development that could be affected.

Table 8.1: Ecological surveys

Survey and appendix	Survey Area and methods	Date of survey period
Extended Phase 1 Survey of Energy Park Site - **Appendix 8.1**	Energy Park Walkover recording the habitat types and boundary features present followed the standard method 'Handbook for Phase 1 habitat survey: A technique for environmental audit' (JNCC, 2010).	August 2021
Aquatic mammal survey of Energy Park Site	All the watercourses on the Energy Park Site were searched for evidence of Otter (*Lutra lutra*). Signs used to establish the presence of Otters included actual observations of animals, 'spraint' latrines deposited on prominent rocks, stones or logs or branches within watercourses (these spraints often contain fish bones and scales and have a sweet odour similar to jasmine tea) and Otter tracks in soft mud adjacent to the watercourses.	August 2021
Badger survey of Energy Park Site	This survey was conducted for the Energy Park. The entire boundary was searched for evidence of setts, latrines, scratches on trees, Badger hair on barbed wire across animal trails, snuffle holes or feeding activity. Areas such as the 'grassed banks' of the Skerth Drain and other major drainages, woodland plantations and old hedge-banks received particular attention.	August 2021, April 2022
Aquatic plant survey of Energy Park Site	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022
Rare arable plant survey of Energy Park Site	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022
Bat surveys of Energy Park	Bat survey include activity transects and the use of static bat detectors in late summer 2021 and 2022 (Collins 2016) and included roost emergence surveys.	2021 and 2022 ongoing
Breeding bird survey of Energy Park Site – **Appendix 8.2**	The breeding bird survey method was based upon the British Trust for Ornithology's Common Birds Census method (Marchant 1983). The Survey Area included the whole of the Energy Park Area.	April to June 2021
Wintering Bird Survey of Energy Park Site – **Appendix 8.2**	The breeding bird survey method was based upon the British Trust for Ornithology's Common Birds Census method (Marchant 1983). Survey area included in the whole of the Energy Park Area.	September 2021 to March 2022
Great crested newt survey of Energy Park Site	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022
Off-site grid connection cable route options	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022

Survey and appendix	Survey Area and methods	Date of survey period
Extended Phase 1 Survey		
Off-site grid connection cable route options aquatic plant survey	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022
Off-site grid connection cable route options rare arable plant survey	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022
Off-site grid connection cable route options breeding bird survey	The breeding bird survey method was based upon the British Trust for Ornithology's Common Birds Census method (Marchant 1983).	2 April to June 2022
Off-site grid connection cable route options wintering bird survey – **Appendix 8.2**.	The breeding bird survey method was based upon the British Trust for Ornithology's Common Birds Census method (Marchant 1983).	September 2021 to March 2022
Off-site grid connection cable route great crest newt survey	Survey ongoing - this information will be provided in ES chapter.	Ongoing surveys 2022

Assessment of effects

8.3.11 The assessment of effects, detailed in this chapter, has been undertaken in accordance with best practice guidance for Ecological Impact Assessment (EcIA), issued by CIEEM (the CIEEM guidelines) entitled 'Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Costal and Marine', as summarised below.

8.3.12 The aims of the ecology assessment are to:

- Identify relevant ecological features (i.e., designated sites, habitats, species, or ecosystems) which may be impacted;
- Provide a scientifically rigorous and transparent assessment of the likely ecological impacts and resultant effects of the Proposed Development. Impacts and effects may be positive or negative;
- Facilitate scientifically rigorous and transparent determination of the consequences of the Proposed Development in terms of national, regional and local policies relevant to nature conservation and biodiversity, where the level of detail provided is proportionate to the scale of the development and the complexity of its potential impacts; and
- Set out what steps will be taken to adhere to legal requirements relating to the relevant ecological features concerned.

8.3.13 The principal steps involved in the CIEEM approach can be summarised as:

- Ecological features that are both present and might be affected by the Proposed Development are identified (both those likely to be present at the time works begin and those predicted to be present at a set time in the future) through a combination of targeted desk-based study and field survey work to determine the relevant baseline conditions;
- The importance of the identified ecological features is evaluated, placing their relative biodiversity and nature conservation value into geographic context, which is then used to define the relevant ecological features that need to be considered further;
- The changes or perturbations predicted to result as a consequence of the Proposed Development (i.e. the potential impacts) and which could potentially affect relevant ecological features are identified and their nature described;
- Established best-practice, legislative requirements, or other incorporated design measures to minimise or avoid impacts are also described and are taken into account;
- The likely effects (positive or negative) on relevant ecological features are then assessed, and where possible quantified;
- Measures to avoid or reduce any predicted significant effects, if possible, are then developed in conjunction with other elements of the design (including mitigation for other environmental disciplines) and if necessary, measures to compensate for effects on features of nature conservation importance are also included;
- Any residual effects of the Proposed Development are reported; and
- Ecological enhancements.

8.3.14 It is not necessary in the assessment to address all habitats and species with potential to occur in the relevant study area and instead the focus is on those that are "relevant" i.e. ecological features that are considered to be important and potentially affected by the Proposed Development. The CIEEM guidelines makes clear that there is no need to *"carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable"*. This does not mean that efforts should not be made to safeguard wider biodiversity and requirements for this have been considered. National and local planning policy documents emphasise the need to achieve net gains for nature and that a core principle for planning is that it should contribute to conserving and enhancing the natural environment and reducing pollution. These considerations have been applied to the assessment methodology in this chapter.

8.3.15 There is a need to determine the scale at which the relevant ecological features identified through the desk studies and field surveys undertaken for the Proposed Development are of value. The value of each relevant ecological feature has been defined with reference to the geographical level at which it matters as set out below.

- International (i.e. Ramsar Sites, SACs and SPAs), normally within the geographic area of Europe;
- UK or national (Great Britain, but considering the potential for certain ecological features to be more notable (of higher value) in England, with context relative to Great Britain as a whole);
- Regional (East of England) – however, a geographical area for regional importance has not been defined. A feature is of regional importance when it is of greater importance than within the county of Lincolnshire but does not reach the threshold to be of National importance;
- County (Lincolnshire);
- District (North Kesteven District Council and Boston Borough Council); and

- Local (biodiversity features that do not meet criteria for valuation at a district or higher level, but that have sufficient value to merit retention or mitigation e.g. for purposes of ensuring no net loss of biodiversity).

Assessment of significance

8.3.16 The determination of the significance of effects has been made based on the predicted effect on the structure and function, or conservation status, of relevant ecological features, as follows:

- Not significant - no effect on structure and function, or conservation status; and
- Significant - structure and function, or conservation status is affected.

8.3.17 Effects should be considered as being significant when "an effect either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national / local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local. A significant effect is an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. In broad terms, significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)" CIEEM 2018).

8.3.18 There are a number of approaches for determining the significance of effects on ecological features. The CIEEM guidelines (2018) recommend the avoidance of the use of the matrix approach for categorisation (major, moderate, and minor). However, in order to provide consistency of terminology within this chapter, the findings of the CIEEM assessment have been translated into the classification of effects scale, as outlined in **Table 8.2**.

Table 8.2: Translation of EIA terminology to equivalent CIEEM classification

Effects classification terminology used in other EIA chapters	Equivalent CIEEM assessment
Major beneficial	Beneficial effect on structure / function or conservation status at regional, national, or international level.
Moderate beneficial	Beneficial effect on structure/ function or conservation status at County level.
Minor beneficial	Beneficial effect on structure / function or conservation status at Local level.
Neutral / Negligible	No effect on structure / function or conservation status.
Minor adverse	Adverse effect on structure / function or conservation status at Local level.
Moderate adverse	Adverse effect on structure / function or conservation status at County level
Major adverse	Adverse effect on structure / function or conservation status at Regional, National, or International level.

Legislative and Policy Framework

The Conservation of Habitats and Species Regulations 2017 (as amended)

8.3.19 The Conservation of Habitat and Species Regulations 2017 (2017 Habitat Regulations) transposed the land and marine aspects of the Habitats Directive (Council Directive 92/43/EEC) and certain elements of the Wild Birds Directive (Directive 2009/147/EC) (known as the Nature Directives) in domestic legislation. This provides for the designation and protection of European Sites (and adapts planning and other controls for the protection of these sites). This includes Annex I (including habitats) and Annex II (including species) for which such sites can be designated.

8.3.20 The Habitats Regulations also provide protection for certain European Protected Species (EPS) that are listed on Schedule 2 (animals) or Schedule 4 (plants). Provision is made for the granting of licences that permit certain acts as lawful, providing the appropriate authority is satisfied that there is no satisfactory alternative, and the favourable conservation status of the species will be maintained.

8.3.21 The 2019 amendment to the Habitats Regulations means that Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network, following the UK exit from the EU. The 2019 Regulations have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes: existing SACs and SPAs; and new SACs and SPAs designated under these Regulations.

Convention on Biological Diversity

8.3.22 The United Nations Environmental Programme Convention on Biological Diversity of 1992. Under the Convention, governments undertake to conserve and sustainably use biodiversity. They are required to develop national biodiversity strategies and action plans, and to integrate these into broader national plans for environment and development, particularly, important sectors such as energy.

Ramsar Convention

8.3.23 The Ramsar Convention 1971 is an international treaty to ensure the sustainable use of wetlands which includes the designation of wetlands of international importance. Government policy extends the same level of protection to Ramsar wetlands as that afforded to sites that are designated under the Habitats Directive.

Wildlife and Countryside Act 1981

8.3.24 The Wildlife and Countryside Act 1981 (as amended) (WCA 1981) is a primary piece of UK wildlife legislation, protecting birds, other animals and plants (including vascular plants, bryophytes, lichens and fungi), allowing for the designation of protected areas including Sites of Special Scientific Interest (SSSIs) and promoting protections for such designated areas. The Wildlife and Countryside Act 1981 also defines a list of invasive non-native species, making it illegal to spread them in the wild.

Countryside and Rights of Way Act 2000

8.3.25 The Countryside and Rights of Way Act 2000 extends powers relating to the protection and management of SSSIs. This includes powers for entering management agreements, placing a duty on public bodies to further the conservation and enhancement of SSSIs, increasing penalties for conviction, and appeal processes for the notification, management and protection of SSSIs. It also introduced the offence of 'reckless' disturbance of threatened species.

The Environment Act 2021

8.3.26 The Environment Act allows the UK to enshrine better environmental protection into law. It provides the Government with powers to set new binding targets, including for air quality, water, waste reduction and a new target to reverse the decline in species abundance by the end of 2030. The Environment Act also establishes the Office of Environmental Protection (OEP) which will hold the Government and other public bodies to account and ensure environmental laws are complied with.

8.3.27 Part 6 of the Environment Act makes provision for mandatory 10% biodiversity net gains for planning applications under the Town and Country Planning Act 1990 and NSIP which, when secondary legislation is released, is likely to come into effect in 2023.

Water Environment (Water Framework Directive) (England and Wales) Regulation 2017

8.3.28 The EU Water Framework Directive has been transposed into environmental legislation in England by the Water Environment (WFD) (England and Wales) Regulations 2017. The WFD follows a holistic approach to the sustainable management of water by considering the interactions between surface water (including transitional and coastal waters, rivers, streams and lakes), groundwater and water-dependent ecosystems.

Natural Environment and Rural Communities Act 2006

8.3.29 Section 40 of the Natural Environment and Rural Communities Act 2006 (NERC Act) places a duty on public authorities in England to conserve biodiversity, which includes restoring or enhancing species populations or habitat. In England, Section 41 of the NERC Act requires the Secretary of State for Environment to publish and maintain a list of habitats and species that are of 'principal importance' for the purpose of conserving biodiversity, and are regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

Protection of Badgers Act 1992

8.3.30 The Protection of Badgers Act 1992 provides specific legislation to protect Badgers *Meles meles* from cruelty. This means that it is unlawful to knowingly kill, capture, disturb or injure an individual, or intentionally damage, destroy or obstruct an area used for breeding, resting or sheltering by badgers.

Hedgerow Regulations 1997

8.3.31 The Hedgerow Regulations (Defra 1997) provide arrangements for Local Planning Authorities in England and Wales to protect "important hedgerows", by controlling their removal through a system of notification. To be "important" under the regulation hedgerows must meet specific wildlife, historic and landscape criteria.

Salmon and Freshwater Fisheries Act 1975

8.3.32 The Salmon and Freshwater Fisheries Act 1975 (as amended) relates to the protection of freshwater fish, including Salmon (*Salmo salar*) and Trout species and their habitats.

Eels (England and Wales) Regulation 2009

8.3.33 The Eels (England and Wales) Regulations 2009 (the Eel Regulations) aimed to halt and reverse the decline in the European Eel (*Anguilla anguilla*) stocks through control of harvesting eels and protection of habitats and in particular prevention of obstructions in water course which may impede eel passage.

Animal Welfare Act 2006

8.3.34 The Animal Welfare Act has been enacted to prevent unnecessary suffering to both domestic and wild vertebrates.

Invasive Allen Species (permitting and Enforcement) Order 2019

8.3.35 The Invasive Alien Species (Enforcement and Permitting) Order 2019 brings the EU Invasive Alien Species Regulation 1143/2014 into domestic legislation. This puts in place measures to manage invasive alien plant and animal species in England and Wales, including the relevant licenses, permits and rules for keeping invasive alien species.

Planning Policy

National Planning Policy Statement

8.3.36 The EIA for this Proposed Development must have regard to the relevant policies of the National Planning Policy Framework, July 2021 (NPPF) and relevant National Policy Statements (NPS).

8.3.37 The Overarching National Policy Statement for Energy (EN-1), National Policy Statement for Renewable Energy Infrastructure (EN-3) National Policy Statement for Electricity Networks Infrastructure (EN-5) were published in 2011. These Policy Statements do not specifically deal with large scale solar development. However, the EIA takes account of the relevant sections within these NPS:

- Overarching National Policy Statement for Energy (EN1) with particular reference to paragraphs 4.2.2 and 4.2.3, which provide national policy on what an ES for a Nationally Significant Infrastructure Project (NSIP) project should contain; paragraph 4.3.1 which states what the Secretary of State must, under the Conservation of Habitats and Species Regulations 2017 consider when granting a development consent order; and part 5 section 5.3 which sets out guidance on generic impacts relating to biodiversity for the applicant's assessment and decision-making on the application;
- National Policy Statement for Renewable Energy Infrastructure (EN-3) with particular reference to paragraph 2.4.2, which underlines the importance of good design for energy infrastructure in design of the project to mitigate impacts such as noise and effects on ecology; and
- National Policy Statement for Electricity Networks Infrastructure (EN-5) with particular reference to paragraph 2.8.9, which details biodiversity considerations when choosing an underground electricity line. This includes the environmental consequences as underground cables can disturb sensitive habitats.

8.3.38 The NPSs set out the Government's energy policy, the need for new infrastructure and guidance for determining an application for a DCO. The NPSs include specific criteria and issues which should be covered by applicants' assessments of the effects of their scheme, and how the decision maker should consider these impacts. The relevant NPS requirements, together with an indication of where in the PEIR chapter the information provided to address these requirements, are provided in **Table 8.3**.

Table 8.3: National Policy Statement requirements

NPS Paragraph reference	Requirement from the NPS	Where addressed in this PEIR
Overarching National Policy Statement for Energy EN-1		
Para 4.3.1	Prior to granting a development consent order, the IPC [now Planning Inspectorate, PINS] must, under the Habitats and Species Regulations, (which implement the relevant parts of the Habitats Directive and the Birds Directive in England and Wales) consider whether the project may have a significant effect on a European site, or on any site to which the same protection is applied as a matter of policy, either alone or in combination with other plans or projects. Further information on the requirements of the Habitats and Species Regulations can be found in a Government Circular. Applicants should also refer to Section 5.3 of this NPS on biodiversity and geological conservation. The applicant should seek the advice of Natural England and/or the Countryside Council for Wales and provide the IPC with such information as it may reasonably require to determine whether an Appropriate Assessment is required. In the event that an Appropriate Assessment is required, the applicant must provide the IPC with such information as may reasonably be required to enable it to conduct the Appropriate Assessment. This should include information on any mitigation measures that are proposed to minimise or avoid likely effects.	This was considered in the scoping stage and considered in Sections 8.3 and 8.4.
Para 5.3.3	Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project.	Section 8.3 and 8.4.
Para 5.3.4	The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	Section 8.3 and 8.4.

NPS Paragraph reference	Requirement from the NPS	Where addressed in this PEIR
Para 5.3.6	In having regard to the aim of the Government's biodiversity strategy the IPC should take account of the context of the challenge of climate change: failure to address this challenge will result in significant adverse impacts to biodiversity. The policy set out in the following sections recognises the need to protect the most important biodiversity and geological conservation interests. The benefits of nationally significant low carbon energy infrastructure development may include benefits for biodiversity and geological conservation interests and these benefits may outweigh harm to these interests. The IPC may take account of any such net benefit in cases where it can be demonstrated.	Section 8.3.
Para 5.3.7	As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives (as set out in Section 4.4); where significant harm cannot be avoided, then appropriate compensation measures should be sought.	Section 8.4.
Para 5.3.8	In taking decisions, the IPC should ensure that appropriate weight is attached to designated sites of international, national, and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment.	Section 8.4.
Para 5.3.9	The most important sites for biodiversity are those identified through international conventions and European Directives. The Habitats Regulations provide statutory protection for these sites but do not provide statutory protection for potential Special Protection Areas (pSPAs) before they have been classified as a Special Protection Area. For the purposes of considering development proposals affecting them, as a matter of policy the Government wishes pSPAs to be considered in the same way as if they had already been classified. Listed Ramsar sites should, also as a matter of policy, receive the same protection	Section 8.4.
Para 5.3.11	Where a proposed development on land within or outside an SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted. Where an adverse effect, after mitigation, on the site's notified special interest features is likely, an exception should only be made where the benefits (including	Section 8.4.

NPS Paragraph reference	Requirement from the NPS	Where addressed in this PEIR
	need) of the development at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs. The IPC should use requirements and/or planning obligations to mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest.	
Para 5.3.13	Sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Sites, have a fundamental role to play in meeting overall national biodiversity targets; contributing to the quality of life and the well-being of the community; and in supporting research and education. The IPC should give due consideration to such regional or local designations. However, given the need for new infrastructure, these designations should not be used in themselves to refuse development consent.	Section 8.4.
Para 5.3.20	The IPC will need to take account of what mitigation measures may have been agreed between the applicant and Natural England (or the Countryside Council for Wales) or the Marine Management Organisation (MMO), and whether Natural England (or the Countryside Council for Wales) or the MMO has granted or refused or intends to grant or refuse, any relevant licences, including protected species mitigation licences.	Section 8.4.

Draft National Policy Statements

8.3.39 The Government is currently reviewing and updating the Energy NPSs in order to reflect leaving the EU, to ensure its policies and strategic approach for the energy system that is set out in the Energy White Paper (December 2020), and to ensure that the planning policy framework enables the delivery of the infrastructure required for the country's transition to net zero carbon emissions. As part of the Energy NPS review process, the Government published a suite of Draft Energy NPSs for consultation on 6 September 2021.

8.3.40 These include the following Draft NPSs, which are expected to be important and relevant to the Secretary of State's decision, and have therefore been taken into account by the EIA:

- Draft Overarching National Policy Statement for Energy (EN-1);
- Draft National Policy Statement for Renewable Energy (EN-3); and
- Draft National Policy Statement for Electricity Networks Infrastructure (EN-5).

8.3.41 Where the relevant paragraphs in the Draft NPS these are set out in **Table 8.4** below.

Table 8.4: Requirements of Draft National Planning Statements

NPS Paragraph reference	Requirement from the draft NPS	Where addressed in this PEIR
Draft Overarching National Policy Statement for Energy EN-1		
4.5.1	Environmental net gain is an approach to development that aims to leave the natural environment in a measurably better state than beforehand. Applicants should therefore not just look to mitigate direct harms, but also consider whether there are opportunities for enhancements. Biodiversity net gain is an essential component of environmental net gain. Projects should consider and seek to incorporate improvements in natural capital, ecosystem services and the benefits they deliver when planning how to deliver biodiversity net gain.	Section 8.5 and **Appendix 8.4**
4.5.2	Although achieving biodiversity net gain is not an obligation for projects under the Planning Act 2008, energy NSIP proposals should seek opportunities to contribute to and enhance the natural environment by providing net gains for biodiversity where possible. Applicants are encouraged to use the most current version of the Defra biodiversity metric to calculate their biodiversity baseline and inform their biodiversity net gain outcomes and to present this data as part of their application. Biodiversity net gain should be applied in conjunction with the mitigation hierarchy and does not change or replace existing environmental obligations.	Section 8.5
5.4.4	The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests. As set out in Section 4.6, the design process should embed opportunities for nature inclusive design. The applicant is encouraged to consider how their proposal can contribute towards Biodiversity Net Gain in line with the ambition set out in the 25 Year Environment Plan. Energy infrastructure projects have the potential to deliver significant benefits and enhancements beyond Biodiversity Net Gain, which result in wider environmental gains. The scope of potential gains will be dependent on the type, scale, and location of each project	Section 8.3, 8.4 and 8.5

NPS Paragraph reference	Requirement from the draft NPS	Where addressed in this PEIR
5.4.5	The government's 25 Year Environment Plan marked a step change in ambition for wildlife and the natural environment. The Secretary of State should have regard to the aims and goals of the government's 25 Year Environment Plan and any relevant measures and targets. In doing so, the Secretary of State should also take account of the context of the challenge of climate change: failure to address this challenge will result in significant adverse impacts to biodiversity. The policy set out in the following sections recognises the need to protect and enhance biodiversity and geological conservation interests. The benefits of nationally significant low carbon energy infrastructure development may include benefits for biodiversity and geological conservation interests and these benefits may outweigh harm to these interests. The Secretary of State may take account of any such net benefit in cases where it can be demonstrated.	Section 8.3, 8.4 and 8.5
5.4.6	As a general principle, and subject to the specific policies below, development should at the very least aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives (as set out in Section 4.2 above); where significant harm cannot be avoided, then appropriate compensation measures should be sought. If significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then the Secretary of State will give significant weight to any residual harm.	Section 8.3 and 8.4
5.4.8	Important sites for biodiversity are those identified through international conventions and the Habitats Regulations. The Habitats Regulations set out sites for which an HRA will assess the implications of a plan or project, including Special Areas of Conservation and Special Protection Areas. As a matter of policy, the following should be given the same protection as sites covered by the Habitat's Regulations: (a) potential Special Protection Areas and possible Special Areas of Conservation; (b) listed or proposed Ramsar sites; and (c) sites identified, or required, as compensatory measures for adverse effects on other HRA sites	Section 8.3 and 8.4
5.4.10	Development on land within or outside a SSSI, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits (including	Section 8.4

NPS Paragraph reference	Requirement from the draft NPS	Where addressed in this PEIR
	need) of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs. The Secretary of State should use requirements and/or planning obligations to mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest.	
5.4.12	Sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Wildlife Sites, are areas of substantive nature conservation value and make an important contribution to ecological networks and nature's recovery. They can also provide wider benefits including public access (where agreed), climate mitigation and helping to tackle air pollution. National planning policy expects plans to identify and map Local Wildlife Sites, and to include policies that not only secure their protection from harm or loss but also help to enhance them and their connection to wider ecological networks. The Secretary of State should give due consideration to such regional or local designations. However, given the need for new nationally significant infrastructure, these designations should not be used in themselves to refuse development consent. Development will still be expected to comply with the biodiversity and geological conservation requirements set out in this NPS.	Section 8.4
5.4.14	Development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, the Secretary of State should maximise such opportunities in and around developments, using requirements or planning obligations where appropriate. This can help towards delivering biodiversity net gain. Wider ecosystem services and benefits of natural capital should also be considered when designing enhancement measures.	Section 8.5
5.4.18	The applicant should include appropriate mitigation measures as an integral part of the proposed development. In particular, the applicant should demonstrate that: • during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works • the timing of construction has been planned to avoid or limit disturbance to birds during the breeding season • during construction and operation best practice will be followed to ensure that risk of	Section 8.4

NPS Paragraph reference	Requirement from the draft NPS	Where addressed in this PEIR
	disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements.	
5.4.19	Applicants should consider producing and implementing a Biodiversity Management Strategy as part of their development proposals. This could include provision for biodiversity awareness training to employees and contractors so as to avoid unnecessary adverse impacts on biodiversity during the construction and operation stages.	Section 8.4 and the ES will include Outline LEMP
5.4.22	The Secretary of State should consider what appropriate requirements should be attached to any consent and/or in any planning obligations entered, in order to ensure that any mitigation or biodiversity net gain measures, if offered, are delivered, and maintained. Any habitat creation or enhancement delivered for biodiversity net gain should generally be maintained for a minimum period of 30 years.	Section 8.5
Draft National Statement for Renewable Energy Infrastructure EN-3		
2.50.2	The applicant's ecological assessments should identify any ecological risk from developing on the proposed site. Issues that may need assessment include habitats, ground nesting birds, wintering birds, bats, dormice, reptiles, great crested newts, water voles and badgers. The use of an advising ecologist during the design process can ensure that adverse impacts are mitigated, and biodiversity enhancements are maximised, although this is a decision for the individual applicant. The assessment may be informed by a 'desk study' of existing ecological records, an evaluation of the likely impacts of the solar farm upon ecological features, and should specify mitigation to avoid or minimise these impacts, and any further surveys required.	Section 8.3
2.50.3	The assessment should consider earthworks associated with construction compounds, access roads and cable trenching. Where such soil stripping occurs topsoil and subsoil should be stripped, stored, and replaced separately in order to minimise soil damage and to provide optimal conditions for site restoration. Soil handling may be informed through a soil and Agricultural Land Classification (ALC) survey, with detailed guidance available in Defra's guidance on Construction Code of Practice for the Sustainable Use of Soils on Construction Sites or any subsequent updates.	Chapter 16: Land Use & Agriculture
2.50.4	The assessment should consider how security and lighting installations may impact on the local ecology. Where pole mounted CCTV facilities are proposed the location of these facilities should be	Section 8.4

NPS Paragraph reference	Requirement from the draft NPS	Where addressed in this PEIR
	carefully considered in order to minimise impact. If lighting is necessary, it should be minimised and directed away from areas of likely habitat	
2.50.6	The assessment should consider the impacts of mobile arrays or trackers (if proposed) to avoid animals becoming trapped in moving parts.	Section 8.4
2.50.7	The applicant's assessment may be accompanied by a Flood Risk Assessment. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not in general be significant. Where access tracks need to be provided, permeable tracks should be used, and localised Sustainable Drainage Systems (SuDS), such as swales and infiltration trenches, should be used to control any run-off where recommended. Given the temporary nature of solar PV farms, sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses. Culverting existing watercourses/drainage ditches should be avoided. Where culverting for access is unavoidable, it should be demonstrated that no reasonable alternatives exist and where necessary it will only be in place temporarily for the construction period	Chapter 9: Hydrology, Hydrogeology, Flood Risk & Drainage
5.50.8	The assessment should consider enhancement, management, and monitoring of biodiversity. Solar farms have the potential to increase the biodiversity value of a site, especially if the land was previously intensively managed. In some instances, the increase in biodiversity caused by the repurposing of previously developed or intensely managed land for solar generation may equate to a net positive impact	Section 8.5
2.50.9	The applicant should consider whether they need to provide geotechnical and hydrological information (such as identifying the presence of peat at each site) including the risk of landslide connected to any development work.	Chapter 9: Hydrology, Hydrogeology, Flood Risk & Drainage
2.50.10	Proposed enhancements should take account of the above factors and as set out in Section 5.4 of EN1 and aim to achieve environmental and biodiversity net gain in line with the ambition set out in the 25 Year Environment Plan. This might include maintaining or extending existing habitats and potentially creating new important habitats, for example by instating: cultivated strips/plots for rare arable plants, rough grassland margins, bumble bee plant mixes, and wild bird seed mixes. It is advised that an ecological monitoring programme is developed to monitor impacts upon the flora of the site and upon any particular ecological receptors (e.g., bats and wintering	Section 8.5

NPS Paragraph reference	Requirement from the draft NPS	Where addressed in this PEIR
	birds). Results of the monitoring will then inform any changes needed to the land management of the site, including, if appropriate, any livestock grazing regime.	
2.50.11	Proposed enhancements should take account of the above factors and as set out in Section 5.4 of EN1 and aim to achieve environmental and biodiversity net gain in line with the ambition set out in the 25 Year Environment Plan. This might include maintaining or extending existing habitats and potentially creating new important habitats, for example by instating: cultivated strips/plots for rare arable plants, rough grassland margins, bumble bee plant mixes, and wild bird seed mixes. It is advised that an ecological monitoring programme is developed to monitor impacts upon the flora of the site and upon any particular ecological receptors (e.g., bats and wintering birds). Results of the monitoring will then inform any changes needed to the land management of the site, including, if appropriate, any livestock grazing regime	Section 8.4 and 8.3 Detail will be set out in an Outline LEMP in the ES.
2.50.12	In addition to Section 5.4 of EN-1 there are specific considerations which should inform Secretary of State decision-making where developments are proposed on peat. In these cases, the Secretary of State should be satisfied that the solar farm layout and construction methods have been designed to minimise soil disturbance when building and maintaining roads and tracks and other infrastructure. This is to ensure the development will result in minimal disruption to the ecology, or release of CO_2 and that the carbon balance savings of the scheme are maximised	Chapter 16: Land Use & Agriculture

National Planning Policy Framework (NPPF)

8.3.42 The National Planning Policy Framework (NPPF) states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible.

8.3.43 It specifies the obligations that the Local Authorities and the UK Government have regarding statutory designated sites and protected species under UK and international legislation and how this it to be delivered in the planning system.

8.3.44 Section 15 of the NPPF explains the National Planning Policy with regard to conserving and enhancing the natural environment and how local planning authorities should determine planning applications with regard to ecology and biodiversity. The policies set out in the NPPF to a large extent mirror those that are explained in NPS EN-1.

Local planning policy

8.3.45 Local planning policy has been considered when assessing potential ecological constraints and opportunities identified by the desk study and field surveys; and, when assessing requirements for further survey, design options and ecological mitigation. The local planning policy documents relevant to the Proposed Development are presented in **Table 8.5**.

8.3.46 The Central Lincolnshire Local Plan 2012-2036 was adopted by the Central Lincolnshire Joint Strategic Planning Committee (CLJSPC) on 24 April 2017 and encompasses the Local Plans of the City of Lincoln, West Lindsey and North Kesteven District Councils. The Central Lincolnshire authorities are preparing a new Local Plan to replace the Local Plan adopted in 2017.

8.3.47 Table 8.5 set out the policies in the current local and emerging local plan for the Energy Park (Central Lincolnshire Local Plan) and the Grid Connection (Southeast Lincolnshire Local Plan)

Table 8.5: Relevant Local Plan Policies in current and emerging local plans

Local Plan	Policies
2017 Central Lincolnshire Local Plan	**Policy LP21: Biodiversity and Geodiversity** All development should: • protect, manage, and enhance the network of habitats, species, and sites of international, national, and local importance (statutory and non-statutory), including sites that meet the criteria for selection as a Local Site; • minimise impacts on biodiversity and geodiversity; and • seek to deliver a net gain in biodiversity and geodiversity. Development proposals that will have an adverse impact on a European Site or cause significant harm to a Site of Special Scientific Interest, located within or outside Central Lincolnshire, will not be permitted, in accordance with the NPPF. Planning permission will be refused for development resulting in the loss, deterioration, or fragmentation of irreplaceable habitats, including ancient woodland and aged or veteran trees, unless the need for, and benefits of, the development in that location clearly outweigh the loss or harm. Proposals for major development should adopt an ecosystem services approach, and for large scale major development schemes (such as Sustainable Urban Extensions) also a landscape scale approach, to biodiversity and geodiversity protection and enhancement identified in the Central Lincolnshire Biodiversity Opportunity Mapping Study. Development proposals should create new habitats, and links between habitats, in line with Biodiversity Opportunity Mapping evidence to maintain a network of wildlife sites and corridors to minimise habitat fragmentation and provide opportunities for species to respond and adapt to climate change. Development should seek to preserve, restore, and re-create priority habitats, ecological networks and the protection and recovery of priority species set out in the Lincolnshire Biodiversity Action Plan and Geodiversity Action Plan. Where development is within a Nature Improvement Area (NIA), it should contribute to the aims and aspirations of the NIA. Development proposals should ensure opportunities are taken to retain, protect and enhance biodiversity and geodiversity features proportionate

Local Plan	Policies
	to their scale, through site layout, design of new buildings and proposals for existing buildings. **Mitigation** Any development which could have an adverse effect on sites with designated features and / or protected species, either individually or cumulatively, will require an assessment as required by the relevant legislation or national planning guidance. Where any potential adverse effects to the biodiversity or geodiversity value of designated sites are identified, the proposal will not normally be permitted. Development proposals will only be supported if the benefits of the development clearly outweigh the harm to the habitat and/or species. In exceptional circumstances, where adverse impacts are demonstrated to be unavoidable, developers will be required to ensure that impacts are appropriately mitigated, with compensation measures towards loss of habitat used only as a last resort where there is no alternative. Where any mitigation and compensation measures are required, they should be in place before development activities start that may disturb protected or important habitats and species.
Central Lincolnshire Local Plan Review Proposed Submission	**Policy S60 Protecting Biodiversity and Geodiversity** All development should: a) protect, manage, enhance, and extend the ecological network of habitats, species, and sites of international, national, and local importance (statutory and non-statutory), including sites that meet the criteria for selection as a Local Site; b) minimise impacts on biodiversity and features of geodiversity value; c) deliver measurable and proportionate net gains in biodiversity in accordance with Policy S61; and d) protect and enhance the aquatic environment within or adjoining the site, including water quality and habitat. **Part One:** Designated Sites. The following hierarchy of sites will apply in the consideration of development proposals: 1. International Sites: The highest level of protection will be afforded to internationally protected sites. Development proposals that will have an adverse impact on the integrity of such areas, will not be supported other than in exceptional circumstances, in accordance with the NPPF. Development proposals that are likely to result in a significant adverse effect, either alone or in combination with other proposals, on any internationally designated site, must satisfy the requirements of the Habitats Regulations (or any superseding similar UK legislation). Development requiring Appropriate Assessment will only be allowed where it can be determined, taking into account mitigation, that the proposal would not result in significant adverse effects on the site's integrity. 2. National Sites (NNRs and SSSIs as shown on the Policies Map): Development proposals should avoid impact on these nationally protected sites. Development proposals within or outside a national site, likely to have an adverse effect, either individually or in combination with other developments, will not normally be supported unless the benefits of the development, at this site, clearly outweigh

Local Plan	Policies
	both the adverse impacts on the features of the site and any adverse impacts on the wider network of nationally protected sites. 3. Irreplaceable Habitats Planning permission will be refused for development resulting in the loss, deterioration, or fragmentation of irreplaceable habitats, including ancient woodland and aged or veteran trees, unless there are wholly exceptional reasons, and a suitable compensation strategy will be delivered. 4. Local Sites (LNR, LWS and LGS as shown on the Policies Map) Development likely to have an adverse effect on locally designated sites, their features, or their function as part of the ecological network, will only be supported where the benefits of the development clearly outweigh the loss, and the coherence of the local ecological network is maintained. Where significant harm cannot be avoided, the mitigation hierarchy should be followed. **Part Two:** Species and Habitats of Principal Importance All development proposals will be considered in the context of the relevant Local Authority's duty to promote the protection and recovery of priority species and habitats. Development should seek to preserve, restore, and re-create priority habitats, ecological networks and the protection and recovery of priority species set out in the Natural Environment and Rural Communities Act 2006, Lincolnshire Biodiversity Action Plan, Lincolnshire Geodiversity Strategy and Local Nature Recovery Strategy. Where adverse impacts are likely, development will only be supported where the need for and benefits of the development clearly outweigh these impacts. In such cases, appropriate mitigation or compensatory measures will be required. **Part Three:** Mitigation of Potential Adverse Impacts Development should avoid adverse impact on existing biodiversity and geodiversity features as a first principle, in line with the mitigation hierarchy. Where adverse impacts are unavoidable, they must be adequately and proportionately mitigated. If full mitigation cannot be provided, compensation will be required as a last resort where there is no alternative. Development will only be supported where the proposed measures for mitigation and/or compensation along with details of net gain are acceptable to the Local Planning Authority in terms of design and location and are secured for the lifetime of the development with appropriate funding mechanisms that are capable of being secured by condition and/or legal agreement. If significant harm to biodiversity resulting from development cannot be avoided, adequately mitigated, or, as a last resort, compensated for, then planning permission will be refused.
Central Lincolnshire Local Plan Review Proposed Submission	**Policy S61: Biodiversity Opportunity and Delivering Measurable Net Gains** Following application of the mitigation hierarchy, all development proposals should ensure opportunities are taken to retain, protect and enhance biodiversity and geodiversity features proportionate to their scale, through site layout, design of new buildings and proposals for existing buildings with consideration to the construction phase and ongoing site management.

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	Development proposals should create new habitats, and links between habitats, in line with Central Lincolnshire Biodiversity Opportunity and Green Infrastructure Mapping evidence, the biodiversity opportunity area principles set out in Appendix 4 to this Plan and the Local Nature Recovery Strategy (once completed), to maintain and enhance a network of wildlife sites and corridors, to minimise habitat fragmentation and provide opportunities for species to respond and adapt to climate change. Proposals for major and large-scale development should seek to deliver wider environmental net gains where feasible. All qualifying development proposals must deliver at least a 10% measurable biodiversity net gain attributable to the development. The net gain for biodiversity should be calculated using Natural England's Biodiversity Metric. Biodiversity net gain should be provided on-site wherever possible. Biodiversity offsetting schemes should only be used in exceptional circumstances, where net gain cannot be achieved within the site boundary or where greater gains can be delivered off-site where the improvements can be demonstrated to be deliverable and are consistent with the Local Nature Recovery Strategy. All development proposals must provide clear and robust evidence for biodiversity net gains and losses in the form of a biodiversity gain plan, which should be submitted with the planning application, setting out: a) information about the steps to be taken to minimise the adverse effect of the development on the biodiversity of the onsite habitat and any other habitat. b) the pre-development biodiversity value of the onsite habitat;
South East Lincolnshire Local plan 2011-36	**Policy 28: The Natural Environment** A high quality, comprehensive ecological network of interconnected designated sites, sites of nature conservation importance and wildlife-friendly greenspace will be achieved by protecting, enhancing, and managing natural assets: **1. Internationally-designated sites, on land or at sea:** a. development proposals that would cause harm to these assets will not be permitted, except in exceptional circumstances, where imperative reasons of overriding public interest exist, and the loss will be compensated by the creation of sites of equal or greater nature conservation value; b. all major housing proposals within 10km of The Wash and the North Norfolk Coast European Marine Site, including the Sustainable Urban Extensions in Boston (site Sou006 & Wes002), Spalding (site Pin024/Pin045) and Holbeach West (site Hob048), will be the subject of a project-level Habitats Regulations Assessment (HRA) to assess the impact of recreational pressure on The Wash and North Norfolk Coast European Marine Site. This should include: i. locally-specific information relating to access and site sensitivities; Where the project-level HRA concludes that avoidance and/or mitigation measures are required, it is expected that: ii. Suitable Alternative Natural Greenspace (SANGs) should be provided on site Sou006 and Wes002, site Pin024/Pin045 and site Hob048 as part of their package of mitigation measures; or

Local Plan	Policies
	iii. all other major housing proposals should provide SANGs on-site and/or through a financial contribution to provide and/or enhance natural greenspace in the locality; iv. Suitable Alternative Natural Greenspaces should be designed in accordance with capacity and facility requirements in relation to the developments they mitigate for, best practice elsewhere and relevant evidence. **2. Nationally or locally-designated sites and protected or priority habitats and species:** a. development proposals that would directly or indirectly adversely affect these assets will not be permitted unless: i. there are no alternative sites that would cause less or no harm; and ii. the benefits of the development at the proposed site, clearly outweigh the adverse impacts on the features of the site and the wider network of natural habitats; and iii. suitable prevention, mitigation and compensation measures are provided. **3. Addressing gaps in the ecological network**: a. by ensuring that all development proposals shall provide an overall net gain in biodiversity, by: i. protecting the biodiversity value of land, buildings, and trees (including veteran trees) minimising the fragmentation of habitats; ii. maximising the opportunities for restoration, enhancement and connection of natural habitats and species of principal importance; iii. incorporating beneficial biodiversity conservation features on buildings, where appropriate; and maximising opportunities to enhance green infrastructure and ecological corridors, including water space; and iv. conserving or enhancing biodiversity or geodiversity conservation features that will provide new habitat and help wildlife to adapt to climate change, and if the development is within a Nature Improvement Area (NIA), contributing to the aims and objectives of the NIA.

Natural England and Department for Environment, Food and Rural Affairs (Defra) Standing Advice (Protected Species)

8.3.48 Standing advice from Natural England and Defra provides guidance on protected and notable species and includes reference to the best practice approaches to survey, mitigation and compensation. Guidance is also provided on the procedure for obtaining protected species licences.

8.3.49 This advice has informed the planning of surveys and the approach to mitigating impacts upon protected species, including where necessary the requirement for Natural England mitigation licences.

UK Biodiversity Framework

8.3.50 The UK Biodiversity Action Plan (UKBAP) was launched in 1994 and established a framework and criteria for identifying species and habitat types of conservation concern The UKBAP was subsequently succeeded by the UK Post-2010 Biodiversity Framework (July 2012) The UK list of 943 priority species and 56 habitats, however, remains an important reference source and has been used to help draw up statutory lists of priority habitats and species in England, Scotland, Wales and Northern Ireland. For the purpose of this assessment, the UKBAP is still used as one of the criteria to assist in assigning national value to an ecological receptor.

8.3.51 The UK Post-2010 Biodiversity Framework is relevant within England in the context of Section 40 of the NERC Act 2006 meaning that Priority Species and Habitats are material considerations in planning. These habitats and species are identified as those of conservation concern due to their rarity or a declining population trend. The objectives of this framework have been considered in this chapter.

Birds of Conservation Concern (BoCC)

8.3.52 The Birds of Conservation Concern (BoCC) is an assessment of the conservation status of all regularly occurring British birds which is updated every 5 to 6 years. The lists (Red, Amber and Green), that indicate the level of conservation importance for each species, are derived from quantitative assessments from standardised criteria. The assessment is based on the most up-to-date evidence available, and criteria include conservation status at global and European levels and, within the UK: historical decline, trends in population and range, rarity, localised distribution and international importance.

8.3.53 The most recent version Birds of Conservation Concern has been compiled by the Birds of Conservation Concern partnership, a coalition of the UK's leading bird conservation and monitoring organisations, which comprises the British Trust for Ornithology (BTO), Game and Wildlife Conservation Trust, Joint Nature Conservation Committee (JNCC), Natural England, Northern Ireland Environment Agency, Natural Resources Wales, NatureScot, and the Royal Society for the Protection of Birds (RSPB).

Local Nature Recovery Strategy (LNRS)

8.3.54 LNRSs are a system of spatial strategies for nature which will support the delivery of biodiversity net gain and provide a focus for a strengthened duty for all public authorities to conserve and enhance biodiversity. The LNRS will:

- agree priorities for nature's recovery, and
- map the most valuable existing habitat for nature, and map specific proposals for creating or improving habitat for nature and wider environmental goals.

8.3.55 The Greater Lincolnshire Nature Partnership (GLNP) has adopted the following policies

- No net loss of Priority or other semi-natural habitat by 2025;
- 10% land area of Greater Lincolnshire is Priority habitat by 2045;
- 25% land area of Greater Lincolnshire is semi-natural habitat within a functioning ecological network.

8.3.56 Work has begun on the preparation of a LNRS for Greater Lincolnshire, which will replace the Biodiversity Action Plan (BAP).

Scoping Criteria

8.3.57 A scoping request was submitted to The Planning Inspectorate on 7th January 2022. Formal written responses to this scoping request with regard to Ecology and Ornithology have been received from the Planning Inspectorate, Environment Agency, Natural England, North Kesteven District Council and Lincolnshire County Council.

8.3.58 Comments have separately been received from Lincolnshire Wildlife Trust and Buglife, and are included in **Table 8.6**.

8.3.59 A number of the matters raised in response were generic matters covered by legislation and policy requirements. Specific matters raised in response to the consultation are listed in Table 8.6.

Table 8.6: Specific matters raised to date, including the Scoping Opinion

Specific matter raised	How matter has been addressed
The Planning Inspectorate	
The Wash Special Protection Area (SPA) and Ramsar sites: The ES should consider the potential for the Proposed Development site to provide functionally linked land for bird species associated with the Wash SPA and Ramsar sites, or flight paths in the event that overhead line infrastructure is proposed.	Winter Bird surveys have been conducted on the Energy Park and Grid route at time of high tide on the Wash SPA in order to assess potential use of the site by species included in the SPA designation to allow an assessment of any potential effects including any effects should overhead infrastructure be proposed. Details of surveys are included at **Appendix 8.2.**
Vegetation Clearance: The ES should explain how phasing and methods of vegetation disturbance will avoid disturbance of protected species. Relevant measures should be secured by a DCO requirement.	An Outline LEMP with be included with the ES.
Best practice guidance: Paragraph 8.57 [of the Scoping Report] states that following best practice guidance during construction, operation, and decommissioning phases will enable any significant effects on ecology to be avoided or minimised. The ES should set out what best practice and other guidance will be followed, how this has been used to inform the design of the Proposed Development and any mitigation measures proposed and where and how these are secured.	The guidance and best practice to be followed in Sections 8.3, 8.4 and 8.5. Table 8.7 describes proposed mitigation measures and how these will be secured.
Biodiversity Net Gain (BNG): Paragraph 8.59 [of the Scoping Report] states that a full BNG calculation using Biodiversity Metric 3.0 will accompany a draft Landscape and Ecological Management Plan (LEMP) as part of the EIA. The ES should distinguish between measures intended to avoid or reduce the potential for likely significant effects, or those which have been identified for enhancement only.	The BNG assessment is set out in Section 8.5 will be an Appendix to the ES. A preliminary calculation has been completed and the Headline Results are at Appendix 8.4. The PEIR identifies significant effects in Section 8.4 and Table 8.9.
Methodology: The Scoping Report notes that survey data has been collected over a period of time. Should the ecological impact assessment seek to rely on older datasets, the ES should explain whether this approach has been agreed with relevant consultation bodies and why these surveys remain representative of the current situation on site.	Up to date surveys are being carried out as set out in Section 8.3. Reference to previous surveys from 2010 and 2017 will only be used provide background information and help put any new surveys in context of any longer term changes with the area.

Specific matter raised	How matter has been addressed
Veteran trees: Veteran trees are not referenced in the Scoping Report. The ES should identify any veteran trees which may be affected by the Proposed Development and assess any likely significant effects.	An Arboricultural Survey of the Energy Park and Grid Connection route is being carried out during summer 2022. An assessment of potential effects of Veteran Trees will be considered in the Arboricultural Survey which will form an appendix to the ES.
Panel Spacing: The ES should explain the relationship between panel spacing and vegetation growth on site and how spacing will be designed to avoid shading of vegetation.	The spacing of panels is determined by a number of factors including optimising output of the Energy Park. It is proposed that bifacial panels will be used which generate electricity from the front and rear of panels which rely of the reflection of light from vegetation. This will be the case for trackers or fixed panels. This is considered in Chapter 4 and in Section 8.4 in this chapter.
Confidential annexes: Public bodies have a responsibility to avoid releasing environmental information that could bring about harm to sensitive or vulnerable ecological features. Specific survey and assessment data relating to the presence and locations of species such as badgers, rare birds and plants that could be subject to disturbance, damage, persecution, or commercial exploitation resulting from publication of the information, should be provided in the ES as a confidential annex. All other assessment information should be included in an ES chapter, as normal, with a placeholder explaining that a confidential annex has been submitted to the Inspectorate and may be made available subject to request.	Noted: Details about protected species that could be subject to disturbance, damage, persecution, or commercial exploitation will be included in confidential appendices. The only example included in this PEIR is badgers contained in **Appendix 8.5.**
Natural England	
The proposed development is not within any Impact Risk Zone for European Designated sites: thus we would not anticipate any adverse impact to European designated sites or need for HRA.	Noted. The Energy Park and Grid Cable Route are over 16km from the Wash SPA. Wintering bird surveys have been conducted at high tide to assess whether any wetlands birds included in the designation depend on the area as a high tide feeding or roosting area.
Recommend that an in combination / cumulative of other large solar project in the area namely Mallards Pass and Cottam is carried out.	Cumulative aspects in relation to ecology and ornithology are assessed in Section 8.6.
It is recognised that due to the nature of solar panels a good proportion of the agricultural land affected by the development will not be *permanently* lost. However, the large development area and development lifetime give rise to a number of concerns with regard to agricultural productivity to both the long term potential of this land and safeguard all soil	The strategic land use and impact on agriculture are consider in Chapter 16: Land Use & Agriculture.

Specific matter raised	How matter has been addressed
resources and retain important function and ecosystem services. The ES should consider the following issue: • The degree to which soil are disturbed or damaged • The extent to which agricultural land would be disturbed or lost ad with BMV would be impacted • Set out details of how any adverse impacts on BMV can be minimised through design Set out details of how any adverse impacts on soils can be avoided or minimised by management and design to minimise soil handling and maximise sustainable use to achieve successful after use and minimise off-site impacts.	
The ES should include a Biodiversity Net Gain Assessment and Habitat Management Plan explaining how the site will be managed for the lifetime of the development and how it would contribute to the wider Nature Recovery Network.	A Biodiversity Net Gain assessment using the Natural England metric version 3 is set out in Section 8.5, and **Appendix 8.4**, and a Habitat Management Plan will be included in an Outline LEMP in the ES.
The ES should contain details of decommissioning and after use of the site and how this will avoid impact on soils and ensure the land can be restored to its form condition.	The legal agreement with the landowner is for 40 years after which it will be return to it's previous use. Given the rapidly changing climate it is not possible to define what crops or type of agricultural land use could occupy the area in 40 years from the operation of the Proposed Development. The ES will set out how the decommissioning will minimise negative impacts on the soils in Chapter 16: Land Use & Agriculture.
North Kesteven District Council	
Provided that direct impacts on LWS are avoided through use of directional drilling and that there is no potential for significant indirect effects, then it is agreed that these LWS can be scoped out. This should be confirmed by the applicant later.	The details of crossing the LWS South Forty Foot Drain by direct drilling are set out in Chapter 4. Where hydraulic drilling is required, a launch pit swathe of 50m x 50m is anticipated. These will be setback from the South Forty Foot Drain within fields either side of the Drain (Section 8.5) The land will return to it's previous use, with the exception of the link boxes which will be a ground level access to the joint bays. It is anticipated the location of these will be available for the ES, and where possible will be at field edges.
The proposed development is not located within an area identified within the Local Plan policies map as an area suitable for landscape scale biodiversity enhancement but there are several small woodlands that are individually identified as suitable for enhancement. These woodlands would not be affected by the proposed development,	Noted.

Specific matter raised	How matter has been addressed
so there are no conflicts in relation to any defined "Biodiversity Opportunity Areas".	
The habitat data gathered should be suitable to evidence the BNG site condition assessment. This should be provided with the BNG assessment for all relevant on and off-site habitat parcels	An extended phase 1 survey has been carried out for the Energy Park (Appendix 8.1) and is currently being carried out for the off site Grid Route which will inform, and update the BNG assessment in Section 8.5 (and Appendix 8.4).
More information is needed to permit us to agree that notable flora are not likely to be present. The suitability of the existing baseline will depend on the botanical expertise of the surveyors and the timing of the surveys. Currently, the information presented is insufficient to confirm that scarce arable flora can be scoped out (the proposed land use change will result in widespread losses of arable habitats). The drains could also support notable flora, and these could (if sufficiently localised in occurrence) be affected by new bridges, culverts or installation of cables using open cut methods	A rare arable plant and aquatic plant survey of the Energy Park Site has been commissioned for 2022 survey season and these species groups will be included in the extended phase 1 survey of the Grid Route.
It is not clear if specific consideration has been given to Schedule 1 bird species. Survey methods for these may diverge from those suitable for a more general breeding bird survey. Prior surveys for the wind farm identified quail, marsh harrier, hobby and barn owl. At least some of these species could be affected by construction activities and/or the permanent change in land use. They may also be a consideration in relation to agreement of public access routes.	Specific consideration of schedule 1 species has been included in the breeding and wintering bird surveys and potential effects will be assessed when survey complete. The same ornithologist that conducted the survey for the previous wind farm application to ensure continuity of survey methods and knowledge of the areas.
The potential for barn owl nest sites to occur in trees along the grid connection corridor should be considered, and this could be scoped at the same time as the proposed bat roost assessment.	The breeding birds survey of the off-site Grid Route will include an assessment for nesting Barn Owl. Two schedule 1 species have been recorded on the Energy Park Site. These are for a single Barn Owl territory and one single sighting of foraging Hobby.
Similar to the above point, but with a lesser level of legal protection, prior surveys have recorded a variety of notable bird species that will also be a specific consideration in relation to land use change. Losses of habitat for corn bunting are a potentially important consideration given the species is in rapid national decline.	Breeding bird surveys on the Energy Park Site in 2021 failed to record breeding Corn Bunting. This species was recorded breeding on site during the surveys conducted prior the wind farm application in 2010 possibly reflecting the national decline as noted by NKDC.

Specific matter raised	How matter has been addressed
We agree that it is not likely to be proportionate to require wintering bird surveys for the grid connection corridor, provided that areas of potential sensitivity are otherwise identified, and details are provided on how any potential constraints will be managed. Similarly, we agree that bat activity surveys are not relevant to the grid connection corridor as long as potential roosting sites are identified and protected	Noted: However, winter birds survey were carried out at high tide on The Wash to assess whether significant number of birds included in the SPA designation use the areas as a high tide roost or foraging area are considered in Section 8.3 - 8.4 and Appendix 8.2.
The submitted project scope (ecology) does not provide detail on the proposed approach to ecological impact assessment (EcIA). We therefore advise that this should be undertaken in accordance with current good practice which is the Guidelines for ecological impact assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management, 2019).	The ecological impact assessment (EcIA). Will be undertaken in accordance with current good practice which is the Guidelines for ecological impact assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management, 2019) as set out in Sections 8.3 and 8.4.
The assessment should identify and show regard to relevant planning policy and related guidance, including and particularly National Policy Statements (NPS) EN-1, EN-3 and Planning Inspectorate Advice Note Ten in relation to Habitats Regulations Assessment (HRA). NPS EN-4 is not likely to have direct relevance (as its remit is pipelines), but its requirements in relation to ecology are potentially equally applicable to cable laying for grid connection e.g., requirements in relation to reinstatement of habitats, and avoidance of important hedgerows.	The relevant planning policy and guidance being used in the assessment are set out in. as set out in Sections 8.3 and 8.4.
Given the progress made to date on ecological surveys, we consider that it will be possible to submit a relatively comprehensive and complete EcIA with the PEIR (as opposed to a more high-level assessment). We would encourage this approach, to permit detailed review and advice in advance of submission of the DCO application.	Details of all surveys and assessment completed to date are included in the PEIR.
While we understand the rationale for scoping out European Sites and other statutory sites, and agree that this is likely to be correct, this should not be undertaken based solely on considerations of relative distance from the proposed development. Instead, regard should be given to the site-specific Impact Risk Zones defined by Natural England. It should be noted that some form of HRA will be required to accompany the DCO	This is noted. Natural England as noted above have stated: "*The proposed development is not within any Impact Risk Zone for European Designated sites: thus we would not anticipate any adverse impact to European designated sites or need for HRA*" The Energy Park and Grid route are over 16km from the Wash SPA. Wintering bird surveys have been conducted at high tide to assess whether any wetlands birds

Specific matter raised	How matter has been addressed
application even where European Sites are not likely to be adversely affected. The relevant requirements are set out in Advice Note Ten.	included in the designation depend on the area as a high tide feeding or roosting area.
All potentially significant direct and indirect impacts and effects should be identified and assessed. Species could be affected by the long-term habitat changes arising from the proposed development, as well as by impacts occurring during construction. The proposed development represents a substantive change in land use, and it is unlikely that the habitats within the solar array would be suitable to maintain all the species associated with the large arable fields currently present. For example, given the scale and nature of the proposed development impacts to farmland birds should be thoroughly assessed. If significant effects are identified, then appropriate options to mitigate these effects should be identified.	All potentially significant direct and indirect impacts and effects have been identified and assessed and set out in Section 8.4 include any effects during construction and long term changes result from the installation of solar panels and the change will be assessed.
The species assessment should also consider the effects of solar panelling and associated infrastructure on birds, bats, and general ecology during the operation of the proposed development. The potential for the proposed development to attract or displace populations, and impacts associated with collision risk and barrier effects, should be assessed where significant effects are likely to occur. Security fencing is a specific consideration in relation to potential barrier effects and the known presence of badger. Any necessary mitigation measures, such as mammal gates, should be described	Assessment of the potential effects of solar panels and security fencing in term of collision risk and barrier effects has been carried out as set out in Section 8.4.
More detail will need to be provided in relation to potential impacts on watercourses from new crossings. Consideration should also be given to any design requirements specified by the Internal Drainage Boards (IDBs) as this may also have relevance to the impact assessment. We have received guidance in the past that has necessitated lining of the channel to limit scope for vegetation growth under bridge crossings where it would be inaccessible during drainage maintenance works.	Once identified and the aquatic plant survey are completed detailed assessment of the potential effects on water crossing will be carried out in close liaison with Black Sluice IDB.
In specific relation to the grid connection corridor, we consider that impact avoidance measures should be explored first before considering habitat removal. Options for the use of directional drilling should be considered in relation to	The assessment of potential effects along the grid connection route will follow the mitigation hierarchy of avoid, minimise, restore, and offset with detailed reasons and justification provided where avoidance measures will not be used.

Specific matter raised	How matter has been addressed
avoidance of all higher quality habitats, and explanation should be provided where this is not considered feasible. Such an approach would be consistent with guidance on protecting priority habitats within EN-1.	The phase 1 survey of the grid connection route has yet to be completed. However, the initial design of the Proposed Development will involve direct drilling under South Forty Foot Drain LWS.
We agree with the list of proposed new habitats, although it also needs to be clarified how these will be suitably managed long-term in support of the biodiversity gain reported in the DCO application. Consideration should also be given to enhancement of drain habitats where these are falling out of condition or otherwise would benefit from reprofiling.	An Outline Landscape Ecological Management Plan (LEMP) will be included with the DCO application which will detail long term management and monitoring of habitats within the Energy Park Site. This will give the opportunities to support the delivery of the objectives of the Lincolnshire Biodiversity Action Plan and the emerging Greater Lincolnshire Nature Strategy and National Pollinator Strategy.
The draft LEMP should provide more detail on how the proposed habitats will be created, established, and managed long-term. In refining the proposed approach further, regard should be given to the Lincolnshire Biodiversity Action Plan and the Greater Lincolnshire Nature Strategy. The applicant has already identified the potential to support the aims of the National Pollinator Strategy, and in relation to this the proximity of the site to a 'B-Line' identified by the nature conservation charity Buglife is of potential relevance.	The Outline LEMP will accompany the ES chapter. This will include details of the long term management and monitoring of the grasslands. This will give the opportunities to support the delivery of the objectives of the Lincolnshire Biodiversity Action Plan and the emerging Greater Lincolnshire Nature Strategy and National Pollinator Strategy.
The indicative site zones plan provides an indication of where new habitats would be located, although we cannot identify what is proposed in each area. In addition, it is not clear if the northern public access areas would also be managed for biodiversity. This would be desirable given that they are adjacent to the Head Dike Biodiversity Opportunity Area (see the baseline section, above). However, and while acknowledging the desirability of a circular amenity route, we are not satisfied that the identified areas are appropriate. The northern access areas are locations that are currently remote from roads and habitation so are locations where habitat enhancement could be achieved for sensitive species such as marsh harrier or otter. In comparison, the off-site areas to the south of the proposed solar park are much closer to roads and habitation. Please could more consideration be given to possible access routes that would permit realisation of such biodiversity opportunities.	The proposed habitat enhancements are shown on **Figure 4.1e: Ecological Enhancements**. The proposed circular path is connected to the existing footpath network (HECK/15/1) and has been extended following consultation. It should be noted that it is the existing footpath that runs along the Head Dike, albeit the bridge was removed *c.* 2005. The proposed permissive path is away from sensitive habitats on the Head Dike. The Head Dike land is outside the Proposed Development Boundary and applicant has no control over the management of this area. As a Flood Management Structure the management comes under the responsibility of the landowner, Black Sluice IDB and Environment Agency.

Specific matter raised	How matter has been addressed
In addition, a potentially greater gain for biodiversity and landscape connectivity might be achieved by relocating the enhancement areas to the north (along Head Dike) and pulling the solar array further south, while still permitting access via the circular amenity route. Please could this be considered further, if only to explain how the layout has been derived. The proposed point of access onto the amenity route also needs to be identified, as presumably allowance for parking will be necessary and this may have additional habitat impacts.	The Head Dike is outside the Proposed Development boundary and applicant has no control over the management of this area. The Proposed Development is separated from southern bank the Head Dike (main river) by a Black Sluice IDB managed watercourse which requires continuous access for management. Including the set back from IDB controlled drain, the distance will be over 30m. The access to the permissive path will be via the existing public right of way HECK/15/1. No public car parking will be provided for access to this permissive path to avoid increasing emissions by people driving to use it.
Clarity will be needed on whether the proposed habitats, particularly the grasslands, will be managed solely for biodiversity or if some form of agricultural use is also proposed. If agricultural use is proposed then potential conflicts between biodiversity and agricultural use should be carefully considered, and a realistic assessment should be provided of the BNG achievable under agricultural regimes.	An Outline LEMP will be submitted with the DCO application which will detail those areas with the Energy Park which will be managed principally for biodiversity and those areas where agricultural practices will continue. The current proposal would see a majority of Energy Park grazed.
Establishment of off-site habitats before the start of construction is encouraged, particularly where this would help offset some of the impacts on protected and notable species during construction e.g., impacts on ground nesting birds	An Outline LEMP will be submitted with the DCO application which will detail those areas with the Energy Park which will be managed principally for biodiversity gain.
In addition to the new habitats and the associated benefits arising from these for a broad suite of flora and fauna, specific enhancement measures for specific species are also identified by the applicant. We recommend that these be reviewed further once the potential impacts and effects on species have been assessed. Impacts on the baseline species interest of the site should be mitigated as fully as possible, and a clear distinction should be maintained between this essential mitigation and enhancement. Proposals for species enhancement also need to be realistic and therefore are best targeted at species already present or that are reasonably likely to colonise in the near future.	The changes in habitat as result of the Proposed Development are set out in Section 8.4. Mitigation measures are set out in Section 8.5 and enhancements in Section 8.6.
It cannot be assumed that all of the proposed new habitats will contribute to BNG, as to demonstrate this the applicant first needs to quantify the habitat losses	The changes in habitat as result of the Proposed Development are set out in Section 8.4 The preliminary biodiversity

Specific matter raised	How matter has been addressed
to the proposed development and related requirements for habitat compensation to achieve no net loss. This will be provided later by the applicant in the form of a Biodiversity Net Gain (BNG) calculation. The current iteration of the Natural England metric (Metric 3.0) should be used to make the BNG calculation. All permanent habitat losses should be quantified, including within the grid connection corridor. Where habitat impacts are scoped out on the basis that they are temporary, they should be evidenced with reference to a clear description of the habitats concerned and realistic assumptions on the ability to reinstate these habitats within the applicable timeframe (within 2 years from point of habitat removal, see the guidance accompanying Biodiversity Metric 3.0).	net gain assessment is set out in Section 8.5 and **Appendix 8.4**.
Potential Cumulative Ecological Effects Given the characteristics of the affected landscape and its habitats, and the prior species data collected for Heckington Fen Wind Farm, I cannot identify any likely cumulative effects arising in combination with onshore works for Triton Knoll. The Triton Knoll website indicates that the onshore cabling works are now completed, so there would be no overlap in construction periods between the two developments. Both projects have or will utilise directional drilling to avoid impacts on important habitats. Triton Knoll has achieved BNG, so there would be no cumulative habitat losses with the proposed development that are likely to produce a significant adverse effect on biodiversity.	Noted: An assessment of potential cumulative effects is detailed to Section 8.6.
Lincolnshire Wildlife Trust	
LWT supports and insists that you will include data requests to the Lincolnshire Environmental Records Centre (LERC), and you will consult the National Biodiversity Network (NBN) as part of the desk study to inform the Preliminary Environmental Information Report and Environmental Statement.	A data request has been made as part of the desk study. Data on designated sites and protected and notable species within 5km of the Application Site is listed in **Appendix 8.3** and shown on **Figure 8.2**.
We would wish to see a comprehensive geo-referenced assessment of all nearby site designations, with an assessment of proximity and biodiversity risk posed by the proposed development in each case in accordance with CIEEM Ecological Impact Assessment guidance.	Location of statutory and non-statutory designated sites are shown on **Figure 8.2**. An assessment of potential effects on these sites is set out in Section 8.4.

Specific matter raised	How matter has been addressed
We see that it has so far been determined (Paragraph 8.12) that there are "no conflicts in relation to any defined "Biodiversity Opportunity Areas." We are not sure at this stage whether this is based on the Biodiversity Opportunity Mapping Study for central Lincolnshire 2013 or whether the Greater Lincolnshire Nature Partnership has been consulted for the most up-to date information. We would insist that this assessment is made on the basis of the latest available data and analysis.	Greater Lincolnshire Nature Partnership website cites the Biodiversity Opportunity Mapping Study for Central Lincolnshire which was completed in 2013 by CBA Consultants and forms part of the evidence base for the combined Local Plan. The Biodiversity Opportunity Mapping was a follow on study from the Green Infrastructure study of 2011. The Energy Park not within any area identified within this study although it is classified as an area with "*soils most suitable for wetland habitat creation".*
The Lincolnshire Wildlife Trust calls for a minimum of 10% Biodiversity Net Gain under the requirements of the Environment Act 2021. This is applicable to NSIPs and would need to be determined by UK Habitats Assessment methodology, scored by the latest version of the DEFRA Biodiversity Metric, and supported by appropriate post-intervention habitat monitoring and management for a minimum 40-year period.	A preliminary biodiversity net gain assessment is set out in Section 8.5 (and **Appendix 8.4**) was carried out using the latest iteration of the Natural England metric (Metric 3.0). A habitat monitoring and management plan will be part of the Outline LEMP in the DCO Application.
We expect any mitigations for Water Voles and Otters would relate to protection of riverbanks and margins from disturbance and damage by buffering and mitigated risk of pollution events. We will expect these to be built into CEMPs for each phase. As a reasonable approach, we would call for a minimum stand-off of 5m from any ditch and 10m from any larger or natural watercourse.	To date surveys have not recorded water vole or otter on the Energy Park Site. However, a precautionary approach of a minimum 9m stand-off from all drainage board water courses/ditches and 8m from all other ditches has been included within the Site Layout as set out in Section 8.4. The phase 1 survey of the grid connection route has yet to be completed. However, the initial design of the Proposed Development will involve directional drilling under South Forty Foot Drain LWS.
We would want to see GCN eDNA surveys undertaken between April and June of all accessible ponds within red line boundaries and land within 250m.	GCN eDNA surveys have been carried out during April 2022 and set out in Section 8.3. Due to the samples returning inconclusive, caused by the water chemistry full population assessments are being carried out between April and June 2022. There have been no positive records of GCN recorded within the Energy Park Site since 2010 and no positive records found during ecological surveys for the Viking Link, Triton Knoll or the Vicarage Drove (Solar) planning application.
LWT supports Paragraph 8.54 [of the Scoping Report] which states that 'The potential impact of the security fencing in relation to potential barrier to mammal movements will be assessed.' We would	Appropriate gates and or gaps will be placed in the fencing at appropriate locations to allow free passage of Brown Hare across the site.

Specific matter raised	How matter has been addressed
call for this to take Brown Hare into account	
If Badger setts and/or Badger activity has been identified on or close to any part of the site, LWT would expect to see Natural England consulted on the need for a licence and full measures for Badger mitigation proposed within the PEIR, LEMP and CEMP. We would insist that any fencing would not extend below the ground surface where this would conflict with Badger activity and that 'Badger gates' would be considered for ensuring site boundary permeability for this species	Natural England guidance in relation to Badger has been followed as set out in Section 8.4. Appropriate gaps or gates will be placed in the fencing to allow free passage of badgers across the site as set out in Section 8.4. These will be close to existing setts and identified Badger tracks.
Lincolnshire County Council	
The Council is generally agreeable to the methodology and approach detailed within the Scoping Report however notes that paras 8.4, 8.7 and 8.41 suggest that updated breeding and wintering bird surveys are not proposed to be carried out in relation to the main solar park and energy storage area.	Updated surveys have been completed and will be presented in the ES. The results from the updated wintering birds survey are considered in Section 8.4 and presented in Appendix 8.2.
Consultation is being carried out on the BNG process and therefore should the version of the metric change or the approach to BNG alter because of this consultation then this will need to be reflected.	Noted.
Environment Agency	
Particularly interested in opportunities around the Head Dike. We recognise the challenge here is that the bigger watercourses are high level carriers so significant habitat improvement on these would most likely need to consider the more complex setting back of embankments to create habit. This may or may not be feasible within the scheme and if this is an option that can be considered a range of permissions would be required for this including our own flood environmental permit. Our Partnership and Strategic Overview team would be happy to engage in conversations to find a way forward on any flood risk implications.	The Head Dike is outside the Proposed Development boundary and applicant has no control over the management of this area. The Proposed Development is separated from southern bank the Head Dike (main river) by a Black Sluice IDB managed watercourse which requires continuous access for management. Including the set back from IDB controlled drain, the distance will be over 30m. Ecotricity will engage with Partnership and Strategic Overview team to consider opportunities for habitat enhancements.
On a smaller scale and for general habitat within the smaller drainage network there are potential ways of improving habitat to be considered, for example to increase the wet marginal areas on the existing drains. This would require consultation with Black Sluice IDB as well as the usual checks and permissions including ecological, water	Noted. Ecotricity will engage with The Black Sluice IDB to consider opportunities for habitat enhancements.

Specific matter raised	How matter has been addressed
voles especially. There are also some further guides out there for artificial drainage networks that have ideas at varying levels of ambition.	
If an ambition is to wet the landscape a bit more around the solar farm then the applicant may want to speak with the Lincolnshire Wildlife Trust who have a big focus on the Fens through the Fens for the future project as they will have lots of ideas for environmental enhancement and ways to capture BNG.	Noted. Ecotricity will engage with Black Sluice IDB and LWT to consider opportunities for habitat enhancements.
Buglife	
Having looked at the area it does not fall into any of the designated Important Invertebrate Areas or indeed the B-Lines so unlikely to hold much invertebrate interest at present. Reference made to 'A manual for the survey and evaluation of the aquatic plant and invertebrate assemblages of grazing marsh ditch systems' Version 6. Consideration should be given to sowing a low growing pollinator friendly mix.	Noted.

Limitation to the Assessment

8.3.60 Although best practice was followed for the field surveys, some the species in question are secretive animals and it possible that some field signs may have been overlooked. In addition, usage of the Proposed Development by bird species for foraging, shelter and as a transit route varies with season, and the surveys carried out therefore represent only 'snapshots' of activity within the Survey Area at the time of the survey (see Figures 1 + 2 in Appendix 8.2 for the Survey Area). In order to reduce this issue in relation to mobile mammals, static bat detectors survey were conducted to record bat activity throughout the Energy Park Site. It should also be noted that absence of recorded field signs is not necessarily evidence that a particular species is not utilising an area. However, this report will identify the probable value of the Proposed Development for the pertinent species, based upon the survey data gathered.

8.3.61 This Energy Park Site has been subject to previous intensive ecological surveys conducted in 2008-2010 prior to the submission of the wind park planning application(s). Further surveys were conducted between 2015-2018 prior to the proposed construction of the wind park. These surveys recorded the same habitat and a similar range of species as found in the current surveys.

8.4 BASELINE CONDITIONS

Site Description and Context

8.4.1 The Energy Park Site is bounded by a drainage ditch which lies directly to the south of the Head Dike, which runs along the northern boundary, Holland Dike to the east, the A17 Sleaford to Holbeach road to the south and B1395 Sidebar Lane and agricultural land to the west, extending to approximately 586ha. The Energy Park Site lies wholly within North Kesteven District, abutting Boston Borough boundary along the eastern edge.

8.4.2 Land within the Energy Park Site is in arable use and is subdivided into rectilinear parcels by long linear drainage ditches that lie principally north-south, connected east-west by shorter ditches including Labour in Vain Drain. The ditches have an engineered profile, colonised in part by emerging aquatic plant species. The Energy Park Site is very flat and low-lying at between 2m and 3m above Ordnance Datum (AOD) and is predominantly within Flood Zones 2 and 3, with a narrow ribbon of Flood Zone 1 occurring along the southern edge and south-western corner of the Energy Park Site.

8.4.3 Six Hundred Farm lies in the eastern third of the Energy Park Site, with access gained from Six Hundred Drove via the A17. Two further access tracks lie off the A17 adjacent Rectory Farm in the centre of the Energy Park Site and at Elm Grange in the southwest corner, these in turn connect to Crab Lane toward the northeast corner of the Energy Park Site, and then to Sidebar Lane. The access tracks follow ditch alignments.

8.4.4 Intermittent shrubs/hedgerows occur within or along the boundary of the Energy Park Site, with tree cover limited to four small plantation woodland blocks.

8.4.5 The route for the proposed off-site Grid Connection has not been finalised. At this time there are two route options being considered. They run predominately south from the Energy Park Site, one from the east of the Energy Park, and one south close to the proposed site entrance. Both cross the A17, the South Forty Foot Drain and the railway. The underground cable will connect into the existing Bicker Fen Substation. As the assessment progresses it will be determined which of these routes will be progressed to the DCO application stage.

8.4.6 Both of these routes run through similar agricultural land. Survey work of these two route options is being undertaken at the time of writing to help determine the optimum route. The wider assessment area includes both of these two off-site grid route options.

Baseline Survey Information

Energy Park Site

Desk study

8.4.7 There are no internationally important statutory designated sites (Ramsar, SAC & SPA) or national sites (SSSI, NNR, LNR) within 10km of the Energy Park Site. The nearest SSSI is Horbling Fen SSSI located 11.5km to the southwest of the Energy Park Site, designated for its geological interest. The Wash, situated approximately 16km to the southeast of the Energy Park Site at its nearest point, is the nearest SAC, SPA and Ramsar site.

8.4.8 A data search was requested from the LERC for local designated sites and species recorded with 5km of the Energy Park Site (Appendix 8.3). There are no non-statutory designation within the Energy Park Site. There are four Local Wildlife Sites (LWS) within 5km of the Energy Park Site. The South Forty Foot Drain LWS is located approximately 1km to the south of the Energy Park Site. This is a man-made watercourse with bankside vegetation comprising rough neutral grassland, scrub, and trees. The Drain supports large populations of many aquatic plants occur in the watercourse, such as shining and perfoliate pondweed, whorled water-milfoil, rigid hornwort, mare's-tail, arrowhead, water-crowfoot, common, ivy-leaved & fat duckweed, and water-starwort. The water's-edge is dominated by a broad strip of reed sweet-grass in many places, usually with smaller numbers of branched bur-reed, reed canary-grass, greater pond-sedge, bulrush, and in the south by club-rush. The Drain is a good corridor linking the centre of Boston with the River Witham. There are otter records along the South Forty Foot Drain.

8.4.9 The three further LWS within 5km are Great Hale Eau, Broadhurst Drain East, Old Forty Foot Drain. These are 1.5-4km south of the Energy Park Site. These are all drainage ditches supporting a range of aquatic plans and some section of the banks species typical of unimproved grasslands such as common knapweed, greater knapweed, common sorrel and meadow vetchling lesser trefoil, selfheal, smooth meadow-grass, cock's-foot, false oat-grass and creeping bent, mixed with typical plants of bare patches, such as colt's-foot, beaked hawk's beard.

8.4.10 The Old Forty Foot drain LWS supports a population of the globally-threatened fine-leaved water-dropwort, and a range of aquatic plants species including are lesser and narrow-leaved water-plantain, water-violet, water-crowfoot, horned and fennel pondweed, waterstarwort, duckweed, mare's-tail, stonewort and other algae. The water's edge holds water-cress, water mint, water-plantain, creeping-Jenny, purple loosestrife, yellow iris, meadowsweet, branched bur-reed, reed sweet-grass, reed canary-grass, common reed, common spike-rush, tufted-sedge, false fox-sedge and greater pond-sedge.

8.4.11 Heckington Grassland SNCI is located approximately 5km to the west of the Energy Park Site. This SNCI consists of grassland bordered by hedgerows and is used by a variety of breeding and over-wintering birds. Old Wood South Kyme SNCI is located approximately 5km to the north of the Energy Park Site, and is an area of woodland with Ash coppice, scrub, Elm, and tall herbs. A plan showing the location of these designations **Figure 8.2**.

8.4.12 The LERC hold no records of protected, national priority or local local priority mammals species within the Energy Park although there is a record of an otter spraint from the Skerth Drain just outside northern boundary of the Energy Park Site.

8.4.13 There are records of five protected or priority mammals within 5km of the proposed Energy Park Site, including Brown Hare (66), Badger (38), Otter (7), Water Vole (224), and Hedgehog (46) held by LERC. Most of the records of Water Vole are over ten years old although there are six Water Vole records in the last 10 years with several from Great Hale Eau drain approximately 1.5km south of the Energy Park Site and one from Car Dyke approximately 1.6km from the Energy Park Site.

8.4.14 The LERC lists 81 records of at least eight bat species from with 5km of the Energy Park Site. Of those identified to species level Common Pipistrelle (*Pipistrellus pipistrellus*) are frequently recorded (11 plus 8 pipistrelle *sp*. records), there are also seven records of Daulbenton's bat (*Myotis daubentinii*), three records of Myotsis sps, three records of Noctle bat (*Nyctalus noctula*) and two records of brown long eared bat (*Plecotus auritus*).

8.4.15 LERC has records of 68 bird records within 5km of the Energy Park Site. Of these, 27 are protected under national and international legislation. With the exception of those classified as 'non native' the remainder are of national or local priority status (Appendix 8.3).

8.4.16 The Wash SPA is internationally important for 14 wintering wetland birds species (17,000 dark-bellied brent geese (*Branta bernicla bernicla*) (12% of the European wintering population), 7,300 pinkfooted geese (*Anser brachyrhynchus*) (7%), 16,000 shelducks (*Tadorna tadorna*) (12%), 1,700 pintails (*Anas acuta*) (2%), 24,000 oystercatchers (*Haematopus ostralegus*) (3%), 5,500 grey plovers (*Pluvialis squatarola*) (7%), 500 sanderlings (*Calidris alba*) (3%), 7,500 knots (*Calidris canutus*) (21%) 29,000 dunlins (*Calidris alpina*) (1%) 8,200 bar-tailed godwits (*Limosa lapponica*) (1%), 3,700 curlews (*Numenius arquata*) (1%), 4,331 redshanks (*Tringa totanus*) (5%) and 980 turnstones (*Arenaria interpres*) (2%). and five nationally important number of species of wetland birds (3,900 wigeon (*Anas penelope*) (2% of the British wintering population), 220 goldeneye (*Bucephala clangula*) (1%), 130 gadwall (*Anas strepera*) (3%), 830 common scoters (*Melanitta nigra*) (2%), 260 black-tailed godwits (*Limosa limosa*) (6%) and several gull species (*Larus*). The LERC has provided two records of curlew within 5km of the Energy Park between 1998-2016, one record of dark bellied brent goose in 2017, seven records of gadwall between 2009-2019 and 39 records of pinkfooted geese between 1998-2020.

8.4.17 There are records of four amphibians; common frog (*rana temporia)* (9), Common Toad (*Bufu bufo)* (7)*,* Great crested newt (2) and Smooth newt (2) held by LERC within 5km of the Energy Park Site. One of the great crested newt records date back to 1976 and the second is a field observation from a pond approximately 1.5km to the south of the Energy Park Site.

8.4.18 There are no records held by LERC of protected plant species or invertebrates within 5km of the Energy Park Site. The data search revealed a small number of invertebrate records with just one beetle species, four species of butterfly, one bee species, four species of moth and seven species of molusc within 5km of the Energy Park Site.

Phase 1 Habitats Surveys

Arable land

8.4.19 The Phase 1 habitat survey (see Appendix 8.1) showed the Energy Park Site to consist of intensively farmed arable fields. At the time of the survey they were growing winter wheat although winter barley and winter sown oilseed rape are also grown on the Energy Park Site. The arable fields were generally cultivated right up to the field margins resulting in very few areas of botanical or ecological importance. A few of which were bordered on headlands by rough grassland. Intensive arable farmland is generally of a low nature conservation value.

Grasslands

8.4.20 A few of the arable fields were bordered on headlands by rough grassland and there are narrow strips of rough grassland along a number of farm tracks along with rough grassland along a number of ditches. These are floristically of low nature conservation value but do provide foraging areas for farmland birds, Brown Hare and Badger. Further arable plant surveys are being conducted in the Summer 2022.

Hedgerows and boundary habitat

8.4.21 The majority of the fields are separated by drainage ditches; many of these are less than 1m in depth and 1.5m in width and were dry during the 2021 survey period. These dry ditches were often choked with vegetation including Great Reed Mace (*Typha latifolia*), Sedges, rank grasses, willow, and some bramble. Some major IDB managed drains were also present being more than 2m in depth and up to 3.5m in width which permanently held water. There are four boundaries with small sections of defunct, species-poor hedgerow, comprising mainly of Hawthorn with sporadic Blackthorn, Ash and Dog Rose.

Woodland

8.4.22 Tree cover is limited to four small plantation woodland blocks containing Ash (*Fraxinis excelsior*), Field maple (Acer *campestre*), Sycamore (Acer *pseudoplatanus*) and Bird cherry (*Prunus Padus*). These appear to have been planted by a previous landowner for game cover and are not present on pre 1960 maps (https://maps.nls.uk/os/6inch-england-and-wales/.) There are number of more mature Ash and Oak trees in plantation woodland in the southeast section which may well have been trees within the garden of the now demolished Six Hundred Acre farm. This block of woodland is identified on the Priority Habitat Inventory as Deciduous Woodland (England). There are a small number of isolated ash trees on five of the dry boundary ditches. There is a small block of ancient woodland called Oak Wood 4.4km to the north-west of the Energy Park Site, just north of the village of North Kyme.

Wetlands and water courses

8.4.23 There is one pond in the centre of the Energy Park Site which is relatively open with steep sides with Common Pond Sedge (*Carex nigra)* and Reed Sweet Grass (*Glyceria maxima)* surrounded by dense ruderal vegetation including dense stands stinging nettle *Urtica dioica*. There are some major drains present which are more than 2m in depth and up to 3.5m in width which permanently held water and contained plants such as Frogbit (*Hydrocharis morsus-ranae)* and Broad-leaved Pondweed (*Potamogeton natan)* as well as Common Reed (*Phragmites australis)* Reed Sweet Grass *Glyceria maxima* and contained plants such as Frogbit (*Hydrocharis morsus-ranae)* and Broad-leaved Pondweed (*Potamogeton natans*). Further aquatic plant surveys are being conducted during 2022.

Species

Otter

8.4.24 No evidence of Otter was observed at the Energy Park Site; however, the Skerth Drain as well as some of the deeper ditches which permanently held water present on the Energy Park Site appeared suitable for Otters and there is a LERC record of otter spraint from the Skerth Ditch. Although not recorded during the survey, given the lifespan of the project and the suitable habitat with the Energy Park Site otters are included in this assessment. This species is a protected species targeted for conservation nationally.

Water Vole

8.4.25 No evidence of Water Vole was observed at the Energy Park Site; however, several main drains and ditches found on the Energy Park Site appeared suitable for Water Voles. No Water Voles were recorded on the Energy Park Site during surveys in 2010 and 2017 (conducted as part of the original wind farm application). Mink (a major predator with the potential to cause extinction of local Water Vole populations) were observed on the Energy Park Site in 2017 but no evidence of Mink was recorded during surveys in 2021 and 2022. Although not recorded given the lifespan of the project and the suitable habitat with the Energy Park Site and relatively recent records of Water Voles within 2km of the Energy Park Site, Water Voles are included in this assessment. This species is a protected species targeted for conservation nationally and is also a local priority species.

Hazel Dormouse

8.4.26 There is no suitable habitat for Hazel Dormouse within the Energy Park Site. The Energy Park Site is in an area of England where Hazel Dormouse has been extinct (or never present) since at least 1885. Therefore this species has been scoped out of this assessment.

Brown Hare

8.4.27 Although no specific surveys for Brown Hare were conducted, Brown Hare have been record on the Energy Park Site during site visits and a minimum of seven individuals were recorded during further badger surveys conducted in April 2022. The home range of Brown Hare ranges between 20 and 190ha depending on the quality of the habitat. A number of Brown Hare present may be entirely dependent on the habitat, although it is likely that many may range beyond the limits of the Energy Park Site. This species is a priority species targeted for conservation nationally and is considered to be of Local Importance.

Badgers

8.4.28 The Badger surveys conducted in 2021 recorded positive evidence of the presence of Badgers. Full details are available in the confidential **Appendix 8.5.**

Bats

8.4.29 Bat transect survey conducted in 2021 and (ongoing in 2022) recorded a small number of Common and Soprano Pipistrelle mainly feeding along the main water courses. Emergence surveys in September 2021 recorded two Common Pipistrelle and one Long eared emerging from the old farmhouse the centre of the Energy Park Site. These species were also recorded in small number emerging from this building in the 2010 surveys for the wind farm planning application.

Breeding birds

8.4.30 Breeding bird surveys were conducted in 2021 (Appendix 8.2). A range of common farmland birds where recorded breeding or foraging within the Energy Park Site. A total of 646 pairs of 39 bird species were found breeding on and immediately adjacent to the proposed Energy Park Site. However, the majority of these were in woodland, copses and farm buildings or along hedgerows and drainage ditches traversing the Energy Park Site. Only 118 pairs of two species (115 Skylark and three Yellow Wagtail) were found breeding on the open fields where the Energy Park will be constructed.

8.4.31 In terms of recognised conservation importance, no Annex I species were found breeding, one Schedule 1 species were found (one pair of Barn Owl bred in a farm building) and 160 pairs of seven BOCC Red List species (Stanbury *et al* 2021; Grey Partridge, Skylark, Starling, Tree Sparrow, Yellow Wagtail, Linnet and Yellowhammer) were found breeding. The range and number of bird species found breeding and foraging on the Energy Park Site are typical of the arable landscape within Lincolnshire and are assessed as being of local importance.

Wintering birds

8.4.32 Wintering birds on the Energy Park Site were surveyed once per calendar month during September 2021 - March 2022. Surveys were conducted to coincide with the time period around high tide on the Wash SPA. A total of 71 bird species were recorded on/around the Energy Park Site during the winter months, including nine Annex I species, 3 (Golden Plover, Great White Egret, Marsh Harrier, Montagu's Harrier, Red Kite, Short-eared Owl, Kingfisher, Merlin and Peregrine), two additional Schedule 1 species, four (Barn Owl and Hobby) and 13 BOCC Red List species (Stanbury *et al* 2021; Grey Partridge, Lapwing, Herring Gull, Skylark, House Martin, Starling, Mistle Thrush, Tree Sparrow, House Sparrow, Greenfinch, Linnet, Corn Bunting and Yellowhammer). However, numbers of birds involved were small and generally representative of insignificant proportions of highly mobile, much larger wintering populations present in the wider countryside. The range and number of bird species found wintering on the Energy Park Site are typical of the arable landscape within Lincolnshire and are assessed as being of local importance.

Great Crested Newt

8.4.33 HSI (habitat suitability index) score for the pond in the centre of the Energy Park Site was classified below average suitability in 2022. HSI score for a number ditches on the Energy Park Site were classified as poor suitability in 2022. eDNA samples taken in April 2022 for the pond and a sample from three ditches all came back as inconclusive due to water chemistry. Standard torching and bottle trapping is currently being carried out during the 2022 Great Crested Newt survey season (April to June). Smooth newts were observed in the pond on two separate site visits in April 2022. Previously Great Crested Newt surveys, conducted as part of the original wind farm planning application in 2010 and pre wind farm construction surveys conducted in 2017, did not record Great Crested Newts on the Energy Park Site.

8.4.34 There are records of four amphians; common frog (*rana temporia*) (9), Common Toad (*Bufu bufo*) (7) , Great Crested Newt (2) and Smooth newt (2) held by LERC within 5km of the Energy Park Site. One of the Great Creasted Newt records dates back to 1976 although the second is a field observation from a pond approximately 1.5km to the south of the Energy Park Site.

<u>Reptiles</u>

8.4.35 The data search for the intensive arable habitat within the Energy Park Site is largely unsuitable to sustain reptile populations apart from perhaps Grass Snake along drainage diches or possible grassy banks which contain the canalised Skerth Drain. These areas may possibly support a relict population of Slow Worm or Common Lizard. However, this area is beyond the development footprint and will not be affected by the Energy Park construction. The potential for significant reptile populations at the Energy Park Site is minimal.

<u>Invertebrates</u>

8.4.36 The data search revealed existing records of just 10 species of common and widely distribute insects (1 beetle; 4 butterflies; 1 bee and 4 moths). Habitats at the margins and boundaries of the fields are likely to be of value for a range of invertebrate species typical of wetlands grasslands and hedgerows . The wet ditches and drains on the Energy ParkSite are also likely to support a small range of aquatic invertebrates tolerant of high nutrient and chemicals. Assemblages of invertebrates supported by the arable fields comprising the vast majority of the Energy Park Site are likely to be poor, particularly for pollinating species.

<u>Rare Arable plants</u>

8.4.37 These surveys are being conducted during summer 2022.

<u>Aquatic plants</u>

8.4.38 These surveys are being conducted during summer 2022.

<u>Off-site Grid Connection</u>

<u>Designated sites</u>

8.4.39 There are no internationally important statutory designated sites (Ramsar, SAC & SPA) or national sites (SSSI, NNR, LNR) within 10km of the two route options for the off-site Grid Connection. The nearest SSSI is Horbling Fen SSSI located 5km to the southwest of the proposed substation extension location at Bicker Fen. This SSSI is designated for its geological interest. The Wash is the nearest SAC, SPA and Ramsar site, situated approximately 14.8km at its nearest point to the southeast of proposed substation extension at Bicker Fen.

8.4.40 There are nine Local Wildlife Sites (LWS) within 5km of the Grid Connection Route: The South Forty Foot Drain; Great Hale Eau; Broadhurst Drain East; Old Forty Foot

Drain; Old Forty Foot Drain to South Forty Foot Drain; Mill Drain; Willow Farm Drain; Cole's Lane Ponds; and Mackay's Pit.

8.4.41 The Grid Route will cross the South Forty Foot Drain LWS. This is a man-made watercourse with bankside vegetation comprising rough neutral grassland, scrub, and trees. The Drain supports large populations of many aquatic plants occur in the watercourse, such as shining and perfoliate pondweed, whorled water-milfoil, rigid hornwort, mare's-tail, arrowhead, water-crowfoot, common, ivy-leaved & fat duckweed, and water-starwort. The water's-edge is dominated by a broad strip of reed sweet-grass in many places, usually with smaller numbers of branched bur-reed, reed canary-grass, greater pond-sedge, bulrush, and in the south by club-rush. The Drain is a good corridor linking the centre of Boston with the River Witham. There are otter records along the South Forty Foot Drain.

8.4.42 Great Hale Eau; Broadhurst Drain East; Old Forty Foot Drain to South Forty Foot Drain; Mill Drain; and Willow Farm Drain are all drainage ditches to the west of the South Forty Foot Drain. They all supporting a range of aquatic plans and some section of the banks species typical of unimproved grasslands such as common knapweed, greater knapweed, common sorrel and meadow vetchling lesser trefoil, selfheal, smooth meadow-grass, cock's-foot, false oat-grass and creeping bent, mixed with typical plants of bare patches, such as colt's-foot, beaked hawk's beard.

8.4.43 The Old Forty Foot drain LWS supports a population of the globally-threatened fine-leaved water-dropwort, and a range of aquatic plants species including are lesser and narrow-leaved water-plantain, water-violet, water-crowfoot, horned and fennel pondweed, waterstarwort, duckweed, mare's-tail, stonewort and other algae. The water's edge holds water-cress, water mint, water-plantain, creeping-Jenny, purple loosestrife, yellow iris, eadowsweet, branched bur-reed, reed sweet-grass, reed canary-grass, common reed, common spike-rush, tufted-sedge, false fox-sedge and greater pond-sedge.

8.4.44 Mackay's Pit LWS is to the east of the A17 in the parish of Swineshead. The pit has been dredged and will be re-stocked with fish. Fishing platforms are available and fishing is allowed all year round.

8.4.45 Cole's Lane Ponds lie of Station Road in the village of Swineshead to the east of the A17. The LWS comprise amenity ponds and wildflower meadows.

Habitats

Arable land

8.4.46 The majority of the route is intensive arable land use for growing winter wheat, winter barley, oil seed rape, maize and various vegetable crops. There is a few re-seeded improve pasture used for grazing cattle. A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and the results will be included in the ES.

Grasslands

8.4.1 There is a some re-seeded, improved pasture used for grazing cattle. A phase 1 survey is being conducted during summer 2022 and the results will be included in the ES.

Boundary habitat

8.4.2 A phase 1 survey is being conducted during summer 2022 and the results will be included in the ES.

Woodlands

8.4.3 There is a small block of woodland at Hammond Beck identified on the Priority Habitat Inventory as Deciduous Woodland (England). A phase 1 survey is being conducted during summer 2022 and the results will be included in the ES. There is a small area of plantation woodland adjacent to the Bicker Fen substation. This area is being surveyed as part of ongoing works and further details will be provided in the ES.

Wetlands and water courses

8.4.4 The off-site Grid Connection Route crosses a number IDB controlled drainage ditches and the South Forty Foot Drain which is classified as main river. A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and the results will be included in the ES.

Species

Otter

8.4.5 There is suitable habitat for otter along the South Forty Foot Drain and several drainage channels.

Water Vole

8.4.6 There is suitable habitat for Water Voles along the South Forty Foot Drain and a number of drainage channels. A phase 1 survey is being conducted during summer 2022 and the results will be included in the ES.

Brown Hare

8.4.7 The arable fields along the off-site Grid Connection Route are suitable for Brown Hare.

Badgers

8.4.8 There are a number of badger setts in the vicinity of the off-site Grid Connection. A phase 1 survey is being conducted during summer 2022 and the results will be included in the ES.

Great Crested Newt

8.4.1 A phase 1 survey and Great crested newt surveys of suitable ponds is being conducted during summer 2022 and the results will be included in the ES.

Breeding birds

8.4.2 A breeding bird survey of the off-site Grid Connection Route is being carried out during summer 2022.

Wintering birds

8.4.3 Wintering bird surveys were conducted on the Energy Park Site and the off-site Grid Connection Route at times of high tide on the Wash. These recorded a small number of common farmland birds and a small number of Pink-Footed Goose and Whooper Swans feeding on waste vegetables (See Appendix 8.2).

Rare Arable plants

8.4.4 A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and the results will be included in the ES.

Aquatic plants

8.4.5 A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and the results will be included in the ES.

Implications of climate change

8.4.6 The UK Climate Change Projections 2018 (UKCP18) project the following:

- temperatures are projected to increase, particularly in summer;
- winter rainfall is projected to increase and summer rainfall is most likely to decrease;
- heavy rain days (rainfall greater than 25mm) are projected to increase, particularly in winter;
- near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant effects of winds; however, the increase in wind speeds is projected to be modest; and
- the frequency of winter storms over the UK is projected to increase.

8.4.7 The projected increases in summer temperatures over the life span of the project (40 years) are likely to lead to lower water levels in the drains within the Energy Park Site during the summer months which may have a negative effect on aquatic plants within the ditches. Increased winter rainfall may increase water level with ditches which may result in inundation of a number of the outlying badger setts where the entrance is below the top of the ditch banks.

8.4.8 The predicted increase in summer temperature and potentially increased abundance in flying invertebrates may benefit insectivore birds and may benefit bats present and foraging with the area. Badgers' primary food source is various species of worms therefore increased summer temperature and longer periods of dry ground may degrade the quality of suitable forgaging habitat for badgers. Young Brown hare (leverets) which are left by their mothers in small depressions above ground from birth may benefit from warmer dryer spring and summer weather result in higher survival rates to adult.

8.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction

Construction - Energy Park

8.5.1 Solar PV and energy storage technologies are rapidly evolving. As a result, the project parameters are required to maintain the flexibility to allow the latest technology to be utilised at the time of construction.

8.5.2 The Development is likely to include the following infrastructure:

- Solar PV modules- Bifacial panels which absorb light energy from both the top and underside of the panel no matter which final height or design of panels will be used;
- PV module mounting infrastructure. The mounting structure of the solar panels is not yet determined. They may be fixed south facing or east west tracker panels which move during the day. The height of the solar panel will depend on the outcome of the flood risk modelling. It is expected the flood modelling will demonstrate a need to raise panels above 1m at the lowest

point. However, if this is not the case the lowest point of the panels for the fixed panel will be between either be between 1-2.2m in height, with an upper height of 4.5m being considered. The spacing between panels could be between 3-6m for fixed panels, and 2m-4m with a tracking system.

- Inverters;
- Transformers;
- Onsite cabling installed on a series of poles with a maximum height of up to 30m;
- Off-site underground cabling to connect the Energy Park Site to National Grid Bicker Fen Substation;
- Fencing and security measures; the fence design will include gaps to allow mammals to pass underneath at strategic locations.
- Access tracks and construction of a new access point onto the highway (A17);
- An electrical compound comprising:
    - An energy storage facility (expected to be formed of batteries storing electrical energy)- an area of 2.8ha is set aside for this element of the Energy Park Development in one location, with a maximum height of 4.5m, and a maximum area of 6.04ha if alterative locations across the Site are used;
    - 1 x 400kV substation 135m x 90m x 15m high;
    - Up to 6 no. onsite 132kV substations which will have dimensions of approximately 40m x 80m x 10m height;
    - 6 no. control building associated with the 132kV substations within the Energy Park. Based on the Rochdale Envelope Principle, the size of the control building is expected to be approximately 15m x 10m x 3m height. A larger control building at the 400kV substation could be 20m x 10m x 3m height and
    - Equipment facilitating electrical connection to the National Grid Bicker Fen Substation.

8.5.3 The area of land for the Energy Park is 586.85ha. Included in this area is a biodiversity net gain area of 96ha and a community orchard of some 1.8ha largely to the south of the Energy Park Site. The area where the solar panels and associated equipment will be located will be surrounded by a security fence. This area will be approximately 440ha. Within this area the energy storage, inverters and transformers will cover approximately 10ha. Within the Energy Park there will a minimum standoff from all Black Sluice IDB maintained drainage ditches of 9m and all other ditches of 8m, which in total will amount to approximately 46ha. There will also be a set back between the solar arrays and the security fencing.

8.5.4 The fenced area of the Energy Park is approximately 440ha. This will be re-seeded prior to construction with a drought resistant species rich seed mix suitable for low density sheep grazing with no additional fertiliser. This will be grazed on a seasonal basis by a local sheep flock. The area to the south of the Energy Park, an area through the centre and the small area to the north have been set aside for Biodiversity Net Gain (BNG) (96ha). This BNG area will be seeded with nature conservation species rich seed mix to provide habitat for insects and pollinators as well as nesting farmland birds and foraging habitats for birds and mammals. This will be managed as a nature conservation pasture with late winter sheep grazing; no grazing during spring until birds have finished nesting and flowers seeded followed by a hay cut and aftermath grazing. A nature conversation species rich seed mix will be used in the areas between the fenced Energy Park and the drainage ditches (46ha). This will be managed as hay meadow with an annual late cut and harvest. An area of 1.8ha will be developed as a community orchard with a species rich meadow beneath.

8.5.5 There is currently 6.5km of farm track within the Energy Park Site. During the construction phase, temporary construction compounds will be required as well as access tracks to facilitate access to all parts of the Energy Park with a total length approximately 16.8km.

8.5.6 The construction phase of the Development is currently anticipated to last up to 18 months but will be dependent on the final design and the findings of the access and traffic assessment. The types of construction activities required will be:

- Importing of construction materials;
- Culverting one ditch on the site;
- The establishment of the construction compound – this will likely move over the course of the construction process as each phase is built out;
- Creation of new access point of the site (A17);
- Installing the security fencing around the Energy Park Site; the perimeter security fence will be implemented early in the construction phase. The fence design will include gaps to allow mammals to pass underneath at strategic locations. This fence will also prevent construction activity in proximity to retained vegetation;
- Importing the PV panels and the energy storage equipment;
- Erection of PV frames and modules;
- Laying of overhead cables on-site and digging cable trenches and laying cables;
- Installing transformer cabins;
- Construction of onsite electrical infrastructure for the export of generated electricity;
- Creation of the permissive path; and
- New habitat creation.

8.5.7 The potential effects of construction of the Energy Park may include:

- Injury or mortality to species using the Energy Park Site due to construction activities for example site clearance.
- Changes in level disturbance to species using the Energy Park Site resulting from changes in normal farming practices (cultivation, sowing, spraying harvest) to construction activities (e.g., noise, vibration, human activity, light).
- Loss or gain of habitat during construction resulting from changes in land use. Temporary change in habitat during construction associated with Energy Park Site clearance, access tracks or construction compounds.
- Habitat degradation due to direct or indirect effects resulting in a reduction in the ecological condition of habitats and suitability for some species it supports, for example changes in water quality, or changes in surface or ground water flow.
- Changing structure of area due to construction of vertical structures (solar panels and supports, substations, energy storage facilities, fencing etc).

Construction: Designated Sites

8.5.8 The construction of the Energy Park will not result in any loss of habitat within any internationally, important nationally important or locally important sites. There was no evidence of birds included in the designation Wash SPA using the area of the Energy Park as high tide roost or high tide feeding area. It is considered that that construction of the Energy Park will have no effect on any sites of national or international important. The effect is therefore determined to be Not Significant.

8.5.9 There are no Local Wildlife Sites within or adjacent to the Energy Park. It is considered that that construction of the Energy Park will have no effect on any LWS. The effect is therefore determined to be Not Significant.

Construction: Habitats

Arable land

8.5.10 Site clearance activities and cessation of arable farming practices across the Energy Park Site would result in the loss of cultivated arable land. The change from intensive arable to mosaic to grassland habitat will be a be significant biodiversity benefit at least at local level and potentially greater. In EIA terms this would be classified as Minor to Moderate beneficial. The effect is therefore determined to be Not Significant.

Grasslands

8.5.11 The areas of grassland within the Energy Park Site are restricted to field boundaries. These areas are currently dominated by coarse grass species of low conservation value although some of the drainage ditch banks grassland are a greater species diversity. There is potential for damage to these habitats due to vehicle movement and construction activity. However many of these areas of rough grassland adjacent to watercourses and will be fenced off from construction activity. Any impacts of damage on these grassland areas will only be short term as the vegetation would be expected to quickly re-establish. Given the existing vegetation present, this area will invariably suffer less damage from churning up/compaction of the ground than arable land free of vegetation.

8.5.12 The initial design of the Energy Park will result in a significant increase in the area of land brought into grassland management and that will enhance the nature conservation value. The increase in the area's grassland habitat will be a significant biodiversity benefit at least at local level and potentially greater. In EIA terms this would be classified as Moderate beneficial. The effect is therefore determined to be a positive Significant effect.

Boundary habitat

8.5.13 The Energy Park will be built entirely within the current arable fields and will not require the removal of any of the gappy hedgerow. The boundary ditches will be largely unaffected although there may be a need to cross one boundary with security fencing. It is proposed that as an ecological and landscape enhancement there will be approximately 10.19km of new hedgerow planted within the Energy Park Site.

8.5.14 Construction activities could lead to a small amount of noise and possibly light disturbance to the species within the boundary habitats, however, this would be temporary. There is the potential for some dust deposition or runoff on the hedgerow flora generated by the traffic moving into and around the construction zone. Such effects would be temporary and reversible in the short-term. It should also be noted that a certain amount of noise disturbance, dust deposition and runoff would be anticipated as a result of routine annual agricultural activities.

8.5.15 Precautionary protection measures will be taken to fence off boundary habitat for avoiding risk of accidental damage. The fencing will be installed as the first item in the Energy Park Site construction, in order to demarcate the buffer between the boundary and construction area. Construction crew will be informed that no materials should be stored, or vehicles driven within this area via a toolbox talk delivered to all key construction staff at the commencement of construction.

Mitigation

8.5.16 An Outline CEMP will be prepared for the Energy Park Site and will detail the measures required to minimise the dust deposition and run-off which may affect the boundary habitat. This will include how dust-generating activities will be avoided, ensuring stockpiles of spoil and site materials will be stored away from field boundaries, restrictions on working during periods of heavy rain and the installation of silt fencing and/or temporary drainage channels if necessary.

Residual effects

8.5.17 The increase in the boundary habitat as part of the initial design of the Energy Park will be a significant biodiversity benefit at least at a local level and potentially greater. In EIA terms this would be classified as Minor to Moderate beneficial. The effect is therefore determined to be a positive Significant effect.

Woodlands

8.5.18 The construction of the Energy Park will not result in any loss of woodland or encroachment of woodlands within the Energy Park Site.

8.5.19 However, there is potential for damage or compaction to tree roots when installing the fencing and array structures. This negative impact would affect only the outer edges (approximately 5m wide) of the woodland, comprising a length of approximately 500m. Damage to roots may lead to permanent, irreversible damage resulting in the death of the tree. It would be expected to take over 30 years for a new mature tree to take the place of the lost tree, so the duration of the impact would be for the majority of the lifetime of the Energy Park as the Park would be operational for 40 years.

8.5.20 Construction activities could lead to a small amount of noise and possibly light disturbance to the species within the woodland, however, this would be temporary and would only affect the margins of the woodland. There is the potential for some dust deposition or runoff on the hedgerow flora generated by the traffic moving into and around the construction zone. Such effects would be temporary and reversible in the short-term. It should also be noted that a certain amount of noise disturbance, dust deposition and runoff would be anticipated as a result of routine annual agricultural activities.

Mitigation

8.5.21 Precautionary protection measures will be taken to fence of woodland to avoid risk of accidental damage. The fencing will be installed prior to construction commencing, in order to demarcate the buffer between the woodland and construction area. Construction crew will be informed that no materials should be stored, or vehicles driven within this area via a toolbox talk delivered to all key construction staff at the commencement of construction.

8.5.22 An Outline CEMP will be prepared which will detail the measures required to minimise the dust deposition and run-off which may affect the woodland habitat. This will include how dust-generating activities will be avoided, ensuring stockpiles of spoil and site materials will be stored away from woodlands field boundaries, restrictions on working woodlands during periods of heavy rain and the installation of silt fencing and/or temporary drainage channels if necessary.

Residual effects

8.5.23 The mitigation implemented will ensure that the small plantation woodlands will be protected from adverse impacts during construction. There will be no effect on woodlands during construction. This would be classified as Neutral / Negligible effect and deemed to be Not Significant.

<u>Wetlands and water courses</u>

8.5.24 There is potentially a risk of degradation of the retained pond habitat through dust deposition and runoff during construction activities. This could damage the habitat within and surrounding the ponds as well as affecting the species which inhabit them. This impact would be temporary, as it would be the result of construction activities close to the pond only.

8.5.25 However, the pond in the centre of the site is at least 30m from the nearest part of the Energy Park separated by a track and drainage ditch to the south and east and plantation woodland to the north and west and therefore it is highly likely that the pond will be unaffected by construction.

8.5.26 The construction of the Energy Park will be within the current arable fields and there will be no changes to main river or IDB managed drains during construction.

8.5.27 There will be one landowner managed drain close to the entrance which may need to be culverted.

8.5.28 There is potentially a risk of degradation of drainage ditches habitat through dust deposition and runoff during construction activities. This could damage the habitat within and surrounding the ditches as well as affecting the species which inhabit them. This impact would be temporary, as it would be the result of construction activities close to the drainage ditches. A certain amount of noise disturbance, dust deposition and runoff would be anticipated as a result of routine annual agricultural activities.

<u>Mitigation</u>

8.5.29 The negative impacts of possible dust deposition or silt runoff on the drainage ditches within the Energy Park Site will be mitigated for by the implementation of a CEMP. This will restrict working during periods of heavy rain and outline the installation of silt fencing, if required.

8.5.30 An Outline CEMP will define working methodology to ensure that as little vehicular movement as possible occurs close to the drainage ditches, thus reducing the risk of disturbance or injury to of any species which may use this habitat and also reducing dust deposition and runoff and steps to be taken to limit the likelihood of pollution or spillage events.

8.5.31 Contractors will be provided with a toolbox talk prior to construction focusing on ensuring that this buffer is maintained during construction. This buffer will be demarcated. There will be a 9m stand-off from all IDB watercourses to boundary security fencing and 8m from all other ditches around the Energy Park. The perimeter security fence around the Energy Park Site will be implemented early in the construction phase. This fence will also prevent construction activity in proximity to water courses.

8.5.32 If the landowner managed ditch close to the entrance requires a culvert, detailed working methods will be included in the Outline CEMP including further surveys for water voles and aquatic plants.

<u>Residual effects</u>

8.5.33 The pond, drainage ditches and wildlife species within them will be protected from construction phase impacts by implementing the described measures. Following construction and the cessation of the application of fertilisers, herbicide and pesticides the water quality within the drains is expected to improve resulting in an overall beneficial impact which will be Significant at a local level.

Construction: Species

Otter

8.5.34 Otter were not recorded on the Energy Park area. It is however possible that Otter may use the major IDB Drains and the Skerth Drain. There will be a standoff at least 8m from all water courses to boundary fence of the Energy Park. The construction of the Energy Park will be constructed entirely within the arable fields and construction traffic will use existing culverts, with the exception of the new access. The effect on otter is classified as Neutral / Negligible and Not Significant.

Water Vole

8.5.35 Water Vole were not recorded on the Energy Park area. It is, however, possible that Water Vole may use the major IDB Drains and the Skerth Drain and potentially recolonise the Energy Park Site. The initial Energy Park design includes a standoff at least 8m from all watercourses, and the construction of the Energy Park will be entirely within the arable fields. Construction traffic will use existing culverts and access routes, with the exception of the new access. There will be no fenced crossing of the IDB drains on the Energy Park Site. There will be no effect on Water Vole. This is classified as Neutral / Negligible and is not Significant.

8.5.36 Although Water Vole are not present on the Energy Park Site, prior to construction of the security fencing and installation of any culverts (if needed) a Water Vole survey will be carried in the appropriate survey season to allow sufficient time to agree a program of licence works with Natural England should Water Vole recolonise the area.

Brown Hare

8.5.37 Brown Hare are present within the arable fields where the Energy Park will be constructed. Brown hare live with intensive farming methods and leverets can run within hours of birth to avoid farm machinery, although their natural instinct is to remain still to avoid predator detection. Hares breed between January and August and during these periods impacts upon hares may be slightly greater than at other times of year. There is potential of disturbance, death or injury during clearance works which would be an adverse effect at local level, and considered to be a Minor Adverse effect, and Not Significant.

Mitigation

8.5.38 Protection measures for Brown Hare during the construction of the Energy Park and associated infrastructure will include:

- Habitat manipulation to create suitable habitat for Brown Hare outside construction areas prior to commencement.
- Habitat manipulation to minimise suitability for Brown Hare in construction area prior to each phase on construction.
- The provision of ramps into any open excavations to allow any Brown Hare (particularly leverets that have fallen in to escape).
- Contractor training and induction to ensure awareness and care during installation of solar arrays and associated infrastructure.
- Adopting a speed limit of 10mph across the site to reduce the possibility of incidental mortality.

- Any Brown Hares encountered during works should be allowed to move away of works.

8.5.39 Implementation of the measures will ensure there will no effect on the conservation status of Brown Hare: this would be classified as Neutral / Negligible and therefore Not Significant.

Badgers

8.5.40 The main badger setts are outside any construction areas and this will minimise risk of disturbance or damage to those setts. There are however a number of outlying setts. These are all with drainage ditch banks and although there is a low risk of direct damage, there is a potential risk of disturbance by the construction of the Energy Park. The use of this outlying setts changes from year to year with new setts being dug as well old ones being abandoned. Therefore, there is a potential risk of disturbance which would be an adverse effect at local level, which would be considered to be Minor Adverse and potentially Significant

Mitigation

8.5.41 Protection measures for badger setts during the installation of the Energy Park and associated infrastructure will include:

- Prior to each stage of construction, a badger survey will be conducted in sufficient time for appropriate mitigation measure to be in place where there is a potential for disturbance;
- The creation of construction exclusion zones delineated by Heras fencing where appropriate to control direct impacts to setts;
- If necessary licenced temporary closure of a sett or licenced works within an agreed distance from the sett; and
- To prevent badgers and other mammals from becoming trapped the provision of ramps into any open excavations to allow any badger (or other mammals) that have fallen in to escape.

Residual effects

8.5.42 Implementation of these measures will ensure there will be no effect on conservation status of Badger. The effect will therefore be considered to be Neutral/Negligible and Not Significant.

Bats

8.5.43 Three species of bat were recorded in small numbers foraging on the Energy Park Site. Foraging activity was concentrated along wet drainage ditches, IDB drains and woodlands. These habitats will be unaffected during construction. Two common pipistrelle and one Brown Long-eared bat were recorded emerging from the derelict farm building in the centre of the Energy Park Site. The derelict buildings are outside the development footprint of the Energy Park and will be unaffected by construction of the Energy Park. This development does not require these buildings to be demolished. Construction will take place during daylight hours therefore there will be no need for floodlighting, although there may be a small number of security lights on construction compounds. It is unlikely that this low level of lighting will affect bat behaviour during construction of the Energy Park. There will no effect on conservation status of bats. In EIA terms this would be classified as Neutral / Negligible effect and is Not Significant.

Breeding birds

8.5.44 A range of common farmland birds were recorded breeding or foraging within the proposed Energy Park Site. A total of 646 pairs of 39 bird species were found breeding on and immediately adjacent to the proposed Energy Park Site. However, the majority of these were located in woodland, copses and farm buildings or along hedgerows and drainage ditches traversing the Energy Park Site. Only 118 pairs of two species (115 Skylark and three Yellow Wagtail) were found breeding on the open fields where the Energy Park will be constructed.

8.5.45 In terms of recognised conservation importance, no Annex I species were found breeding, one Schedule 1 species was found (one pair of Barn Owl bred in a farm building) and 160 pairs of seven BOCC Red List species (Stanbury *et al* 2021; Grey Partridge, Skylark, Starling, Tree Sparrow, Yellow Wagtail, Linnet and Yellowhammer) were found breeding.

8.5.46 The farm building will be unaffected by construction therefore there will be no risk of disturbance of species nesting within buildings.

8.5.47 There will a temporary loss and disturbance of open habitat during construction. There may also be potentially risk of disturbance to bird nesting in boundary habitats where boundary fencing will be constructed. This would be an adverse effect at local level, and would be considered to be Minor Adverse and Not Significant.

Mitigation

8.5.48 Standard Good Practice to avoid impacts to nesting birds during works, including disturbance to Schedule 1 species nesting in building, will include:

- appropriate timing of clearance works (i.e., outside of the breeding season between October and February inclusive; and pre-clearance nesting bird checks if required.
- In the event that any active bird nest would be impacted by clearance/installation works, it would be necessary to defer works within a minimum 5m radius of the nest until the nest is no longer active.
- Access to buildings on site will be prevented by fencing to avoid accidental disturbance to nesting schedule 1 species.

Wintering birds

8.5.49 A total of 71 bird species was recorded on/around the proposed solar farm during the winter months, including nine Annex I species (Golden Plover, Great White Egret, Marsh Harrier, Montagu's Harrier, Red Kite, Short-eared Owl, Kingfisher, Merlin and Peregrine), two additional Schedule 1 species (Barn Owl and Hobby) and 13 BOCC Red List species (Stanbury et al 2021; Grey Partridge, Lapwing, Herring Gull, Skylark, House Martin, Starling, Mistle Thrush, Tree Sparrow, House Sparrow, Greenfinch, Linnet, Corn Bunting and Yellowhammer). However, numbers of birds involved were small and generally representative of insignificant proportions of highly mobile, much larger wintering populations present in the wider countryside. There will no effect on conservation status of winter birds during construction. In EIA terms this would be classified as a Neutral/Negligible effect and Not Significant.

Aquatic plants

8.5.50 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.51 There is potentially a risk of degradation of drainage ditch habitat through dust deposition and runoff during construction activities. This could affect the aquatic plant species. This impact would be temporary, as it would be the result of construction activities close to the drainage ditches. A certain amount of noise disturbance, dust deposition and runoff would be anticipated as a result of routine annual agricultural activities.

Mitigation

8.5.52 An Outline CEMP will be developed that will detail a working methodology to ensure that as little vehicular movement as possible occurs close to the drainage ditches, thus reducing the risk of disturbance or injury to any species which may use this habitat and also reducing dust deposition and runoff and outlines the steps to be taken to limit the likelihood of pollution or spillage events.

8.5.53 The negative impacts of possible dust deposition or silt runoff on the drainage ditches could affect aquatic plants within the Energy Park Site will be mitigated for by the implementation of the proposed CEMP. This will restrict working during periods of heavy rain and outline the installation of silt fencing, if required.

8.5.54 Contractors will be provided with a toolbox talk prior to construction focusing on ensuring that this buffer is maintained during construction. This buffer will be demarcated. There will be a 9m stand-off from all IBD watercourses and 8m for all other ditches to boundary security fencing around the Energy Park. The perimeter security fence around the be implemented early in the construction phase. This fence will also prevent construction activity in proximity to water courses.

Residual effects

8.5.55 Any aquatic plant species of high conservation value found in drainage ditches will be protected from construction phase impacts by implementing the described measures. Following construction and the cessation of the application of fertilisers, herbicide and pesticides the water quality within the drains is expected to improve resulting in an overall beneficial impact significant at a local level.

Rare arable plants

8.5.56 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

Construction Cable Route and Grid Connection

8.5.57 This section considered the off-site grid connection cable routes and above grounds works at the National Grid Bicker Fen Substation.

8.5.58 Installing the off-site grid cable from the Energy Park to Bicker Fen Substation will involve digging a trench approximately 1.2-5m deep and some 1-3m wide. Where directional drilling is required this could be up to 10m deep. This trench will be located within a 25m wide easement within which the grid cable will be installed. The route will require crossing the South Forty Foot Drain Local Wildlife Site (LWS) and various smaller watercourses as well as major roads, rail, high pressure gas main and third-party grid connections. Certain crossing points will require directional drilling as appropriate although all works will be within the easement area. Where directional drills are required, a launch pit swathe of 50m x 50m is anticipated.

8.5.59 The potential effects of the off-site grid connection may include:

- Injury or mortality to species using site due to construction activities for example site clearance.

- Short term changes in level disturbance to species using the off site grid route resulting from changes in normal farming practices (cultivation, sowing, spraying harvest) to construction activities (e.g., noise, vibration, human activity, light).
- Temporary change in habitat during construction associated with site clearance, access tracks, direct drilling or construction compounds.
- Habitat degradation due to direct or indirect effects resulting in a reduction in the ecological condition of habitats and suitability for some species it supports, for example changes in water quality, or changes in surface or ground water flow.
- Changing structure of area due to construction of vertical structures (substations or fencing).

Designated sites

8.5.60 There will be no internationally important statutory designated sites (Ramsar, SAC & SPA) or national sites (SSSI, NNR, LNR) within 10km of the off-site grid route or the extension at Bicker Fen substation. The nearest SSSI is Horbling Fen SSSI located 5km to the southwest of Bicker Fen Substation. This SSSI is designated for its geological interest. The Wash is the nearest SAC, SPA and Ramsar site, situated approximately 14.8km to the southeast of Bicker Fen at its nearest point,.

8.5.61 A small number Pink-footed Geese flocks, listed in the SPA citation, were recorded on part of the grid connection cable route survey areas during October, November and January feeding on waste vegetable crop residue.

Mitigation

8.5.62 A precautionary approach has been taken with the initial design ensuring that the grid connection will be placed under the South Forty Foot Drain removing any collision risk or risk of damage to the LWS.

8.5.63 Where hydraulic drilling is required a launch pit swathe of 50m x 50m is anticipated. These will be setback from the South Forty Foot Drain within fields either side of the Drain. The land will return to its previous use, with the exception of the link boxes which will be at ground level access to the joint bays. It is anticipated the location of these will be available for the ES, and where possible will be at field edges.

8.5.64 There will a temporary disturbance of 2,500m^2 arable land each side of the boundary of the South Forty Foot Drain LWS to allow for direct drilling which will have no effect on the conservation status of the LWS. These areas will be returned to the previous land use after construction.

8.5.65 An Outline CEMP will be provide further detail on construction and drilling methods.

Residual effect

8.5.66 Implementation of these measures will ensure there will no effect on conservation status of South Forty Foot Drain. With this mitigation in place there will be a Neutral / Negligible effect and would be Not Significant.

Habitats

Arable land

8.5.67 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and an assessment of potential construction effects will be included in the ES

Grasslands

8.5.68 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys. A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and an assessment of potential construction effects will be included in the ES.

Boundary habitat

8.5.69 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys. A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and an assessment of potential construction effects will be included in the ES.

Woodlands

8.5.70 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys. A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and an assessment of potential construction effects will be included in the ES.

8.5.71 However, the construction of the extension at Bicker Fen Substation has the potential for the loss of a small area of deciduous woodland. The conservation value of this woodland will be assessed as part of the off-site phase 1 report. The extent of this potential loss will be determined once the design and location of the extension substation has be finalised with National Grid. Construction activities could lead to a small amount of noise and possibly light disturbance to the species within the woodland, however, this would be temporary and would only affect the margins of the woodland. There is the potential for some dust deposition or runoff on the hedgerow flora generated by the traffic moving into and around the construction zone. Such effects would be temporary and reversible in the short-term. This woodland was originally planted to screen the existing Bicker Fen Substation. Therefore, its removal for the extension to the substation would be a minor adverse effect at local level and would be deemed to be: Not Significant.

Mitigation

8.5.72 Standard Good Practice to avoid impacts to nesting birds during works, including disturbance to Schedule 1 species nesting in building, will include:

- appropriate timing of clearance works (i.e., outside of the breeding season between October and February inclusive; and pre-clearance nesting bird checks if required.
- If any active bird nest would be impacted by clearance/installation works, it would be necessary to defer works within a minimum 5m radius of the nest until the nest is no longer active.

8.5.73 In order to prevent damage to the whole areas of woodland there will be clear demarcation of the construction area by installation of fencing prior to construction. The construction crew will be informed that no materials should be stored or vehicles driven within this area via a toolbox talk delivered to all key construction staff at the commencement of construction.

8.5.74 If a small part of the deciduous plantation woodland has to be removed to enable an extension to be built at the National Grid Bicker Fen Substation it is proposed that, if possible, to mitigate for this loss a new plantation could be planted elsewhere on the Bicker Fen Substation site or another suitable location.

Wetlands and water courses

8.5.75 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys. A phase 1 survey, including rare arable plants and aquatic plant surveys is being conducted during summer 2022 and an assessment of potential construction effects will be included in the ES.

8.5.76 However, the construction of the extension of substation at Bicker Fen has the potential for damage to the identified pond to the south east of the existing substation. The extent of this potential damage will be determined once the design and location of the extension substation has be finalised with National Grid. Construction activities could lead to a small amount of noise and possibly light disturbance to the species within the pond, however, this would be temporary. There is the potential for some dust deposition or runoff on the hedgerow flora generated by the traffic moving into and around the construction zone. Such effects would be temporary and reversible in the short-term. Therefore, an adverse effect at local level would occur which is considered to be Minor Adverse and Not Significant.

Mitigation

8.5.77 In order to prevent damage to the pond there will be clear demarcation of the construction area by installation of fencing prior to construction. The construction crew will be informed that no materials should be stored or vehicles driven within this area via a toolbox talk delivered to all key construction staff at the commencement of construction.

8.5.78 An Outline CEMP will be provide further detail on construction and drilling methods.

Species

Otter

8.5.79 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.80 If otters are present on the land being used for the off-site grid connection or extension to Bicker Fen Substation, mitigation solutions would be similar to measures outlined for the construction of the Energy Park.

Water Vole

8.5.81 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.82 If Water Voles are present on the land being used for the off-site grid connection or extension to Bicker Fen Substation, mitigation solutions would be similar to measures outlined for the construction of the Energy Park.

Brown Hare

8.5.83 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.84 If Brown Hares are present on the land being used for the off-site grid connection or extension to Bicker Fen Substation, mitigation solutions would be similar to measures outlined for the construction of the Energy Park.

Badgers

8.5.85 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.86 If Badgers are present on the land being used for the off-site grid connection or extension to Bicker Fen Substation, mitigation solutions would be similar to measures outlined for the construction of the Energy Park.

Breeding birds

8.5.87 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.88 However, the likely effects are that there is a potential risk of disturbance to breeding birds in open habitat and boundary habitat during construction. This would be an adverse effect at a local level, and would be considered to be a Minor Adverse effect.

Mitigation

8.5.89 Standard Good Practice to avoid impacts to nesting birds during works, including disturbance to Schedule 1 species nesting in building, will include:

- appropriate timing of clearance works (i.e., outside of the breeding season between October and February inclusive; and pre-clearance nesting bird checks if required.
- If any active bird nest would be impacted by clearance/installation works, it would be necessary to defer works within a minimum 5m radius of the nest until the nest is no longer active.

Residual effects

8.5.90 Implementation of these mitigation measures will ensure there will no effect on the conservation status of breeding birds. The residual effect is therefore considered to be Neutral / Negligible and Not Significant.

Wintering birds

8.5.91 Fourteen species of waterbird were recorded along/around and overflying potential off-site grid routes during the winter months. However, only two of these were Pink-footed Goose and a single Berwick’s is a qualifying species of The Wash SPA.

8.5.92 The Wash pink-footed goose population feeds over a very wide area extending to over 350,000ha. The only roosting site in The Wash SPA is at Snettisham which holds large numbers of roosting birds; the five year mean peak is 37,908 geese. Feeding areas from the roost site are primarily inland to the south and east in Norfolk, though some also move across the Wash to South Lincolnshire. Arable fields are the main food source in this area, particularly post-harvest sugar beet tops and other vegetable crops. Some landowners leave arable stubble and crop residues specifically to attract pink-footed geese during the shooting season (1st September to 31 January) to lease out the shooting rights. However, geese often feed on marshes much closer to the roost, particularly after the shooting season (Brides *et al* 2013).

8.5.93 Given the extensive foraging areas used by the Wash pink-footed Goose population and their preference to feed close to the roost at Sneettisham it is considered highly unlikely that there would have any effect on the conservation status of the SPA during the construction of the off-site grid connection. Once the timetable of grid route construction has been agreed and the timing of landowner access agreed it would also be possible to ensure there are no suitable grazing areas within the section of the grid route close to Swinehead to avoid attracting pink-footed geese.

8.5.94 The off-site Grid Connection will cross the South Forty Foot Drain LWS. Placing overhead cables could, during construction, cause damage or disturbance during the erection of this infrastructure. The presence of overhead powerlines over or adjacent to water bodies can create a collision risk to wetland birds as well as predatory birds feeding along such features. Whether a power line across the South Forty Foot Drain would actually result in collisions cannot generally be determined untill the power lines have been in place for a number of years and post construction monitoring has bee carried out although determining collisions into powerlines over water can only be accurately determined by the use of remote cameras or collision monitoring sensors on the cables.

Mitigation measures

8.5.95 A precautionary approach will be taken and the grid connection will be placed under the South Forty Foot Drain, removing any bird collision risk with overhead cables.

8.5.96 Once the timetable of off-site Grid route construction has been agreed and the timing of landowner access agreed it would also be possible to ensure there are no suitable feeding areas for geese with the section of the off-site grid route close Swinehead to avoid attracting pink-footed geese construction of the grid connection.

Residual effects

8.5.97 Implementation of these measures will ensure there will no effect on conservation status of wintering birds. Therefore the residual effect of the construction of the off-site grid cable and extension to Bicker Fen Substation on wintering birds will be Neutral / Negligible and Not Significant.

Operation of the Energy Park

8.5.98 The potential effects of the operation of the Energy Park for 40 years may include.

- Changes in level disturbance to species using the site resulting from changes in normal farming practices (cultivation, sowing, spraying harvest) to low density sheep grazing and conservation management of grasslands.
- Loss or gain of habitat in the wider vicinity during lifetime of the project (40 years) resulting from changes inland use.
- Habitat degradation due to direct or indirect effects resulting in a reduction in the ecological condition of habitats and suitability for some species it supports, for example changes in water quality, or changes in surface or ground water flow.
- Changing structure of area due to presence of vertical structures (solar panels and supports, substations, energy storage facilities and fencing).
- Barrier effects of fencing.
- Collision risk of vertical structures including fencing, solar panels, substation, and overhead power lines and energy storage structures.
- Shading of habitat beneath solar panels and changes in light level and or reflection.

- Low level noise from substations, energy storage or solar tracker systems.
- Movement of a tracker systems.

Operation: Designated sites

8.5.99 The operation of the Energy Park will not result in any changes in habitat within any internationally, important nationally important or locally important sites. There was no evidence of birds included in the designation for The Wash SPA using the area of the Energy Park as high tide roost or high tide feeding area.

8.5.100 Stopping arable cultivation, the cessation application of fertiliser and agrochemicals combined with conversation mosaic of grasslands will reduce silt, fertiliser and agrochemical run-off into the drains, the Skerth Ditch and eventually into The Wash SPA. It is estimated the loss of soil in UK due to intensive agricultural practices is between 0.1-0.3 tonnes per ha per year (UK Parliamentary office publication 265) which would equate to between 2,120—7,032 tonne of top soil prevented from entering The Wash SPA (over the 40 year operational life of the Proposed Development). However, in comparison to the total volumes of soil and chemicals entering The Wash from the surrounding intensive agricultural landscape in Lincolnshire, Cambridgeshire and Norfolk which drain into The Wash the reduction in volumes from the Energy Park will be insignificant.

8.5.101 It is considered that that operation of the Energy Park will have no effect on any sites of international, national or local important. Therefore the residual effect of the operation of the Energy Park on the Designated Sites within the wider locality will be Neutral / Negligible and Not Significant.

Operation: Habitats

Arable

8.5.102 The Energy Park will be built entirely within the current arable fields. The intensive arable agriculture within the fields will be returned to grass pasture to be grazed by local sheep flocks at low density. The areas will be re-seeded prior to construction with a drought resistant seed mix suitable for sheep grazing with no additional fertilisers within the fenced area of the Energy Park of approximately 440ha). The area to the south of the Energy Park, and area through the centre and the small area to the north are all set aside for Biodiversity Net Gain (BNG) (96ha) and will be seeded with nature conservation grass seed mixed to provide habitat for insects and pollinators as well nesting farmland birds and foraging habitat for birds and mammals. This will be managed as a nature conservation pasture with late winter sheep grazing, no grazing during spring until birds have finished nesting and flowers seeded followed by a hay cut and aftermath grazing. A nature conversation seed mix will be used in the areas between the fenced Energy Park and the drainage ditches (46ha). This will be managed as hay meadow with an annual late cut and harvest. An area of approximately 1.8ha will be developed as a community orchard with a species rich meadow beneath.

8.5.103 The grass pasture beneath the solar panels will be subject to a degree of shading from the solar panels. The level of shading will be dependent on the final design of panels selected and spacing between rows. The higher fixed panels (2.2-4.5m) will create the least shading and the lower fixed panels (1-3.5m) the most. Tracker panels will create the least permanent shading. However only 40-60% of the land (176 – 264 ha) within Energy Park will be subject to some shading and even then shading will not prevent grass growth beneath the panels.

8.5.104 The change from intensive arable to mosaic to grassland habitat will be a significant biodiversity benefit at least at local level and potentially greater. In EIA terms this would be classified as Minor to Moderate beneficial. The residual effect would therefore be considered as a beneficial Significant impact.

Grasslands

8.5.105 There will be a significant increase in grassland habitat and increase in the biodiversity of the grassland habitat within the Energy Park. There will be 440ha of grassland managed by low density sheep grazing on a seasonal basis. The 96ha of Biodiversity Net Gain has been designed from the outset to maximise the biodiversity value of the area in particular for farmland birds. It will be sown nature conservation seed mix to provide nesting habitat for farmland birds and habitat for insects and pollinators. The initial ecological design of the Energy Park is to manage this area specifically to maximise the overall biodiversity value but particularly for farmland birds. A further 46ha will be a sown nature conversation seed mix. This area is the land between the fenced Energy Park and the drainage ditches. This will be cut short in early spring followed by a late hay cut.

8.5.106 The species composition of grassland habitats can be detrimentally affected by the presence of the solar arrays with shade tolerant species, including agricultural weed species such as dock and thistle, becoming established beneath the array strings and outcompeting other species. However many of these species provide excellent food sources for birds and invertebrates and with ongoing cutting and low density grazing they will gradually die-out.

Mitigation

8.5.107 Any areas of bare ground remaining following construction are to be sown with an appropriate seed mix suitable for the conditions and location, as prescribed within the LEMP that will be prepared for the Energy Park Site. The Energy Park Site will be subject to post construction surveys at suitable intervals and if necessary the management can be modified and area over seeded.

Residual effect

8.5.108 Overall, there will a significant beneficial effect on the nature conservation status in relation to grassland habitat of at least a local level. Therefore the residual effect will be Minor to Moderate beneficial and would be Significant.

Boundary habitat

8.5.109 There will be a significant increase in boundary habitat (10.19km) within the Energy Park. The cessation of intensive arable farming practices, including spraying crops with pesticides and herbicides, is likely to be of benefit to hedgerow habitats on the Energy Park Site, particular the ground flora at hedgerow bases. New hedgerow once established will be managed on a suitable rotation of cutting and managed to keep a low and tight structure to provide nesting habitat for hedgerows for farmland bird species as well as minimising high perching location for crows and other predator birds. Management will be of a rotational basis land in winter to allow hedgerow species to fruit providing food for over wintering birds. The new hedgerow will include a wide range of species to provide pollen and nector through the spring and summer for invertebratesOverall, there will a beneficial effect on the nature conservation status in relation to boundary habitat of at least a local level. This will offer a Significant benefit at Local level.

Woodlands

8.5.110 The woodland areas are outside the development footprint. The operational scheme is likely to deliver a minor beneficial effect on the woodland ground flora due to the cessation of arable farming practices and the elimination of fertiliser, herbicide and pesticides use. Overall, a residual neutral effect is anticipated, which is Not Significant.

Wetlands and water courses

8.5.111 The one pond in the centre of the Energy Park Site and all wet drainage ditches will be retained. Those drainage ditched managed by the Black Sluice IDB will continued to be managed by the IDB. There will be no change in the management of Non IDB internal drainage ditches. The operational scheme is likely to deliver a minor beneficial effect on the woodland ground flora due to the cessation of arable farming practices and the elimination of fertiliser, herbicide and pesticides use. Overall, a residual Neutral effect is anticipated, which is Not Significant.

Operation: Species

Otter

8.5.112 The cessation of the use of agrichemical throughout the Energy Park Site will reduce the run-off of toxic chemical in water courses which is likely to benefit the invertebrate population which in turn may increase fish and amphibian densities within the wet ditches. This may benefit otters which may return to use the area. Overall, there be no effect on the conservation status of otter and so the effect would be determined to be Neutral/Negligible and Not Significant.

Water vole

8.5.113 Water Vole are not present on the Energy Park Site. There would be no change in the management of the most suitable habitats within the Energy Park Site for water vole (the IDB managed drains) therefore if Water Voles were to recolonise the areas there would be no change in the availability of habitat. Overall, there will be no effect on the conservation status of water vole and the operation of the Energy Park would have a Neutral/Negligible effect which is Not Significant.

Brown hare

8.5.114 The change from intensive arable land to a mosaic of grassland pasture will increase the habitat quality for foraging Brown Hare and the panels may provide cover from aerial predators. The fences are designed to provide easy passage for badgers and therefore will not restrict movement of Brown Hare across the area. A study on existing solar parks has found evidence that hares were more abundant within solar arrays compared to control sites nearby (Montag *et al*). This impact will last for at least the lifespan of the Energy Park and will result in a Minor Beneficial effect on Brown Hare. This would be Significant at a local level.

Badgers

8.5.115 The change from intensive arable land to a mosaic of grassland pasture will significantly increase the area and habitat quality for foraging Badgers. The fences are designed to provide easy passage for badgers and therefore will not restrict their movement across the area. This impact will last for at least the lifespan of the Energy Park and will result in a Minor to Moderate Beneficial effect on Badgers at a local level.

Bats

8.5.116 There is a small population of bats resident on the Energy Park Site and a small number of bats foraging, mainly along the larger drains. The cessation of intensive arable farming practices (particularly insecticide spraying) and reversion of the land to mosaic of permanent sheep-grazed grassland can be expected to result in increased numbers and diversity of invertebrates at the Energy Park Site, including prey species for the local population of bats.

8.5.117 However, there has been some concern raised that the presence of solar panels may have detrimental impacts on bats when echolocating, for instance by confusing solar panels for water bodies (Taylor *et al* 2019 , Horvath *et al* 2010 , Kriska *et al* 2006). Studies into this potential impact do not suggest that this would result in detrimental impacts on bat populations. However, one preliminary study found no beneficial effects on bat abundance within solar arrays compared to control sites (Montag *et al* 2016).

8.5.118 Approximately 10.19km of new hedgerow planting of appropriate species is to be created at the Energy Park Site. This will greatly improve the ability of bats to navigate across the Energy Park Site, as well as increasing foraging opportunities for this species.

8.5.119 It is not thought that the noise from inverters or substations will have an effect on navigating bats, and minimal lighting will be required during the operation of the Energy Park. The most frequently recorded bat species, Common Pipistrelle, are generally tolerant of individual lights and are often recorded feeding on insect attracted to security lighting. Therefore, fragmentation of habitat as a result of noise/light pollution will not occur.

8.5.120 Overall, it is expected the operation of the Energy Park Site will be either neutral or a minor, non-significant, beneficial effect.

<u>Breeding birds</u>

8.5.121 The change from intensive arable land to a mosaic of grassland pasture, the removal of all agrochemical inputs. In 2021, according the landowners farm records for the Energy Park Site the following was applied to the wheat crop: 272 tonnes of chemical fertiliser and 5,581 litres of agrochemicals and a change in the three dimensional structure of the land is likely to effect the number and diversity of birds breeding within the Energy Park. Although it is assumed that the Energy Park will reduce the number open habitat nesting species such as skylark there have been a limited number of studies on the effects of solar farms on breeding birds (Harrison *et al* 2016). It is likely that different avian species are likely to be affected differently by solar developments, dependant on the habitat within and around a solar PV development.

8.5.122 Shotton (2019) found a significantly higher species richness of birds on solar farms compared to nearby controlled areas. Birds also showed a highly significant preference for the centre of solar farms rather than the margins. There was also a negative association between sward height in solar farms and the presence of birds suggesting that management of land within a solar farm may be a major factor in any changes in breeding birds.

8.5.123 Montag *et al* (2016) completed a comparison of 11 solar farms with comparable control areas. Nine of these sites were manged using light sheep grazing. This study found a greater diversity of birds within solar farms compared to comparable control plots. Overall bird abundance was higher on solar farms than control plots (average of 47 verses an average 35) although the abundance of birds on solar farms compared to control areas was only statistically significant in two of the sites. Although the overall number of Skylark territories found on solar sites (26) was slight fewer than on the control sites (29) this variation was not statistically significant. There was evidence of a greater level of foraging by skylark within solar parks compared to control sites which was statistically significant on two sites. This study also found a significantly greater number of Birds of Conservation Concern (Red and Amber listed) within solar farms compared to control sites.

8.5.124 The change in the three dimensional structure will reduce the area of open habitat for open nesting species but will also provide more singing locations for territorial defence of farmland birds species. Yellow Hammer, Corn Bunting and Skylark have all been recording singing perched on the top of solar panels (Montag 2016, Shotton 2019). For Skylark this may be a more energy efficient means of advertising and defending a territory that typical high flight song behaviour.

8.5.125 The solar technology has not yet been confirmed. Those limited studies on the effect of solar farms on breeding birds have all been on solar farms with fixed south facing panels and there has been no studies on the effect of east-west tracker panels. These panels are fixed to a central pivot and gradually move to face the sun, facing east at dawn, horizontal to the ground at mid-day and west at sunset. The rate of movement is very gradual and barely perceptible to the casual observer over a short period of time as it matches the sun there are no sudden movements. It is unknown whether this slow movement and change in the angle of the solar panels or the slow movement of the panels disturb birds. The risk of birds or other animals being trapped in moving parts of tracker panels has be raised. There are no published incidents of this problem and anything becoming trapped in moving parts would reduce the efficiency and required extra maintenance. It is therefore designed out of these systems.

8.5.126 The spacing between the rows of solar trackers will be less than that compared to fixed panels although there will be greater areas around the ends of the solar arrays compared to fixed panels. The wider spacing within the fixed south panel layout is likely to support a greater number of more open habitat nesting species that the narrower spacing that would occur if a tracker technology were implemented.

8.5.127 Where studied it has been found that solar farms have a high diversity of plant species as well as a higher abundance and diversity of invertebrates when compares to nearby comparable farmland (Montag *et al* 2016). The anticipated boost in abundance and diversity of invertebrate prey species though management of the grassland within the 440ha fenced area of Energy Park, the 46ha of land sown with a nature conversation seed mix, and the 96ha of Biodiversity Net Gain land will also boost the quality foraging habitat available to birds nesting in the surrounding arable farmland and is likely to increase their breeding success. Although Skylark are ontinue to nest panels within the Energy Park this may be at a lower density. However, is likely to be at higher density in the Biodiversity Net Gain areas therefore unlikely to be a significant change in total number. Overall it is expected that there will be an increase in the diversity and number of breeding birds within and around the Energy Park resulting in a non-significant minor beneficial effect on the conservation status at a local level.

8.5.128 The introduction of vertical structures, particularly fencing, substation and energy storage facilities into the landscape could potentially increase the risk of bird collision. However, it is grouse species that are at highest risk from collision (Baines & Andrews 2003) from fencing and built structure which are not present on this Energy Park Site.

8.5.129 The layout and location of substations and energy storage facilities has yet to be finalised. One option under consideration is spreading these out into a number of locations throughout the Energy Park. Overhead power lines could be used to connect back to the main substation, of which three may cross wider IDB maintained drains. Powerlines over water bodies can sometimes, but not always increase the risk of collision by waterbirds using those water bodies. Although there are limited number of waterbirds breeding on the site there is a potential for small increase in the collision risk of waterbirds flying along these wider drains. If there was an increase in bird collision this is likely to be minor negative effect at a local level.

Mitigation

8.5.130 If the design requires the use of overhead powerlines within the Energy Park these will be fitted with bird deflectors (often known as flappers) to increase the visibility of the powerline to waterfowl to minimise the risk of collision.

Residual

8.5.131 The addition of overhead bird deflectors will ensure there is no significant effect on breeding waterbirds.

Wintering birds

8.5.132 The change from intensive arable land to a mosaic of grassland pasture, removal of all agrochemical inputs and a change in the three-dimensional structure of the land is likely to have effect on the number and diversity of a range birds species wintering within the Energy Park.

8.5.133 A number of other species that forage in large open arable fields during the winter were recorded including Rook, Carrion crow, Skylark, Starling, Wood Pigeon, Lapwing, Golden plover, Black headed gull and Common gull. The design of the Energy Park includes a large Biodiversity Net Gain areas which are likely to be used by these species. There is abundance of similar arable land present within a 5km radius of the Energy Park Site and would likely have the capacity to receive some increase in foraging pressure by these species resulting from the displacement from the Energy Park Site.

8.5.134 The cessation of intensive arable activities within the Energy Park and reversion to a mosaic of grassland under a sheep-grazing management regime and the establishment of 10.19km of new hedgerow is likely to increase the invertebrate, seed and hedgerow fruits available to a wide range species which winter in the area. Therefore, it is considered that there would be no residual effect on the conservation status of the winter birds and the effect would be Neutral / Negligible and Not Significant.

8.5.135 The layout and location of substations and energy storage facilities has yet to be finalised. One option under consideration is spreading these out into a number of locations throughout the Energy Park. Overhead power lines could be used to connect back to the main substation, of which three may cross wider IDB maintained drains. Powerlines over water bodies can sometimes, but not always increase the risk of collision by waterbirds using those water bodies. Although there are limited number of waterbirds breeding on the site there is a potential for small increase in the collision risk of waterbirds flying along these wider drains. If there was an increase in bird collision this is likely to be minor negative effect at a local level.

8.5.136 If the design requires the use of overhead powerlines within the Energy Park these will be fitted with bird deflectors (often known as flappers) to increase the visibility of the powerline to waterbirds to minimise the risk of collision.

Residual

8.5.137 The addition of overhead bird deflectors will ensure there is no significant effect on wintering waterbirds.

Amphibians

8.5.138 The cessation of intensive agricultural practices is likely to be beneficial to any remnant amphibian populations and over time it is possible amphibians may recolonise the Energy Park Site.

Reptiles

8.5.139 The cessation of intensive agricultural practices is lilkey to be beneficial to any remnant reptile populations and over times it is possible that the reptiles may recolonise the Energy Park Site.

Invetebrates

8.5.140 The cessation of intensive arable farming practices (particularly insecticide spraying) and reverting the land to mosaic of grassland can be expected to result in an increased diversity and numbers of invertebrates at the Energy Park Site. This includes a number of pollinating of butterfly and bee species which have been shown to have increased diversity and abundance in solar arrays compared to control plots (Montag *et al* 2016). Given the large extent of grasslands habitat that will likely increase in quality, the operational impacts of the Energy Park will have a significant beneficial effect on a range of invertebrates.

8.5.141 The Energy Park is 1.7km to the west of a Buglife B-line and there is a potential connection to it via a series of ditches and drains leading from the Skerth drain to the B-line. The presence of an area of grassland important for invertebrates within the Energy Park may result a future changes or diversion of the B-line to encourage other landowners to create invertebrate friendly habitats.

Aquatic plants

8.5.142 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.143 The cessation of the use of agrochemicals throughout the Energy Park Site will reduce the run-off of toxic chemicals in the water courses which is likely to benefit the water quality of the drainage ditches.

Arable plants

8.5.144 At the time of drafting this PEIR the survey work is still ongoing and the assessment is therefore awaiting the results of the surveys.

8.5.145 However, if rare arable plants are identified, and considered significant, then there may be a need to set aside a small area outside the security fencing to be cultivated every year for arable plants.

Operation of off-site Grid Connection and Substation Extension at Bicker Fen

8.5.146 Along the majority of the off-site Grid Route the land will be returned to its previous land use. There may be a small number of above ground structures resulting in the loss of a small amount of farmland for permanent structures. As the design of the off-site grid route processes, the locations and areas of these size of losses will be known.

8.5.147 Overall, given that the cable is being placed underground, it is considered that there will be no effect on existing habitats or species along the route of the off-site Grid Connection cable. Therefore, it is considered that there would be no effect on the conservation status of habitat or species along the route of the Grid Connection. The residual effect from the operation of the off-site grid connection route will therefore be Neutral / Negligible and Not Significant.

8.5.148 It is considered that there will be no effect on existing habitats or species at the extension site at Bicker Fen Substation. Therefore, it is considered that there would be no effect on the conservation status of habitat or species at the substation. The residual effect from the operation of the substation extension will therefore be Neutral / Negligible and Not Significant.

Decommissioning

8.5.149 The decommissioning of the Energy Park is likely to occur in or around 2067. The operational life of the Scheme is to be 40 years. Decommissioning is expected to take in the region of 6-12 months and will be undertaken in phases. A 12-month decommissioning period has been assumed for the purpose of a worse case assessment in this PEIR.

8.5.150 It is expected that the effects of decommissioning the Energy Park will be similar to those during construction. However, it is likely that the overall nature conservation value of the area of Energy Park will be greater than the current intensive arable landscape. Based on the habitat to be created during the construction of the Energy Park it is likely that the return of the land to arable cultivation is likely to result in a decline in the overall conservation status of the Energy Park Site. However, there is no guarantee what crops will be planted on the Energy Park Site once the Energy Park is decommissioned. The choice of crop will be determined by the landowner, and this will depend on the global markets for crops at that time.

8.5.151 Whilst the broad habitat types created during construction are likely to be present in 2067 the ongoing effects of climate change are likely to result is some marked changes in the species present in the wider area by 2067. Therefore, a full pre-decommissioning survey will be required to full assess the potential effects of decommissioning on fauna and flora. It is the intention that the community orchard will remain on the Energy Park Site after decommissioning.

8.5.152 It is intended that after the 40-year operational life, the solar panels energy storage, and associated equipment will be removed from the Energy Park Site. The substation extension at Bicker Fen is likely to remain once the Energy Park Site is decommissioned. It is the intention that the off-site cables will be at a depth of over 1m. Therefore, it is expected that all cables will remain in place and will not need to be removed in the decommissioning process. Therefore, there will be no disturbance to the habitats from their removal.

8.5.153 At this time, there is limited detailed information known about the climate, habitat mix and species at the time of decommissioning. As the removal works are less instructive than the construction works the effects of removal of above ground equipment will be less that the installation. It is therefore reasonable to assume that the effect will temporary, minor and not significant.

8.5.154 However, it is proposed that prior to decommissioning new ecological surveys of the Energy Park Site are surveyed to understand the ecological baseline at that time.

8.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

8.6.1 The design of the Energy Park has included a stand off of at least 9m from all IDB water courses and 8m from all other ditches to minimise the risk to water vole should they recolonise the area and to allow the ongoing management of drainage ditches to ensure the long term maintenance and enhancement of the quality of the soil with the Energy Park Site.

8.6.2 The outlier badger setts that are on the Energy Park site have been considered in the design of the layout.

8.6.3 10.19km of new hedgerow will be planted around the Energy Park Site. The locations of these new hedgerows can be seen on **Figure 4.1e**. These hedgerows will offer landscape screening but will also offer new areas of habitat and feeding grounds for local wildlife. An area of 1.8ha will be planted up as a community orchard. This will be maintained as meadow grassland underneath.

8.6.4 The off-site Grid Connection to Bicker Fen Substation will be underground and where required to cross key obstacles, such as the South Forty Foot Drain it will be direct drilled under the feature.

Additional Mitigation

8.6.5 An Outline CEMP will be prepared for the Proposed Development which will detail the measures required to minimise the dust deposition and run-off which may affect the boundary habitats. This will include how dust-generating activities will be avoided, ensuring stockpiles of spoil and site materials will be stored away from field boundaries, restrictions on working during periods of heavy rain and the installation of silt fencing and/or temporary drainage channels if necessary.

8.6.6 The Outline CEMP will also include protection measures for Brown Hare during the construction of the Energy Park and associated infrastructure within the Grid Cable Route. It will include

- Habitat manipulation to create suitable habitat for Brown hare outside construction prior to commencement;
- Habitat manipulation to minimise suitability for Brown hare in construction area prior to each phase on construction;
- The provision of ramps into any open excavations to allow any Brown hare (particularly leverets that have fallen in to escape;
- Contractor training and induction to ensure awareness and care during installation of solar arrays and associated infrastructure;
- Adopting a speed limit of 10mph across the Application Site to reduce the possibility of incidental mortality; and
- Any hares encountered during works should be allowed to move away of works.

8.6.7 Mitigation measures and protection measures for badger setts during the installation of the Energy Park and associated infrastructure will include:

- Prior to each stage of construction, a badger survey will be conducted sufficient time for appropriate mitigation measure to be in place where there is a potential for disturbance;
- The creation of construction exclusion zones delineated by Heras fencing where appropriate to control direct impacts to setts;
- If necessary licenced temporary clossure of a sett or licenced works within an agreed distance from the sett; and
- To prevent badgers and other mammals from becoming trapped the provision of ramps into any open excavations to allow any badger (or other mammals) that have fallen in to escape.

8.6.8 Standard Practice to avoid impacts to nesting birds during works, including disturbance to Schedule 1 species nesting in building, will include:

- appropriate timing of clearance works (i.e., outside of the breeding season between October and February inclusive; and pre-clearance nesting bird checks if required;
- In the event that any active bird nests would be impacted by clearance/installation works, it would be necessary to defer works within a minimum 5m radius of the nest until the nest is no longer active; and
- Access to buildings on the Energy Park Site will be prevented by fencing to avoid accidental disturbance to nesting schedule 1 species.

Table 8.7: Proposed mitigation measures

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured	
		By Design	By DCO Requirement
1	Enhancement of the area for biodiversity to deliver beneficial effects	X	
2	Prevention of damage to habitats during construction through implementation of Construction Environmental Management Plan (CEMP)		X
3	Prevention of disturbance or risk of injury of mortality to species during construction through implementation of a CEMP		X
4	Ongoing management to deliver biodiversity net gains through Landscape and Environmental Management Plan (LEMP)		X

Enhancements

8.6.9 The Energy Park has been designed to enhance the overall Biodiversity value of the land in order to minimise the need for mitigation to be subsequently included in the design of the Energy Park.

8.6.10 The intensive arable agriculture within the fields will be returned to grass pasture to be grazed by local sheep flocks at low density once the Energy Park is operational. The areas will be re-seeded prior to construction with a drought resistant seed mix suitable for sheep grazing with no additional fertilizers within the fenced area of the Energy Park being used. This area is approximately 440ha.

8.6.11 The area to the south of the Energy Park, and an area through the centre and the small area to the north of the Energy Park Site will be set aside for Biodiversity Net Gain (96ha) and will be seeded with nature conservation grass seed mixes to provide habitat for insects and pollinators as well as nesting farmland birds and foraging habitat for birds and mammals. This will be managed as a nature conservation pasture with late winter sheep grazing, no grazing during spring until birds have finished nesting and flowers seeded followed by a hay cut and aftermath grazing. Large amounts of fertiliser have been applied to this land over its years in agricultual production and it is recognised that in the first few years these grassland may be encroached by various arable weed and dominant grass species. However with the non addition of fertiliser, hay harvest and grazing the nutrient level of the soils will rapidly decrease. Subsequently over seeding with species rich seed mixes may then be required which will be determined by the results of ongoing monitoring of the Energy Park Site.

8.6.12 A nature conversation species rich seed mix will be used in the areas between the fenced Energy Park and the drainage ditches (46ha). This will be managed as hay meadow with an annual late cut and harvest. Large amount of fertiliser have been applied to this land over the years in intensive arable farming and in recognised that that in the first few years these grasslands may be encroached by various arable weed and dominant grass species. However, with no additional fertiliser and hay harvest the nutrient level of the soils will rapidly decrease. Subsequent over seed with species rich seed mixes may then be required which will be determined by the results of ongoing monitoring of the Energy Park Site.

8.6.13 The creation of large mosaic of grassland combined with the cessation of the use of fertiliser and agrochemicals will have a significant, positive beneficial effect on the diversity of the flora and the abundance and diversity of invertebrates within the Energy Park Site.

8.6.14 An area of approximately 1.8ha will be developed as a community orchard with a species rich meadow beneath. It is proposed that this will be planted with a range of traditional Lincolnshire varieties which flower at different times through the season to provide pollen and nectar over a longer period. Fallen fruit will also provide food resource for a range of overwintering birds, particularly song thrushes, mistle thrush, redwing and fieldfare which will also benefit from the additional 10.19km of new hedgerow. A range of traditional Lincolnshire varieties are potentially available from the East of England Apples Project and their members. Selected varieties can then be grafted onto suitable rootstock in sufficient time for planting to ensure successful establishment.

8.6.15 Preliminary Biodiversity Net Gain calculations has been calculated using Natural England Metric version 3 for the Energy Park only. The 586ha of arable cropland had baseline of 1,193 habitat units. A conservative approach has been taken and it has been assumed Energy Park will result in the loss of 30ha of this habitat under access track, substations and energy storage area and compounds. It will result in the conversion of 465ha (the remaining cropland) to the broad category of other neutral grassland within the Energy Park Site. A further 96ha will become lowland meadows to the south of the Energy Park Site and 1.8ha as traditional orchard delivering 3650 biodiversity units. A conservative approach has been taken and it has been assumed that the grassland beneath the solar panel will be considered as poor to take into the account of the shading effects, whilst the grassland between panels and outside the solar array area but within the Energy Park Site will only be of moderate conservation value. It assumed the condition of the Biodiversity Net Gain areas to the south of the Energy Park Site will be in a fairly good condition and the orchard will be in a good condition. This gives a preliminary Net Biodiversity Gain of 205.8%, see **Appendix 8.4** for details. A detailed Biodiversity Net Gain report will be provided with the ES chapter.

8.7 CUMULATIVE AND IN-COMBINATION EFFECTS

8.7.1 There are nine proposed solar developments which could potentially result in cumulative effects of the nature conservation and ornithology within the Region. These are listed in Chapter 2 of this PEIR. Cumulative effects on biodiversity can occur when nearby development causes significant change in the nature conservation value of the local ecology and in combination may cause cumulative effects e.g. removing the majority of a particular habitat in an area or removing alternative foraging or breeding habitat for a particular species or creating a new area of habitat which in combination may create sufficient new habitat to allow a particular species to expand its range and the population to increase.

8.7.2 The dominant habitat within this region is arable farmland. Overall these other solar farm sites, combined with Heckington Fen will cover just over 4,554 ha which represent 0.654% of farmland habitat in Lincolnshire. Four of the solar sites overlap neighbouring county boundaries reducing the percentage of Lincolnshire farmland habitat even further. In EIA terms the loss of such a such small percentage of farmland habitat, without mitigation or enhancements, would be considered as negligible and Not Significant. Within the scoping documents, PEIR or EIA documents associated with each of these proposed solar developments it is stated that they will provide sufficient mitigation and or enhancements to ensure there are no significant effects individually. Those which are yet to be determined will also be seeking to achieve a 10% BNG for ecology within their Site Design.

8.7.3 The State of Nature Report which highlights the changing status of nature in the UK, identifies intensive agriculture and climate changes as the most important pressures on wildlife in the UK today (The State of Nature partnership 2019). Potentially the creation of 4,554ha of low intensity, managed grassland could be regarded as a significant biodiversity gain although in comparison to the total area of intensively manged farmland still remaining within Lincolnshire, the change may still be considered as negligible and not significant.

8.7.4 The conversion of 4,554ha to permanent grassland for 40 years will reduce the run-off of agrochemicals and soils into the drainage system and eventually into The Wash and Humber Estuary SPA/SAC sites. This could amount to between 18,200 and 54,648 tonnes of soils over the 40-year lifetime of these solar projects. However, in comparison to the amount of run off of agrochemicals and soil loss from the whole of the Wash's catchment, this saving remains to be insignificant.

8.7.5 The construction of the Energy Park and off-site Grid Connection and extension to the substation at Bicker Fen is likely to take place in 2026/27. This will not overlap with the construction period of the Viking Link or Triton Knoll grid connections. Therefore, there will be no cumulative effects on ecology or ornithology from the construction work of these two major infrastructure projects.

8.8 SUMMARY

Introduction

8.8.1 This chapter has, where surveys have been completed, identified and assessed the potential impacts effects of the proposed development of a 586.85 ha Energy Park and off-site grid connection cable route and above grounds works at the National Grid Bicker Fen Substation on ecology and nature conservation value during construction, operation, and decommissioning.

8.8.2 An extended Phase1 survey, badger surveys, breeding and wintering bird surveys have been completed on the Energy Park site. Wintering bird surveys have been completed on the off-site grid connection cable route and above grounds works at the National Grid Bicker Fen Substation. There are ongoing surveys for great crested newt, bats, aquatic plants and rare arable plants on the Energy Park site. Surveys for breeding birds, badger, great crested newts, rare arable plants and aquatic plants and an extended Phase 1 survey are currently being carried out along the proposed off-site grid connection cable route and above grounds works at the National Grid Bicker Fen Substation.

8.8.3 This chapter provides an assessment of the potential direct and indirect effects on nature conservation designations, important habitats, protected species onsite and offsite. It considers avoidance design measures, mitigation, compensation and management activities to minimise any potential effects.

Baseline Conditions

8.8.4 The Energy Park and associated off-site Grid Connection will be situated within an intensively farmed landscape of low nature conservation value. The substation extension is within the National Grid land boundary, alongside the existing Bicker Fen Substation. The large fields associated with the remainder of the Proposed Development are divided by wet ditches and Internal Drainage Board managed water courses. There are no sites of international, national or local importance within or adjacent to the Energy Park Site. There is one Local Wildlife Site (The South Forty Foot Drain) along the route of the off-site grid connection. The Wash SPA is approximately 16km from the Proposed Development. The data searches did not reveal the presence of any protected species within the Energy Park. There are records of otter from the South Forty Foot Drain and records of Water Vole within the last 5 years in the Great Hale Eau LWS.

8.8.5 There are limited number of gappy hedgerows on the Energy Park Site, and a small number trees mainly restricted to plantation woodlands. The wet drainage ditches provide suitable habitats for Water Vole and Otter but no evidence of their use by these species was found on the Energy Park Site. There is an active Badger population within the Energy Park Site. There are a number of common farmland birds using the Energy Park Site. There are a small number of birds that contribute to the Wash SPA wintering in the area including a small flock of Pink-footed geese feeding on one section of Grid Connection route.

Likely Significant Effects

8.8.6 During construction of the Energy Park there is a risk of dust deposit or silt runoff or disturbance to boundary habitat, woodlands, ponds, and wetlands. There also disturbance to wintering birds, nesting birds, Brown Hare, and Badger during construction.

Mitigation and Enhancement

8.8.7 The initial design and construction methods will ensure negative effects are minimised from the outset. The initial design of the Energy Park ensured a 9m stand off from all IDB watercourses which will ensure protection of water vole should they re-colonise the Energy Park Site. Direct drilling under the South Forty Foot Drain will ensure no negative effects on the Local Wildlife Site.

8.8.8 The initial design also includes the creation of 96ha of species rich grasslands and 1.8ha of traditional orchard managed specifically for nature conservation, largely to the south of the Energy Park Site. A further 46ha of species rich grassland within the Energy Park Site will be managed to maximise the nature conservation value. These open high quality grassland will be managed to maximise their value for ground nesting farmland birds, bees, butterfly and other invertebrates. These grasslands will also provide extensive foraging habitat for Brown Hare and Badger.

8.8.9 Beneath the solar panels 440ha of intensive arable farmland will be converted to low intensity sheep pasture. The conversation of the land from intensive arable to grass pasture will also dramatically reduce the runoff of agri-chemicals and topsoil into in the Wash SPA via the drainage network. There will be an overall significant residual, locally beneficial effect on biodiversity of area. The preliminary Net Biodiversity Gain calculation estimated a net gain of 205.8%.

8.8.10 The implementation of a comprehensive Construction and Environmental Management Plan (CEMP) will ensure there is no damage to any hedgerow, woodland or watercourses during construction. The implementation of this CEMP will ensure there is no significant disturbance or risk of injury or mortality of breeding farmland birds, disturbance to wintering wetland birds or disturbance and risk of injury to Badger or Brown Hare.

Cumulative and In-Combination Effects

8.8.11 A review and assessment of other renewable projects in the area has identified no significant cumulative negative effects. Intensive agriculture and climate change have been identified by the UK State of Nature Report as the most significant pressure on wildlife in the UK today. The creation of large areas of renewable energy generation and large area of species rich grassland is likely to lead to a net biodiversity gain.

Conclusion

8.8.12 The majority of the land is considered to be of low nature conservation value. Any temporary disturbance or risk of harm can be minimised through the implementation of a comprehensive CEMP. The initial design of Energy Park and on-going management will ensure that there is an overall biodiversity gain.

Table 8.8: Summary of Potential Cumulative Sites and their Potential Cumulative Effects

	Details of Cumulative Schemes							
No.	**Name of Scheme**	**LPA**	**NSIP**	**Reference**	**Size**	**Distance from Site**	**Area**	**Potential Cumulative Effect**
1	Vicarage Drove-Approved	Boston Borough	No	B/21/0443	49.9MW	*c.* 4.5km south of the Energy Park Site at its closest point but adjacent to the the proposed extension to the substation at Bicker Fen	80	No – The Applicant for the development has provided sufficient mitigation on the site and no significant impacts have been reported
2	Land at Little Hale Fen-Screening	North Kesteven	No	21/1337/EIASCR	49.9MW	*c.* 4.6km north-east of the Energy Park Site at its closest point	80	No – The applicant states that overall, it is considered that the proposed development would not have any significant adverse effects on biodiversity and that there is potential for net biodiversity gains as a result of taking the land out of intensive arable production and managing the areas under and around the solar panels for habitat benefits.
3	Land at Ewerby Thorpe-Screening	North Kesteven	No	14/1034/EIASCR	28MW	*c.* 4.1km north-west of the Energy Park Site at its closest point	73	No - Overall, it is considered that the proposed development would not have any significant adverse effects on biodiversity and that there is potential for net biodiversity gains as a result of taking the land out of intensive arable production and managing the areas under and around the solar panels for habitat benefits.
4	Land to the North of White Cross Lane-Approved	North Kesteven	No	19/0863/FUL	32MW	*c.* 8.4km west of the Energy Park Site at its closest point	20	No- Overall the development would not having any significant effects on biodiversity. There is a comprehensive LEMP. There will be a predicted Biodiversity Net Gain of 12.12% increase

	Details of Cumulative Schemes							
No.	**Name of Scheme**	**LPA**	**NSIP**	**Reference**	**Size**	**Distance from Site**	**Area**	**Potential Cumulative Effect**
								in habitat and 72.18% in hedgerow units.
5	Land South of Gorse Lane, Silk Willoughby-Approved	North Kesteven	No	19/0060/FUL	20MW	*c.* 11km west of the Energy Park Site at its closest point	70	No- Overall the development would not have any significant effects on biodiversity. There is a comprehensive LEMP.
6	Cottam Solar Project - Scoped	PINS to determine. Falls in administrative e areas- Nottinghamshire, Lincolnshire County, Bassetlaw District and West Lindsey	Yes	EN010133	50MW + (NSIP)	*c.* 43.6km north-west of the Energy Park Site at its closest point	1270	Although a large site this is a significant distance from the Heckington Fen Application Site and it is highly unlikely to create a cumulative impact particularly as the Applicant has stated that the development has provided sufficient mitigation on their site and no significant impacts have been reported.
7	Gate Burton Energy Park - – Statutory Consultation	PINS to determine. Falls in administrative areas- Nottinghamshire, Lincolnshire County, Bassetlaw District and West Lindsey	Yes	EN010131	50MW + (NSIP)	*c.*48.6km north-west of the Energy Park Site at its closest point	684	Although a large site this is a significant distance from the Heckington Fen Application Site and it is highly unlikely to create a cumulative impact particularly as the Applicant for the development has provided sufficient mitigation on their site and no significant impacts have been reported

	Details of Cumulative Schemes							
No.	**Name of Scheme**	**LPA**	**NSIP**	**Reference**	**Size**	**Distance from Site**	**Area**	**Potential Cumulative Effect**
8	West Burton Solar Project - Scoped	PINS to determine. Falls in administrative areas- Nottinghamshire, Lincolnshire County, Bassetlaw District and West Lindsey	Yes	EN010132	50MW + (NSIP)	*c.*41.3km north-west of the Energy Park Site at its closest point	788	Although a large site this is a significant distance from the Heckington Fen Application Site and it highly unlikely to create a cumulative impact particularly if the Applicant for the development has provided sufficient mitigation on their site and no significant impacts have been reported.
9	Mallard Pass Solar Farm – Statutory Consultation	PINS to determine. Falls in administrative areas- Rutland County and South Kesteven	Yes	EN010127	50MW + (NSIP)	*c.*33.2km south-west of the Energy Park Site at its closest point	900	Although a large site this is a significant distance from the Heckington Fen Application Site and it highly unlikely to create a cumulative impact particularly if the Applicant for the development has provided sufficient mitigation on their site and no significant impacts have been reported.

Table 8.9: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction Energy Park								
Boundary habitat	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Boundary habitat	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Ponds and wetlands	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Ponds and wetlands	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Woodland	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Woodland	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Badger	Disturbance during construction	Temporary	N/A	N/A	Local	Minor-Moderate adverse	Compliance with CEMP to ensure no disturbance which may include licenced temporary sett closure	Not significant
Brown Hare	Disturbance, injury or mortality during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with guidance in CEMP and specific working practices	Not significant
Breeding birds	Disturbance, injury or mortality during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with guidance in CEMP and specific working practices	Not significant
Aquatic plants	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with guidance in CEMP and specific working practices	Not significant

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction of off-site Grid Connection and substation extension at Bicker Fen								
Non Statutory designed sites: South Forty Foot Drain	Permanent damage and creation collision risk to birds	Permanent	N/A	N/A	Local	Minor – moderate adverse	Placing Grid connection beneath the South Forty Foot Drain	Not significant
Non Statutory designed sites: South Forty Foot Drain	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with guidance in CEMP and specific working practices	Not significant
Boundary habitat	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Boundary habitat	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Ponds and wetlands	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Ponds and wetlands	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Woodland	Damage or disturbance during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant
Woodland	Dust deposit or silt runoff during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP to ensure no damage	Not significant

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Woodland	Potential loss of a small areas of woodland for construction of substation	Permanent	N/A	N/A	Local	Minor adverse	Replanting of an area of wood of the same size and species mix on or off site	Not significant
Badger	Disturbance during construction	Temporary	N/A	N/A	Local	Minor-Moderate adverse	Compliance with CEMP to ensure no disturbance which may include licenced temporary sett closure	Not significant
Brown Hare	Disturbance, injury or mortality during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP and specific working practices	Not significant
Breeding birds	Disturbance, injury or mortality during construction	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP and specific working practices	Not significant
Wintering birds	Disturbance of feeding geese	Temporary	N/A	N/A	Local	Minor adverse	Compliance with CEMP and specific working practices	Not significant
Wintering birds	Permanent damage and creation of collision risk to birds from over ground cables	Permanent	N/A	N/A	Local	Minor – moderate adverse	Placing Grid connection beneath the South Forty Foot Drain	Not significant
Operation of Energy Park								
The Wash SPA / Ramsar Site	Reduction in silt and agrochemical inflow into The Wash SPA	Temporary but for the lifespan of the Energy Park	N/A	N/A	Internationally important	Minor beneficial	N/A	Not significant

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Grasslands	Increase in area of grasslands	Temporary but for the lifespan of the Energy Park	N/A	N/A	Local	Moderate beneficial	N/A	Significant at local level
Boundary habitat	Increase in the length of boundary habitat	Temporary but for the lifespan of the Energy Park	N/A	N/A	Local	Moderate beneficial	N/A	Significant at local level
Brown Hare	Increase in area of grasslands	Temporary but for the lifespan of the Energy Park	N/A	N/A	Local	Moderate beneficial	N/A	Significant at local level
Badger	Increase in area of grasslands	Temporary but for the lifespan of the Energy Park	N/A	N/A	Local	Minor beneficial	N/A	Significant at local level
Invertebrates	Cessation of intensive arable farming. Increase in area of grasslands.	Temporary but for the lifespan of the Energy Park	N/A	N/A	Local	Minor beneficial	N/A	Significant at local level
Operation of off-site Cable Route and Extension to Bicker Fen substation								
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cumulative and In-combination								
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Decommissioning								
The Wash SPA/ Ramsar Site	Increase in silt and agrochemical inflow into The Wash SPA	Permanent	N/A	N/A	Internationally important	Minor adverse	N/A	Not significant

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
	as intensive farming practices commence on the Energy Park Site							
Invertebrates	Commencement of intensive arable farming. Decrease in area of grasslands	Permanent	N/A	N/A	Local	Minor adverse	N/A	Significant at local level

Notes:

*	Enter either: Permanent or Temporary / Direct or Indirect

**	Only enter a value where a sensitivity v magnitude effects has been used – otherwise 'Not Applicable'

***	Enter either: International, European, United Kingdom, Regional, County, Borough/District or Local

****	Enter either: Major / Moderate / Minor / Negligible AND state whether Beneficial or Adverse (unless negligible)

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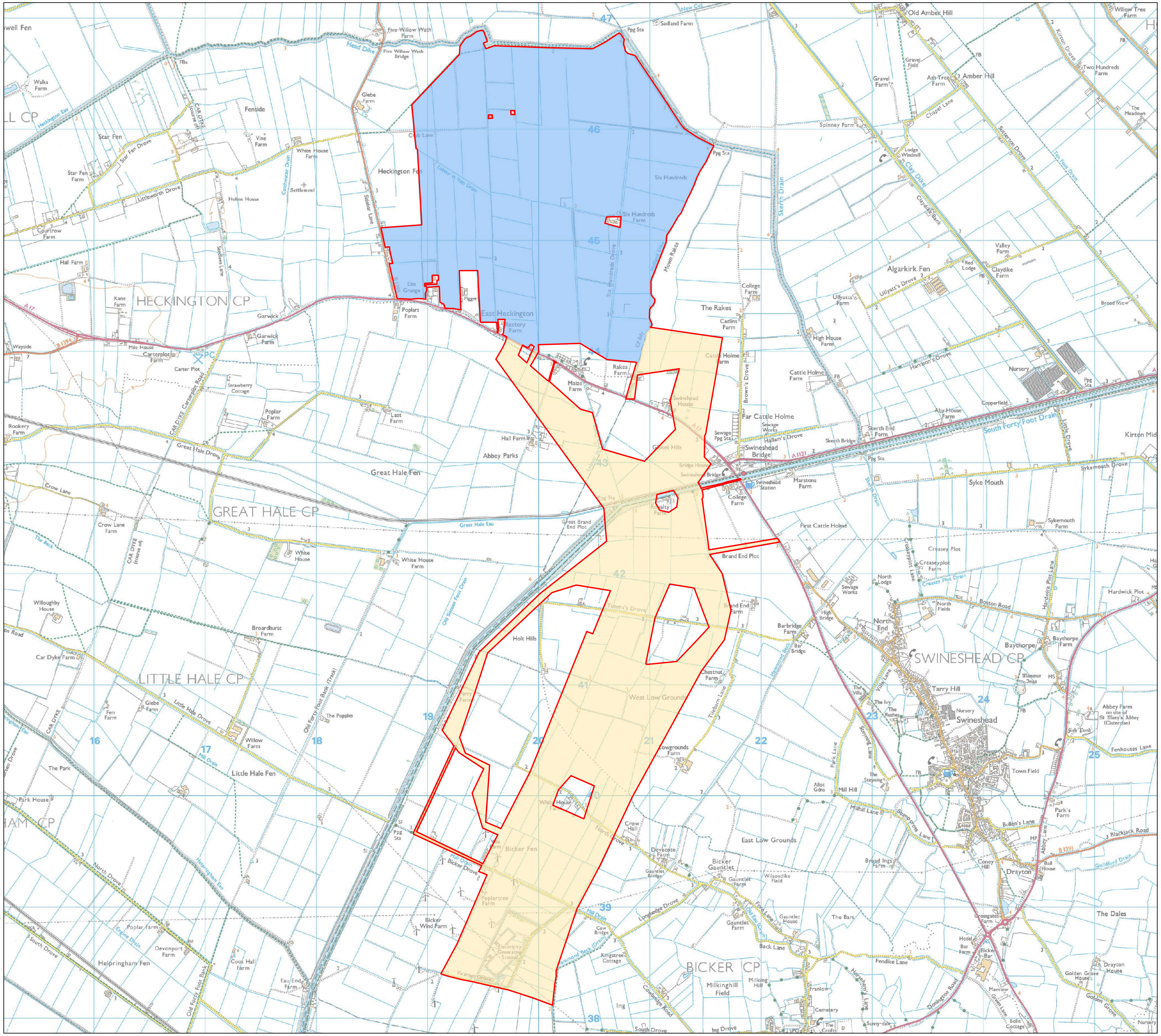
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 8.1- Survey Areas

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Energy Park Area
- Grid Connection Routes Area

0 — 2.5 km

N

FIGURE 8.1

Surveys Area

DRWG No: **P20-2370_35** Sheet No: **-** REV: **_**

Date: 08/06/2022

Scale: 1:35,000 @ A3

DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

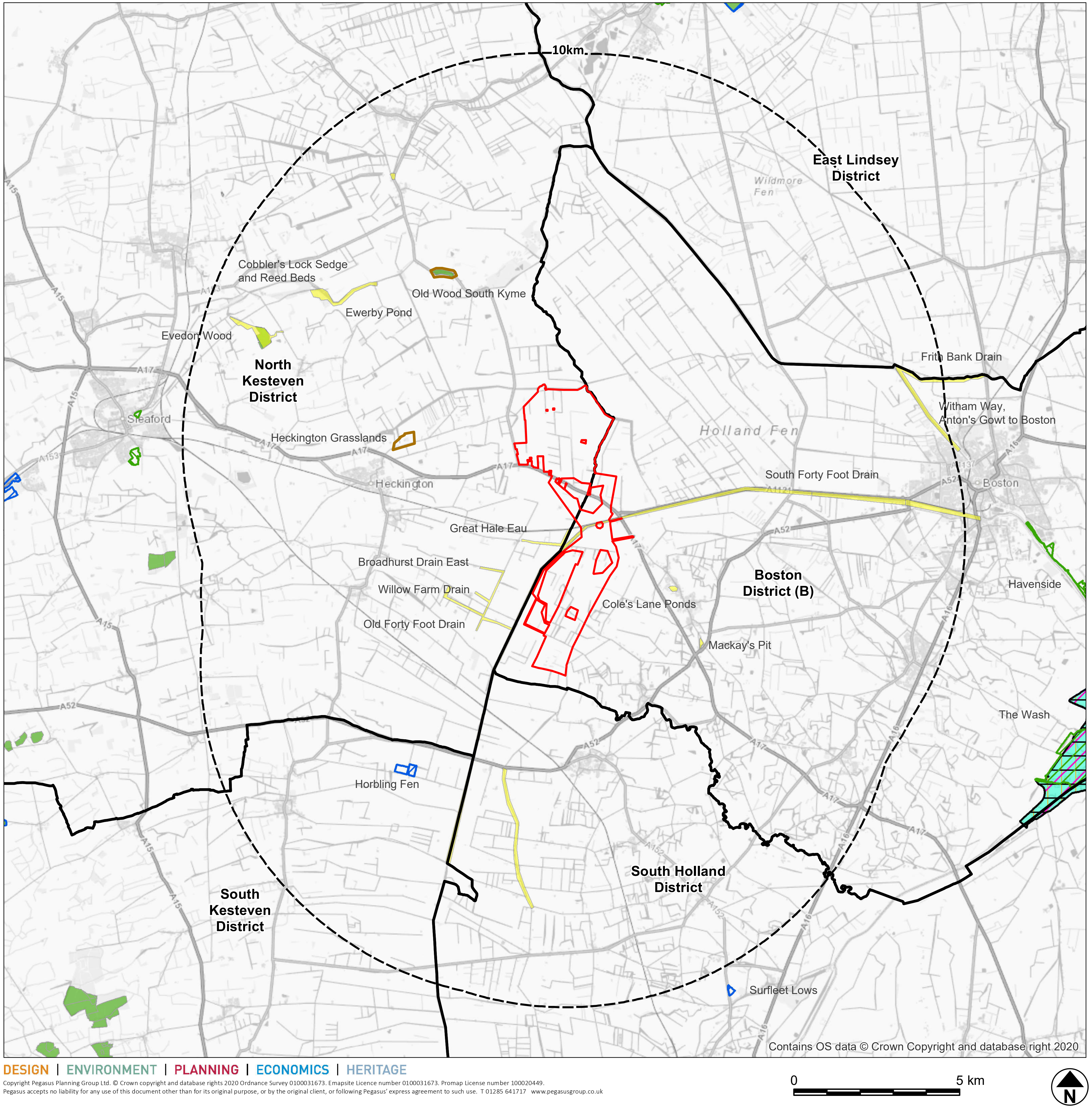
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 8.2-Statutory and Non-Statutory Designated Sites and Protected and Notable Species within 5km of the Proposed Development

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Local Authority Boundary
- Site of Nature Conservation Interest
- Local Wildlife Site
- Local Nature Reserve (LNR)
- National Nature Reserve (NNR)
- RAMSAR
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)
- RSPB Reserve
- Ancient Woodland

Revisions:
First Issue- 13/12/2021 AD
A - 23/03/22022 CR Revised boundary
B - 15/06/2022 CR Revised boundary and LWS added

Ecology & Ornithology Designations Plan

Heckington Fen Solar

Client: Ecotricity
DRWG No: **P20-2370_09** Sheet No: - REV: **B**
Drawn by: CR Approved by: IH
Date: 15/066/2022
Scale: 1:120,000 @ A3

Pegasus Environment

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Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 9: Hydrology, Hydrogeology, Flood Risk and Drainage

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

9 HYDROLOGY, HYDROGEOLOGY, FLOOD RISK AND DRAINAGE

9.1 EXECUTIVE SUMMARY

9.1.1 This Chapter sets out the assessment of likely significant effects of the Proposed Development upon hydrology, hydrogeology, flood risk and drainage arising from the construction, operation and decommissioning of the Proposed Development.

9.1.2 It is concluded that potential effects arising from construction of the Proposed Development are likely to be localised and temporary and controlled by embedded mitigation measures. The residual effects are therefore Negligible and Not Significant.

9.1.3 With the implementation of embedded mitigation measures, the residual effects associated with operation of the Energy Park are Negligible and Not Significant. The electrical connection to the National Grid Bicker Fen Substation comprises an underground cable that would not give rise to impacts upon hydrology, hydrogeology, flood risk and drainage during the operational phase.

9.1.4 The assessment concludes that there is no requirement for additional mitigation measures and that there will be no cumulative effects within the wider catchment of the principal watercourses in the area.

9.2 INTRODUCTION

9.2.1 This chapter presents the assessment of likely significant effects of the Proposed Development upon hydrology, hydrogeology, flood risk and drainage arising from the construction, operation and decommissioning of the Proposed Development. It summarises the assessment methodology, the relevant legislation, policy, guidance and standards, the consultation undertaken to support and inform the assessment, and the baseline conditions both at and in the vicinity of the Proposed Development. It then considers the mitigation measures required to prevent, reduce or offset effects.

9.3 ASSESSMENT APPROACH

Methodology

9.3.1 The assessment in relation to the water environment is predominantly desk-based but also included an Energy Park Site walkover. The most up to date information available on publicly accessible websites and mapping has been used to determine the existing baseline conditions at the Energy Park Site and in the immediate vicinity. This has allowed identification of the receptors in both the surface water and groundwater environment, which will need consideration during the design of the Proposed Development.

9.3.2 A walkover survey has been undertaken to facilitate an understanding of the baseline water environment and the general landform of the Proposed Development and surrounding area and to define the scope/specifications of technical assessments and surveys. This survey included the off-site cable route options and extension works at National Grid Bicker Fen Substation.

9.3.3 The assessment is supported by the collection and interpretation of data and information requested from the Environment Agency (EA), Black Sluice Internal Drainage Board (BSIDB) and the Environmental Health department at North Kesteven District Council (NKDC). These organisations provided flood risk data and hydrological information for a 2km radius around the boundary of the Proposed Development (Energy Park, off-site cable route and substation) including groundwater abstractions, surface water abstractions, water quality data, discharges and private water supply records. This information has been used to characterise the baseline water environment and identify receptors.

9.3.4 In addition, the EA, BSIDB and the Environmental Health department at NKDC. have been consulted to agree the methodology for the technical assessments and analysis required to inform the EIA process.

9.3.5 The key data and sources of information collected are listed in **Table 9.1**.

Table 9.1 Sources of Information

Source	Data
Ordnance Survey mapping at 1:50,000 and 1:25,000 scales:www.multimap.com	Topography: elevation, relief.
Cranfield University's National Soils Resources Institute Soilscapes website: http://www.landis.org.uk/soilscapes/	Soil type and land use.
Magic Map: https://magic.defra.gov.uk/magicmap.aspx Natural England website: https://designatedsites.naturalengland.org.uk/	Nature Conservation Sites: Special Areas of Conservation (SACs). Special Protection Areas (SPAs). Sites of Special Scientific Interest (SSSI).
The National River Flow Archive: www.nwl.ac.uk/ih/nrfa/index.htm	Climate: rainfall.
https://flood-map-for-planning.service.gov.uk/ https://flood-warning-information.service.gov.uk/long-term-flood-risk/ EA: http://environment.data.gov.uk/catchment-planning/ The National River Flow Archive: www.nwl.ac.uk/ih/nrfa/index.htm	Surface Water. Surface watercourses and flood risk. Water quality. River flows.
British Geological Survey GeoIndex: http://www.bgs.ac.uk/geoindex/	Solid and drift geology.
Data requested from the EA. https://data.gov.uk/dataset/f3684ee9-4c81-4ccd-a658-7f8d9dc70706/environment-agency-register-licence-abstracts https://data.gov.uk/dataset/55b8eaa8-60df-48a8-929a-060891b7a109/consented-discharges-to-controlled-waters-with-conditions http://www.environment-agency.gov.uk/maps/ EA Source Protection Zones and 2009 River Basin Management Plans (Groundwater): http://www.environment-agency.gov.uk/maps/	Groundwater levels. Groundwater vulnerability. Groundwater quality. Abstractions and discharges.
Data requested from NKDC.	Private water supplies.

Assessment of Significance

9.3.6 The methodology for the assessment of potential impacts follows the generic EIA methodology guided by IEMA (2016) and current government guidance, and is based on the following principles:

- The type of effect (long-term, short-term, or intermittent; positive, negative or neutral);

- The probability of the effect occurring:
- Receptor sensitivity (see **Table 9.2**); and
- The magnitude (severity) of the effect (see **Table 9.3**).

9.3.7 The assessment methodology identifies the significance of an effect by firstly considering the sensitivity of the receptor (i.e. its importance and ability to tolerate and recover from change) and, secondly, by considering the likely magnitude of the impact (i.e. its spatial extent and duration). By combining sensitivity and magnitude, the significance of the effect is established. Where significant negative effects are identified, mitigation measures are proposed to reduce the significance.

9.3.8 The sensitivity of receptors has been assessed using the criteria set out in **Table 9.2**.

Table 9.2: Receptor Sensitivity

Sensitivity	Criteria	Examples
High	Feature with a high yield and / or quality and rarity at a national or international scale, with a limited potential for substitution. Attribute highly sensitive to change	Conditions supporting sites with international conservation designations (SAC, SPA, Ramsar sites), where the designation is based specifically on aquatic features. Highly productive aquifers and surface water resources typically used for public water supplies. Public water supplies. Conditions supporting a SSSI. Sites with freshwater fish protected areas. Water quality of receptor water body: Supporting WFD element type (e.g. Priority Substances) classified as 'High', ''Good' or Pass'. NPPF PPG Flood Risk Vulnerability Classification "Essential Infrastructure" or "Highly Vulnerable".
Medium	Feature with a medium yield and/or quality at a regional scale, or good quality at a local scale, with some limited potential for substitution. Attribute tolerant of some degree of change	Medium productivity aquifer and surface water resources typically used for smaller public water supplies or industrial water supplies. Industrial water supplies. Conditions supporting local nature conservation interest (e.g. National Nature Reserve [NNR]), where the interest features are water-dependent. Water quality of receptor water body: Supporting WFD element classified as at least 'Good' in all cases. NPPF PPG Flood Risk Vulnerability Classification "More Vulnerable".
Low	Feature with variable yield and/or quality at a local scale, with potential for substitution.	Low productivity aquifer and surface water resources typically used for private water supplies or not utilised. Private water supplies; livestock supplies; springs; ponds/lagoons; non-

Sensitivity	Criteria	Examples
	Attribute tolerant of modest change.	statutory groundwater-dependent conservation sites. Water quality of receptor water body: Supporting WFD element type classified as less than 'Good' in any situation (any supporting element). NPPF PPG Flood Risk Vulnerability Classification "Less Vulnerable".
Negligible	Feature with poor yield and / or quality at a local scale, with good potential for substitution. Attribute tolerant of substantial change.	Unproductive strata. Water quality of receptor water body: Supporting WFD element type classified as 'Poor' or 'Bad', with severely restricted ecosystems and pollution. Small surface water bodies such as drainage ditches and ephemeral ponds that are too small to be classified under WFD and have limited ecological potential due to being artificial or heavily-modified. NPPF PPG Flood Risk Vulnerability Classification "Water Compatible".

9.3.9 The magnitude of change arising as a result of the Proposed Development has been assessed using the criteria set out in Table 9.3.

Table 9.3: Magnitude of Change

Magnitude of Change	Criteria	Examples
Large	Results in a loss of feature/attribute and/or quality and integrity of the attribute. Following development, the baseline situation is fundamentally changed.	Major reduction in groundwater levels, flow or quality, reducing use and water body status. Major reduction in groundwater levels or water quality leading to a marked deterioration in conditions that support Groundwater Dependent Terrestrial Ecosystems (GWDTE) features. Deterioration in river flow regime, morphology or water quality, leading to sustained, permanent or long-term breach of relevant SSSI conservation objectives (COs), or downgrading of WFD status (deterioration in current thresholds as defined by current WFD status, including supporting WFD elements). Complete loss of resource or severely reduced resource availability to other water users. Change in flood risk resulting in potential loss of life or damage to nationally critical infrastructure.
Moderate	Results in impact on integrity of feature/attribute, or loss of part of feature/attribute.	Moderate reduction in groundwater levels, flow or quality, reducing use and water body status in some circumstances. Moderate reduction in groundwater levels or water quality leading to some deterioration in conditions that support GWDTE features.

Magnitude of Change	Criteria	Examples
	Following development, the baseline situation is noticeably changed.	Deterioration in river flow regime, morphology or water quality, leading to periodic, short-term and reversible breaches of relevant SSSI conservation objectives, or downgrading of WFD status (deterioration in current thresholds as defined by current WFD status, including supporting WFD elements). Water quality status may impact upon potential future thresholds in relation to objective WFD status – potential for prevention of waterbody reaching its future WFD objectives. Minor reduction in resource availability for other water users. Change in flood risk resulting in potential for major damage to property and infrastructure.
Small	Results in minor impact on feature, of insufficient magnitude to affect its use/integrity in most circumstances. Following development, the baseline situation is largely unchanged with barely discernible differences.	Measurable reduction in groundwater levels, flow or quality, but with limited consequences in terms of use and water body status. Measurable reduction in groundwater levels or water quality, leading to a minimal change in conditions that support GWDTE features. Measurable deterioration in river flow regime, morphology or water quality, but remaining generally within SSSI COs, and with no change of WFD status (of overall status or supporting element status) or compromise of Environmental Quality Standards (EQSs). No change in resource availability for other water users. Increase in flood hazard in areas with no flood risk receptors e.g. increased flooding of agricultural land. Change in flood risk resulting in potential for minor damage to property and infrastructure.
Negligible	Results in little or no impact on feature, with insufficient magnitude to affect its use / integrity. The impacts are unlikely to be detectable or outside the norms of natural variation.	No measurable reduction in groundwater levels or flow. Any change to water quality will be quickly reversed once activity ceases with no consequence in terms of use, water body status (of overall status or supporting element status) or compromise of Environmental Quality Standards (EQSs). No measurable reduction in groundwater levels or water quality, leading to no change in conditions that support GWDTE features. No measurable deterioration in river flow regime, morphology or water quality, and no consequences in terms of SSSI conservation objectives, WFD designations, water resources or flood risk. Change in flood risk causes more frequent inconvenience and triggering of emergency response measures, but does not result in increased risk of damage to property and infrastructure.

9.3.10 The significance of a potential effect is determined using the matrix presented at **Table 9.4**. The significance of an effect can be beneficial, neutral or adverse. For the purpose of undertaking the assessment in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, effects determined to be moderate or greater are considered significant in EIA terms.

9.3.11 Those levels of effect which are shaded in Table 9.4 equate to those considered significant under the EIA Regulations with the others constituting no effect or an insignificant effect.

Table 9.4: Determining Significance of Effect

Magnitude of change	Receptor sensitivity			
	High	**Medium**	**Low**	**Negligible**
Large	Substantial	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Small	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Legislative and Policy Framework

9.3.12 The planning policy context is summarised in Chapter 5. The policy, legislation and guidance relevant to the assessment of the potential effects of the Proposed Development on hydrology, hydrogeology, flood risk and drainage is summarised below and in **Table 9.5**.

National Policy Statements

9.3.13 The relevant National Policy Statements (NPS) provide the primary basis for decisions by the Secretary of State on development consent applications for Nationally Significant Infrastructure Projects (NSIPs).

9.3.14 The Overarching National Policy Statement for Energy (NPS EN-1) identifies both water quality and resources and flood risk as topics requiring consideration/assessment as part of energy related projects and requires that:

- Where the Project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the Project on, water quality, water resources and physical characteristics of the water environment (Paragraph 5.15.2)

- An application should be accompanied by a Flood Risk Assessment (FRA) for energy projects of 1ha or greater in Flood Zone 1 and all energy projects in Flood Zones 2 and 3 (Paragraph 5.7.4)

- Where a project may be affected by or may increase flood risk, pre-application discussions should be undertaken with the Environment Agency (EA) and other bodies (Paragraph 5.7.7)

- Any requirements for sequential testing are satisfied (Paragraph 5.7.9); and

- Priority is given to the use of Sustainable Drainage Systems (SuDS) (Paragraph 5.7.9)

9.3.15 NPS EN-3 for Renewable Energy Infrastructure addresses climate change adaptation and requires that applicants set out how proposals would be resilient to rising sea levels and increased risk of flooding. In respect of water quality and resources, NPS EN-3 refers to the assessment requirements set out in NPS EN-1.

9.3.16 NPS EN-5 provides the primary basis for decisions taken by the Secretary of State on applications received for electricity networks infrastructure and sets out the factors influencing route selection and the impacts that may arise from such development. However, NPS EN-5 refers back to NPS EN-1 regarding the assessment of flood risk and consideration of resilience to climate change and does not therefore set out additional policy in respect of flood risk.

9.3.17 The National Policy Statements were first published in 2011. The Energy White Paper (Powering our Net Zero Future, December 2020) announced that the government would review the NPS to reflect the policies and broader strategic approach set out in the White Paper.

9.3.18 The requirements and criteria regarding flood risk set out in Draft NPS EN-1, published in September 2021, are consistent with those set out in the NPS originally published in 2011. Draft NPS EN-1, Paragraph 5.8.8 refers applicants to the National Planning Policy Framework and the associated Flood Risk and Coastal Change Planning Practice Guidance for further details regarding the minimum requirements for Flood Risk Assessments.

9.3.19 Paragraph 5.8.15 of Draft NPS EN-1 states that preference should be given to locating projects in areas of lowest flood risk and that the Secretary of State should not consent development in flood risk areas (Flood Zones 2 and 3 in England), accounting for all sources of flooding and the predicted impacts of climate change, unless they are satisfied that the sequential test requirements have been met.

9.3.20 Draft NPS EN-3 refers to Draft NPS EN-1 regarding the considerations that applicants and the Secretary of State should take into account to help ensure that renewable energy infrastructure is safe and resilient to climate change. Paragraph 2.3.4 notes that solar PV sites may be proposed in low lying, exposed sites and that applicants should consider how plant will be resilient to the increased risk of flooding. Paragraph 2.50.7 notes that the applicant's FRA will need to consider the impact upon drainage and that localised SuDS, such as swales and infiltration trenches, should be used to control run-off.

9.3.21 Draft NPS EN-5 refers back to Draft NPS EN-1 regarding considerations relating to flood risk and resilience to the effects of climate change and does not therefore set out additional policy in respect of flood risk.

National Planning Policy Framework

9.3.22 The National Planning Policy Framework (NPPF), as revised 20th July 2021, sets out national planning policy with regards to development and flood risk. The accompanying Planning Practice Guidance (PPG) 'Flood Risk and Coastal Change' (discussed below) provides local planning authorities with guidance on implementation of the planning policy as set out in the NPPF.

9.3.23 The NPPF (Paragraphs 161-163) advocates use of the risk-based, sequential approach (which recognises that risk is a function of probability and consequence), in which new development is preferentially steered towards areas at the lowest probability of flooding. It also requires that new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change.

9.3.24 In respect of flood risk, paragraph 159 states that: "**Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere**".

9.3.25 Paragraph 162 requires that the sequential approach is applied to steer new development to areas with the lowest risk of flooding. However, Paragraph 166 confirms that the sequential test does not need to be undertaken for planning applications that come forward on sites allocated in the development plan through the sequential test.

9.3.26 According to Annex 3 of the NPPF, solar farms are categorised as Essential Infrastructure. In addition to application of the Sequential Test, Table 3 of the NPPG PPG 'Flood risk and coastal change' requires that the Exception Test is applied for proposals comprising Essential Infrastructure in Flood Zone 3. Full details will be set out in the FRA supporting the ES.

National Planning Practice Guidance

9.3.27 The PPG (Ministry of Housing, Communities and Local Government, 20th August 2021) defines the Flood Zones that provide the basis for application of the Sequential Test. The Flood Zones are defined as follows (PPG Table 1 Paragraph: 065 Reference ID: 7-065-20140306):

- Flood Zone 1: Low probability of flooding - less than 0.1% (1 in 1,000) annual probability of river or sea flooding in any year;
- Flood Zone 2: Medium probability of flooding - between 1% and 0.1% (1 in 100 and 1 in 1000) annual probability of river flooding and between 0.5% and 0.1% (1 in 200 and 1 in 1000) annual probability of sea flooding in any year;
- Flood Zone 3a: High probability of flooding - 1% (1 in 100) or greater annual probability of river flooding or 0.5% (1 in 200) or greater annual probability of sea flooding in any year; and
- Flood Zone 3b: The functional floodplain - where water has to flow or be stored in times of flood, including flood conveyance routes and areas designed to flood as part of a flood defence scheme.

9.3.28 It should be noted that Flood Zones 1, 2 and 3a definitions ignore the presence of flood defences.

9.3.29 The 'Flood Risk and Coastal Change' PPG advocates the use of sustainable drainage systems (SuDS) to reduce the overall level of flood risk. SuDS can reduce the causes and impacts of flooding, remove pollutants from urban run-off at source and combine water management with green space providing benefits for amenity, recreation and wildlife.

9.3.30 The NPPF (Paragraphs 153 and 154) and the 'Flood Risk and Coastal Change' PPG require that the spatial planning process should consider the possible impacts of climate change and contingency allowances are provided to enable impacts to be considered over the lifetime of the development

Table 9.5: Policy, legislation and guidance

Legislation	Description
Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ('WFD Regulations 2017') consolidate, revoke and replace the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, which transpose the European Union (EU) Water Framework Directive (WFD) into national law. The WFD is a wide-ranging piece of European legislation that establishes a new legal framework for the protection, improvement and sustainable use of surface waters, coastal waters and groundwater across Europe in order to: • Promote sustainable water use; • Contribute to the mitigation of floods and droughts; • Prevent deterioration and enhance status of aquatic ecosystems, including groundwater; and • Reduce pollution Water management has historically been co-ordinated according to administrative or political boundaries. The WFD promotes a new approach based upon management by river basin - the natural geographical and hydrological unit. River basin management plans, published by the Environment Agency (EA) and the Department for Environment Food & Rural Affairs (Defra), include clear objectives in respect of water quality and pollution control and a detailed account of how objectives are to be met within a prescribed timeframe.
The Flood Risk Regulations 2009	The Flood Risk Regulations 2009 transpose the European Commission (EC) Floods Directive (Directive 2007/60/EC) into domestic law. The regulations require that Preliminary Flood Risk Assessments (PFRAs) are prepared by the EA and Unitary/County Authorities (Lead Local Flood Authorities (LLFA)) that identifies areas at significant potential risk of flooding. For these "significant risk" areas, hazard maps must be produced, and flood risk management plans developed, to reduce flood risk.
Water Act 2003	This Act was a revision of the Water Resources Act (WRA) (1991) which stated that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters. The Act sets out regulatory controls for water abstraction, discharge to water bodies, water impoundment and protection of water resources. Elements of the WRA 1991 have now also been superseded by the Environmental Permitting (England and Wales) Regulations 2010.

Legislation	Description
Environmental Permitting (England and Wales) Regulations 2016	The Environmental Permitting Regulations 2016 consolidate and replace the 2010 Regulations and the 15 associated amendments. The permitting regime covers a range of activities that release emissions to land, air or water or that involve waste. The regime covers facilities previously regulated under the Pollution Prevention and Control Regulations 2000 and Waste Management Licensing and exemptions schemes, some parts of the WRA 1991 and the Groundwater Regulations 2009. Schedule 21 relates to water discharge activities and Schedule 25 relates to flood risk activities. Schedule 22 to the Regulations relates to Groundwater activities and the regulations place a duty on regulating authorities to implement the Water Framework Directive and the Groundwater Daughter Drainage Directive and exercise their relevant function to ensure all necessary measures are taken to: (a) prevent the input of any hazardous substance to groundwater; and (b) limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater" (Paragraph 6, Schedule 22).
Groundwater Regulations 1998	These require the prevention of List I substances (such as mercury, cadmium, polyaromatic hydrocarbons) entering groundwater and the control of List II substances (such as heavy metals, nutrients, phenols) to avoid pollution of groundwater. Within the context of the WFD, the Groundwater Daughter Directive was brought into force in January 2009, which will seek to prevent deterioration in groundwater quality.
The Land Drainage Act 1991 & 1994	The Land Drainage Act 1991 consolidates various enactments relating to Internal Drainage Boards and the functions of these Boards and local authorities, including Lead Local Flood Authorities, in relation to land drainage. Amongst other matters, the Act sets out provisions and powers in respect of the control of flow of watercourses and watercourse restoration/improvement works.
The Water Resources Act 1991	The WRA 1991 sets out the responsibilities of the EA in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The WRA 1991 regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater. Discharge to controlled waters is only permitted with the consent of the EA. Similarly, a licence is required to abstract from controlled waters.
Flood and Water Management Act 2010 & Sustainable Drainage Systems: Written Statement – HCWS161	The Flood and Water Management Act (FWMA) 2010 takes forward some of the proposals set out in three previous strategy documents published by the UK Government: Future Water, Making Space for Water and the UK Government's response to the Sir Michael Pitt Review of the summer 2007 floods. In doing so, it gives the EA a strategic overview of flood risk and gives local authorities responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas.

Legislation	Description
	The FWMA 2010 (Schedule 3) proposed the establishment of Sustainable drainage systems (SuDS) Approval Bodies (the SAB) at county or unitary local authority levels. The role of the SAB was envisaged as implementing the recommendations of the Pitt Review (2008) in promoting the use of SuDS within future development. Following a period of consultation, the proposed role of the SAB has been amended, with the promotion of SuDS being incorporated into the planning process. This has been achieved by designating LLFA's as statutory consultees with regards to 'local' sources of flood risk and surface water management. The Ministerial Written Statement HCWS161 details this change in policy, which came into effect in April 2015. The FWMA 2010 also amends Section 106 of the Water Industry Act 1991 (WIA) in respect of the right of connection to a public sewer. As the role of the SAB has been removed following HCWS161, this process is now subsumed into the planning process under the purview of the LLFA.
Flood Risk Assessments: climate change allowances	This guidance was published by the EA in February 2016 and should be used as the basis for preparing FRAs. The guidance sets out the climate change allowances for peak river flow, peak rainfall intensity, sea level rise, offshore wind speeds and extreme wave height. Allowances in respect of peak river flow vary according to River Basin District, flood zone and proposed land-use (and therefore the lifetime of the development). The Application Site lies within the Humber River Basin District.
Non-statutory Technical Standards for Sustainable Drainage Systems	This document contains non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems serving housing, non-residential or mixed-use developments and was published by Defra in March 2015.
The SuDS Manual (C753)	The SuDS Manual (2015) expands upon the framework set out by the Government's Non-Statutory Technical Standards for SuDS and sets out the latest industry practice and guidance regarding the planning, design, construction, management and maintenance of SuDS.
Rainfall Runoff Management for Developments (Report SC030219/R, October 2013)	This document advises regulators, developers and local authorities on the requirements for storm water drainage design for new developments and sets out recommended methods for the sizing of storage measures for the control and treatment of storm water runoff.

Scoping Criteria

9.3.31 In January 2022 the Applicant submitted an EIA Scoping Report to the Planning Inspectorate and requested a Scoping Opinion under Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. The Inspectorate consulted a number of 'consultation bodies', statutory undertakers and local authorities and published a Scoping Opinion on 17th February 2022.

9.3.32 A summary of the comments, including those from within the Scoping Opinion that are relevant to this chapter are presented in **Table 9.6**.

Table 9.6: Summary of comments

Reference	Comment	ES Response
3.3.2	Where relevant, the ES should provide information for the whole of the Proposed Development, being clear when information relates to certain components.	The assessment considers all aspects of the Proposed Development, comprising the Energy Park, off-site cable route and above ground works at the National Grid Bicker Fen Substation.
3.3.3	The ES should clearly explain and justify the study area used in the assessment.	The study area is explained and justified in **Chapter 3- Site Description, Site Selection and Iterative Design Process**, and **Chapter 4- Proposed Development**
3.3.4	The ES should include a FRA based on the requirements of the Environment Agency standing advice. This should include a description of how the Proposed Development satisfies the requirements of the sequential and exception test, where relevant. The FRA should demonstrate the Proposed Development including flood suitable mitigation measures and flood resilient construction that will allow the development to remain operational for its 40-year lifespan. This includes confirming that all the flood sensitive equipment associated with the Proposed Development remains operational during a 0.1% event. Furthermore, the FRA should consider the surface water drainage/flood risk impacts that may occur off site and the potential of increased flood risk beyond the site boundary. This should include consideration of the potential for the solar installation to increase the rate of runoff from the site.	A FRA is currently being prepared in accordance with requirements set out by both the EA and BSIDB. The FRA will address the sequential test and exception test and will be included as an appendix to the ES.
3.3.5	Paragraph 3.6 of the Project Description states that steel poles will be driven into the ground to support each row of modules. Although the Project Description does not indicate the number of modules, given the area of the 'solar development area' in Figure 3, there is likely to be a high number of steel poles required. The baseline identifies that there is a naturally high ground water	The assessment considers the impact of steel poles upon hydrogeology/groundwater aquifers.

	level and that in most fields, the soils drain into marginal ditches. This aspect chapter should consider the cumulative effects of these poles across the entirety of the developable area on the drainage patterns within the site and the study area.	
3.3.6	The baseline identifies that the site is underlain by tidal flat deposits which include layers of peat. Considering the potential need for piled steel poles, as stated in paragraph 3.6, there is potential to disturb peat deposits. The ES should demonstrate how effects on peat deposits have been avoided and where this is not possible, the ES should assess likely significant effects due to peat disturbance.	The assessment considers the potential to disturb peat deposits based upon the information currently available. Findings/conclusions will be reviewed following a geo-environmental survey prior to completion of the ES.

9.3.33 The assessment relating to hydrology, hydrogeology, flood risk and drainage considers the following potential effects:

Construction Phase

- Potential adverse effects on drainage patterns, surface water flows and aquifer recharge;
- Potential pollution of watercourses and underlying aquifers resulting from spilled hydrocarbons/petrochemicals from construction plant and the mobilisation of silts and contaminants during earthworks operations;
- Potential to disturb peat deposits if foundations are piled into any underlying layer of peat;
- Potential adverse effects upon the Head Dike/Skerth Drain flood defences;
- Potential adverse effects upon flood storage and flood flows/flood routing processes as a result of works within the floodplain; and
- Potential adverse effects resulting from compaction of the ground caused by construction plant and an increase in the extent of impermeable surfaces associated with access roads and compound areas.

Operational Phase

- Potential adverse effects on drainage patterns, surface water flows and aquifer recharge;
- Potential pollution of watercourses and underlying aquifers resulting from the flushing of silts and hydrocarbons from areas of hardstanding; and
- Potential adverse effects upon flood storage and flood flows/flood routing processes as a result of buildings/infrastructure within the floodplain.

Decommissioning Phase

- At the end of its operational life, the decommissioning of the Energy Park is considered to have similar effects upon the water environment as those during the construction stage; and
- At the end of its operational life, it is anticipated that any above ground works for the electrical connection will be removed and all below ground off-site

cabling would be left *in situ*. As such, the decommissioning works would be minimal, such that significant effects would be unlikely.

Limitations to the Assessment

9.3.34 In the absence of observed/recorded data, the hydraulic model used to assess floodplain extents is uncalibrated and therefore based upon a number of assumed parameters. As a result, there is a degree of uncertainty associated with the design flood levels. However, the modelling analysis has been undertaken in accordance with guidelines set out by the EA and using industry-standard methods. A modelling method statement was drafted and subsequently approved by the EA in April 2022 (**Appendix 9.1**). In addition, model sensitivity testing has been undertaken to understand the potential impact upon design flood levels caused by variation of model input parameters. On this basis, the flood levels estimated using the model are considered to be sufficiently robust to inform the FRA and preparation of this chapter of the ES.

9.3.35 With no recent ground investigation data available, it is assumed that the soils and geology types within the site area conform to the mapping descriptions presented by the British Geological Surveys and Defra (2021) Soilscapes online soil map. Also, that locally, both the superficial deposits and bedrock are low permeability, unproductive aquifers as inferred by the EA's aquifer designation mapping.

9.4 BASELINE CONDITIONS

Site Description and Context

9.4.1 The Application Site is situated on the Lincolnshire Fens, a coastal plain in the east of England which comprises a large area of broad, flat marshland supporting a rich biodiversity. The proposed Energy Park is located within Heckington Fen, approximately 5km east of the village of Heckington and 11km west of Boston. The off-site cable route extends across Great Hale Fen, West Low Grounds and Bicker Fen, connecting to the National Grid Bicker Fen Substation approximately 6km to the south of the proposed Energy Park.

9.4.2 Topography across the Application Site is only a few metres above sea level and the land generally slopes very gently towards the north/north-east. The lowest point within the proposed Energy Park is 0.77m Above Ordnance Datum (AOD) along the northern boundary, while the highest point is 3.3mAOD along the southern boundary. Levels at National Grid Bicker Fen Substation are approximately 2mAOD.

9.4.3 The principal watercourses in the area are the River Witham and South Forty Foot Drain, located approximately 4km and 1.5km to the east and south of the proposed Energy Park respectively (**Figure 9.1**). Both are classified as Main River and therefore under the jurisdiction of the EA. The Energy Park itself is bound along the northern boundary by the Head Dike/Skerth Drain (which is also classified as Main River) and the Energy Park area is bisected by a number of ditches/drains, some of which are operated and maintained by the Black Sluice Internal Drainage Board. Water levels within the network of ditches/drains are managed through pumping to the Head Dike/Skerth Drain.

9.4.4 The Energy Park is currently in agricultural use and therefore comprises permeable surfaces, such that surface water run-off generally infiltrates into the ground or is routed to the various ditches/drains that bisect the site. Similarly, the off-site cable route traverses an area characterised by agriculture.

Baseline Survey Information

Tidal/Fluvial Flood Risk

9.4.5 The EA publishes online floodplain maps (https://flood-map-for-planning.service.gov.uk). These maps show the possible extent of fluvial flooding for a 1 in 100 year flood (1% probability of occurrence) and the possible extent of tidal flooding associated with a 1 in 200 year event (0.5% probability of occurrence), ignoring the presence of flood defences. Also shown is the possible extent of flooding arising from a 1 in 1,000 year event (0.1% probability).

9.4.6 The flood map indicates that the majority of the Energy Park is located within Flood Zone 3 (High Probability – land having a 1 in 100 or greater annual probability of fluvial flooding). Limited areas along the southern fringe of the Energy Park are located within Flood Zone 2 (Medium Probability – land having between a 1 in 100 and 1 in 1,000 annual probability of flooding) and Flood Zone 1 (Low Probability – land having a less than 1 in 1,000 annual probability of flooding). The Environment Agency (EA) has confirmed that the source of flooding is Main River (the Head Dike and Skerth Drain). These watercourses are characterised by fluvial defences (comprising earth embankments) and the EA has advised that the defences are in fair condition and reduce the risk of flooding (at the defence) to a 10% (1 in 10) chance of occurring in any year.

9.4.7 The off-site cable route and National Grid Bicker Fen Substation are also shown to lie within Flood Zone 3 associated with fluvial flooding arising from the South Forty Foot Drain (SFFD). The SFFD is also classified as Main River and benefits from flood defences comprising earth embankments.

Surface Water Flood Risk

9.4.8 The EA 'Flood Risk from Surface Water Map' (https://flood-warning-information.service.gov.uk/long-term-flood-risk) shows areas that may be susceptible to surface water flooding following an extreme rainfall event. The mapping shows that the majority of the Energy Park is at 'Very Low' risk of surface water flooding. The map highlights a number of isolated and very localised areas within and adjacent to the Energy Park at high, medium and low risk of surface water flooding. These areas generally coincide with watercourses/ditches/drains and topographical 'low' points across the terrain (i.e. areas where surface water would naturally accumulate following rainfall).

9.4.9 The EA mapping also shows that the majority of the off-site cable route and National Grid Bicker Fen Substation is at 'Very Low' risk of surface water flooding, with only very localised areas at high, medium and low risk of flooding.

Reservoir Flood Risk

9.4.10 The EA 'Flood Risk from Reservoirs Map' shows the area that may be affected by flooding as a result of a breach of a large, raised reservoir i.e. capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land.

9.4.11 According to EA records the nearest reservoir is located approximately 8km to the west of the Energy Park, between Heckington and Sleaford. The EA's map shows that, when river levels are normal, only limited and localised areas along the northern boundary of the Energy Park adjacent to Head Dike are affected by reservoir flooding. The mapping shows that under conditions when there is also flooding from rivers, the majority of the Energy Park may be affected by reservoir flooding.

9.4.12 The EA mapping shows that the off-site cable route and National Grid Bicker Fen Substation is only affected by reservoir flooding under conditions when there is also flooding from rivers.

Groundwater Flood Risk

9.4.13 As set out in Paragraphs 9.4.19 to 9.4.24, BGS mapping indicates that the Energy Park, off-site cable route and National Grid Bicker Fen Substation are entirely underlain by Tidal Flat (superficial) deposits comprising predominantly low permeability clay, with a thickness of approximately 4m.

9.4.14 The BGS mapping also shows that the bedrock comprises a thick layer (up to 160m) of low permeability, unproductive mudstones and siltstones of the Ancholme Group. The Energy Park comprises the West Walton Formation and the Ampthill Formation of the Jurassic Period. The northern area of the off-site cable route is underlain by bedrock comprising the West Walton Formation and the southern area of the off-site cable route and the National Grid Bicker Fen Substation are underlain by bedrock comprising the Oxford Clay Formation.

9.4.15 EA aquifer designation maps at https://magic.defra.gov.uk categorise both the superficial deposits and bedrock deposits as 'unproductive' (i.e. areas comprised of rocks that have negligible significance for water supply or baseflow to rivers, lakes and wetlands).

9.4.16 Geological data therefore suggests that groundwater emergence is unlikely due to the thick layers of low permeability superficial and bedrock deposits that underlie the Energy Park, off-site cable route and National Grid Bicker Fen Substation.

9.4.17 Neither the Central Lincolnshire SFRA Level 1 or SFRA Level 2 identify groundwater flooding as an issue across the North Kesteven District. The South East Lincolnshire SFRA, covering Boston Borough, does not present information regarding groundwater flood risk.

Water Framework Directive

9.4.18 The Application Site falls within the area administered by the Anglian River Basin Management Plan. The relevant Management Catchment is the Witham and the Operational Catchment is the South Forty Foot Drain. According to the EA's Catchment Data Explorer (https://environment.data.gov.uk/catchment-planning), the Application Site lies within the '*Black Sluice IDB draining to the South Forty Foot Drain Water Body*' (Water Body ID GB205030051515). This water body is designated as 'heavily modified', which denotes that it has been substantially changed in character as a result of physical alterations by human activity. It cannot therefore achieve 'good ecological status' and the environmental (Water Framework Directive) objective for the water body is to achieve 'good ecological potential'. The overall water body classification is currently 'Moderate' potential (Cycle 2, 2019).

Geology and Soils

9.4.19 The geological environment, which controls the behaviour and quality of the groundwater and potential pathways to receptors, is described as part of the baseline conditions at the site. Stratigraphy of the lithologies underlying the site is shown in **Table 9.7** and geological mapping is presented in **Figure 9.2** and **Figure 9.3**.

9.4.20 Soils are described as loamy and clayey floodplain soils of coastal flats with the potential for perched groundwater tables, which sit above the low permeability superficial deposits (Soilscapes (DEFRA), 2022). Any perched groundwater is contained within the thin soil layer, is not laterally continuous and does not form an aquifer. Fertility is lime-rich to moderate, and the soils are mostly drained into marginal ditches in most fields.

9.4.21 Made Ground refers to lithology that is made up of artificial material, or the reworking of natural material used to create a new landform. Due to the greenfield nature of the site, it is unlikely that Made Ground exists beneath the Application Site.

9.4.22 The BGS 1:50000 mapping indicates that the Energy Park, off-site cable route and National Grid Bicker Fen Substation extension (which comprise the EIA assessment area, see **Figure 1.1**) are entirely underlain by tidal flat deposits comprising a consolidated soft silty clay, with layers of peat, sand and basal gravel. Approximately 500m to the west of the EIA assessment area, deposits of glacial till overly the tidal flats and extend 7km to the south-west. A BGS borehole record (BGS Ref: TF24SW2) located approximately 1.5km east of the EIA assessment area documented the tidal flat deposits as comprising 2.6m of grey clay underlain by black silt and gravels. Located on the Energy Park Site's southern boundary, another BGS borehole (BGS Ref: TF14SE2) recorded 2.44m of silt underlain by 1.27m of sands and gravels. The thickness of the deposits increases from ~4m on the southern boundary of the Energy Park Site, to 13m at a location 3.4km to the east, and up to 16m thick some 4km to the north. Therefore, from the borehole records it is anticipated that the tidal flat deposits within the south-west part of the Energy Park Site are around 4m thick and increase in thickness towards the north-east of the Energy Park Site.

9.4.23 The BGS geology mapping shows that the bedrock underlying the Energy Park Site comprises the Jurassic age West Walton Formation in the south-west half of the Energy Park and the Ampthill Clay Formation in the north-east half. The north-eastern part of the off-site cable route comprises the West Walton Formation, while in the south-west, the Oxford Clay Formation, which underlies the West Walton Formation, is exposed.

9.4.24 The Oxford Clay Formation comprises a silicate mudstone with limestone nodules, with a typical thickness of 50–70m. The West Walton Formation, which overlies the Oxford Clays, is described by the BGS as comprising calcareous mudstones, silty mudstone and siltstones, with subordinate fine-grained sandstones and argillaceous limestones. It is estimated to be 20-40m in thickness and dips approximately 5 degrees to the east. Conformably overlying the West Walton Formation, the Ampthill Clay Formation consists of smooth or slightly silty mudstone with grey argillaceous limestone nodules and is estimated to be up to 50m in thickness. BGS borehole records (BGS Ref: TF14SE2; TF14SE4/A) located on the West Walton Formation, documented the bedrock as comprising brown-grey clay, with sporadic argillaceous limestone nodules down to 135 metres below ground level (mbgl). At depths greater than 100mbgl, the records noted the clay becoming slightly sandy with stone beds present. However, the borehole records did not distinguish the West Walton Formation from the underlying Oxford Clay Formation. Hence, the thickness of West Walton at the site is unknown. Groundwater was encountered in the West Walton Formation at 71 mbgl (Ref: TF14SE4/B). Two borehole records located on the Ampthill Formation approximately 4 km to north of the site (BGS Ref: TF15SE28; TF25SW14) described the bedrock as comprising hard, dark olive grey, laminated silty clays with shell fragments.

Table 9.7: Stratigraphy of lithologies underlying the Proposed Development

Age	Formation/Group	Description	Thickness
Quaternary Period	Tidal flats	Grey clay underlain by black silt and gravels.* Layers of peat and silty clay may also be present**	~4m, increasing towards the north-east*
Jurassic	Ampthill Clay Formation (Ancholme Group)	Mudstone, mainly smooth or slightly silty, pale to medium grey with argillaceous limestone (cementstone) nodules; some rhythmic alternations of dark grey mudstone in the lower part; topmost beds are typically pale grey marls with cementstone.**	Up to 50m**
	West Walton Formation (Ancholme Group)	Brown-grey clay, with sporadic argillaceous limestone nodules. Clay becoming slightly sandy at greater depths, with stone beds present.**	20-40m**
	Oxford Clay Formation (Ancholme Group)	Calcareous mudstone, silty mudstone and siltstone, with subordinate fine-grained sandstones and argillaceous limestone (cementstone) or siltstone nodules;	50-70m**
Sources: *BGS borehole log records **BGS Online Lexicon of Named Rock Units			

Hydrogeology and Groundwater Vulnerability

9.4.25 The superficial tidal flat deposits are classified as 'unproductive' by the EA in terms of the aquifer designation and vulnerability. However, BGS borehole record TF24NW2, 3.4km east of the Proposed Development is noted to have encountered groundwater within layers of silty sand. The groundwater here is likely to form part of a perched aquifer, where water is found within higher permeability silty sandy layers surrounded by lower permeability silty clays.

9.4.26 Both the West Walton and Ampthill Clay Formations are also classified as 'unproductive'. Most BGS borehole records did not encounter any groundwater. However, one borehole (Ref: TF14SE4/B), located 1.6km south-west of the Energy Park found a small quantity of water at a depth of 71 mbgl within a thin limestone bed. In addition, the EA's Catchment Data Explorer shows that the Proposed Development does not lie within a groundwater management catchment and there are no Source Protection Zones (SPZs) recorded within 2km of the Proposed Development.

9.4.27 Since both the superficial deposits and bedrock lithologies underlying the Proposed Development are designated as 'unproductive', there is negligible groundwater flow down to depths of at least 70-100 mbgl. At this depth, the Kellaways Formation, which underlies the Oxford Clay Formation, forms a confined Secondary A aquifer below the off-site cable route section of the Proposed Development.

Table 0.8: Aquifer designations

Group	Formation	Aquifer classification
Superficial	Tidal flats	Unproductive
Bedrock	Ampthill Clay Formation	Unproductive
	West Walton Formation	Unproductive

<u>Abstractions and discharges</u>

9.4.28 Information provided by the EA and North Kesteven District Council indicates there are 41 surface water abstractions and 54 discharge locations within 5km of the Proposed Development. However, there are no licensed or private groundwater abstractions within 5km of the proposed development.

<u>Receptors</u>

9.4.29 Based upon review and characterisation of baseline conditions, the principal receptors that may be affected by the Proposed Development have been identified. Their sensitivity (defined based upon a combination of the methodology outlined in Section 9.2 above and professional judgement) is summarised in **Table 9.9** below:

Table 9.9: Receptor sensitivity

Receptor	Rationale	Sensitivity
Surface Water		
Head Dike/Skerth Drain	The Dike is categorised as Main River under the jurisdiction of the EA. It drains a predominantly rural catchment and inflows to the system are controlled by pumping. Based upon the criteria set out in Table 9.2, the Dike is categorised as low sensitivity.	Medium
Head Dike/Skerth Drain flood defences	The defences comprise earth embankments and the EA has advised that the defences are in fair condition and are inspected regularly.	Medium
Surface water drains	The drains currently cater for run-off from the wider catchment within which the Proposed Development will be located and are the subject of routine maintenance by the BSIDB. In addition, the BSIDB has confirmed that improvement works and the provision of	Medium

	additional pumping station capacity will be implemented in the longer term. The drains are therefore regarded as being of low sensitivity.	
The 'Black Sluice IDB draining to the South Forty Foot Drain Water Body'	The 'Black Sluice IDB draining to the South Forty Foot Drain Water Body' is designated as a 'heavily modified' water body and the classification is currently 'Moderate Potential'. Based upon the criteria set out in Table 9.2, the water body is categorised as low sensitivity.	Low
Existing development/ infrastructure/ third party assets/land in the vicinity and downstream of the proposed development	Land use in the vicinity of the site is generally categorised as 'Less Vulnerable' (in accordance with the NPPF PPG Flood Risk Vulnerability Classification). Based upon the criteria set out in Table 9.2, 'Less Vulnerable' uses are considered to be of low sensitivity.	Medium
Groundwater		
Superficial tidal flat deposits	Unproductive aquifer with very limited groundwater flow. Any groundwater present will be locally perched.	Negligible
West Walton Formation and Ampthill Clay Formation	Unproductive aquifer with very limited groundwater flow. Any groundwater present will be locally perched.	Negligible

Implications of Climate Change

9.4.30 The UK Climate Change Projections 2018 (UKCP18) project the following:

- temperatures are projected to increase, particularly in summer;
- winter rainfall is projected to increase and summer rainfall is most likely to decrease;
- heavy rain days (rainfall greater than 25mm) are projected to increase, particularly in winter;
- near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant effects of winds; however, the increase in wind speeds is projected to be modest;
- the frequency of winter storms over the UK is projected to increase; and
- changes in seasonal recharge rates as a response to variations in rainfall patterns.

9.4.31 The baseline hydrological regime may change as a result of the predicted impacts of climate change, irrespective of any development. River flows, tide levels and rainfall intensities are predicted to increase as a result of climate change. Should such changes materialise, rates of surface water run-off, flood flows within watercourses and flood levels associated with a breach of flood defences would increase. In addition, the seasonality of rainfall and river flows is likely to become more pronounced. The ES will be supported by a Flood Risk Assessment that will take account of the potential future changes in the hydrological regime by incorporating appropriate allowances for climate change, as published by the EA (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances).

9.4.32 The baseline hydrogeological regime is unlikely to change as a result of the predicted impacts of climate change, given the unproductive nature of the geology and absence of aquifers that would be affected by changing recharge rates.

Embedded Mitigation Measures Incorporated into the Proposed Development

9.4.33 The design philosophy that underpins the Proposed Development includes measures to prevent, reduce and offset significant adverse effects upon hydrology, hydrogeology, flood risk and drainage. Being 'built-in' to the proposals from the outset, the assessment of the significance of effects includes consideration of these embedded mitigation measures.

9.4.34 The Heckington Fen Solar Park DCO will be accompanied by an Outline Construction Environmental Management Plan (CEMP), the implementation of which is secured through a DCO requirement. Mitigation measures in respect of impacts on hydrology, hydrogeology, flood risk and drainage during the construction phase would be secured through implementation of the measures set out in this document. Details of the likely mitigation are outlined below:

Construction Phase

- A management system would be in place to adequately manage works within the floodplain;
- Best practice working methods to prevent both water pollution and adverse impacts upon the surface water drainage regime;
- Appropriate storage of hydrocarbons and petrochemicals in accordance with Control of Substances Hazardous to Health (COSHH) Regulations 2002 and Control of Pollution (Oil Storage) (England) Regulations 2001;
- Any surface water potentially contaminated by hydrocarbons would be passed through oil interceptors prior to discharge;
- Precautions would be in place to prevent silt laden run-off, arisings or chemicals entering watercourses; and
- Where required, cables would be laid at a sufficient depth beneath watercourses/drains to avoid causing damage to the integrity of embankments during installation.

Operational Phase

- Surface Water Management infrastructure would be designed in accordance with CIRIA C753 and guidance set out by both the BSIDB and LLFA, such that the surface water run-off regime replicates that existing prior to development;
- Implementation of SuDS (i.e. swales);
- Elevated floor levels and flood resilient construction measures. Building floor levels will be set an appropriate freeboard above the modelled breach flood level of the Head Dike, with flood sensitive equipment further raised compared to floor levels (as per parameters to be set out in the FRA that will support the ES);
- The Solar Panel Height for the fixed model has a leading edge currently set at 2.2m Above Ground Level (AGL) to allow for the worst-case scenario for fluvial flooding. This has been designed using the EA flood levels for a 1 in 1,000 year plus climate change event. Further site-specific modelling has been undertaken in line with a methodology agreed with the EA, which may enable this leading edge height to be reduced and still comply with the 1 in 1000 year plus climate change design standard;
- In the tracker model for the solar panels, the panels can move on their pivot so that they are set at 180 degrees to the ground level. At this position they would be 2.4m AGL and so floodwater could flow under the panel and through the supporting poles without obstructing flow. This would again achieve the 1 in 1000 year plus climate change design standard required by the EA; and

- The design of the Energy Park site has ensured that there are no panels or ancillary equipment within 9m of any surface water drains operated by the Black Sluice Internal Drainage Board and 8m for all other drainage ditches. These buffers from the ditches have been set through consultation with the interested parties and ensure that they have all the access they need to maintain the flow of water in these ditches at all times.

Decommissioning Phase

- A management system would be in place to adequately manage works within the floodplain;
- Best practice working methods to prevent both water pollution and adverse impacts upon the surface water drainage regime;
- Appropriate storage of hydrocarbons and petrochemicals in accordance with Control of Substances Hazardous to Health (COSHH) Regulations 2002 and Control of Pollution (Oil Storage) (England) Regulations 2001;
- Any surface water potentially contaminated by hydrocarbons would be passed through oil interceptors prior to discharge; and
- Precautions would be in place to prevent silt laden run-off, arisings or chemicals entering watercourses.

9.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

9.5.1 This section describes the findings of the assessment of likely significant effects associated with the Proposed Development, prior to the implementation of any mitigation measures additional to those incorporated into the design (Paragraph 9.4.33). The assessment methodology is outlined in Section 9.3. As set out in paragraph 9.4.33, the assessment of the significance of effects includes consideration of 'mitigation by design'/embedded mitigation measures. The potential effects considered are outlined in 9.3.33 and effects for the construction, operational and decommissioning phases are considered separately.

Energy Park

Construction

Surface Water Drainage – Flows

9.5.2 Development works, including earthworks operations, have the potential to impact upon the surface water drainage regime which, in turn, may impact upon sensitive receptors in the vicinity of the Energy Park.

9.5.3 Construction activities will include the clearance of vegetation, topsoil stripping and stockpiling, establishment of compound areas, excavation and site re-profiling to create construction platforms, preparation of site access tracks and construction of foundations. Compaction of the ground caused by construction plant and an increase in the extent of impermeable surfaces associated with access roads and compound areas has the potential to impact upon the surface water drainage regime and increase surface water run-off from the Energy Park Site. However, such effects would be localised and temporary and controlled using measures set out within the CEMP. The surface water drains and the Head Dike are considered to be of Medium sensitivity and, following implementation of the CEMP, the magnitude of impact is considered to be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Surface Water Drainage – Water Quality

9.5.4 Construction activities also have the potential to give rise to the contamination of surface water resulting from spilled hydrocarbons/petrochemicals from construction plant and the mobilisation of silts and contaminants during soil stripping and earthworks operations, potentially leading to increased silt loading in watercourses.

9.5.5 However, such effects would be localised and temporary and controlled using measures set out within the CEMP. The surface water drains, the Head Dike and the WFD Water Body are considered to be of Low sensitivity and, following implementation of the CEMP, the magnitude of impact is considered to be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Flood Defences

9.5.6 Construction works in close proximity to the flood defences have the potential to affect the stability of the embankment and therefore the structural integrity of the defences. The implementation of embedded mitigation measures, including those within the CEMP and other measures which may be required by conditions imposed by the relevant authority upon approvals under the protective provisions for works in close proximity to flood defences, would control the potential impacts of construction works. The flood defences are noted to be in fair condition (see Section 9.4.6) and are considered to be of Medium sensitivity. Following implementation of the CEMP, the magnitude of impact is considered to be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Flood Storage, Flood Flows and Flood Routing Processes

9.5.7 Construction works have the potential to affect flood storage and flood flows/flood routing processes as a result of construction activities and earthworks operations within the floodplain. Construction works therefore have the potential to increase flood risk locally and downstream.

9.5.8 The implementation of measures set out in the CEMP and as required by conditions imposed via Permits/Consents for works within watercourse corridors will facilitate control of the potential impacts of construction works upon flood storage and flood flows/flood routing processes such that flood risk locally and downstream is not increased. The receptors are considered to be of Medium sensitivity and, as a result of the implementation of measures in the CEMP and the requirements of conditions imposed upon Permits/Consents, the magnitude of impact is considered to be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Groundwater aquifer – flows

9.5.9 For the anticipated construction activities, as detailed in Chapter 3 of this PEIR, the ground surface is expected to remain above the groundwater. It is unlikely that groundwater would be encountered for the majority of the works as groundwater is only anticipated to be >70 metres below ground level (mbgl) within the confined Kellaways Formation Aquifer.

9.5.10 Compaction of the ground caused by construction and an increase in the extent of impermeable surfaces associated with access roads and compound areas, have the potential to impact upon the rate of surface water infiltration. However, given that the underlying superficial deposits and bedrock constitute low permeability, unproductive aquifers, infiltration rates are not expected to be significantly affected by areas of increased hardstanding across the site.

9.5.11 The superficial and bedrock aquifers are deemed to have negligible sensitivity. The magnitude of the effect of construction activities on groundwater flow is deemed to be negligible and the significance of effect is therefore Negligible Adverse and Not Significant.

Groundwater aquifer – water quality

9.5.12 Effects on groundwater quality could result from excavations and earthworks as well as spillages and leaks of fuels, oils and chemicals. This could result in potential pollution to any underlying aquifers. This may arise from runoff associated with construction activities (e.g. through generation of silt borne run-off during groundworks and accidental spills and leaks from construction plant).

9.5.13 During future piling activities associated with the Proposed Development (standard depth of 4m assumed), groundwater quality of the aquifer units may be affected where there is potential to generate viable pollutant pathways between the superficial deposits and bedrock groundwater.

9.5.14 The superficial and bedrock aquifers are deemed to have negligible sensitivity. The magnitude of the effect of construction activities on groundwater quality is deemed to be negligible and the significance of effect is therefore Negligible Adverse and Not Significant.

Peat deposits

9.5.15 Based upon the limited data currently available, there is no evidence of peat within the Energy Park Site area. Peat was identified in just one of the nearby BGS borehole logs (Ref: TF24SW11) located to the south of the Energy Park Site at Swinehead Bridge, at a depth of 7.6 mbgl. If, through subsequent ground investigation, peat is found to be present, it is likely to be at depths that exceed the likely depth of the piled steel poles (~4m). On this basis, it is not anticipated that the Proposed Development will disturb peat deposits and there will likely be no significant effects.

Operation

Surface Water Drainage – Flows

9.5.16 The Energy Park will give rise to an increase in the impermeable area within the catchment, thereby increasing surface water run-off to the adjacent drains. This has the potential to increase flood risk to existing development/infrastructure/third party assets/land downstream. However, such effects would be controlled by the embedded mitigation measures outlined above, specifically a drainage strategy that controls surface water flows such that the surface water run-off regime replicates that existing prior to development. Following discussions with the BSIDB and LLFA, it is currently envisaged that the proposals will incorporate simple swale-type features beneath the leading edge of the solar panels. Full details will be set out in the FRA that will form an appendix to the ES.

9.5.17 The surface water drains and existing development/infrastructure/third party assets/land downstream of the Energy Park are considered to be of Medium sensitivity and the magnitude of impact will be Negligible following the implementation of embedded mitigation measures. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Surface Water Drainage – Water Quality

9.5.18 There is the potential for the contamination of surface water entering the local surface water drains, resulting from the flushing of silts and hydrocarbons from areas of hardstanding. However, the implementation of pollution control measures as part of the drainage strategy will facilitate the control of diffuse pollution. The surface water drains and WFD water body are considered to be of Low sensitivity and the magnitude of impact will be Negligible following the implementation of embedded mitigation measures. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Flood Storage, Flood Flows and Flood Routing Processes

9.5.19 Elements of the Energy Park, such as the energy storage facility and 132kV substation(s), will be elevated above the peak water level associated with a breach of the Head Dike flood defences during a 1 in 1,000 year plus climate change flood event (as set out in the FRA that will support the ES). This will necessitate the localised raising of ground levels which has the potential to reduce the volume of storage available within the floodplain. The receptors are considered to be of Medium sensitivity and the magnitude of impact will be Negligible (on account of the significant expanse of floodplain relative to the small and localised scale of any ground raising). On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Groundwater aquifer – flows

9.5.20 The collection of surface water from the Energy Park Site using the new drainage system (comprising swale-type features) that is proposed potentially limits the volume of direct recharge to the aquifers. However, neither the superficial deposits or the bedrock constitute a viable resource for abstraction and are of limited potential.

9.5.21 Similarly, groundwater flow paths are unlikely to be affected by piling due to the low permeability and absence of significant groundwater within the superficial or bedrock units.

9.5.22 The superficial and bedrock aquifers are deemed to have negligible sensitivity. The magnitude of the effect of activities during operation on groundwater flows is deemed to be negligible and the significance of effect is therefore Negligible Adverse and Not Significant.

Groundwater aquifer – water quality

9.5.23 The collection of surface water from the Energy Park Site using the proposed drainage system that is proposed minimises the potential for any contaminated surface runoff to reach the superficial or bedrock aquifers during the operational stage. In addition, control of replacement material in the construction phase means that rainfall-infiltration through the new fill material is unlikely to introduce potential contaminants.

9.5.24 The superficial and bedrock aquifers are deemed to have negligible sensitivity. The magnitude of the effect of activities during operation on groundwater quality is deemed to be negligible and the significance of effect is therefore Negligible Adverse and Not Significant.

Decommissioning

9.5.25 At the end of its operational life, the decommissioning of the Energy Park is considered to have similar effects upon the water environment as those during the construction stage and, therefore, similar measures to reduce effects are likely to be proposed. The potential effects of the decommissioning phase in respect of hydrology, hydrogeology, flood risk and drainage are therefore anticipated to be Not Significant.

Off-site cable route and above ground works at the National Grid Bicker Fen substation

9.5.26 The Proposed Development would require a new electrical connection to the Bicker Fen Substation to export power to the electricity network. The electrical connection will be routed predominantly underground, such that potential effects along the cable route would be associated with installation of the cable by either standard open-cut, cross-country construction techniques or trenchless techniques.

Construction

Surface Water Drainage – Flows

9.5.27 The laying of temporary surfacing material for access purposes, establishment of temporary construction compounds, stockpiling areas and compaction of the ground due to construction plant has the potential to reduce the permeability of the ground, leading to increased surface water run-off to nearby watercourses. Similarly, the installation of temporary drainage/de-watering measures could potentially increase flows in nearby drains/ditches/watercourses. These activities have the potential to increase run-off and impact upon the surface water drainage regime. The receptors are considered to be Medium sensitivity and the effects would be localised and temporary and controlled using measures set out within the CEMP. As a result, the magnitude of impact during installation of the underground cable would be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

9.5.28 Construction activities at the National Grid Bicker Fen Substation will comprise localised and small-scale, above ground engineering works associated with installation of a new feeder bay. The final location of the new bay is still to be decided by National Grid. At this time they are indicating that the new bay will either be in the south-west or north-west area of the existing substation. The new bay area will be within a compound approximately 145m x 45m. The installed equipment is expected to be 55m x 30m. A control building at Bicker Fen is also anticipated and is estimated to be 8m x 5m x 4m high. The new bay will comprise a poured concrete pad with equipment similar to that already installed in other bays in the substation complex. If the south-west bay location is chosen, the area of plantation trees on this land will need to be removed.

9.5.29 The works have very minor potential to impact upon the surface water drainage regime at the substation. The local surface water drains are considered to be Medium sensitivity and any effects would be localised and temporary and controlled using measures set out within the CEMP. As a result, the magnitude of impact associated with works at the substation would be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Surface Water Drainage – Water Quality

9.5.30 Construction activities have the potential to give rise to the contamination of surface water resulting from spilled hydrocarbons/petrochemicals from construction plant and the mobilisation of silts and contaminants during engineering, earthworks and open-cut trenching operations, potentially leading to increased silt loading in watercourses. However, such effects would be localised and temporary and controlled using measures set out within the CEMP. The surface water drains and the WFD Water Body are considered to be of Low sensitivity and, following implementation of the CEMP, the magnitude of impact is considered to be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

9.5.31 Construction activities at the National Grid Bicker Fen Substation will comprise localised and small-scale, above ground engineering works associated with installation of a new feeder bay. The works have very minor potential to give rise to the contamination of surface water, thereby affecting the water quality of nearby drains. The local surface water drains are Low sensitivity and any effects would be localised and temporary and controlled using measures set out within the CEMP. As a result, the magnitude of impact associated with works at the substation would be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Flood Storage, Flood Flows and Flood Routing Processes

9.5.32 The crossing of ditches, drains and watercourses using open-cut techniques has the potential to reduce the flow capacity and/or change the flow regime, thereby leading to a temporary and localised increase in flood risk. However, flows will be managed in accordance with the methodologies set out in the CEMP (e.g. over-pumping or the creation of flow diversion channels). The implementation of these and other measures as required by conditions imposed via Permits/Consents for works within watercourse corridors will facilitate control of the potential impacts of construction works upon flood storage and flood flows/flood routing processes, such that flood risk locally and downstream is not increased.

9.5.33 The receptors are considered to be of Medium sensitivity and the effects would be localised and temporary and controlled by measures in the CEMP. As a result, the magnitude of impact during installation of the underground cable would be Negligible. On this basis, the significance of the effect would be Negligible and therefore Not Significant.

Groundwater aquifer – flows

9.5.34 For the anticipated construction activities, as detailed in Chapter 4 of this PEIR, the ground surface is expected to remain above the groundwater. It is unlikely that groundwater would be encountered for the majority of the works as groundwater is only anticipated to be >70 metres below ground level (mbgl) within the confined Kellaways Formation Aquifer.

9.5.35 The laying of temporary surfacing material for access purposes, establishment of temporary construction compounds, stockpiling areas and compaction of the ground due to construction plant has the potential to impact the rate of surface water infiltration. However, given that the underlying superficial deposits and bedrock constitute low permeability, unproductive aquifers, infiltration rates are not expected to be significantly affected by areas of increased hardstanding.

9.5.36 The superficial and bedrock aquifers are deemed to have negligible sensitivity. The magnitude of the effect of construction activities on groundwater flow is deemed to be negligible and the significance of effect is therefore Negligible Adverse and Not Significant.

Groundwater aquifer – water quality

9.5.37 Effects on groundwater quality could result from excavations and earthworks as well as spillages and leaks of fuels, oils and chemicals. This could result in potential pollution to any underlying aquifers. This may arise from run-off associated with construction activities (e.g. through generation of silt borne run-off during groundworks and accidental spills and leaks from construction plant).

9.5.38 During future piling activities associated with the Proposed Development (standard depth of 4m assumed), groundwater quality of the aquifer units may be affected where there is potential to generate viable pollutant linkage between the superficial deposits and bedrock groundwater.

9.5.39 The superficial and bedrock aquifers are deemed to have negligible sensitivity. The magnitude of the effect of construction activities on groundwater quality is deemed to be negligible and the significance of effect is therefore Negligible Adverse and Not Significant.

Operation

9.5.40 The electrical connection to the National Grid Bicker Fen Substation comprises an underground cable and localised and small-scale, above ground engineering works associated with installation of a new substation feeder bay. During the operational phase, it would not therefore give rise to impacts upon hydrology, hydrogeology, flood risk and drainage. Consideration of operational impacts associated with the electrical connection is therefore scoped out of the assessment.

Decommissioning

9.5.41 At the end of its operational life, it is anticipated that any above ground works for the electrical connection (including the equipment at Bicker Fen Substation, but not the concrete pad) will be removed. All below ground off site cabling would be left *in situ* as it will all be 1m or more below surface level. As such, the decommissioning works along the off-site cable route and at Bicker Fen Substation would be minimal, such that significant effects upon hydrology, hydrogeology, flood risk and drainage would be unlikely.

9.6 MITIGATION AND ENHANCEMENT

Additional Mitigation

Construction and Decommissioning

9.6.1 Potential effects arising from construction of the Energy Park, off-site cable route and works at the Bicker Fen Substation are likely to be localised and temporary and controlled by embedded mitigation measures delivered through the CEMP. The effects are therefore Negligible and Not Significant. On this basis, there is no requirement for additional mitigation measures over and above those already identified.

9.6.2 At the end of its operational life, the decommissioning of the Energy Park is considered to have similar effects upon the water environment as those during the construction stage and, therefore, similar measures to reduce effects are likely to be proposed. On this basis, there is unlikely to be a requirement for additional mitigation measures.

9.6.3 At the end of its operational life, it is anticipated that the below ground electrical cabling associated with the off-site substation connection would be left *in situ*, such that there would be no decommissioning works and therefore no potential effects upon hydrology, hydrogeology, flood risk and drainage.

Operation

9.6.4 As noted above, the off-site electrical connection comprises an underground cable which would not require water, nor be sensitive to flood risk. During the operational phase, it would not therefore give rise to impacts upon hydrology, hydrogeology, flood risk and drainage.

9.6.5 With the implementation of embedded mitigation measures as set out above, the effects associated with operation of the Energy Park are Negligible and therefore Not Significant. On this basis, there is no requirement for additional mitigation measures over and above those identified.

Table 9.10: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured	
		By Design	By DCO Requirement
1	Construction Environmental Management Plan (CEMP), setting out various measures to control impacts upon watercourses, flood defences, surface water drainage, water quality and floodplain storage/flows/routing processes		X
2	Surface water management strategy	X	
3	Design levels elevated above breach flood level and flood resilient construction	X	

9.7 CUMULATIVE AND IN-COMBINATION EFFECTS

9.7.1 Construction and operation of the Proposed Development could occur simultaneously with 'Other Developments' located in the vicinity of the application site.

The 'Other Developments' are identified within Chapter 2 of this PEIR. Other proposed development will be subject to compliance with local and national planning policy and the Water Environment (WFD) regulations. Other proposals will therefore be required to demonstrate (amongst other matters) that flood risk is not increased, that the surface water drainage regime and water quality are not adversely affected. Without demonstrating compliance, planning permission would not be granted and construction could not commence.

9.7.2 The 'Other Developments' are therefore likely to be subject to embedded mitigation and additional mitigation, where applicable, as required by the specifics of the proposed schemes. This would result in the residual effects of the construction and operational phases being classified as Not Significant or Beneficial. When combined with the Not Significant residual effects of the Heckington Fen Solar Park construction and operational phases, the cumulative effects are likely to be Not Significant or Beneficial, depending on the extent of mitigation measures implemented as part of 'Other Developments'.

9.8 SUMMARY

Introduction

9.8.1 This Chapter has set out the assessment of likely significant effects of the Proposed Development upon hydrology, hydrogeology, flood risk and drainage arising from the construction, operation and decommissioning of the Proposed Development.

9.8.2 The assessment was supported by the collection and interpretation of data and information requested from the Environment Agency (EA), Black Sluice Internal Drainage Board (BSIDB) and North Kesteven District Council (NKDC). This information has been used to characterise the baseline water environment and identify receptors.

Baseline Conditions

9.8.3 The Proposed Development is situated on the Lincolnshire Fens, a coastal plain in the east of England which comprises a large area of broad, flat marshland.

9.8.4 The principal watercourses in the area are the River Witham and South Forty Foot Drain, located approximately 4km and 1.5km to the east and south of the proposed Energy Park respectively. Both are classified as Main River and therefore under the jurisdiction of the EA. The Energy Park itself is bound along the northern boundary by the Head Dike/Skerth Drain (which is also classified as Main River) and the site area is bisected by a number of ditches/drains, some of which are operated and maintained by the BSIDB. Water levels within the network of ditches/drains are managed through pumping to the Head Dike/Skerth Drain.

9.8.5 The Energy Park Site is currently in agricultural use and therefore comprises permeable surfaces, such that surface water run-off generally infiltrates into the ground or is routed to the various ditches/drains that bisect the site. Similarly, the off-site cable route traverses an area characterised by agriculture.

9.8.6 According to the EA's flood map, the majority of the Energy Park Site is located within Flood Zone 3 (High Probability – land having a 1 in 100 or greater annual probability of fluvial flooding) and benefits from flood defences offering a 1 in 10-year standard of protection.

9.8.7 The off-site cable route and National Grid Bicker Fen Substation are also shown to lie within Flood Zone 3.

9.8.8 The EA 'Flood Risk from Surface Water Map' shows that the majority of the Energy Park and the off-site cable route and National Grid Bicker Fen Substation are at 'Very Low' risk of surface water flooding.

9.8.9 The EA 'Flood Risk from Reservoirs Map' shows the area that may be affected by flooding as a result of a breach of a large, raised reservoir i.e. capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land. According to EA records, the nearest reservoir is located approximately 8km to the west of the Energy Park, between Heckington and Sleaford. The EA's map shows that, when river levels are normal, only limited and localised areas along the northern boundary of the Energy Park adjacent to Head Dike are affected by reservoir flooding. The off-site cable route and National Grid Bicker Fen Substation are unaffected by reservoir flooding when river levels are normal.

9.8.10 British Geological Survey mapping indicates that the Energy Park, off-site cable route and National Grid Bicker Fen Substation are entirely underlain by superficial and bedrock deposits comprising predominantly low permeability clay. EA aquifer designation maps categorise both the superficial deposits and bedrock deposits as 'unproductive' (i.e. areas comprised of rocks that have negligible significance for water supply or baseflow to rivers, lakes and wetlands).

9.8.11 The Proposed Development lies within the '*Black Sluice IDB draining to the South Forty Foot Drain Water Body*', which is designated as 'heavily modified' (substantially changed in character as a result of physical alterations by human activity). The environmental (Water Framework Directive) objective for the water body is to achieve 'good ecological potential'. The overall water body classification is currently 'Moderate' potential (Cycle 2, 2019).

Likely Significant Effects

9.8.12 The assessment finds that construction activities have the potential to impact upon the surface water drainage regime and increase surface water run-off from the Application Site. Similarly, the assessment identifies the potential for construction activities to give rise to the contamination of surface water resulting from spilled hydrocarbons/petrochemicals from construction plant and the mobilisation of silts and contaminants during soil stripping and earthworks operations, potentially leading to increased silt loading in watercourses.

9.8.13 The assessment also notes that construction works in close proximity to the flood defences have the potential to affect the stability of the embankment and therefore the structural integrity of the defences. Also, floodplain storage and flood flows/flood routing processes may be affected as a result of construction activities and earthworks operations within the floodplain, such that there is potential to increase flood risk locally and downstream.

9.8.14 However, the assessment finds that these likely effects are Not Significant, on account of 'mitigation by design'/embedded mitigation measures that are either 'built-in' to the proposals from the outset or secured through a DCO requirement.

9.8.15 Potential construction phase effects upon groundwater aquifers are found to be Not Significant, principally on account of the low permeability of the ground and the unproductive nature of the aquifers.

9.8.16 During the operational phase of the Proposed Development, the assessment finds that an increase in the impermeable area within the Energy Park Site has the potential to increase surface water run-off to the adjacent drains, potentially increasing flood risk elsewhere. Similarly, the assessment identifies the potential for the contamination of surface water entering the local surface water drains, resulting from the flushing of silts and hydrocarbons from areas of hardstanding. However, the assessment finds that these likely effects are Not Significant, on account of 'mitigation by design'/embedded mitigation measures that are either 'built-in' to the proposals from the outset or secured through a DCO requirement.

9.8.17 The assessment also notes that the raising of ground levels to locate flood-sensitive infrastructure above the flood level has the potential to reduce the volume of storage available within the floodplain. However, the assessment notes that any such ground raising would be very small scale and localised and located within a significant expanse of floodplain. On this basis, it is concluded that the likely effects are Not Significant.

9.8.18 Potential operational phase effects upon groundwater aquifers are found to be Not Significant, principally on account of the low permeability of the ground and the unproductive nature of the aquifers.

9.8.19 The electrical connection to the National Grid Bicker Fen Substation comprises an underground cable that would not require water, nor be sensitive to flood risk. The assessment therefore concludes that, during the operational phase, it would not give rise to impacts upon hydrology, hydrogeology, flood risk and drainage.

Mitigation and Enhancement

9.8.20 Potential effects arising from construction of the Energy Park, off-site cable route and works at the Bicker Fen Substation are likely to be localised and temporary and controlled by embedded mitigation measures. The effects are therefore Not Significant and there is no requirement for additional mitigation measures.

9.8.21 At the end of its operational life, the decommissioning of the Energy Park is considered to have similar effects upon the water environment as those during the construction stage and, therefore, similar measures to reduce effects are likely to be proposed. On this basis, it is concluded that there is unlikely to be a requirement for additional mitigation measures.

9.8.22 At the end of its operational life, it is anticipated that the off-site electrical cabling would be left *in situ*, although all above ground works would be removed. As such there would be limited decommissioning works and therefore limited or no potential effects upon hydrology, hydrogeology, flood risk and drainage.

9.8.23 The electrical connection comprises an underground cable such that, during the operational phase, it would not give rise to impacts upon hydrology, hydrogeology, flood risk and drainage.

9.8.24 With the implementation of embedded mitigation measures the effects associated with operation of the Energy Park are Not Significant. On this basis, there is no requirement for additional mitigation measures over and above those identified.

Cumulative and In-combination Effects

9.8.25 The assessment notes that construction and operation of the Proposed Development could occur simultaneously with 'Other Developments' located in the vicinity of the Application Site. Other proposed development will be subject to compliance with local and national planning policy and therefore required to demonstrate (amongst other matters) that flood risk is not increased, that the surface water drainage regime and surface water quality are not adversely affected and that groundwater aquifers are not affected. Without demonstrating compliance, DCO consent (or planning permission, as relevant) would not be granted and construction could not commence. On this basis, these committed development schemes will not give rise to any significant effects and there will be no cumulative effects within the wider catchment.

Conclusion

9.8.26 It is concluded that potential effects arising from construction of the Proposed Development are likely to be localised and temporary and controlled by embedded mitigation measures. The residual effects are therefore Negligible and Not Significant.

9.8.27 With the implementation of embedded mitigation measures, the residual effects associated with operation of the Energy Park are Negligible and Not Significant. The electrical connection to the National Grid Bicker Fen Substation comprises an underground cable that would not give rise to impacts upon hydrology, hydrogeology, flood risk and drainage during the operational phase.

Table 9.11: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction								
Aquifers and groundwater abstractions	Change in flows	Permanent Direct	Negligible	Negligible	Borough/District	Negligible	None required	Negligible
Aquifers and groundwater abstractions	Change in quality	Temporary Direct	Negligible	Negligible	Borough/District	Negligible	None required	Negligible
Surface water drains	Change in flow regime	Temporary Direct	Medium	Negligible	Local	Negligible	CEMP	Negligible
Surface water drains	Change in water quality	Temporary Direct	Low	Negligible	Local	Negligible	CEMP	Negligible
Flood defences	Impact upon stability and structural integrity	Permanent Direct	Medium	Negligible	Local	Negligible	CEMP	Negligible
Floodplain	Impact upon flood storage, flood flows and flood routing processes	Temporary Direct	Medium	Negligible	Local	Negligible	CEMP	Negligible
Peat deposits	Disturbance of deposits	Permanent Direct	Medium	Negligible	International	Negligible	None required	Negligible
Operation								
Aquifers and groundwater abstractions	Change in flows	Permanent Direct	Negligible	Negligible	Borough/District	Not Significant	None required	Negligible

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Aquifers and groundwater abstractions	Change in quality	Temporary Direct	Negligible	Negligible	Borough/District	Not Significant	None required	Negligible
Surface water drains	Change in flow regime	Permanent Direct	Medium	Negligible	Local	Negligible	Provision of drainage/SuDS measures to capture run-off from solar panels. No Panels or equipment to be within 9m of IDB drains and 8m of other drainage ditches on Energy Park Site	Negligible
Surface water drains	Change in water quality	Permanent Direct	Low	Negligible	Local	Negligible	None required	Negligible
Floodplain	Impact upon flood storage, flood flows and flood routing processes	Permanent Direct	Medium	Negligible	Local	Negligible	Leading edge of solar panels to be elevated above 1 in 1,000 year plus climate change flood level	Negligible
Decommissioning								
Aquifers and groundwater abstractions	Change in flows	Permanent Direct	Negligible	Negligible	Borough/District	Negligible	None required	Negligible
Aquifers and groundwater abstractions	Change in quality	Temporary Direct	Negligible	Negligible	Borough/District	Negligible	None required	Negligible

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Surface water drains	Change in flow regime	Temporary Direct	Medium	Negligible	Local	Negligible	Similar to operational phase	Negligible
Surface water drains	Change in water quality	Temporary Direct	Low	Negligible	Local	Negligible	Similar to operational phase	Negligible
Flood defences	Impact upon stability and structural integrity	Permanent Direct	Medium	Negligible	Local	Negligible	Similar to operational phase	Negligible
Floodplain	Impact upon flood storage, flood flows and flood routing processes	Temporary Direct	Medium	Negligible	Local	Negligible	Similar to operational phase	Negligible
Cumulative and In-combination								
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 9.1- Hydrology and Drainage

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

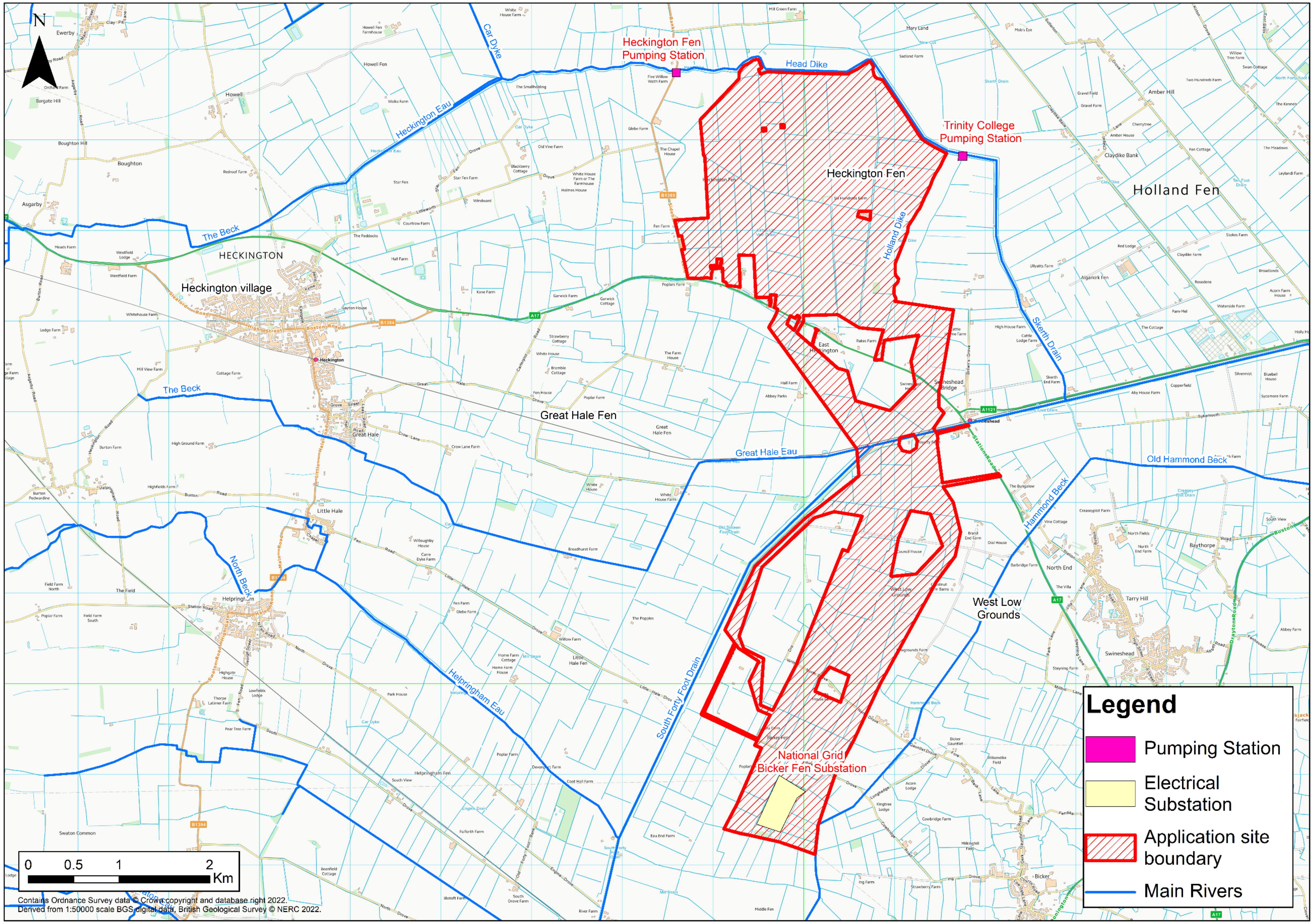


FIGURE 9.1

Hydrology and drainage

Date: 30/05/2022

Scale: 1:35000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 9.2- Superficial Geology

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

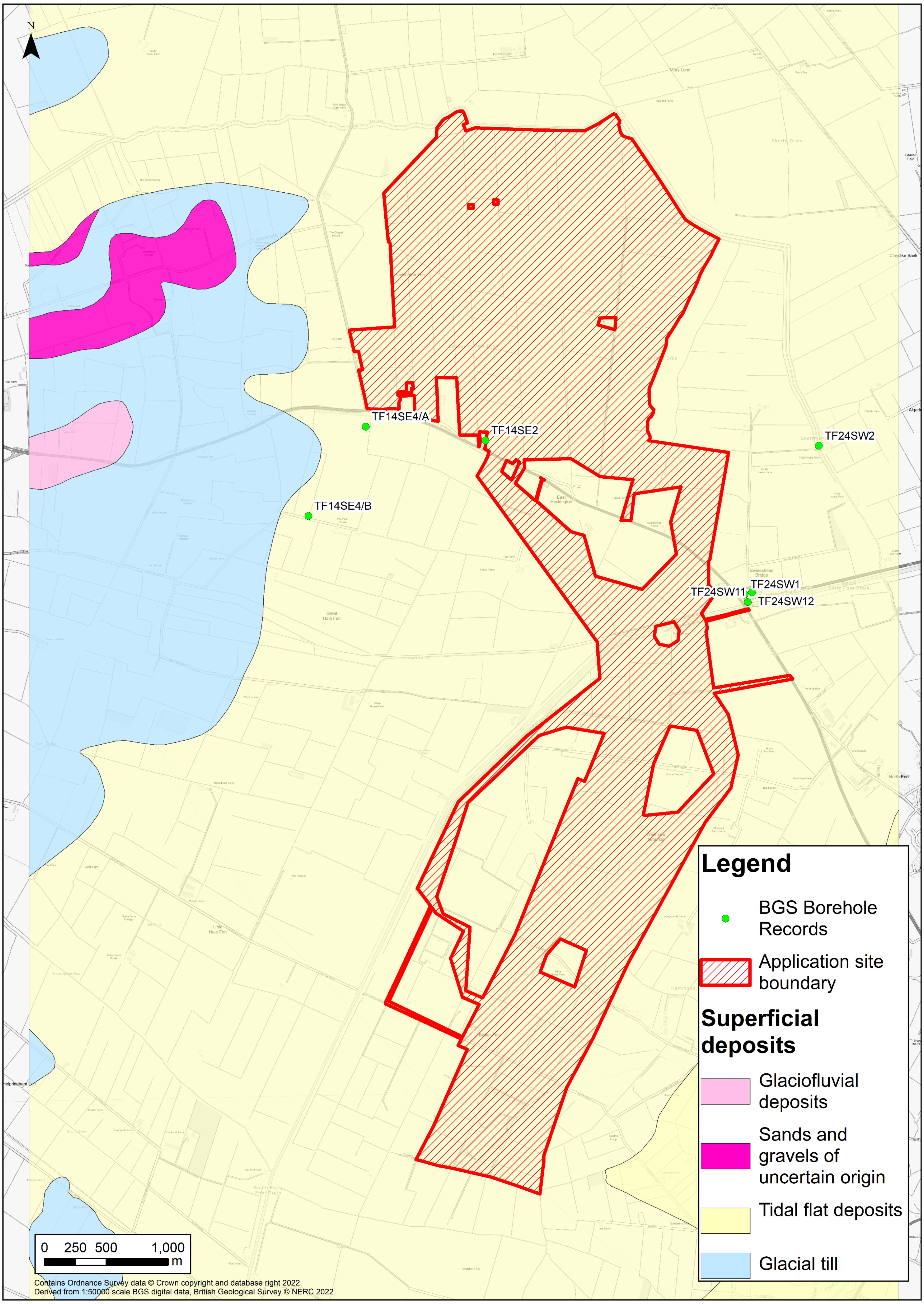


FIGURE 9.2
Superficial geology

Date: 30/05/2022

Scale: 1:25000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 9.3- Bedrock Geology

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

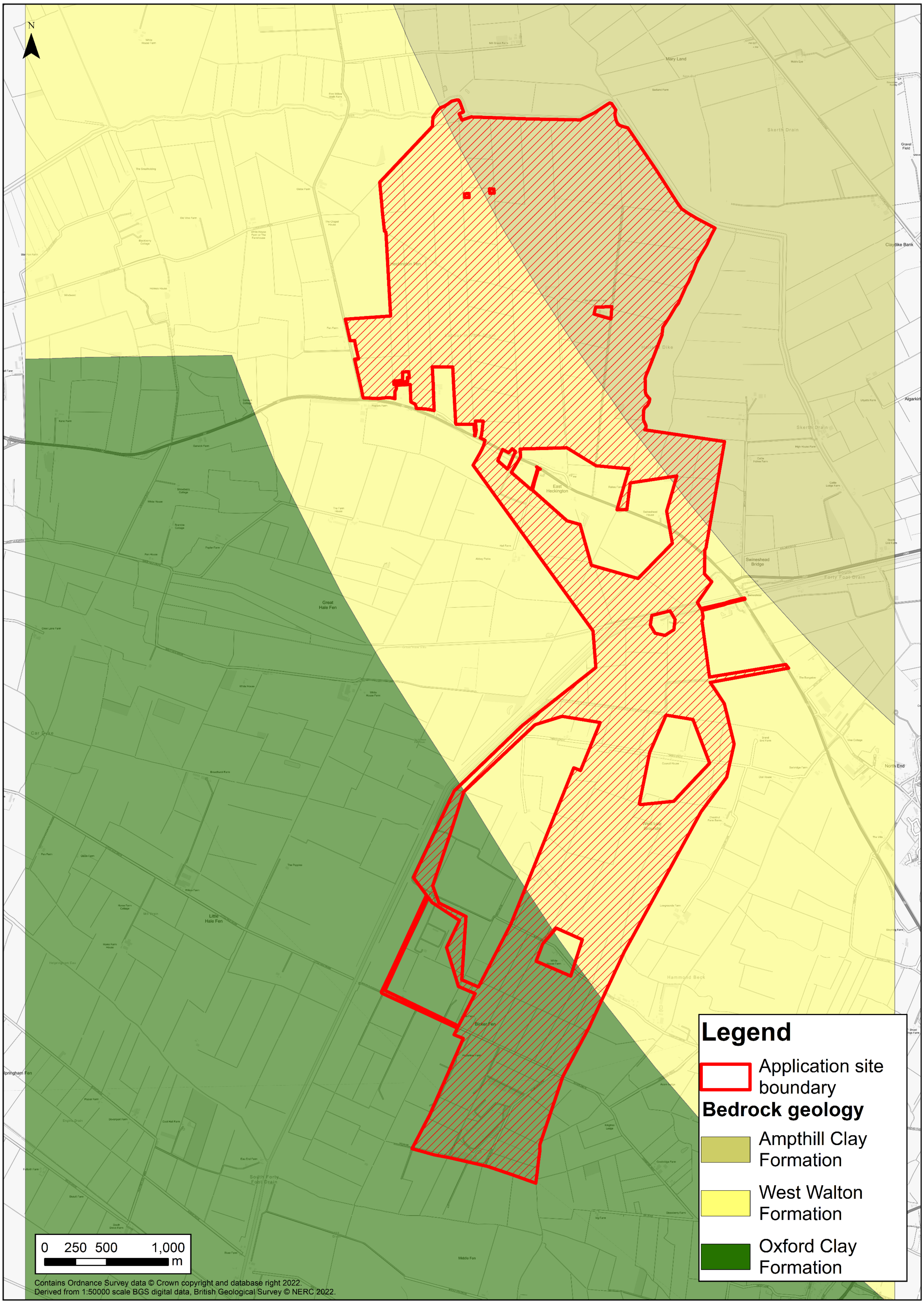


FIGURE 9.3

Bedrock geology

Date: 30/05/2022

Scale: 1:25000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 10: Cultural Heritage

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

10 CULTURAL HERITAGE

10.1 EXECUTIVE SUMMARY

10.1.1 This Chapter sets out the assessment of likely significant effects of the Proposed Development upon cultural heritage receptors arising from the construction, operation and decommissioning of the Proposed Development.

10.1.2 Known above-ground heritage assets within the Energy Park will be retained. Further (intrusive) investigations are required to identify and assess potential below-ground archaeological remains within the Energy Park and along the route of the electrical connection to the National Grid Bicker Fen Substation. At this stage, however, physical effects upon buried archaeological remains, arising from the construction of the Proposed Development, are not anticipated to be significant.

10.1.3 Mitigation by design may be required with regard to non-physical effects upon designated heritage assets arising from the construction and operation of the Energy Park. The residual effects are not anticipated to be significant.

10.1.4 No cumulative effects upon cultural heritage have been identified.

10.2 INTRODUCTION

10.2.1 This Chapter considers the likely significant effects of the Proposed Development on cultural heritage receptors. It includes consideration of buried archaeological remains, historic earthworks, and historic buildings and structures.

10.2.2 This Chapter has been informed by an archaeological desk-based assessment and setting assessments being undertaken by Pegasus Group and reported in a Heritage Statement and geophysical survey undertaken and reported on by ASWYAS, Headland Archaeology, Magnitude Surveys, and SUMO Geophysics.

10.2.3 The Chapter has been prepared by Pegasus Group. The author, as required by the 2017 EIA Regulations, is a **"competent expert[s]/person[s]" with "sufficient expertise"**. This is demonstrated by their academic qualifications (BA Hons, MA, PhD), Member accreditation of the Chartered Institute for Archaeologists, and seven years' experience of EIA.

10.2.4 This Chapter is supported by:

- Appendix 10.1 – Summary Report of Geophysical Survey Results; and
- Figure 10.1 – Designated Heritage Assets.

10.3 ASSESSMENT APPROACH

Methodology

Consultation

10.3.1 Consultation is ongoing with the archaeological advisors to Lincolnshire County Council, North Kesteven District Council, and Boston Borough Council. The timing of key correspondence undertaken to date is summarised in Table 10.1.

Table 10.1: Correspondence with LPA archaeological advisors

Date	Form and topic of communication
October 2021	Email from Elizabeth Pratt of Pegasus Group to Matthew Adams at Lincolnshire County Council, placing request for initial advice; Call to Denise Drury at Heritage Lincolnshire, for an initial discussion regarding the requirement for and scope of archaeological assessments.
5th November 2021	Teams meeting organised by Pegasus Group and Ecotricity for Lincolnshire County Council Officers, with Jan Allen of Lincolnshire County Council in attendance.
26th January 2022	Teams meeting held between Matthew Adams and Jan Allen of Lincolnshire County Council and Elizabeth Pratt of Pegasus Group, for a focussed discussion regarding the requirement for and scope of archaeological assessments.
March–April 2022	Emails between Matthew Adams and Jan Allen of Lincolnshire County Council, Denise Drury of Heritage Lincolnshire, and Elizabeth Pratt of Pegasus Group regarding the scope, methodology, and results of geophysical surveys of the Energy Park.
27th May 2022	Submission of geophysical survey reports to Matthew Adams, Jan Allen, and Denise Drury.

10.3.2 Consultation is forthcoming with the Conservation Officers at North Kesteven District Council and Boston Borough Council, and the Inspectors for Ancient Monuments and Historic Buildings and Areas at Historic England.

<u>Guidance</u>

10.3.3 The archaeological desk-based assessment and setting assessments were undertaken by Pegasus Group in accordance with all relevant heritage industry guidance and best practice, including:

- Standard and Guidance for Historic Environment Desk-Based Assessment (Chartered Institute for Archaeologists (CIfA) 2014);
- Planning Practice Guidance (PPG) 'Conserving and Enhancing the Historic Environment' (MHCLG, updated July 2019);
- Historic Environment Good Practice Advice in Planning Note 1: The Historic Environment in Local Plans (Historic England 2015);
- Historic England Advice Note 12: Statements of Heritage Significance: Analysing Significance in Heritage Assets (Historic England 2019); and
- Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (2nd Edition; Historic England 2017).

10.3.4 The geophysical surveys were undertaken by ASWYAS, Headland Archaeology, Magnitude Surveys and SUMO in accordance with relevant industry guidance and best practice, including:

- Geophysical Survey in Archaeological Field Evaluation (English Heritage 2008);
- Standard and Guidance for Archaeological Geophysical Survey (CIfA 2014); and
- Guidelines for the use of geophysics in archaeology: questions to ask and points to consider (EAC 2015).

<u>Baseline Data Procurement & Analysis</u>

<u>Data sources</u>

10.3.5 The following key sources were consulted as part of the assessment process:

- The National Heritage List for England (NHLE) for information relating to designated heritage assets;
- The Lincolnshire Historic Environment Record (HER) for information relating to recorded heritage assets and previous archaeological works;
- Historic maps held by Lincolnshire Archives and available through The Genealogist, National Library of Scotland, and Promap websites;
- Digital terrain model LiDAR data, available at 1m spatial resolution, from the Environment Agency Open Source Archive;
- Previous published and grey literature reports relating to archaeological investigations previously undertaken; and
- Online resources, including geological data available from the British Geological Survey (BGS), soil data available from the Cranfield University Soilscapes Viewer, and historic satellite imagery available on Google Earth.

<u>Data processing and analysis</u>

10.3.6 A proportionate level of data, sufficient to inform the assessment of archaeological potential, significance and potential impact, has been acquired from the sources listed in section 10.2.3 above. All data has been reconciled and analysed in accordance with the relevant industry guidance and best practice, and consistent with the objectives of Environmental Impact Assessment (EIA).

10.3.7 All digital spatial data has been interrogated using industry-standard Geographical Information System (GIS) software.

HER data

10.3.8 The results of full commercial data searches were received from Lincolnshire HER in August 2021 and February 2022. The search area comprised a 2km-radius measured from the redline boundary of the Proposed Development.

10.3.9 All of the HER data supplied was reconciled and analysed within the context of the project aims and objectives.

10.3.10 The HER data returned contained numerous records of varying reliability and relevance. Only those recorded sites and events that are of relevance to the determination of potential, significance and impact in respect of cultural heritage are discussed further within this chapter.

LiDAR data

10.3.11 The entirety of the land being considered for the Proposed Development has been subject to Environment Agency LiDAR survey (aerial laser-scanning).

10.3.12 Available LiDAR data was downloaded in composite Digital Terrain Model (DTM) format, from the Environment Agency Open Source Archive. The data was then processed and interrogated using industry-standard GIS software.

10.3.13 Multiple hill-shade and shaded-relief models were created, principally via adjustment of the following variables: azimuth, height, and 'z-factor' or exaggeration. The models created were colourised using pre-defined ramps and classified attribute data.

Site inspection

10.3.14 Walkover surveys of the Energy Park Site were undertaken on 11th, 12th 13th and 14th April 2022 in order to i) assess the Energy Park Site within its wider landscape context, ii) identify/confirm any evidence for previous disturbance within the Energy Park Site, and iii) examine any known or suspected archaeological features within the Energy Park Site.

10.3.15 Settings assessments were carried out alongside the walkover surveys of the Energy Park Site. Designated and non-designated heritage assets identified as potentially susceptible to non-physical impacts, and their settings, were assessed from the land being considered for the Proposed Development and from publicly accessible locations.

10.3.16 A walkover survey of the cable route corridor will be undertaken after the 2022 harvest.

Settings Assessment

10.3.17 Heritage settings assessment was undertaken in accordance with the industry-standard methodology provided by Historic England in their Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (revised 2017). This guidance promotes a 'stepped' (iterative) approach, as follows:

- **Step 1:** assess which assets would be affected and identify their setting.
- **Step 2**: assess the degree to which these settings and views make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated.
- **Step 3:** assess the effects of the proposed development, whether beneficial or harmful, on that significance or on the ability to appreciate it.
- **Step 4:** explore ways to maximise enhancement and avoid or minimise harm.
- **Step 5:** monitor outcomes.

10.3.18 The following primary resources were used to identify those assets that might be susceptible to impact as a result of changes to their setting arising from the Proposed Development (i.e. **Step 1**):

- the relevant NHLE Listing descriptions;
- elevation and contour mapping;
- geological, soil and hydrological mapping;
- modern and historic mapping;
- LiDAR imagery;
- satellite imagery and aerial photography; and
- A Screened Zone of Theoretical Visibility Model.

10.3.19 A search area of a minimum 5km-radius measured from the Energy Park Site was applied. The potential for impacts through change to setting from the buried cabling and grid connection is considered limited.

10.3.20 The following assets (listed by ascending distance from the Energy Park Site) were deemed potentially sensitive to the Proposed Development:

- Non-designated Primitive Methodist Chapel on Sidebar Lane, *c.*500m west of the Energy Park;
- Non-designated Mill Green Farmhouse, *c.*600m north of the Energy Park;
- Scheduled Monument of settlement site 600m east of Holme House, *c.*550m west of the Energy Park;

- Grade II Listed Church of St John the Baptist at Amber Hill, *c.*1.2km north-east of the Energy Park;
- Grade II Listed Drainage Mill at Spinney Farm, *c.*1.4km east of the Energy Park;
- Grade II Listed Draining Scoop Wheel and Channel north of Deangate House, *c.*1.8km east of the Energy Park;
- Grade I Listed Kyme Tower at South Kyme, *c.*3.7km north-west of the Energy Park;
- Grade II* Listed Church of St Mary and All Saints at South Kyme, *c.*3.9km north-west of the Energy Park;
- Heckington Conservation Area, *c.*4.1km west-south-west of the Energy Park;
- Grade I Listed Church of St John the Baptist at Great Hale, c.4.2km south-west of the Energy Park;
- Grade I Listed Church of St Andrew at Heckington, c.4.5km west of Energy Park;
- Swineshead Conservation Area, *c.*4.5km south-east of the Enery Park;
- Scheduled Monument of Manwar Ings, the remains of a motte and bailey castle at Swineshead, *c*.4.5km south-east of the Energy Park;
- Grade I Listed Church of St Mary at Swineshead, *c.*4.7km south-east of the Energy Park;
- Grade I Listed Church of St Andrew at Ewerby, *c.*6.7km west of the Energy Park; and
- Grade I Listed Church of St Andrew at Asgarby, *c.*6.9km west of the Energy Park.

10.3.21 Settings assessments were undertaken according to the methodology outlined in Historic England's The Setting of Heritage Assets (2017). This work is still in progress.

Assessment of Impact

10.3.22 The impact assessment has considered the following in respect of each identified heritage receptor (asset):

- the asset's **heritage significance**;
- the anticipated **level of harm** to that significance (comparable to 'magnitude'); and
- whether that level of harm would comprise a **significant effect**.

10.3.23 Determination of each of the above has been undertaken in accordance with a robust methodology, formulated within the context of current best practice, recent case law, the relevant statute and policy provisions, and key professional guidance. The rationale for each is set out within the following three sections, alongside the relevant criteria and terminology used in their articulation.

Determining Heritage Significance

10.3.24 In accordance with the levels of significance articulated in the NPPF (2021), three levels of heritage significance are identified and have been utilised for the purposes of this chapter. These are presented in **Table 10.2**.

Table 10.2: Heritage significance

Significance	Qualifying Criteria
Designated heritage assets of the highest significance	Grade I and II* Listed Buildings, Grade I and II* Registered Parks and Gardens, Scheduled Monuments, Protected Wreck Sites, World Heritage Sites and Registered Battlefields. Conservation Areas of especial historic interest. ***Also, non-designated archaeological remains of demonstrably equivalent significance to that of Scheduled Monuments*** (NPPF footnote 68).
Designated heritage assets of less than the highest significance	Grade II Listed Buildings and Grade II Registered Parks and Gardens. The majority of Conservation Areas.
Non-designated heritage assets	Buildings, monuments, sites, places, areas or landscapes identified as having a degree of significance meriting consideration in planning decisions, but which are not formally designated heritage assets (as defined within the PPG).

10.3.25 Sites, buildings or areas that have **no heritage significance** would not be considered heritage assets under the provisions of the NPPF (2021) and so are not considered to be heritage receptors for the purposes of this chapter.

<u>Determining Level of Harm to Heritage Significance</u>

10.3.26 Potential development effects upon the significance of known and potential heritage assets identified within the Application Site have been determined with reference to **harm** and/or **benefit**, as defined within the NPPF (2021). The identification of harm would apply where the proposals would be anticipated to reduce an asset's heritage significance. The identification of heritage benefit would apply where the proposals would be anticipated to enhance (increase) heritage significance.

10.3.27 Where harm to the significance of a **designated** heritage asset is identified, it is discussed in terms of it being either *'substantial'* or *'less than substantial'*, as per the terms of NPPF (2021). <u>The NPPF does not apply these same harm criteria to non-designated heritage assets.</u>

10.3.28 Harm to the significance of **non-designated** heritage assets is treated separately under NPPF (2021) paragraph 203, which requires that in weighing applications that directly or indirectly affect non-designated heritage assets, *'a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset'.*

10.3.29 The methodology adopted for the purposes of this chapter in identifying levels of development effect upon the significance of designated and non-designated heritage assets directly reflects the NPPF's position and language in this regard (**Table 10.3**).

Table 10.3: Level of Heritage Harm / Benefit

Level of Harm / Benefit	Qualifying Criteria
Heritage Benefit	The asset's significance would be enhanced and/or better revealed. This would weigh in favour of the Proposed Development in the planning balance. It would be a desirable outcome, consistent with all key policy objectives and industry guidance provisions.
No Harm	The asset's significance would be preserved. This would be consistent with the NPPF's core sustainability objective, as well as all other relevant statute and policy provisions, including the Planning (Listed Buildings & Conservation Areas) Act (1990) s.66(1) and s.72(1), and NPPF (2021) paragraphs 194–198.
Less than Substantial Harm	The designated asset's significance would be reduced, but still, on balance, substantively preserved. Where 'less than substantial' harm has been identified, an attempt is made to qualify more precisely that level of harm, with reference to the heritage interests defined within the PPG and Statements of Heritage Significance: Analysing Significance in Heritage Assets (Historic England 2019). NPPF (2021) paragraph 202 provides that such less than substantial harm should be *'weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use'*.
Substantial Harm	The designated asset's significance would be subject to such a serious impact (reduction) that its significance would be *'either vitiated altogether or very much reduced'* (2013 High Court Ruling). Substantial public benefit or satisfaction of the four criteria provided within NPPF (2021) paragraph 201 would be required to outweigh this level of harm. Without this, the NPPF directs that consent should be refused.
Harm to Non-Designated Heritage Assets	Harm to the significance of a non-designated heritage asset would comprise a material consideration for the decision-taker. As per NPPF (2021) paragraph 203, a balanced judgement would be required having regard to the scale of any harm or loss and the significance of the heritage asset. Professional judgment is used in defining the anticipated level of harm to the significance of non-designated heritage assets for the purposes of the present chapter; all determinations are fully qualified within the text.

<u>Assessment of Significant Effects ('Significance of Effect')</u>

10.3.30 In determining whether any identified harm to heritage significance would translate into a significant effect for purposes of EIA, this chapter has moved away from a quantitative, matrix-led approach, as such a method would over-simplify the assessment findings. Instead, determinations are based upon professional judgement and are presented qualitatively and with full justification. This approach directly reflects key concepts in current planning policy and heritage guidance and is advocated by Historic England.

10.3.31 Ultimately, a statement of whether any identified harm does or does not represent a significant effect is provided in respect of each cultural heritage receptor using the following terminology: **'Significant'** or **'Not Significant'**.

Legislative and Policy Framework

10.3.32 The following text describes the key statute, policy and guidance provisions relevant to this assessment. Additional detail is provided within Sections 3 and 4 of the Heritage Statement.

Legislation

10.3.33 Legislation relating to the built historic environment is primarily set out within the Planning (Listed Buildings and Conservation Areas) Act 1990 which provides statutory protection for Listed Buildings and Conservation Areas.

10.3.34 Section 66(1) of the Planning (Listed Buildings and Conservation Areas) Act 1990 states that:

> **"In considering whether to grant planning permission [or permission in principle] for development which affects a listed building or its setting, the local planning authority or, as the case may be, the Secretary of State, shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses."**

10.3.35 With regards to development within Conservation Areas, Section 72 (1) of the Planning (Listed Buildings and Conservation Areas) Act 1990 states:

> **"In the exercise, with respect to any buildings or other land in a conservation area, of any powers under any of the provisions mentioned in subsection (2), special attention shall be paid to the desirability of preserving or enhancing the character or appearance of that area."**

National Policy Guidance

National Policy Statements

10.3.36 National Policy Statements EN-1, EN-3 and EN-5 are the determining policy for nationally significant energy infrastructure projects. The historic environment is addressed in Section 5.8 of EN-1: Overarching National Policy Statement for Energy (dated 2011).

10.3.37 Paragraph 5.8.2 defines a heritage asset and heritage significance as follows:

> **"Those elements of the historic environment that hold value to this and future generations because of their historic, archaeological, architectural or artistic interest are called "heritage assets". A heritage asset may be any building, monument, site, place, area or landscape, or any combination of these. The sum of the heritage interests that a heritage asset holds is referred to as its significance."**

10.3.38 Heritage assets of the highest significance carry a designation, namely: World Heritage Site; Scheduled Monument; Protected Wreck Site; Protected Military Remains, Listed Building; Registered Park and Garden; Registered Battlefield; Conservation Area.

10.3.39 Certain non-designated heritage assets can be of a significance equivalent to that of a designated heritage asset and can be treated as such during decision-making. Paragraphs 5.8.4 and 5.8.5 state:

> **"There are heritage assets with archaeological interest that are not currently designated as scheduled monuments, but which are demonstrably of equivalent significance. These include:**
>
> - **those that have yet to be formally assessed for designation;**
> - **those that have been assessed as being designatable but which the Secretary of State has decided not to designate; and**
> - **those that are incapable of being designated by virtue of being outside the scope of the Ancient Monuments and Archaeological Areas Act 1979.**
>
> **The absence of designation for such heritage assets does not indicate lower significance. If the evidence before the IPC indicates to it that a nondesignated heritage asset of the type described in 5.8.4 may be affected by the proposed development then the heritage asset should be considered subject to the same policy considerations as those that apply to designated heritage assets should be considered subject to the same policy considerations as those that apply to designated heritage asset."**

10.3.40 Regarding harm to the significance of a heritage asset, Paragraphs 5.8.14 and 5.8.15 state:

> **"There should be a presumption in favour of the conservation of designated heritage assets and the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be. …Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. Loss affecting any designated heritage asset should require clear and convincing justification. Substantial harm to or loss of a grade II listed building park or garden should be exceptional. Substantial harm to or loss of designated assets of the highest significance, including Scheduled Monuments; registered battlefields; grade I and II* listed buildings; grade I and II* registered parks and gardens; and World Heritage Sites, should be wholly exceptional.**
>
> **Any harmful impact on the significance of a designated heritage asset should be weighed against the public benefit of development, recognising that the greater the harm to the significance of the heritage asset the greater the justification will be needed for any loss. Where the application will lead to substantial harm to or total loss of significance of a designated heritage asset the IPC should refuse consent unless it can be demonstrated that the substantial harm to or loss of**

significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm."

10.3.41 Paragraph 5.8.18 goes on to state:

> **"When considering applications for development affecting the setting of a designated heritage asset, the IPC should treat favourably applications that preserve those elements of the setting that make a positive contribution to, or better reveal the significance of, the asset. When considering applications that do not do this, the IPC should weigh any negative effects against the wider benefits of the application. The greater the negative impact on the significance of the designated heritage asset, the greater the benefits that will be needed to justify approval."**

10.3.42 Regarding archaeological heritage assets, Paragraph 5.8.22 states:

> **"Where the IPC considers there to be a high probability that a development site may include as yet undiscovered heritage assets with archaeological interest, the IPC should consider requirements to ensure that appropriate procedures are in place for the identification and treatment of such assets discovered during construction."**

10.3.43 A draft revised EN-1 (dated September 2021) seeks consistency with the current National Planning Policy Framework (adopted July 2021). It expands the definition of heritage significance to acknowledge the contribution that can be made by setting, and alters the wording of Paragraphs 5.8.4 and 5.8.5 regarding non-designated archaeological heritage assets of demonstrably equivalent significance to Scheduled Monuments.

10.3.44 The draft revised EN-1 also recommends that the applicant prepares proposals that enhance heritage significance and mitigate heritage harm, and considers whether the development effects will be direct, indirect, temporary or permanent. Further, the draft identifies a need to weigh any identified less than substantial harm to the significance of a designated heritage asset againt the public benefits of the proposal.

<u>Local Planning Policy</u>

<u>*Central Lincolnshire Local Plan (adopted 2017)*</u>

10.3.45 Developments within North Kesteven are currently considered against policies set out in the Central Lincolnshire Local Plan adopted in 2017.

10.3.46 Policy LP25, The Historic Environment, states:

> **"Development proposals should protect, conserve and seek opportunities to enhance the historic environment of Central Lincolnshire.**
>
> **In instances where a development proposal would affect the significance of a heritage asset (whether designated or non-designated), including any contribution made by its setting, the applicant will be required to undertake the following, in a manner proportionate to the asset's significance:**

a. describe and assess the significance of the asset, including its setting, to determine its architectural, historical or archaeological interest; and

b. identify the impact of the proposed works on the significance and special character of the asset; and c. provide clear justification for the works, especially if these would harm the significance of the asset or its setting, so that the harm can be weighed against public benefits.

Unless it is explicitly demonstrated that the proposal meets the tests set out in the NPPF, permission will only be granted for development affecting designated or non-designated heritage assets where the impact of the proposal(s) does not harm the significance of the asset and/or its setting.

Development proposals will be supported where they:

d. Protect the significance of designated heritage assets (including their setting) by protecting and enhancing architectural and historic character, historical associations, landscape and townscape features and through consideration of scale, design, materials, siting, layout, mass, use, and views and vistas both from and towards the asset;

e. Promote opportunities to better reveal significance of heritage assets, where possible;

f. Take into account the desirability of sustaining and enhancing non-designated heritage assets and their setting.

The change of use of heritage assets will be supported provided:

g. the proposed use is considered to be the optimum viable use, and is compatible with the fabric, interior, character, appearance and setting of the heritage asset;

h. such a change of use will demonstrably assist in the maintenance or enhancement of the heritage asset; and

i. features essential to the special interest of the individual heritage asset are not lost or altered to facilitate the change of use.

Listed Buildings

Permission to change the use of a Listed Building or to alter or extend such a building will be granted where the local planning authority is satisfied that the proposal is in the interest of the building's preservation and does not involve activities or alterations prejudicial to the special architectural or historic interest of the Listed Building or its setting.

Permission that results in substantial harm to or loss of a Listed Building will only be granted in exceptional or, for grade I and II* Listed Buildings, wholly exceptional circumstances.

Development proposals that affect the setting of a Listed Building will be supported where they preserve or better reveal the significance of the Listed Building.

Conservation Areas

Development within, affecting the setting of, or affecting views into or out of, a Conservation Area should preserve (and enhance or reinforce it, as appropriate) features that contribute positively to the area's character, appearance and setting.

Proposals should:

j. Retain buildings/groups of buildings, existing street patterns, historic building lines and ground surfaces; k. Retain architectural details that contribute to the character and appearance of the area;

l. Where relevant and practical, remove features which are incompatible with the Conservation Area;

m. Retain and reinforce local distinctiveness with reference to height, massing, scale, form, materials and lot widths of the existing built environment;

n. Assess, and mitigate against, any negative impact the proposal might have on the townscape, roofscape, skyline and landscape;

o. Aim to protect trees, or where losses are proposed, demonstrate how such losses are appropriately mitigated against.

Archaeology

Development affecting archaeological remains, whether known or potential, designated or undesignated, should take every practical and reasonable step to protect and, where possible, enhance their significance.

Planning applications for such development should be accompanied by an appropriate and proportionate assessment to understand the potential for and significance of remains, and the impact of development upon them.

If initial assessment does not provide sufficient information, developers will be required to undertake field evaluation in advance of determination of the application. This may include a range of techniques for both intrusive and non-intrusive evaluation, as appropriate to the site.

Wherever possible and appropriate, mitigation strategies should ensure the preservation of archaeological remains in-situ. Where this is either not possible or not desirable, provision must be made for preservation by record according

to an agreed written scheme of investigation submitted by the developer and approved by the planning authority.

Any work undertaken as part of the planning process must be appropriately archived in a way agreed with the local planning authority."

<u>Scoping Criteria</u>

10.3.47 The Cultural Heritage Assessment considers the following potential effects:

- **Construction Phase**: *physical (direct) effects* upon heritage assets within the Proposed Development as a result of demolition or truncation;
- **Construction Phase**: *non-physical (indirect) effects* upon heritage assets within the Proposed Development environs as a result of changes to setting;
- **Operational Phase**: *non-physical (indirect) effects* upon heritage assets within the Proposed Development and its environs as a result of changes to setting;
- **Decommissioning Phase**: *physical (direct) effects* upon heritage assets within the Proposed Development as a result of truncation; and
- **Decommissioning Phase**: *non-physical (indirect) effects* upon heritage assets within the Proposed Development environs as a result of changes to setting.

<u>Limitations to the Assessment</u>

10.3.48 The conclusions presented within this chapter are based upon the baseline conditions (presented below), which are derived in large part from the data held and supplied by the Lincolnshire HER. In establishing the baseline conditions, for the purposes of this chapter, both the accuracy and currency of this data has necessarily been assumed.

10.3.49 The geophysical survey method relies on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Under favourable conditions, it can identify a wide range of features including infilled cut features such as large pits, gullies and ditches, hearths and areas of burning and kilns and brick structures. It is less successful in identifying smaller features such as post-holes and small pits, unenclosed (prehistoric) settlements and graves/burial grounds.

10.3.50 In relation to settings assessment, the inspection of heritage assets identified as potentially susceptible to non-physical impact was undertaken from the Proposed Development and publicly accessible locations. No other privately held land or properties were accessed.

10.4 BASELINE CONDITIONS

<u>Site Description and Context</u>

10.4.1 The Energy Park Site forms part of Heckington Fen. Great Hale and Little Hale Fens lie to the south, and Holland Fen to the north-east.

10.4.2 The bedrock geology of the Energy Park comprises mudstone and siltstone of the West Walton Formation (in the south-western half) and mudstone of the Ampthill Clay Formation (in the north-eastern half). The superficial geology comprises tidal flat deposits of clay and silt.

10.4.3 The upper and midsections of the off-site cable routes for the Proposed Development are characterised by the same bedrock geology as the Energy Park, but the lowermost 2km sections comprises mudstone of the Oxford Clay Formation. The superficial geology is recorded as tidal flat deposits of clay and silt.

Baseline Survey Information

10.4.4 The following baseline focusses primarily on the Energy Park Site and its environs; data gathering and analysis is ongoing for the off-site cable route and grid connection at Bicker Fen Substation.

Prehistoric (pre-43 AD) and Romano-British (43–410 AD)

10.4.5 A focus of Iron Age and Roman settlement and associated activity is indicated by clusters of cropmarks and findspots recorded on land between Sidebar Lane and Sandlees Lane, land to the west of Sandlees Lane, and land south of the junction of Sandlees Lane and the A17, more than 500m west of the Energy Park Site.

10.4.6 Other cropmarks and findspots of probable later prehistoric and Roman date are recorded to the north and east of Swineshead Bridge and around Swineshead, and at Low Grounds, Bicker Fen, north of Donnington, and at Helpringham Fen, in the south-eastern and southern parts of the 2km study area. Some of the cropmarks and findspots at Low Grounds and Bicker Fen lie within and very close to the off-site cable route corridor.

10.4.7 Within the Energy Park Site, Roman pottery sherds, tile fragments and briquetage (a coarse ceramic used to make pans for evaporation of salt from seawater) were collected from three fields located to the north of Rectory Farm by fieldwalking carried out in 1971 before the installation of the North Sea Gas Pipeline.

10.4.8 Geophysical surveys of the Energy Park Site in 2011 (discrete locations) and 2022 (all proposed built-development areas) identified no anomalies unequivocally suggestive of later prehistoric or Roman features. However, linear geophysical trends were identified near the aforementioned briquetage findspots and could be associated. Other magnetic responses suggestive of burning were detected within the eastern part of the Application Site, *c.*1–1.5km west of the findspots, and could derive from salt-making although this is purely conjectural.

Early Medieval (AD 410 – 1066) & Medieval (AD 1066 – 1539)

10.4.9 A spur of high ground at Garwick, located *c.*800m west of the south-western corner of the Energy Park, is believed to be the location of a high-status Middle Anglo-Saxon trading centre of possible Early Anglo-Saxon or even Roman origins. It has yielded one of Lincolnshire's largest recorded assemblages of finds from this period.

10.4.10 The nearby settlements of Heckington, Great Hale, Little Hale, Howell, Steyning (Swineshead), Drayton and Bicker are all recorded in the Domesday Survey of 1086AD. It is likely that all or most of the land of the Energy Park Site comprised salt marsh during the early historic periods. Before drainage engineering in the 17th century onwards, the Energy Park may not have been suitable for agriculture.

Post-medieval (AD 1539 – 1800) & Modern (post-1800)

10.4.11 The linear settlement of East Heckington, strung along the A17 to the south of the Energy Park Site, was in existence by the 18th century. Buildings recorded by the HER include the 19th-century or earlier farmsteads of Poplars Farm, Elm Grange, Home Farm, Rectory Farm, and Rakes Farm (all extant); two 19th-century places of worship (one demolished and the other converted to dwelling); an early-20th century or earlier smithy (demolished); and the early-20th century house and designed landscape of Park House (demolished).

10.4.12 There are numerous 19th-century farmsteads scattered across the 2km study area. Those closest to the Energy Park Site include Sadland Farm *c.*300m to the north-east of the Energy Park Site; Mill Green Farm *c.*600m to the north; Five Willow Wath Farm *c.*650m to the north-west; and Glebe Farm *c.*550m to the west. Six former farmsteads are recorded within the Energy Park Site on historic Ordnance Survey maps.

10.4.13 The earliest available detailed mapping of the Energy Park Site is the 1764 Enclosure Map for Heckington parish. It depicts the western third of the Energy Park Site as divided into many fields allocated to different landowners and tenants. It depicts the central and eastern thirds as unenclosed land.

10.4.14 The First Edition Ordnance Survey of 1887/8 shows two farmsteads located in the north-west of the Energy Park Site, one in the south-west, one in the centre, and three along Six Hundreds Drove in the east; and field barns to the north of Elm Farm and Rectory. It also shows drainage pumps and associated earthworks adjoining the west end of the northern boundary of the Energy Park Site and within the north-eastern corner of the Energy Park Site.

10.4.15 The 2022 geophysical survey identified former mapped field boundaries and former outfarms across the Energy Park Site. Surviving historic buildings within the Energy Park Site, observed during the walkover survey, include the outfarm on the west side of Six Hundreds Drove (which comprises a dilapidated former dwelling and adjacent barns) and a low brick boundary wall along the west side of the track to the west of Elm Grange. These buildings will remain for the lifetime of the Energy Park; there is no intention for them to be demolished as part of the Proposed Development.

10.4.16 The drainage pump to the north-east also survives. It comprises a cast iron scoop wheel and bars of a timber frame on a gritstone mounting block above the brick-walled base and channel. There is no visible trace of the mapped channel and outlying earthwork on the north-west side; they have presumably been infilled and ploughed out.

10.4.17 Historic aerial photographs dated 5th June 1950 show a pentagon-shaped cropmark in the north-eastern quadrant of the Energy Park Site. The cropmark represents a former duck decoy of post-medieval date. Part of this feature was detected by the 2022 geophysical survey; the remainder may have been ploughed out in the decades since the photograph was taken.

Significance of Identified Archaeological Remains

10.4.18 There are no designated archaeological remains, e.g. Scheduled Monuments, located within the Energy Park Site.

10.4.19 Known and potential non-designated built and archaeological remains located within the Energy Park Site comprise:

- Upstanding post-medieval/modern buildings of Six Hundreds Farm;
- Upstanding post-medieval/modern brick boundary wall to the west of Elm Grange;
- Upstanding remains of a post-medieval/modern drainage pump close to Head Dike to the north-east;
- Buried remains of a post-medieval duck decoy to the east;
- Buried remains of former outfarms and field boundaries in various locations, some but not all of which are shown on historic maps;

- Buried remains of a possible enclosure of uncertain origin to the west of centre; and
- Buried remains of a possible enclosure and circular and linear features of uncertain origin to the east.

10.4.20 The upstanding buildings of Six Hundreds Farm, the wall to the west of Elm Grange, and the drainage pump at Head Dike will be retained within the Energy Park once operational.

10.4.21 Based on currently-available information, none of the potential archaeological remains identified by the desk-based assessment and geophysical survey would be considered heritage assets of the highest significance and as such none are anticipated to require preservation *in situ*.

10.4.22 However this can be clarified by undertaking targeted, intrusive archaeological investigations (trial trenching). The scope of work is still to be agreed through ongoing discussions between Pegasus Group and Lincolnshire County Council, North Kesteven District Council and Boston Borough Council.

10.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Direct Development Effects (i.e. truncation of archaeological remains)

Construction

10.5.1 The Proposed Development comprises the construction, operation and decommissioning of a ground mounted solar photovoltaic electricity generation and energy storage facility with associated infrastructure and landscaping (the Energy Park), and the installation of off -site cabling to connect the Energy Park with Bicker Fen Substation.

10.5.2 Ground clearance and preparation, installation of the solar arrays, excavation of cable trenches, substation bases, energy storage areas and drainage runs, provision of access, and planting will have below-ground impacts.

10.5.3 Construction activities would truncate and/or remove the known and potential buried remains of the post-medieval duck decoy, the post-medieval/modern outfarms and former field boundaries, and the undated sub-square and linear features detected by the geophysical survey.

10.5.4 Given their finite nature, the direct development effects upon the known and potential buried archaeological resource would be direct, long-term, permanent and adverse, but not significant.

Operation

10.5.5 The operation phase of the Proposed Development will have no direct physical effects on the archaeological resource over and above that already identified at construction.

Decommissioning

10.5.6 The decommissioning phase of the Proposed Development will have no direct physical effects on the archaeological resource.

Indirect Development Effects (i.e. as a result of changes to setting)

Construction

10.5.7 The construction of the Proposed Development will, through increase in traffic and noise etc., result in temporary change within the setting of certain heritage assets and this could cause some level of harm to their significance by affecting the experience of the assets.

10.5.8 The Scheduled settlement site 600m east of Holme House (c.550m west of the Energy Park) and the non-Listed buildings of Mill Green Farmhouse (c.600m north of the Energy Park) and Primitive Methodist Chapel on Sidebar Lane (c.500m west of the Energy Park) may be particularly sensitive due to their proximity to the Energy Park.

Operation

10.5.9 The Proposed Development may, for the operational lifespan of the project, result in change within the setting of certain heritage assets, and this could cause some level of harm to their significance.

10.5.10 Ongoing setting assessment indicates that the following heritage assets may be particularly sensitive to the operation of the Proposed Development: the Grade I Listed Kyme Tower at South Kyme, the non-Listed Primitive Methodist Chapel on Sidebar Lane, and the non-Listed Mill Green Farmhouse. Until this assessment is completed it is not possible to determine if the effects will be significant.

10.5.11 Despite partial glimpsed views from and across the Energy Park of the steeples of churches at South Kyme, Great Hale, Heckington, Swineshead, Ewerby and Asgarby, these assets are not considered particularly sensitive to the Proposed Development. Similar such views are afforded from many other locations in the wider landscape due to the flat and low-lying topography. There is no evidence to suggest that the assets were intended to be viewed specifically from the Energy Park Site.

Decommissioning

10.5.12 The decommissioning phase of the Proposed Development will result in permanent change within the setting of certain heritage assets. Depending on the nature of the proposals, this could result in either a level of harm or benefit to their significance.

10.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

10.6.1 The upstanding buildings of Six Hundreds Farm, the wall to the west of Elm Grange, and the drainage pump at Head Dike will be retained within the development layout. During construction, these assets will be fenced off and the construction team will be advised to avoid these assets whilst on the Energy Park Site.

10.6.2 Mitigation by design may also be required to screen visibility of the Energy Park in designed views from and towards certain heritage assets, namely, the non-Listed Mill Green Farmhouse and the non-Listed Primitive Methodist Chapel on Sidebar Lane. Screening options will be considered further as the design of the Energy Park progresses.

Additional Mitigation

10.6.3 Depending on the findings of forthcoming archaeological investigations, further archaeological work may be required pre-commencement to record certain archaeological remains prior to their truncation and/or destruction through construction of the Proposed Development.

Enhancements

10.6.4 No enhancement(s) are currently anticipated to result from the Proposed Development in respect of cultural heritage.

10.7 CUMULATIVE AND IN-COMBINATION EFFECTS

10.7.1 Consideration has been given to the following large-scale NSIP solar schemes elsewhere in Lincolnshire:

- Cottam Solar Project (PINS Reference: EN010133);
- Gate Burton Energy Park (PINS Reference: EN010131);
- West Burton Solar Project (PINS Reference: EN010132); and
- Mallard Pass Solar Farm (PINS Reference: EN010127).

10.7.2 Consideration has been given to the following other schemes:

- Land at Ewerby Thorpe (14/1034/EIASCR);
- Land South of Gorse Lane, Silk Willoughby (19/0060/FUL);
- Land at Little Hale Fen (21/1337/EIASCR);
- Land to the North of White Cross Lane (19/0863/FUL); and
- Vicarage Road, Bicker Fen (B/13/0424).

10.7.3 At this stage of assessment, no cumulative effects are anticipated to result from the Proposed Development in respect of cultural heritage.

10.7.4 At this stage of assessment, no in-combination effects are anticipated to result from the Proposed Development in respect of cultural heritage.

10.8 SUMMARY

Introduction

10.8.1 This chapter has considered potential effects upon the significance of cultural heritage receptors. Buried archaeological remains, earthworks, buildings / structures, and all other aspects of the historic environment have all been considered.

Baseline Conditions

10.8.2 No designated heritage assets are located within the land being considered for the Proposed Development.

10.8.3 Known and potential non-designated heritage assets located within the Energy Park Site comprise the upstanding remains of a derelict outfarm, a boundary wall, and a drainage pump; and the buried remains of a former duck decoy, former outfarms and field boundaries, and rectilinear and linear ditched features of uncertain origin.

10.8.4 There is currently nothing to suggest that these buried remains are or would be of the highest heritage significance in and of themselves, but the need for and timing and scope of further archaeological investigations to clarify this will be negotiated and agreed through forthcoming discussions between Pegasus Group and Lincolnshire County Council, North Kesteven District Council and Boston Borough Council.

10.8.5 There are many Scheduled Monuments, Listed Buildings, Conservation Areas and non-designated heritage assets located within a minimum 5km-radius of the Energy Park Site. Assessment work to date has indicated that the Grade I Listed Kyme Tower at South Kyme, the non-Listed Primitive Methodist Chapel on Sidebar Lane, and the non-Listed Mill Green Farmhouse may be particularly sensitive to the Proposed Development through change to their setting.

Likely Significant Effects

10.8.6 No significant effects have been identified through the assessment work that undertaken to date. This includes direct effects as a result of truncation or destruction of buried archaeological remains, and indirect effects as a result of changes to setting.

Mitigation

10.8.7 At this stage, no mitigation through design is considered necessary for archaeology but planting may be necessary to screen the Energy Park in views from selected heritage assets.

10.8.8 Mitigation may also be required pre-commencement to counter the impacts of construction activities upon the known and potential buried archaeological resource of the Energy Park Site. This may also be required along the off-site cable route, but the geophysical survey of this route is proposed after the 2022 harvest. Once this data has been gathered the need for mitigation can be assessed further.

Conclusion

10.8.9 This chapter has identified no significant effects in respect of cultural heritage assets (above and below ground) that would arise from a development of the nature and on the scale proposed.

10.8.10 **Table 10.4** provides a summary of effects, mitigation and residual effects.

Table 10.4: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Construction								
Buried remains of possible enclosures and linear features	Truncation / loss through ground preparation, piling, excavation of cable trenches, and groundworks for access and landscaping	Permanent Direct	Non-designated heritage asset of low to moderate significance	Harm to non-designated heritage asset	Local to Regional	Not significant	Mitigation by CDO requirement: Archaeological recording	None
Buried remains of a post-medieval duck decoy	Truncation / loss through ground preparation, piling, excavation of cable trenches, and groundworks for access and landscaping	Permanent Direct	Non-designated heritage asset of low significance	Harm to non-designated heritage asset	Local	Not significant	Mitigation by CDO requirement: Archaeological recording	None
Buried remains of former outfarms	Truncation / loss through ground preparation, piling, excavation of cable trenches, and groundworks for access and landscaping	Permanent Direct	Non-designated heritage asset of low significance	Harm to non-designated heritage asset	Local	Not significant	Mitigation by CDO requirement: Archaeological recording	None
Buried remains of former field boundaries	Truncation / loss through ground preparation, piling, excavation	Permanent Direct	Non-designated heritage	Harm to non-designated	Local	Not significant	Mitigation by CDO requirement: Archaeological recording	None

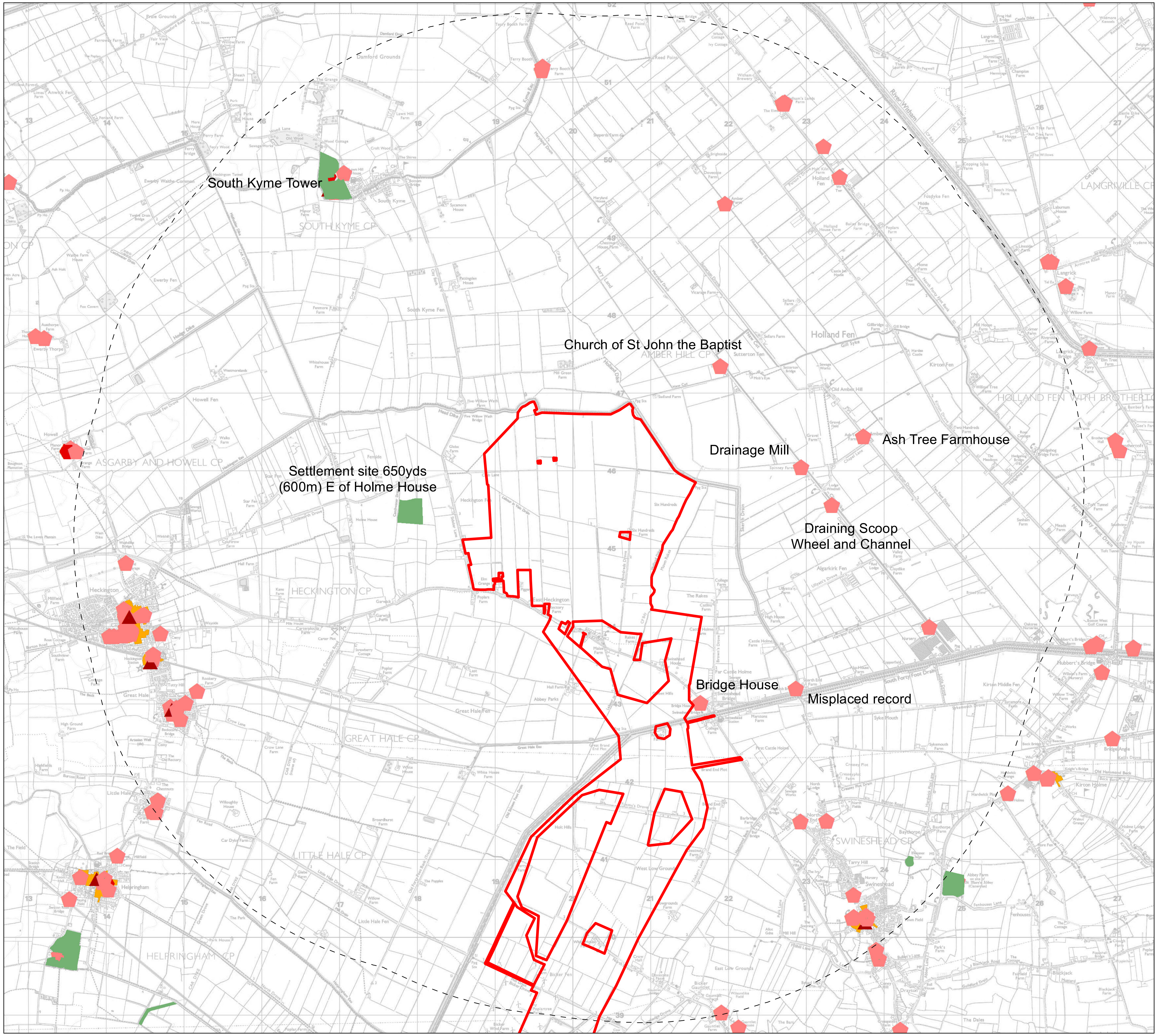
Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
	of cable trenches, and groundworks for access and landscaping		asset of low significance	heritage asset				
Operation								
Grade I Listed South Kyme Tower	Change to setting, specifically, the character of a component of designed views	Permanent Indirect	Designated heritage asset of the highest significance	Harm to designated heritage asset	National	Not significant	Mitigation by design: Planting to provide screening of the Proposed Development	Less than substantial harm
Non-Listed Mill Green Farmhouse	Change to setting, specifically, the character of designed views	Permanent Indirect	Non-designated heritage asset	Harm to non-designated heritage asset	Local	Not significant	Mitigation by design: Planting to provide screening of the Proposed Development	Less than substantial harm
Non-Listed Primitive Methodist Chapel on Sidebar Lane	Change to setting, specifically, the character of the landscape in which the asset is located and experienced	Permanent Indirect	Non-designated heritage asset	Harm to non-designated heritage asset	Local	Not significant	Mitigation by design: Planting to provide screening of the Proposed Development	Less than substantial harm

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 10.1- Designated Heritage Assets

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



0 — 5 km

N

KEY

Proposed Development

5km from Energy Park

Scheduled Monuments

Conservation Areas

Listed Buildings

Grade

I

II

II*

NB Heckington and Swineshead Conservation Areas are concealed by the overlying Listed Buildings layer.

Figure 10.1: Designated Heritage Assets

Heckington Fen Solar

Client:	Ecotricity		
DRWG No:	**P20-2370**	Sheet No: -	REV: -
Drawn by:	EP	Approved by:	GS
Date:	27/05/2022		
Scale:	1:50,000 @ A3		

Pegasus Group

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 11: Socio- Economic

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

11 SOCIO-ECONOMIC

11.1 EXECUTIVE SUMMARY

11.1.1 An assessment of the socio-economic effects in respect of the Proposed Development is presented.

11.1.2 Socio-economic baseline conditions are identified considering all local authorities directly affected by the Proposed Development as well as comparator areas, namely North Kesteven, Boston, Lincolnshire County, East Midlands and England. Conditions are identified in respect of a range of topics including, but not limited to, population growth and projections, deprivation, employment, claimant count and commuting. In summary, there has been relatively higher population growth in North Kesteven and Boston compared to all other comparator areas between 2011 and 2020. North Kesteven has seen a higher employment growth and lower claimant count than Boston and all comparator areas. Conversely, Boston has seen no employment growth and a higher claimant count than all comparator areas.

11.1.3 Effects of all phases of development are considered, including the construction, operational and decommissioning phases. Effects relate to employment, economic contribution, housing, and business rates revenue, as relevant to each development phase. Overall, the socio-economic effects of each development phase are considered to be beneficial. No mitigation or enhancement measures are proposed. Continued efforts to address wider benefits for the community will be undertaken separately and outside of the DCO process.

11.2 INTRODUCTION

11.2.1 This chapter determines the baseline socio-economic conditions and considers the likely socio-economic effects of the Proposed Development.

11.2.2 This assessment is made by examining the potential effects on the population arising from the Proposed Development and assessing the impact this could have on relevant services and facilities in the economy. It identifies the socio-economic baseline in relation to key economic and social variables. It then examines the potential effects that could occur, both direct and indirect, resulting from the Proposed Development during construction (short term effects), operation (long term effects), and decommissioning (short term effects).

11.3 ASSESSMENT APPROACH

Methodology

11.3.1 There is no specific guidance available which establishes a methodology for undertaking an Environmental Impact Assessment (EIA) of the socio-economic effects of a Proposed Development. The approach that has been adopted for this assessment is based on professional experience and best practice[1], and in consideration of relevant policy requirements at the national, regional and local scale.

[1] *Draft Overarching National Policy Statement for Energy (EN-1).* Department for Business, Energy & Industrial Strategy, September 2021.

11.3.2 The assessment specifically includes the following:

- Identification of the socio-economic baseline in respect of each of the key socio-economic issues identified, focusing on the characteristics of the economy and labour force. These characteristics have been used as a measure for assessing future changes associated with or resulting from the Proposed Development.
- Analysis of the full range of socio-economic effects, both direct and indirect, arising from the Proposed Development, during the construction (short term effects), operation (long term effects), and decommissioning (short term effects).

11.3.3 The baseline information has been collated with reference to the following:

- Overarching National Policy Statement for Energy (EN-1) 2011 and 2021 Draft.
- National Policy Statement for Renewable Energy (EN-3) 2011 and 2021 Draft.
- The National Planning Policy Framework (NPPF).
- Office for National Statistics (ONS) data (various outputs as individually referenced within this chapter).
- Ministry of Housing, Communities & Local Government (for deprivation data).
- The Government's Levelling Up White Paper[2].
- The adopted Central Lincolnshire Local Plan[3].
- The Greater Lincolnshire Local Enterprise Partnership[4].
- Information obtained from the client.

11.3.4 It is noted that Census 2022 data is due to be released (in part at least) in May 2022. Relevant published Census 2022 data has not been available for this PEIR but will be referenced and included in the baseline of this Socio-Economic ES chapter when available and before final submission of this DCO application.

Assessment of Significance

11.3.5 The first step in the assessment is to identify the sensitivity of the receptors. In socio-economic assessments, receptors (for example, the labour market) are not sensitive to changing environmental conditions in the same way as many environmental receptors are. To address this, the assessment draws on a combination of measurable indicators and a consideration of the importance of the receptor in policy terms to gauge the receptor's sensitivity. For example, the number of jobs in the area may increase as new developments are completed and occupied by businesses. This is considered alongside the weight attached to these issues in local policy. **Table 11.1** shows the sensitivity criteria followed in this assessment.

Table 11.1: Sensitivity Criteria

Sensitivity	Evidence for Sensitivity Assessment
High	

[2] *Levelling Up*. HM Government (2022).

[3] *The Central Lincolnshire Local Plan* (April 2017).

[4] *Greater Lincolnshire Local Enterprise Partnership. Accessed 3 May 2022. Available at:* Home | Greater Lincolnshire LEP.

Sensitivity	Evidence for Sensitivity Assessment
	Evidence of direct and significant socio-economic challenges relating to receptor. Accorded a high priority in local, regional or national economic regeneration policy.
Medium	Some evidence of socio-economic challenges linked to receptor, which may be indirect. Change relating to receptor has medium priority in local, regional and national economic and regeneration policy.
Low	Little evidence of socio-economic challenges relating to receptor. Receptor is accorded a low priority in local, regional and national economic and regeneration policy.
Negligible	No socio-economic issues relating to receptor. Receptor is not considered a priority in local, regional and national economic development and regeneration policy.

11.3.6 The magnitude of change upon each receptor has been determined by considering the predicted deviation from baseline conditions, both before and, if required, after mitigation. The criteria used for the assessment of magnitude of change, which can be either positive (beneficial) or negative (adverse) are shown in **Table 11.2**.

Table 11.2: Magnitude of Change Criteria

Magnitude of Impact	Description / Criteria
High	Proposed Development would cause a large change to existing socio-economic conditions in terms of absolute and/or percentage change.
Medium	Proposed Development would cause a moderate change to existing socio-economic conditions in terms of absolute or percentage change.
Low	Proposed Development would cause a minor change to existing socio-economic conditions in terms of absolute and or percentage change.
Negligible	No discernible change in baseline socio-economic conditions.

11.3.7 In reporting the effects of significance resulting from the Proposed Development, at construction and operational stages, the assessment contextualises both the sensitivity of the receptor and the magnitude of change. The method uses the matrix shown in **Table 11.3**.

Table 11.3: Significance Matrix

Magnitude of Change	Sensitivity of Receptor				
		High	**Medium**	**Low**	**Negligible**
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Legislative and Policy Framework

National Policy Statements

Overarching National Policy Statement for Energy (EN-1)

11.3.8 The Overarching National Policy Statement (NPS) for Energy (EN-1)[5] notes that where a project is likely to have socio-economic impacts at local or regional levels, an assessment of such impacts should be undertaken. The existing socio-economic conditions in the areas surrounding the Proposed Development should be described as well as how the Proposed Development's socio-economic impacts correlate with relevant local planning policies. EN-1 stipulated the importance of evidence-based socio-economic assessment.

11.3.9 In making their decision, EN-1 noted that the Infrastructure Planning Commission (IPC) (now superseded by the Secretary of State (SoS) should consider any relevant positive provisions and legacy benefits made by the Applicant in relation to socio-economics.

11.3.10 An update to the EN-1 (2011) was published in September 2021[6] (2021 Draft EN-1) and is currently in consultation. Key updates in the 2021 Draft EN-1 compared to the 2011 publication relate to range of impacts to be considered and suggested specific mitigation relating to potential impacts during each of the phases of development.

11.3.11 Firstly, 2021 Draft EN-1 makes reference to an extended list of potential impacts to consider (as relevant) including (but not limited to) creation of jobs and training opportunities, contribution to low-carbon industries, provision of additional local services and improvements to local infrastructure, any indirect beneficial impacts for the region, effects on tourism, impact of a changing influx of workers, and cumulative effects.

11.3.12 Secondly, the Draft EN-1 (2021) makes reference to the need to consider development of accommodation strategies, if appropriate, to address any potential impacts during the construction and decommissioning phases. In addition, it also refers to the potential for the SoS to require the approval of an employment and skills plan detailing arrangements to promote local employment and skills development opportunities.

National Policy Statement for Renewable Energy (EN-3)

11.3.13 Socio-economic impacts were referenced only in respect of onshore wind and biomass power in the National Policy Statement (NPS) for Renewable Energy (EN-3)

[5] *Overarching National Policy Statement for Energy (EN-1),* Department of Energy and Climate Change, July 2011.

[6] *Draft Overarching National Policy Statement for Energy (EN-1),* Department for Business, Energy & Industrial Strategy, September 2021.

published in July 2011[7]. An update to the EN-3 (2011) was published in September 2021[8] (Draft 2021 EN-3) and is currently in consultation. In this latest draft, consideration of solar and potential for associated socio-economic effects is referenced in respect of the potential for socio-economic benefits of the site infrastructure being retained after the operational life of solar photovoltaic generation.

National Planning Policy Framework

11.3.14 The most recent NPPF[9] was published in July 2021. A key focus of the framework is to achieve sustainable development which requires three interdependent objectives that need to be pursued in a mutually supportive way:

- ***Economic Objective:*** Ensure that the economy is strong, responsive and competitive to support growth.
- ***Social Objective:*** Ensure there is a sufficient supply and range of homes available to meet present and future demand.
- ***Environmental Objective:*** Ensure the natural, built and historic environment is protected including mitigating and adapting to climate change

11.3.15 Other relevant points to note from the revised NPPF include:

- Paragraph 60 states that the government have set the objective of significantly increasing the supply of homes, to achieve this there needs to be sufficient land available where it is needed, specific housing requirements need to be met and land with permission needs to be developed without unnecessary delay.
- Paragraph 73 of the NPPF states that to achieve the supply of a large number of homes it is often best done through planning for larger scale development, such as settlements or significant extensions to existing villages and towns, provided they are well located and designed, and supported by the necessary infrastructure.
- The NPPF places significant weight on the need to support economic growth and productivity with chapter 6 setting out the objective of building a strong and competitive economy. Paragraph 82 states that the planning policies should:
    - Set out a clear economic vision and strategy which positively and proactively encourages sustainable economic growth, having regard to Local Industrial Strategies and other local policies for economic development and regeneration.
    - Set criteria, or identify strategic sites, for local and inward investment to match the strategy and to meet anticipated needs over the plan period.
    - Seek to address potential barriers to investment, such as inadequate infrastructure, services or housing, or a poor environment.
    - Be flexible enough to accommodate needs not anticipated in the plan, allow for new and flexible working practices (such as live-work accommodation), and to enable a rapid response to changes in economic circumstances.
- Paragraph 83 finds that alongside this, planning policies and decisions should recognise and address the specific locational requirements of different sectors.

[7] National Policy Statement for Renewable Energy (EN-3), Department of Energy and Climate Change, July 2011.

[8] Draft National Policy Statement for Renewable Energy (EN-3, Department for Business, Energy & Industrial Strategy, September 2021.

[9] *National Planning Policy Framework*. HM Government, July 2021.

Levelling Up White Paper

11.3.16 The strategy presented by the UK Government's **Levelling Up White Paper**[10] is underpinned by the fact that, although the UK as a whole is successful when compared to other countries globally, there is great disparity in respect of the shared value of that success within the UK itself and realising each communities' potential. As such, the White Paper sets out a programme to 'level up' the UK to transform places and boost local growth, including through, but not limited to, encouraging strong innovation, private sector investment, climate conducive development, and improvement in workers' skill and transport systems. The key missions set by the White Paper are, in summary:

- Boost in productivity, wages, jobs and living standards by investment and growth in the private sector.
- Provide opportunities and improvement in public services.
- Contribute to and encourage a sense of community, local pride and belonging.
- Empowerment of local leaders and communities.

11.3.17 It is imperative that the needs of an area are reflected in the proposals made, so that the benefits brought by development will appropriately contribute to, and ultimately result in, true levelling up of the economy, the environment, and society within the UK.

Central Lincolnshire Local Plan 2012-36

11.3.18 The **Central Lincolnshire Local Plan 2012-2036**[11] (adopted April 2017) has been developed for the combined areas of the City of Lincoln, North Kesteven and West Lindsey. It outlines the vision of the districts and the aims and objectives they to enable development in Central Lincolnshire by 2036.

11.3.19 The Local Plan has the vision that:

> **"Central Lincolnshire will be a location of positive growth. Its city, market towns and many of its villages will see new homes built, new jobs created and improved infrastructure[12]."**
>
> **"Echoing the vision of the Greater Lincolnshire Local Enterprise Partnership, the economy of Central Lincolnshire will be diverse and resilient, and continue to make an effective contribution to the UK economy. The local economy will provide real opportunities for people to live, work, invest and visit[13]."**

11.3.20 In order to achieve this vision in Central Lincolnshire, the Plan sets out a series of objectives including the creation of jobs and employment opportunities for everyone and to ensure the local economy is diverse and stable. A key objective looks at the effects of climate change and energy. To minimise the effects of climate change, Central Lincolnshire aim to further develop to areas renewable energy resources to enable them to reduce their dependence on fossil fuels and to minimize greenhouse gas emissions.

11.3.21 Section five of the Local Plan focuses on how a quality Central Lincolnshire can be achieved. This looks at how Central Lincolnshire can have a positive approach to the

[10] *Levelling Up*: HM Government (2022).

[11] *The Central Lincolnshire Local Plan* (April 2017).

[12] *Ibid,* page *4.*

[13] *Ibid, page 4.*

environment and how to achieve quality places that are attractive and sustainable, whilst supporting the quality of life, community wellbeing and local character.

11.3.22 A main focus of ensuring this is focusing on climate change and promoting low carbon living through reducing the amount of carbon that the population of Central Lincolnshire emit in their daily lives. This can be done through a new of means outlined below:

- Reducing demand for energy;
- Improving resource efficiency (sustainable design and construction);
- Increasing the amount of energy, heat and power generation from decentralised, renewable and low carbon sources (rather than from non-renewable sources); and
- Carbon offsetting.

<u>Greater Lincolnshire Local Enterprise Partnership Strategic Economic Plan</u>

11.3.23 The Greater Lincolnshire Local Enterprise Partnership (LEP) developed their Strategic Economic Plan[14] (SEP) in 2014, with a refresh in 2016 to ensure it included the continuing priorities for growth and investment in the LEP area. The programme in the SEP is nearing its completion date and will terminate in 2022.

11.3.24 The SEP outlines five strategies and priorities to enable economic growth and development within the LEP. These are:

- Greater Lincolnshire's important sectors.
- Greater Lincolnshire's emerging sectors.
- Growing Lincolnshire's Businesses.
- A location for investors.
- Greater Lincolnshire's homes and communities.

11.3.25 One of the key priorities for growth within the LEP is driving productivity in key economic sectors such as the low carbon economy. Some of the main priorities for the sector are outlined below.

- In an effort to drive down construction and operational costs, there needs to be increased investment in research and development of renewable energy technologies.
- Increase the availability in training, apprenticeships and employment opportunities within the renewable energy sector by working with local colleges, university and private training providers, as well as other sectors such as manufacturing and energy.
- The LEP want to explore the potential opportunities in new renewable technologies, whilst protecting and maintaining the environment.

<u>Scoping Criteria</u>

11.3.26 PINS issued a Scoping Opinion on 17 February 2022. A summary of the comments raised in respect of Socio-Economics is presented in Table 11.4, including a note as to action taken to address each item.

[14] *Strategic Economic Plan 2014 – 2030*: Greater Lincolnshire Local Enterprise Partnership, 2014.

Table 11.4: Summary of Scoping Consultation Relevant to Socio-Economics

Statutory Consultee	Issue	Action
PINS	New Census data is due to be published in May 2022. This should be used to inform the baseline data and the ES assessment.	Data not published in advance of date for provision of draft PEIRs therefore not yet included in the socio-economic baseline. Baseline will be updated, where applicable, to account for Census 2021 publication prior to final submission. Note included in PEIR to this effect.
	The Inspectorate agrees that it is unlikely that significant climate change effects on socio-economics and human health would arise as a result of the Proposed Development and this matter can be scoped out of the assessment at this stage.	Noted. No detail in respect of interrelation between climate change effects and socio-economics included in this ES chapter.
North Kesteven District Council	Some employment-generating impact (i.e. maintenance/upkeep) is inferred through the reference to the proposed orchard which would be accessed via agreement with the Parish Council for certain community groups. However, there is no reference in the proposed scope to any socio-economic benefit enduring from continued agricultural use of part or all of the site. Paragraphs 13.15 and 16.8 state that sheep will be grazed within the site thus enabling some continuance of agricultural activity. The applicant should therefore attempt to quantify whether and how there are socio-economic benefits stemming from a change from predominantly arable agricultural use of the site pre-development to pastoral use post-development.	Further detail in respect of number of existing on-site jobs (linked to agriculture and indeed any other existing jobs being sought). This information will be used and worked into the final impact assessment.
	We suggest under section 16 below that the applicant should also identify a mechanism by which a change in agricultural activity (and ergo any associated socio-economic effect) can be secured through the DCO process	It is understood that this issue is a point of discussion between the Applicant and legal representatives at this present time. It is proposed that the output of these discussions will be worked into this assessment, for example, as a stated mitigation measure.
	Paragraph 11.5 notes in connection with construction activities that 'the scale and spatial distribution of these direct	At this present time, published guidance in respect of assessment of economic effects of a development scheme have

Statutory Consultee	Issue	Action
	impacts will depend on the locations of the companies carrying out the activities and where they source their labour from'. An established way of calculating the extra value generated by local spend on contractors and services would be by using LM3 multipliers which the applicant might wish to consider depending on the certainty of construction contracts etc at this stage. The multiplier can be found at https://www.lm3online.com/.	been used to underpin the initial findings of the impact assessment in this PEIR. Given the fact that much of the components of solar farms are brought in from elsewhere local spend are unlikely to be as high as other forms of development, for example, residential development. Therefore, we have used standard guidance recommended by Government in respect of assessing the additionality effects of the scheme.
UK Health Security Agency	Population and Human health assessment: It is noted that population and human health will be considered within existing chapters and not form a separate chapter within the ES. Given the current knowledge of the scheme and potential impacts this appears to be a proportionate approach. This should be kept under review as more information becomes available and a separate population and human health chapter may be justified as the assessments develop.	Noted.
	An approach to the identification of vulnerable populations has not been provided. The impacts on health and wellbeing and health inequalities of the scheme may have particular effects on vulnerable or disadvantaged populations, including those that fall within the list of protected characteristics. The identification of vulnerable populations and sensitive populations should be considered. The proposed educational facility has been noted in the scoping report and further details are required to assess any temporal overlap during the construction of the solar farm, particularly if the school will be operational at the time of construction. Baseline health data should be provided, which is adequate to identify any	Linked to above. Noted, but no changes made to the scope and content of this Socio-Economic ES chapter in respect of vulnerable populations or protected characteristics. The education facility being constructed at Elm Grange is likely to be used by 60-80 students, aged 11-16. The school has a STEM focus and works on career-based goals for students. Further information on expected jobs associated with the operation of the Proposed Development is presented.

Statutory Consultee	Issue	Action
	local sensitivity or specific vulnerable populations. The identification of vulnerable populations should be based on the list provided by the Welsh Health Impact Assessment Support Unit and the International Association of Impact Assessment (IAIA). Further details regarding the potential impact on the special educational needs school should be identified for the construction phase of the solar farm.	
	Housing affordability and availability / Socio-economic assessment: The scoping report does not identify the projected numbers of construction workers required for the scheme. The presence of significant numbers of workers could foreseeably have an impact on the local availability of affordable housing, particularly that of short-term tenancies and affordable homes for certain communities. The cumulative impact assessment will need to consider this across the wider study area but also identify the potential for any local (ward level) effects, where there could be knock-on effects on access to accommodation for residents with the least capacity to respond to change (for example, where there may be an overlap between construction workers seeking accommodation in the private rented sector, and people in receipt of housing benefit / low paid employment seeking the same lower-cost accommodation). It should be noted the Housing Needs Assessment for Central Lincolnshire (2020) identifies the private rented sector plays a particularly key role (between 26%-29%) in accommodating those in lower paid roles, such as customer services, caring and leisure service occupations. There are a number of renewable energy schemes proposed for the	Consideration of potential impact on housing during the construction phase addressed in the impact assessment.

Statutory Consultee	Issue	Action
	wider region increasing the potential for non-home-based construction workers to be seeking accommodation. The peak numbers of construction workers and non-home-based workers should be established and a proportionate assessment undertaken on the impacts for housing availability and affordability and impacts on any local services. Any cumulative impact assessment should consider the impact on demand for housing by construction workers and the likely numbers of non-home based workers required across all schemes.	
Lincolnshire County Council	The ES should consider the cumulative economic effect of other schemes including the other NSIP solar farms which are being proposed in the County with consideration to loss of agricultural land and crop production.	Further detail in respect of number of existing on-site jobs (linked to agriculture and indeed any other existing jobs being sought). This information will be used and worked into the final impact assessment.

11.3.27 Informed by the Scoping process undertaken to date, the socio-economic assessment considers the following potential effects:

- **Construction Phase**
  - Employment.
  - Contribution to economic output.
  - Housing.
- **Operational Phase**
  - Employment.
  - Contribution to economic output.
  - Business rates revenue.
- **Decommissioning Phase**
  - Employment.
  - Contribution to economic output.
  - Housing.

Extent of Study Area

11.3.28 The assessment primarily focuses on the effects in the local authority areas of North Kesteven, Boston Borough and Lincolnshire County, and where appropriate, benchmark data for the East Midlands region and Great Britain are also provided.

Limitations to Assessment

11.3.29 Baseline information is derived from the latest available statistics, however there is often a time-lag associated with the publication of this data.

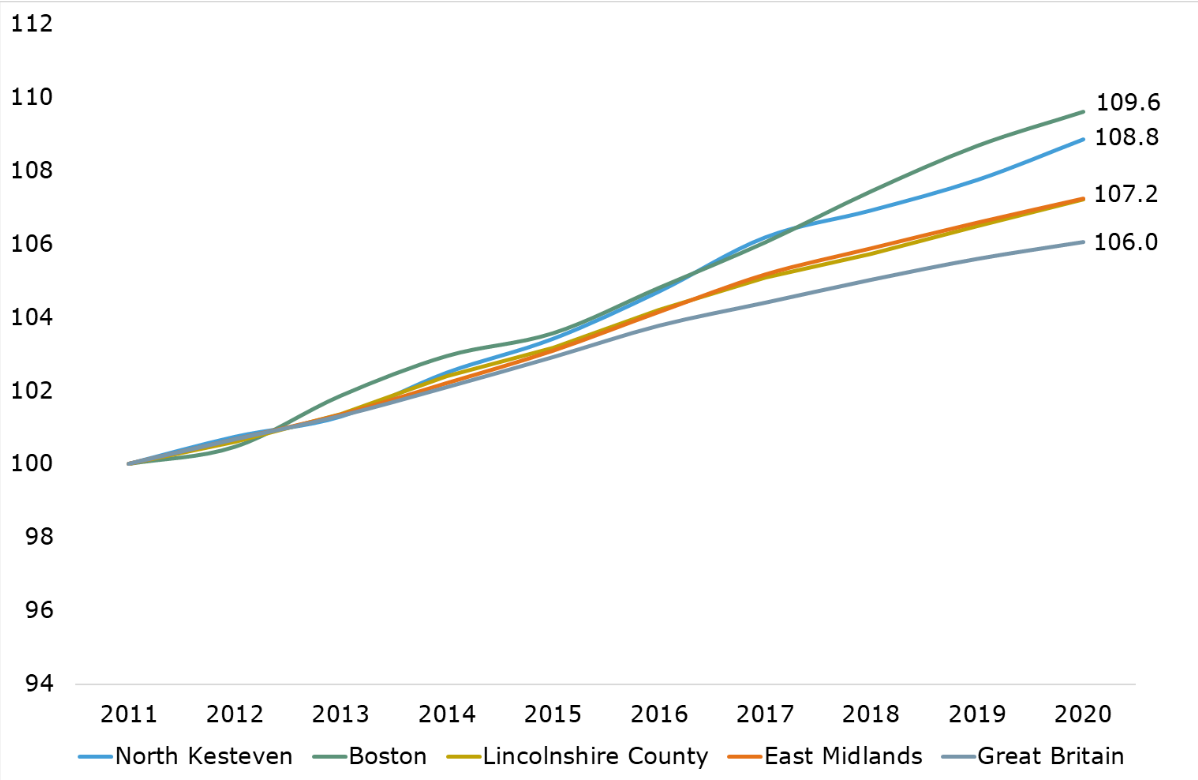
11.3.30 It is acknowledged that there are three elements in terms of what is to be constructed as part of this Proposed Development: the Energy Park and the Off-site cable route and above ground works at the National Grid Bicker Fen Substation. In respect of Socio-Economics, the construction effects have been presented as a combined effect due to detail in terms of the estimated construction costs being available for the whole construction works rather than for each part of construction at this time.

11.4 BASELINE CONDITIONS

Population

11.4.1 Data from the 2020 ONS mid-year population estimates show the total population of North Kesteven is around 118,100 and the population of Boston is around 70,800. Figure 11.1 presents population change between 2011 and 2020. Over this timeframe, North Kesteven's population increased by 8.8% – equating to 9,600 more people, whilst the population growth seen in Boston was relatively higher at 9.6% (6,200). The corresponding population increases for Lincolnshire County and the East Midlands were both 7.2% and the growth in Great Britain over the same period was 6%.

Figure 11.1: Population Change, 2011-20



Source: ONS, Mid-Year Population Estimates

11.4.2 Data on population change by age in North Kesteven show that from 2011 to 2020, the young dependant population group (aged 0-15) increased by around 1,400 (7.3%), the number of economically active people (16-64) grew by 3,000 (4.5%) and people aged 65+ increased by approximately 5,200 (a rise of 22.9% - see Table 11.5). Table 11.6 shows that in Boston the fastest growing age group between 2011 and 2020 were those aged 0-15, with an increase of 20.2% (2,300). In the same time period, Boston saw a growth of 14.7% (1,900) in those aged 65+ and an increase of 4.7% (1,900) in those aged 16-64. All three age groups experienced growth over the same timeframe in Lincolnshire County, the East Midlands and Great Britain, however it was the 65+ cohort that grew the fastest in all areas –by 22.2% in Lincolnshire County, 22.5% in the East Midlands and 19.6% in Great Britain.

Table 11.5: North Kesteven Population Change by Age, 2011-20

	2011	2020	Absolute Change	% Change
0-15	19,100	20,500	1,400	7.3%
16-64	66,700	69,700	3,000	4.5%
65+	22,700	27,900	5,200	22.9%
Total	**108,500**	**118,100**	**9,600**	**8.8%**

Source: ONS, Mid-Year Population Estimates

Table 11.6: Boston Population Change by Age, 2011-20

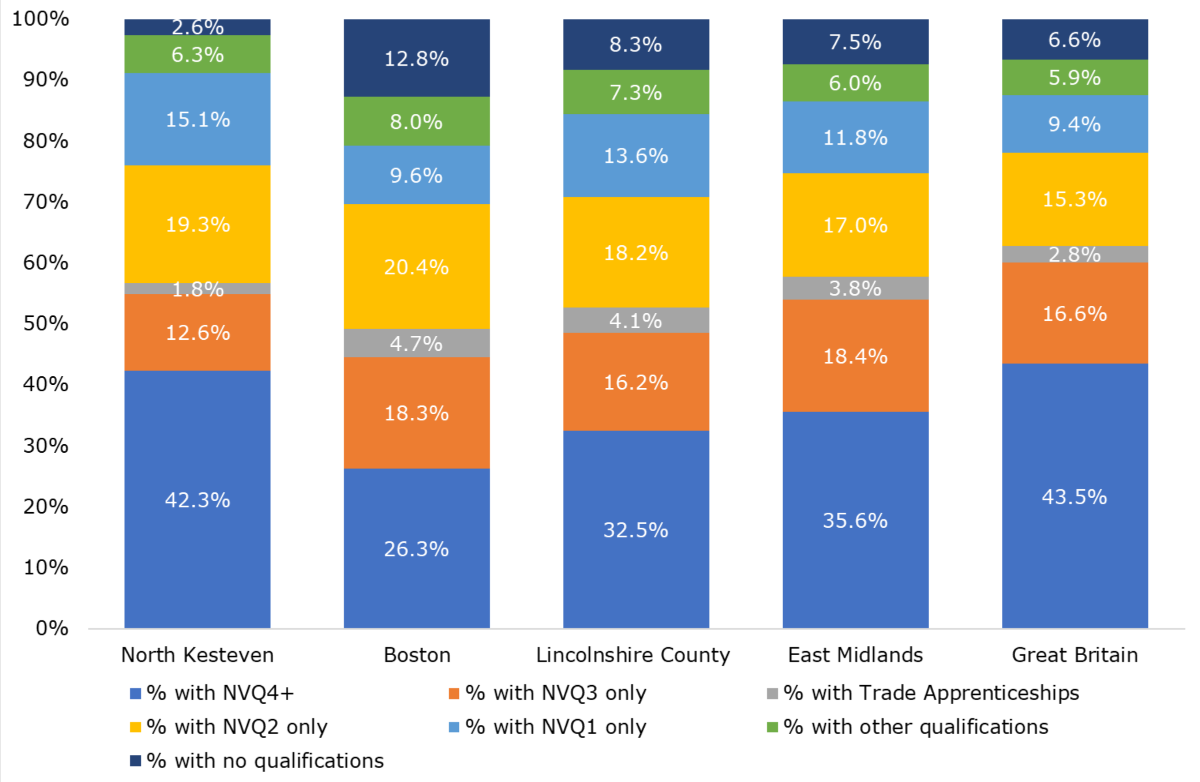
	2011	2020	Absolute Change	% Change
0-15	11,400	13,700	2,300	20.2%
16-64	40,400	42,300	1,900	4.7%
65+	12,900	14,800	1,900	14.7%
Total	**64,600**	**70,800**	**6,200**	**9.6%**

Source: ONS, Mid-Year Population Estimates

Skills

11.4.3 In 2021, 42.3% of working age residents (16-64) in North Kesteven had a degree level qualification or higher (NQF4+); 12.6% had NQF3 only, which equates to 2 A Levels and 4 AS Levels; and 19.3% had NQF2 only (5+ GCSEs or equivalent). Around 2.6% of the area's population had no qualifications. Of all comparator areas, Boston had the lowest proportion of those aged 16-64 that had a degree level qualification at 26.3%, and it also had the highest proportion with no qualifications at 12.8%. Lincolnshire County and the East Midlands had a slightly higher proportion of people aged 16-64 with higher level (NQF4+) qualifications at 32.5 and 35.6% respectively, however Great Britain had the highest proportion at 43.5%. Figure 11.2 shows the full skills breakdown.

Figure 11.2: Skill Levels of the Resident Working Age (16-64) Population, 2021



Source: Annual Population Survey, January-December 2021

Deprivation

11.4.4 The 2019 Index of Multiple Deprivation provides an indication of the average levels of deprivation for Lower Layer Super Output Areas (LSOAs) across England. The index provides an overall assessment of the average levels of deprivation as well as an assessment against domains of deprivation. In total, England has 32,844 LSOAs, with 57 in North Kesteven.

11.4.5 The Energy Park Site falls within the LSOA North Kesteven 012B, which is ranked 15,660 and placed it in the top 50% most deprived LSOAs in England. Looking at the individual domains of deprivation, North Kesteven has its highest level of deprivation for the barriers to housing and services domain where it has a rank of 5,238, placing it in the top 20% most deprived LSOAs for this indicator. It has its lowest rank in crime with a rank of 31,762, putting it in the top 10% least deprived LSOAs for this domain. Table 11.7 shows the rank of each domain in detail.

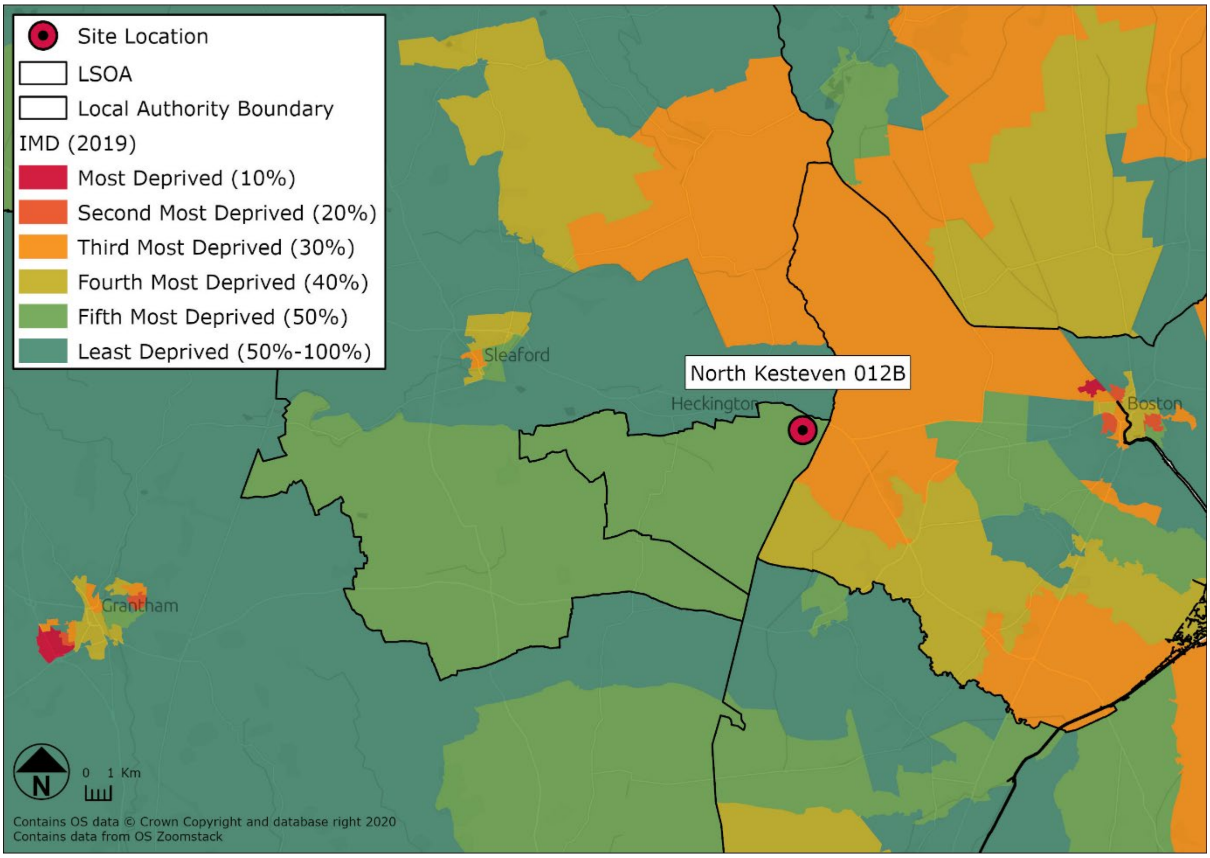
Table 11.7: Index of Multiple Deprivation for North Kesteven 012B

IMD 2019 Domain	North Kesteven 012B Rank (out of 32,844, 1 being the most deprived)
Overall IMD	**15,660**
Income	14,791
Employment	15,772
Education & Training	10,606
Health	28,462
Crime	31,762
Barriers to Housing and Services	5,238
Living Environment	7,640

Source: Ministry for Housing, Communities & Local Government

11.4.6 Figure 11.3 maps the overall level of deprivation in North Kesteven 012B and its neighbouring LSOAs. As can be seen from Figure 11.3 that many LSOAs the east of the site fall within the top 30% most deprived LSOAs in the country, where the majority to the west are the top 50% least deprived LSOAs in the country. However, there is a pocket of deprivation to the west of the site, with some LSOAs falling into the top 10% most deprived areas.

Figure 11.3: Index of Multiple Deprivation for Site Location, 2019

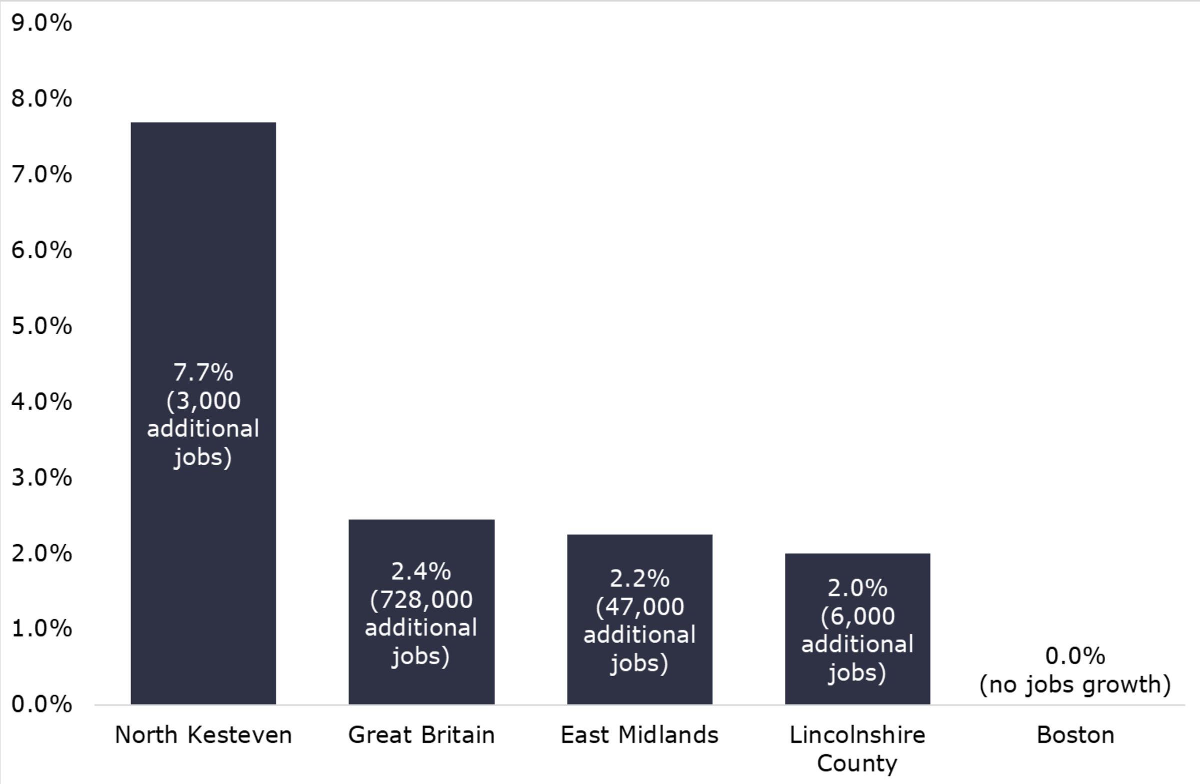


Source: Ministry of Housing, Communities & Local Government

Employment

11.4.7 In absolute terms, North Kesteven saw job numbers increase by around 3,000 between 2015 and 2020 (growing from 39,000 to 42,000 – see Figure 11.4). In relative terms, this equated to a rise of 7.7%. North Kesteven's growth rate was above that for Boston (no growth), Lincolnshire County (2%), the East Midlands (2.2%) and Great Britain (2.4%). The jobs data are sourced from the ONS Business Register and Employment Survey. 2020 is the latest date for which the data are available. The 2021 figures are unlikely to be available until the final quarter of 2022.

Figure 11.4: Employment Change, 2015-20



Source: ONS, Business Register & Employment Survey

11.4.8 The largest sector in North Kesteven as of 2020 is public administration, education and health, with 10,000 jobs – representing 23.5% of total employment. Job numbers in the sector increased by 250 between 2015 and 2020, equating to growth of 2.6%. This sector also accounted for the largest proportion of total employment in Boston at27.5%,supporting 8,950 jobs and growing by 900 (11.2%) jobs between 2015 and 2020.

11.4.9 In terms of overall size, public administration, education and health is followed by the business, financial and professional services sector, in both North Kesteven and Boston. In 2020, the sector supporting 6,350 jobs in North Kesteven and 5,375 jobs in Boston– 14.9% and 16.5% of total employment respectively. This sector experienced growth of 1,325 jobs (26.4%) between 2015 and 2020 in North Kesteven. The construction sector, which is likely to see increased employment opportunities during the Proposed Development's build phase, supports around 3,000 jobs in North Kesteven. This represents 7.1% of total employment in the District, above the proportion of total jobs in the East Midlands (4.7%) and Great Britain (4.9%). In Boston, the construction sector accounted for 3.1% of employment and supported 1,000 in 2020. Table 11.8 shows total employment by sector in more detail.

Table 11.8: Employment by Sector, 2020

	North Kesteven	Boston	Lincolnshire County	East Midlands	Great Britain
Agriculture, mining, utilities etc.	6.2%	9.7%	7.2%	3.4%	2.9%
Manufacturing	14.1%	13.8%	11.4%	11.9%	7.7%
Construction	7.1%	3.1%	4.9%	4.7%	4.9%
Wholesale & retail	17.1%	16.1%	17.6%	16.4%	14.7%
Transport & storage	3.5%	6.1%	4.2%	7.0%	5.0%
Accommodation & food services	5.9%	3.8%	7.5%	6.3%	7.1%
Information & communication	3.5%	0.6%	2.0%	3.0%	4.3%
Business, financial & professional services	14.9%	16.5%	14.8%	17.4%	22.7%
Public admin, education & health	23.5%	27.5%	26.0%	25.6%	26.3%
Arts, entertainment, recreation & other services	4.1%	2.8%	4.6%	4.3%	4.3%

Source: ONS, Business Register & Employment Survey

Business Numbers

11.4.10 Table 11.9 shows the change in the number of businesses in North Kesteven and Boston between 2011 and 2021. It also presents the change for comparator areas of Lincolnshire County, the East Midlands and Great Britain. Boston saw business growth of 11.3% (280 new businesses) between 2011 and 2021, this was below the growth in all other comparator areas. Businesses in North Kesteven grew by 15.7% over this timeframe, equating to 650 new companies. This was behind the growth seen in the East Midlands (27.6% - 47,305 new businesses) and Great Britain (27% - 665,835 new businesses), but above the growth rate seen in Lincolnshire County (12.8% - 3,796 new businesses).

Table 11.9: Change in Business Numbers, 2011-21

	2011	2021	Absolute Change	% Change
North Kesteven	4,135	4,785	650	15.7%
Boston	2,480	2,760	280	11.3%
Lincolnshire County	29,575	33,370	3,795	12.8%
East Midlands	171,590	218,895	47,305	27.6%
Great Britain	2,464,265	3,130,100	665,835	27.0%

Source: ONS, UK Business Count

Commuting

11.4.11 Based on data from the 2011 Census, just under 19,850 people live and work in North Kesteven. Around 16,396 people work in North Kesteven and live elsewhere, with the top origin destinations being Lincoln (6,795), West Lindsey (1,978) and South Kesteven (1,501).

11.4.12 Around 22,966 people currently live in North Kesteven and work elsewhere, with the top locations to commute to being Lincoln (11,050), South Kesteven (2,247) and East Lindsey (1,396).

11.4.13 With an inflow of 16,396 people commuting into North Kesteven and an outflow of 22,966 people commuting out of North Kesteven, there is a net flow of 6,303 out of the LPA.

11.4.14 Around 18,205 people live and work in Boston. There are 7,501 people that work in Boston and live elsewhere, with the top origin destinations being East Lindsey (3,278), South Holland (1,677) and North Kesteven (1,121).

11.4.15 There are around 7,112 people living in Boston and working elsewhere with the top locations to commute to being South Holland (2,920), East Lindsey (1,432) and North Kesteven (807).

11.4.16 With an inflow of 7,501 people commuting into Boston and an outflow of 7,112 people commuting elsewhere from Boston, there is a net inflow of 389 workers into Boston.

Claimant Count

11.4.17 The most accurate measure of unemployment at the current time is the claimant count, which counts the number of people claiming Jobseeker's Allowance plus those who claim Universal Credit and are required to seek work and be available for work.

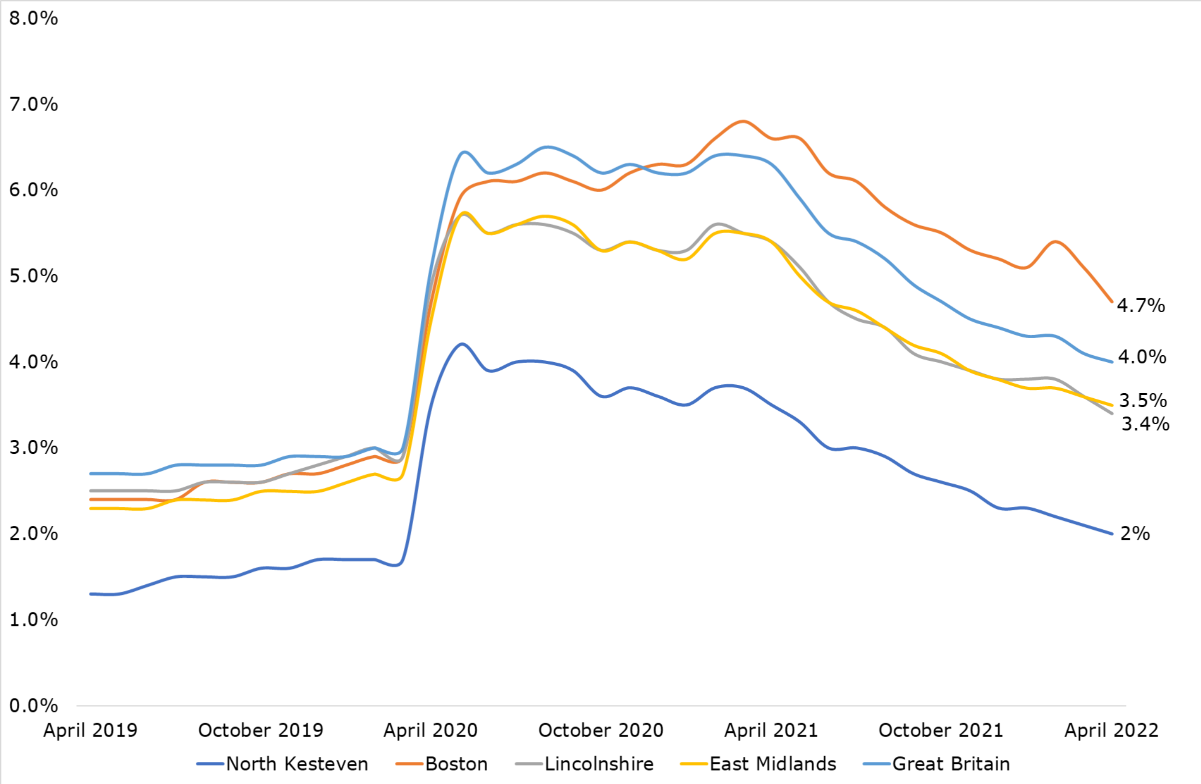
11.4.18 Figure 11.5 shows the claimant count as a proportion of people aged 16-64 in North Kesteven, Boston, Lincolnshire County, the East Midlands and Great Britain for the period April 2019 to April 2022, for all residents aged 16+. A sharp rise is evident in the claimant count between March and April 2020, which will be down to the impact of Covid-19. This is down in part to more people claiming unemployment-related benefits and also because of changes made to the system by government which means more people are eligible to claim benefits. Further details on this are provided below.

11.4.19 ONS state that enhancements to Universal Credit as part of the UK Government's response to the coronavirus mean that an increasing number of people became eligible for unemployment-related benefit support despite still being in work. Consequently, changes in the claimant count will not be wholly because of changes in the number of people who are not in work. It is not possible to identify to what extent people who are employed or unemployed have affected the numbers.

11.4.20 In April 2019, the claimant count in Boston was 2.4%, by April 2022 it had risen to 4.7%. This is an increase of 1,005 more people claiming benefits. This is currently above all other comparator areas. In April 2019, the claimant count in North Kesteven was 1.7% and by March 2022 it had risen to 2.2%, which represented an increase of 325 more people claiming benefits. However, in this period the claimant count has consistently been below the rates seen in Lincolnshire County, the East Midlands and Great Britain which are currently 3.4%, 3.7% and 4.2% respectively.

11.4.21 Changes to the benefits system which came into force at the beginning of October 2021 may mean the claimant count starts to drop at a slightly faster rate, however it is still reasonable to assume that the legacy effects of the pandemic mean it will be higher than it was pre-March 2020.

Figure 11.5: Claimant Count, April 2019-March 2022



Source: ONS, Claimant Count

11.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction Phase

Employment

11.5.1 Economic benefits will arise through the provision of temporary jobs during the construction phase at the site. Based on information provided by the client, it is estimated that the total cost of the Proposed Development is in the region of £400million.

11.5.2 Investment in the proposed scheme is likely to create opportunities for local businesses through the supply chain, during the construction process. It is estimated that there will be around 100 workers on-site during the peak times of the construction period, which is expected to be up to 18-months. In the solar powered growth in the UK report, Cebr[15] give an employment multiplier for large-scale solar PV investments of 2.33 – i.e. for every job supported on-site, 1.33 indirect/induced jobs are supported in the wider economy. Applying this multiplier to the 100 on-site jobs, the Proposed Development could support 133 temporary jobs in the wider economy during the 18-month build phase.

11.5.3 In total, the Proposed Development could support 233 temporary jobs, both direct jobs on-site and indirect/induced roles in the wider economy, during the 18-month construction period.

Contribution to Economic Output

11.5.4 Another way of looking at the economic impact of the construction phase is to calculate the contribution a development makes to wealth creation, as measured by the

[15] *Solar powered growth in the UK – the macroeconomic benefits for the UK of investment in solar PV*: Cebr (report for the Solar Trade Association), September 2014.

increase in the value of goods and services generated within an area. This can be done by looking at the increase in gross value added (GVA), a common proxy for economic output. Using ONS data, it is possible to calculate GVA per employee by sector at a regional level. The Cebr report referred to in paragraph 8.4.3 gives a GVA multiplier of 2.39. Factoring this into the analysis, the overall GVA impact associated with the construction phase is estimated at £29.3million over the 18-month build timeframe.

<u>Accommodation Demand</u>

11.5.5 A maximum of up to 100 construction workers are forecast to be on site during peak times during the construction period (as referenced in the Construction Traffic Management Plan (CTMP)). It is estimated that, based on Ready Reckoners in respect of Leakage defined by the Additionality Guide (2014), between 50% and 75% of benefits of the construction period will go to people living outside of the local area. By association, it can be estimated that between 25% and 50% of construction workers will need to be sourced from outside of the local area; this would equate to between 25 and 50 workers at peak times. This proportion of the construction workers will require accommodation for the duration of the time on site. In order to assess this effect, a review of the available rental properties in the local area as well as hotel accommodation will be undertaken and an indication of the effect identified in the final assessment.

<u>Significance of the Construction Phase Effects</u>

11.5.6 The significance of construction phase effects is assessed as follows:

- The sensitivity of the receptor (employment in construction and other sectors of the economy) is assessed as being **medium,** in line with the criteria set out in Table 11.1. Construction employment represents around 7.2% of total employment in North Kesteven and while the construction jobs created during the build period are unlikely to add any significant pressure to the labour supply, the 67 on-site jobs will still be created within a relatively short timeframe.
- The magnitude of the impact is assessed as **low**, in line with the criteria in Table 11.2. The 67 jobs per annum supported by the construction phase (both direct and indirect) represent a small increase in the number of new employment opportunities for local residents, for a temporary period of time.
- The significance of the temporary effect is therefore considered to be **minor to moderate beneficial**, which is not significant in EIA terms.

<u>Operational Phase</u>

<u>Employment Impact</u>

11.5.7 Based on information provided by the client, it is estimated that once operational there will be up to 5 FTE jobs supported on-site. Applying the multiplier outlined above, as well as the 10 jobs on-site, there will be an estimated 7 jobs supported in the wider economy.

11.5.8 In total, once operational the Proposed Development will support an estimated 12 jobs in North Kesteven and in the wider economy.

11.5.9 In addition to the jobs created by the Proposed Development, the site is part of a landholding which forms part of a larger business whereby the farming team moves around. There are 1.5 FTEs supported by these existing activities and they will continue in the future, therefore there will be no job losses associated with the Proposed Development.

Contribution to Economic Output

11.5.10 The contribution of the site to economic output has been calculated by taking the job creation associated with the scheme and multiplying this by an estimate of average levels of GVA per employee for all jobs in the East Midlands.

11.5.11 It is estimated that once operational and fully occupied, the additional GVA supported by the Proposed Development is estimated to be around £625,800 per annum, allowing for multiplier effects[16]. Over the 40-year operational lifespan of the solar farm the GVA generated is estimated to be around £13.9million (present value[17]).

Business Rates

11.5.12 Business rates are an important economic contributor to an area. It is estimated that the solar project element of the proposed scheme could generate up to £1.3million per annum in business rates[18]. Over the intended 40-year lifespan of the scheme, business rates generated could total around £28.8million (present value).

Significance of the Operational Phase Effects

11.5.13 The significance of the operational phase effects has been assessed as follows:

- The sensitivity of the receptor (labour market of North Kesteven) is considered to be **medium**, in line with the criteria set out in Table 11.1.
- The magnitude of the impact is identified as being **low**, in line with the criteria in Table 11.2. The number of on-site jobs created in the operational phase (13) would represent a small increase on current employment levels, but the employment supported by the operational phase will be long-term. There is also £625,800 per annum of economic output, amounting to £13.9million over the 40-year operational lifespan, and £1.3million in potential business rates revenue per annum, amounting to £28.8million over the project lifespan.
- The significance of the operational effect is therefore considered to be **minor to moderate beneficial**, which is not significant in EIA terms.

Decommissioning Phase

Employment

11.5.14 Employment benefits are expected to be similar to those outlined for the construction phase.

Contribution to Economic Output

11.5.15 Contribution to economic output is expected to be similar to that outlined for the construction phase.

[16] For the GVA estimate, the same multipliers used are the same as the construction GVA multipliers outlined above.

[17] Where future benefits are calculated over a longer timeframe, they have been discounted to produce a present value. This is the discounted value of a stream of either future costs or benefits. A standard discount rate is used to convert all costs and benefits to present values. Using the Treasury's Green Book, the recommended discount rate is 3.5% up to 30 year and 3% thereafter.

[18] Based on information on price per MW of £6,450 in 2017 sourced from Photovoltaic Memorandum of Agreement.

Housing Demand

11.5.16 Housing demand effects during the decommissioning phase will be similar to those outlined for the construction phase.

Significance of the Decommissioning Phase Effects

11.5.17 The significance of decommissioning phase effects is assessed as follows:

- The sensitivity of the receptor is assessed as being **medium,** informed by the potential effects identified for the construction phase.
- The magnitude of the impact is assessed as **low**, informed by the potential effects identified for the construction phase.
- The significance of the temporary effect is therefore considered to be **minor to moderate beneficial**, which is not significant in EIA terms.

11.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

11.6.1 Due to the beneficial impacts identified in this assessment, no specific mitigation measures have been identified. The specific operational requirements of the Proposed Development have been carefully considered to ensure the proposed design provides the best and most efficient layout required, resulting in the socio-economic benefits that have been identified.

Additional Mitigation

11.6.2 Due to the beneficial impacts identified in this assessment, no specific additional mitigation measures have been identified. Table 11.9 reiterates that there is no mitigation, either by design, or by DCO Requirement, that is relevant or required in respect of socio-economics for this Proposed Development.

Table 11.9: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured	
		By Design	By DCO Requirement
1	None required	n/a	n/a

Enhancements

11.6.3 All socio-economic effects of the Proposed Development are expected to be positive. No enhancement measures are proposed.

Other Measures

11.6.4 Continued efforts to address wider benefits for the community will be undertaken separately and outside of the DCO process.

11.7 CUMULATIVE AND IN-COMBINATION EFFECTS

11.7.1 Nine sites have been considered in the assessment of cumulative effects:

- **Vicarage Drove (B/21/0443):** this proposal is for a 49.9MW solar farm, battery storage and associated infrastructure located 4.5km south of the Application Site. A review of the Boston Borough planning website shows no socio-economic benefits have been quantified for this scheme. It is therefore not possible to calculate the construction and operational phase impacts of the scheme.

- **Land at Little Hale Fen (21/1337/EIASCR):** this proposal is for a 49.9 MW solar farm located 4.6km north-east of the Application Site. A review of the North Kesteven planning website shows no socio-economic benefits have been quantified for this scheme. It is therefore not possible to calculate the construction and operational phase impacts of the scheme.
- **Land at Ewerby Thorpe (14/1034/EIASCR):** this proposal is for a 28MW solar farm located 4.1km north-west of the site. A review of the North Kesteven planning website shows that the socio-economic benefits have not yet been quantified and it is therefore not possible to calculate the construction and operational phase socio-economic impacts of the scheme.
- **Land to the north of White Cross Lane (19/0863/FUL):** this proposal is for a 32MW solar farm located 8.4km west of the Application Site. The Planning, Design and Access Statement produced as part of the planning application has reference to socio-economic benefits. It shows that solar farms enable farmers and landowners to diversify, helping to strengthen the economy and support local businesses and services. However, there has been no quantified socio-economic benefits produced and it is therefore not possible to calculate the full socio-economic impact of this scheme.
- **Land South of Gorse Lane, Silk Willoughby (19/0060/FUL):** this proposal is for a 20MW ground mounted solar farm located 11km west of the Application Site. From a review of the North Kesteven planning website there is no socio-economic analysis available for the scheme, therefore it is not possible to calculate the benefits for this site.
- **Cottam Solar Project (EN010133):** this proposal is for a Nationally Significant Infrastructure Project (NSIP) located 43.6km north-west of the Applications Site. The scoping report available on the PINS website outlines that there is a potential for adverse economic impacts through the loss of agricultural income for businesses affected by the operational phase. It is recommended that this could be mitigated against through alternative incomes.
- **Gate Burton Energy Park (EN010131):** this proposal is for an NSIP located 48.6km north-west of the Applications Site. The scoping report for the application outlines that temporary effects on employment and GVA will be considered during the construction and decommissioning phases of the development. The creation of long-term employment opportunities once the scheme is operational will be assessed as well as any impacts that may arise from the displacement of agricultural land. However, no socio-economic benefits for the scheme have been quantified so it is not possible to assess the socio-economic impacts of this scheme.
- **West Burton Solar Project (EN010132):** this proposal is for an NSIP located 41.3km north-west of the site. The scoping report produced for the scheme identifies that there is potential for the scheme to have socio-economic effects at a local and regional level. This includes employment opportunities, increased population in the site location and increase economic activity. The impact that the scheme will have on agricultural and farming practices will be explored further in the Environmental Statement.
- **Mallard Pass Solar Farm (EN010127):** this proposal is for an NSIP located 33.2km south-west of the Application Site. After a review of PINS website there has not been any analysis of the socio-economic impacts of the scheme. The Scoping Report for the Application outlines that the scheme would be designed and maintained safely to not pose a risk to human health. The construction of the Proposed Development would be undertaken in

accordance with safe construction industry practice and would be monitored to ensure it is safe.

Significance of the Cumulative Operational Phase Effects

11.7.2 The significance of the cumulative operational phase effects (for the Proposed Development and cumulative scheme) has been assessed as follows:

- The sensitivity of the receptor (labour market of North Kesteven) is assessed as being **medium**, in line with the criteria set out in Table 11.1.
- The magnitude of the impact is assessed as **medium**, in line with the criteria in Table 11.2, in particular taking into account the level of job creation.
- The significance of the cumulative operational effect is therefore considered to be **moderate beneficial**, which is significant in EIA terms.

11.8 SUMMARY

Introduction

11.8.1 This chapter has analysed the baseline socio-economic conditions and then gone on to assess the likely socio-economic effects of the Proposed Development.

Baseline Conditions

11.8.2 North Kesteven experienced population growth of 8.8% between 2011 and 2020 (9,600 additional people), and in Boston there was a relatively higher population growth of 9.6% (6,200 additional people). Relative to the benchmark areas of East Midlands and Great Britain, North Kesteven and Boston’s population grew at a faster rate over this timeframe. Employment growth in North Kesteven over the last five years has been strong with 7.7% increase in job numbers, especially when compared to the picture at a regional and national level (2.4% and 2.2% respectively). There was no employment growth in Boston in that same period. Lincolnshire County experienced a very similar rate of employment growth (2%) as at the regional and national scale. The construction sector, which is likely to see increased employment opportunities during the Proposed Development’s build phase represents 7.1% of total employment in the District, which is above the proportion of total jobs at the regional scale (4.7%) and Great Britain (4.9%). North Kesteven has a net outflow of commuters, while Boston has a net inflow of commuters. The claimant count in Boston has risen by 2.3% (additional 1,005 claimants) in the period March 2019 to April 2022 and is currently above all other comparator areas. The claimant count in North Kesteven increased but only by 0.5% in this period and is well below all other comparator areas as well as Boston.

Likely Significant Effects

11.8.3 In respect of the construction phase, the assessment indicates that the Proposed Development will have the following temporary effects:

- 67 direct and indirect/induced construction jobs and indirect/induced supply chain jobs over the 18-month construction programme.
- £29.3 million of gross value added over the 18-month construction programme.

11.8.4 The overall socio-economic effect during the construction phase is minor to moderate beneficial in the short term.

11.8.5 In respect of the operational phase, the assessment indicates that the Proposed Development will have the following effects:

- 13 net additional jobs in the North Kesteven economy.

- £625,800 of gross value added per annum or £13.9 million over 40-year lifespan of the project (present value).
- Business rates £1.3 million per annum and £28.8 million over the 40-year project lifespan (present value).

11.8.6 The overall socio-economic effect during the operational phase is minor-moderate beneficial in the long term.

11.8.7 In respect of the decommissioning phase, the assessment indicates that the Proposed Development will have similar scale of effects to those identified during the construction phase. As such, the overall socio-economic effect during the decommissioning phase is expected to be minor to moderate beneficial in the short term.

Mitigation and Enhancement

11.8.8 Due to the beneficial impacts identified in the assessment, no requirement for additional mitigation measures or enhancement measures has been identified.

Cumulative and In-Combination Effects

11.8.9 The cumulative operational effect is considered to be moderate beneficial which is significant in EIA terms.

Conclusion (Socio-Economics)

11.8.10 The Proposed Development would lead to no adverse significant effects from a socio-economic perspective. The Proposed Development will result in a minor to moderate beneficial effect within the construction, operational and decommissioning period in respect of job creation, gross value added, business rates of receptors and the receiving environment.

11.8.11 Continued efforts to address wider benefits for the community will be undertaken separately and outside of the DCO process.

11.8.12 **Table 11.10** provides a summary of effects, mitigation and residual effects.

Table 11.10: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Construction								
Employment	Increase in employment in the construction sector	Short term	Medium	Low	District	Minor to moderate beneficial	None currently confirmed as being relevant	Minor to moderate beneficial
Gross value added	Increased contribution to economic output	Short term	Medium	Low	District	Minor to moderate beneficial	N/A	Minor to moderate beneficial
Housing Demands	Increased demand on housing (particularly affordable housing) in the local area	Short term	Medium	Low	District	Minor to moderate beneficial	None currently confirmed as being relevant	Minor to moderate beneficial
Operation								
Employment	Increase in employment once operational	Long term	Medium	Low	District	Minor to moderate beneficial	None currently confirmed as being relevant	Minor to moderate beneficial
Gross value added	Increased contribution to economic output	Long term	Medium	Low	District	Minor to moderate beneficial	N/A	Minor to moderate beneficial
Business rates	Increase in business rates revenue	Long term	Medium	Low	District	Minor to moderate beneficial	N/A	Minor to moderate beneficial
Decommissioning								
Employment	Increase in employment in the construction sector	Short term	Medium	Medium	District	Moderate beneficial	N/A	Moderate beneficial

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Gross value added	Increased contribution to economic output	Short term	Medium	Medium	District	Moderate beneficial	N/A	Moderate beneficial
Housing Demands	Increased demand on housing (particularly affordable housing) in the local area	Short term	Medium	Low	District	Minor to moderate beneficial	None currently confirmed as being relevant	Minor to moderate beneficial
Cumulative and In-combination								
Economy	Increase in local employment, contribution to economic output, business rates revenue and wages for on-site employees	Long term	Medium	Medium	District	Moderate beneficial	N/A	Moderate beneficial

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Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 12: Noise and Vibration

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

12 NOISE AND VIBRATION

12.1 EXECUTIVE SUMMARY

12.1.1 The assessment has identified potential significant noise effects if trenchless work is required during the construction phase and remains active at night, depending on the final locations where this may be required along the grid connection route. This will be mitigated through design of grid connection route and use of localised screening, and liaison with the closest affected residents. Additional measures (such as alternative methods or temporary relocation) would be investigated to minimise the risk of significant effects. Noise and vibration from other construction activities are such that, providing construction working hours are controlled, their effect would be either not significant or negligible. Construction traffic is associated with negligible effects. Operational noise levels can be controlled to suitable noise limits through detailed design and selection of electrical/mechanical plant, attenuation and/or screening measures: the resulting effects would then either be not significant or negligible.

12.2 INTRODUCTION

12.2.1 This chapter considers the potential noise and vibration effects generated by the Proposed Development during construction, operation and decommissioning. Noise and vibration could initially arise from onsite activities during the construction phase of the Energy Park, such as the construction of onsite access tracks, installation of PV panels and the Onsite substations and associated infrastructure. Works associated with the proposed connection to the National Grid Bicker Fen substation are also considered. The movement of construction traffic, both onsite and travelling on public roads, to and from the Site also represents a potential source of noise and vibration for consideration.

12.2.2 During the operation of the Proposed Development, the main potential source of noise would be associated with electrical and mechanical plant, both the equipment located within the individual PV arrays, energy storage and the Onsite substations.

12.3 ASSESSMENT APPROACH

<u>**Methodology**</u>

<u>Study area and receptors</u>

12.3.1 Residential and educational properties are considered to have a high sensitivity to noise and vibration and have been considered in detail in this chapter. There are a limited number of commercial receptors in proximity to the Energy Park Site but these are considered to have a low sensitivity to noise and are therefore not considered in further detail in this chapter. Public rights of way have not been considered to be noise-sensitive receptors in the context of this noise assessment, as public rights of way would not be expected to be occupied by any individual for a long enough period of time for a significant noise effect to occur.

12.3.2 A study area for the consideration of noise effects was proposed during the scoping process as those noise-sensitive properties that lie within 250m of the Energy Park area, 1 km of the Energy Park substation(s) and energy storage areas and 500m of noisy activities along the grid connection route.

12.3.3 Following consultation, the assessment of operational and construction noise effects has expanded to consider the closest noise-sensitive receptors to the Site, which are located within approximately 150m to 1200m from the proposed Energy Park areas. This includes mainly residential receptors as well as an additional needs school at Elm

Grange. Based on professional judgement and experience of similar developments, significant noise and vibration effects are unlikely beyond this distance. **Appendix 12.2** sets out the representative receptors considered around the Energy Park Site Boundary.

12.3.4 Noise-sensitive receptors located within the rest of the Site Boundary, including the potential area where the cable connection route between the Energy Park Site and the National Grid Bicker Fen Substation would be constructed, were also considered.

12.3.5 Finally, dwellings exposed to traffic noise along the construction traffic route, which is described in **Chapter 14 (Transport and Access)**, were also considered in terms of how the traffic noise levels they currently experience may change during the construction period.

Construction and decommissioning

12.3.6 Noise and vibration from onsite construction and decommissioning activities have been assessed with the guidance of BS 5228 Parts 1 and 2[1]. This provides guidance on a range of considerations relating to construction noise and vibration including general control measures, estimating likely levels and example criteria. All construction noise effects can be characterised as temporary, short term adverse.

12.3.7 Construction noise magnitude criteria are set out in **Table 12.1** based on the guidance values set out in BS 5228-1 (Annex E) and the measured baseline noise levels in the area (in quiet areas), based on sustained construction activities occurring during the weekday day-time or Saturday morning periods, with more stringent criteria considered for works outside of these times. Some properties located closest to the A17 experience higher baseline noise levels (see **Section 12.3**), and therefore the criteria of **Table 12.1** may be relatively stringent, but this will be considered on a case-by-case basis. For construction activities which may be expected to occur for less than four weeks in a year, the magnitude of the corresponding effects would reduce.

12.3.8 Whilst the majority of construction activities will be carried out during daytime, there is the possibility that some activities associated with trenchless construction works may need to be carried out at night. As indicated below, in **Table 12.1**, the applicable criteria would normally reduce by 20dB for night-time work; however, consideration of the duration of the works is also a relevant consideration. **Table 12.1** therefore sets out additional criteria that would apply to trenchless work which would only be undertaken in proximity to any particular location for short periods of less than 1 week.

12.3.9 Some construction activity and associated plant could generate significant vibration: the magnitude of Peak Particle Velocity (PPV) has been estimated for these activities based on reasonable worst-case working locations using BS 5228-2 guidance. The criteria of **Table 12.1** for the assessment of the magnitude of construction vibration are based on the guidance in Section B.2 of BS 5228-2 which provides advice on human response to vibration. BS 5228-2 also advises that any risk of building damage, even for sensitive buildings, would only occur at much stronger vibration levels, therefore the proposed criteria would also provide protection in this regard.

12.3.10 The prediction method of Calculation of Road Traffic Noise (CRTN)[2] has been used to calculate the possible noise effects of construction related traffic passing to and from the Site along local surrounding roads. This is assessed with reference to the Design Manual for Roads and Bridges (DMRB)[3]: see criteria in **Table 12.1**. The Energy Park Site

[1] British Standards Institute (BSI, 2014), BS 5228:2009-A1:2014, Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BS 5228-1) and Part 2: Vibration (BS 5228-2).
[2] HMSO Department of Transport (1988), Calculation of Road Traffic Noise (CRTN).
[3] Highways England (2019): Design Manual for Roads and Bridges (DMRB) – LA111 – Noise and Vibration, Nov 2019.

access road surface will be checked and maintained prior to use, and on this basis the DMRB advises that significant effects from traffic using the road are unlikely (although momentary vibration may be perceptible in some cases).

Table 12.1: Classification of Magnitude of Change - Construction Noise and vibration

Effect magnitude	Construction noise* over working day	Night-time activity (< 1 week)	Construction vibration (PPV)	Construction traffic noise increase
High	> 75 dB L_{Aeq}	> 60 dB L_{Aeq}	> 10 mm/s	> 5 dB
Medium	> 65 dB L_{Aeq} ≤ 75 dB L_{Aeq}	> 55 dB L_{Aeq} ≤ 60 dB L_{Aeq}	> 1 mm/s ≤10 mm/s	3 to 5 dB
Low	> 55 dB L_{Aeq} ≤ 65 dB L_{Aeq}	> 45 dB L_{Aeq} ≤ 55 dB L_{Aeq}	≥ 0.3 mm/s <1 mm/s	1 to 3 dB
Negligible	≤ 55 dB L_{Aeq}	≤ 45 dB L_{Aeq}	<0.3 mm/s	< 1 dB

* This assumes construction during weekday day-time or Saturday mornings for a sustained period of 1 month or more. For sustained works during evening, Sundays, Bank Holidays or Saturday afternoons, the criteria would be reduced by 10dB, and for night-time works by 20dB.

<u>Operational noise</u>

12.3.11 As noted in the section below (Limitations to the Assessment), the potential noise from fixed electrical and mechanical plant potentially associated with the Proposed Development was assessed on a worst-case basis, considering representative manufacturer selections and an indicative layout. The propagation of operational noise from this plant was modelled using the standard methodology[4] set out in International Organisation for Standardisation (ISO) 9613-2. This allowed evaluating the potential noise generated at different distances from the Site.

12.3.12 The resulting effect of operational noise is assessed on the basis of the BS 4142 Standard[5], as recommended in planning guidance in England when considering commercial or plant noise. The standard provides an objective method for rating the potential effect of noise from fixed plant installations based on the background noise levels that prevail on a site (see **Appendix 12.1** for more details on this standard). The potential character of the noise from the electrical plant items, in particular inverters and transformers, is taken into account by incorporating a penalty in line with BS 4142 guidance.

12.3.13 A contextual analysis is fundamental in BS 4142, and this requires consideration of factors such as the nature of the area and, particularly at night-time, the absolute level of the noise. An external free-field noise rating level criterion of $L_{Ar,Tr}$ 35 dB is proposed at receptor locations in cases where the background levels are low (below 30 dB L_{A90}). This would provide satisfactory external amenity during the daytime and suitable internal noise levels at night with windows open for ventilation, even taking into account the potential character of the noise, and similar criteria were applied for other solar farm developments[6]. This was proposed in consultation with North Kesteven District Council (NKDC) and Boston Borough Council (BBC) Environmental Health Department and no adverse comments received. The resulting assessment criteria are set out in **Table 12.2**.

[4] International Standards Organisation (ISO), ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'
[5] BSI (2019), BS 4142 2014-A1 2019: Methods for rating and assessing industrial and commercial sound.
[6] The Planning Inspectorate, Appeal decision, Land north of Halloughton, Southwell, Nottinghamshire. Appeal reference APP/B3030/W/21/3279533, decision dated 18/02/2022.

Table 12.2: Classification of Magnitude of Change – operational noise

Effect magnitude	Operational noise
High	Rating level L_{Ar} above 35 dB and 10 dB or more above background, depending on the context
Medium	Rating level L_{Ar} above 35 dB and 5 dB or more above background, depending on the context
Low	Rating level L_{Ar} between 5 dB above or below background, depending on the context; or rating level does not exceed 35 dB.
Negligible	Rating level L_{Ar} 5 dB or more below background, depending on the context

Assessment of Significance

12.3.14 As all receptors considered for the noise and vibration assessment are of high sensitivity, medium or high magnitudes of change correspond to moderate and major effects respectively which are considered to be significant within the meaning of the EIA Regulations and mitigation will be considered.

12.3.15 In this chapter, negligible or low magnitudes of change correspond to minor or negligible effects respectively are not considered significant, but enhancement measures will be considered to minimise the effects, where possible.

Legislative and Policy Framework

12.3.16 The Environmental Protection Act 1990[7] defines the powers for local authorities to investigate and control statutory nuisance from noise. Local authorities also have powers under the Control of Pollution Act[8] (CoPA) 1974 to control noise and vibration from construction activities. Specifically, Section 60 of the CoPA provides the Local Authority with the power to impose at any time operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with the Local Authority prior to commencement of site works. Notwithstanding these powers, the aim of the planning system is to minimise and control where required construction and operational noise levels from commercial developments.

12.3.17 The Overarching National Policy Statement (NPS) for Energy (EN-1) and 2021 Draft NPS EN-1 both recognise that noise and vibration from energy development can have effects on the quality of human life as well as on wildlife in some cases. These documents outline general principles for the control and management of these effects and relevant factors and standards to consider but do not provide specific guidance.

12.3.18 The 2021 Draft NPS for Renewable Energy Infrastructure (EN-3) specifically considers solar photovoltaic generation and includes construction (including traffic and transport noise and vibration) as a specific factor to consider. The accompanying text does not however identify specific effects related to noise (aside from the volume of traffic potentially associated with construction activities).

12.3.19 The NPS for Electricity Networks Infrastructure (EN-5) sets out specific considerations which apply to electricity network infrastructure. Noise can be generated by high-voltage transmission lines under certain conditions due to corona discharge. NPS

[7] HMSO (1990): Environmental Protection Act, Part III.
[8] HMSO (1974): Control of Pollution Act, Part III.

EN-5 also notes the potential for substation equipment such as transformers and other voltage regulation equipment to produce noise.

12.3.20 The Noise Policy Statement for England (NPSE)[9] and National Planning Policy Framework (NPPF)[10] both include general planning guidance on noise and introduces the principles of adverse noise effects (which should be mitigated and reduced to a minimum) and significant adverse noise effects (which should be avoided). The NPPF also notes that tranquil areas which have remained relatively undisturbed by noise, and which are prized for their recreational and amenity value should be identified and protected.

12.3.21 The online Planning Practice Guidance[11] (PPG) provides more detailed information on the relevance of noise to the planning process and on defining effect thresholds, although these are not precisely defined and need to be considered on a case-by-case basis.

12.3.22 Professional Practice Guidance on Planning and Noise (ProPG), published by the Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health, provides practitioners guidance on a recommended approach to the management of noise in the context of the planning system. Although the guidance is focussed on new residential development, it encourages good acoustic design processes and highlights the importance of considering noise as an early part of development design.

12.3.23 Several local policies highlight the need for considering sources of pollution (including noise and vibration) from local developments and minimise or avoid significant effects in this regard. Specifically, Policy LP26 (Design and Amenity) of the Central Lincolnshire Local Plan[12] and Policies 2 (Development management) and 30 (Pollution) of the South-East Lincolnshire Local Plan[13] were identified.

12.3.24 Other local policies specifically consider low-carbon/renewable energy generation sources and the need for these developments to consider effects on residential amenity (which includes noise): this comprises Policy LP19 (Renewable Energy Proposals) of the Central Lincolnshire Local Plan and Policy 31 (Climate Change and Renewable and Low Carbon Energy) of the South-East Lincolnshire Local Plan.

Scoping Criteria

12.3.25 Following the scoping exercise and subsequent discussion with North Kesteven District Council (NKDC), Boston Borough Council (BBC) and Lincolnshire County Council (LCC), the following potential effects have been assessed:

- Noise and vibration associated with construction and decommissioning activities, including construction traffic; and
- Operational noise effects from plant associated with the Proposed Development.

12.3.26 The additional equipment proposed for the Bicker Fen National Grid Substation extension would only include equipment such as circuit breakers or switches which would generate negligible noise levels during normal operation, or switchgear equipment which would usually be enclosed, but no substantial external noise-generating plant such as a transformer. In addition, the nearest noise-sensitive properties are more than 500m away.

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[9] Department for Environment, Food and Rural Affairs (2010), Noise Policy Statement for England (NPSE).
[10] Ministry of Housing, Communities and Local Government (MHCLG), now the Department for Levelling Up, Housing and Communities (2021), National Planning Policy Framework (NPPF).
[11] Department for Communities and Local Government, now the Department for Levelling Up, Housing and Communities (2014, updated 2019) - Planning Practice Guidance. [Online] Accessed via https://www.gov.uk/guidance/noise--2 [accessed May 2022]
[12] Central Lincolnshire Local Plan 2017-2036, adopted April 2017.
[13] South-East Lincolnshire Local Plan 2011-2036, adopted March 2019.

Therefore, the operational noise or vibration expected to be generated by this extension will be negligible and can be scoped out. The works required to construct this extension will also be relatively limited and unlikely to generate high levels of noise and so were not specifically considered in the construction noise assessment.

12.3.27 Operational traffic would be very limited: see **Chapter 14 (Transport and Access)** which describes an anticipated traffic level of one or two vehicles per day (non-HGVs). This would have no appreciable effect on noise and as a result, the associated effects have been scoped out as agreed with the Planning Inspectorate (PINS).

12.3.28 The equipment proposed as part of the Proposed Development would generate minimal levels of vibration during operation: these would rapidly dissipate and be such that levels would be imperceptible at neighbouring properties, based on experience of similar plant. Therefore, operational vibration was also scoped out as agreed with PINS.

Limitations to the Assessment

12.3.29 There were no significant restrictions associated with the COVID-19 pandemic in place during the survey. It was therefore expected that the pandemic would have had either no substantial influence on human activity and road traffic levels and therefore background noise, or that levels would only be marginally lower than normal therefore resulting in a more conservative assessment.

12.3.30 The Proposed Development will include different items of mainly electrical plant, some of which have associated cooling equipment. As the final plant specification and equipment layout is not known, an assessment of potential noise emissions based on an indicative plant layout and specification has been undertaken.

12.3.31 The assessment is based on a worst-case assumption that a centralised inverter approach is likely to be used (as opposed to string inverters distributed around the site) as this is considered likely to result in the highest potential noise levels at neighbouring properties based on experience of similar developments. The potential noise from Single Axis Tracking motors has also been considered.

12.3.32 Noise modelling is also undertaken on a conservative basis which does not account for the screening from the PV Modules themselves. In addition, although some of the plant may be located in outdoor enclosures, their sound reduction has been neglected for the purpose of this robust assessment in the absence of detailed information on their acoustic performance.

12.3.33 For the potential works which would be required for construction and decommissioning, in the absence of further details at this stage, reasonable worst-case working locations were considered, and typical noise emissions of construction plant items were referenced from BS 5228-1 (see **Appendix 12.2**). These were used to predict the average sound pressure level for the daily construction working period over different phases of the construction for different receptors.

12.3.34 In the absence of a final grid connection route, the potential impacts have been considered based on a route located within the relevant assessment area. For trenchless work in particular, specific drilling locations and techniques are not known at this stage and therefore the assessment was undertaken on a worst-case basis.

12.4 BASELINE CONDITIONS

Site Description and Context

12.4.1 The baseline noise environment in the vicinity of the Energy Park Site was observed to be generally rural in nature, with a range of natural noise sources (bird noise, wind in trees, etc.). Noise from agricultural activities will also represent a contribution at times given the nature of the area, although this may be for limited periods particularly during evening and night-time periods.

12.4.2 Traffic noise, in particular from the A17, also represents a notable influence in the area, which can be dominant for properties located in proximity to the A17, and more distant or minimal for others. As the water in the drains located in the area is generally not running, no audible water noise was noted during the surveys.

12.4.3 This description also applies to the wider assessment area between the Energy Park and the National Grid Bicker Fen Substation, with a decreasing influence of noise from the A17 with increasing distance. Noise from the Bicker Fen wind farm can also be audible in some conditions for locations in relative proximity to it.

Baseline Survey Information

12.4.4 The methodology for determining baseline background noise levels in the vicinity of the Proposed Development was discussed at scoping stage, as well as after scoping directly with North Kesteven District Council (NKDC), Boston Borough Council (BBC) and Lincolnshire County Council (LCC). It was agreed to undertake a new noise survey at representative locations around the Energy Park Site to supplement historical background noise data measured in the area.

12.4.5 This new survey was undertaken at the end of February 2022, at a range of locations agreed in consultation. **Appendix 12.1** sets out the results of the new survey as well as summarising the relevant historical data previously measured in the area, both those undertaken in March 2011 for the Heckington Fen Wind Park and in June 2014 to support the assessment of the Triton Knoll Wind Farm onshore Electrical System works.

12.4.6 The 2022 survey demonstrated that in the day-time, background levels of 33 to 40 dB L_{A90} could be typically experienced at properties neighbouring the Site, with higher noise levels of 44 to 50 dB L_{A90} for locations closer to the A17. During evening periods, levels measured at quieter locations north of the Site tended to decrease to around 31 dB L_{A90} as activity levels decreased, and below 30 dB L_{A90} at night-time. This is considered typical of rural properties, for the majority of periods not affected by agricultural activities. Historical data measured in 2011 at locations north of the Site showed levels sometimes below 30 dB even during quiet day-time periods.

12.4.7 For locations closer to the A17, levels of around 45 and 37 dB were found to be typical for evening and night-time periods respectively in the 2022 survey. However, historical data measured in 2011 in the rear amenity area at number 2 Council Houses in East Heckington suggests that marginally lower levels were experienced there: typically 40 dB for evening periods and on average around 35 dB for the night-time periods. These comparisons suggest that traffic noise levels on the A17 may have increased since 2011, but consultation feedback suggests this could be due to temporary construction activity in the area, and so it may be prudent to refer to the historical data as this would provide a more robust assessment for the operational life of the Proposed Development.

12.4.8 For properties set back around 500-600m from the A17, such as Derwent Cottage, the 2022 measurements suggest that background noise levels are marginally (2-3 dB) quieter than for measurements made closer to the A17. However historical measured data suggests typical levels of around 35 dB for evening periods and below 30 dB for night-time. The College/Caitlins Farm properties are located approximately 1 km from the A17 and therefore experience similar levels as other rural survey locations (particularly based on the 2011 survey).

12.4.9 The typical background noise levels used for the purpose of the BS 4142 analysis based on the above analysis are therefore summarised below in **Table 12.3**.

Table 12.3: Derived typical background noise levels (L_{A90}, dB) based on the review of baseline noise data

Type	Example properties	Quiet day-time (evening) periods	Night-time
Close to the A17 (within 200m)	Elm Grange Farm, Council Houses, The Rakes, etc.	40	35
Within 200-600m of the A17	Derwent Cottage	35	28
Away from the A17 (1 km or more)	Glebe Farm, College Farm	30	23

12.4.10 Finally, for properties south of the A17, along the potential cable connection route between the Energy Park Site and the Bicker Fen National Grid Substation, typical ambient levels during the day-time and night-time vary between 45-50 dB L_{Aeq} during the day-time and around 40 dB L_{Aeq} at night-time.

Implications of Climate Change

12.4.11 As noted in Chapter 13, due to Climate Change, increased temperatures and changes in rainfall are projected. As the assessment of noise effects has been considered against a baseline environment in the absence of rainfall, this would not affect the outcome of the assessment. Increased temperatures would affect the need for plant to operate ancillary cooling equipment: however, the assessment has been undertaken on the basis of all plant (including cooling) operating at full duty, even during the night-time and therefore this accounts for future temperature increases.

12.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction noise

12.5.1 Full details of the exact construction method, plant and duration are not available at this stage of the Proposed Development. Potential noise levels are therefore assessed on a worst-case basis, considering potential emission noise levels from typical activities based on the type and scale of development. It is however assumed that construction and construction vehicle movements would be restricted to day-time periods on weekdays and Saturdays with most activities (see exceptions below) interrupted at other times.

12.5.2 Potential levels of noise associated with different construction activities, for different distances, are evaluated in **Appendix 12.2**. This appendix also sets out the separation distances from the noise-sensitive receptors around the Energy Park Site from the areas where the solar panel array would be constructed. As these work areas are approximately 150m or more from the receptors identified, most construction activities, including setting up temporary site compounds, earthworks and installation of solar panels including percussive piling of support structures, would be associated with noise levels of no more than 55 to 64 dB L_{Aeq} (over the working day). According to the criteria of **Table 12.1**, this would generally represent a low magnitude of change at most, which would correspond to a **temporary minor effect** which is **not significant**.

12.5.3 The only exception would be for Saturday afternoon work, for which, as set out below **Table 12.1**, more stringent criteria could apply. For earthworks undertaken within 200m of noise-sensitive properties or construction of solar panel support structures within 400m, noise levels could exceed 55 dB which would potentially represent a medium magnitude of change for Saturday afternoon work. Although the work undertaken at these distances would last for a period of less than 1 month and then move away, therefore potentially reducing the magnitude of impact, due to the impulsive nature of the piling which may be used it is considered on balance that this would represent a **moderate temporary adverse effect** which is **significant**.

12.5.4 For more distant properties, located 400m or more from the main construction works, the effects would be negligible.

12.5.5 Construction of the Energy Park Site's main access track from the A17 would occur at closer distances to some properties, approximately 65m from Rectory Cottages, which would correspond to noise levels of around 63 dB L_{Aeq}, but this would only be ongoing for a short period of time of less than 1 month, similar in nature to road maintenance works. In addition, properties such as Rectory Cottages experience increased baseline noise levels from the A17 which will reduce the effects of the construction works in practice. Overall, this is considered to be associated with a negligible effect. It is unlikely that this part of the work would be undertaken on a Saturday afternoon, but this would potentially increase the effect to be **temporary minor adverse** which is **not significant.**

12.5.6 The Energy Park Site track located closest to Elm Grange Farm would be used temporarily during an early phase of the construction and could therefore require some upgrading work: although this would be undertaken in relative proximity to sensitive receptors at Elm Grange Farm, these works would last a very short period; furthermore, Elm Grange Farm is also exposed to substantial existing noise from the A17. It is considered that overall the magnitude of change would be low at most, even accounting for Saturday afternoon work, representing a **temporary minor effect** which is **not significant**.

12.5.7 Specific construction activities associated with cable laying works (e.g. horizontal directional drilling (HDD) or other trenchless techniques) could be required outside of the assumed day-time construction hours (i.e. evening, Sundays, Bank Holidays or at night), as the drilling work may need to continue through the night, such that a continuous operation can be completed. Once a bore has been started, it is not possible to stop until it is completed, hence the potential need for some night-time working. Despite the short associated duration of the works, this may be associated with potentially significant effects. Currently, the locations where trenchless works may be required are not known as the cable connection route between the Energy Park Site and the Bicker Fen National Grid Substation has not been finalised. Although other techniques such as micro-bore / pipe jacking could be used, but data for an HDD rig has been assumed to represent a worst-case scenario.

12.5.8 **Appendix 12.2** demonstrates that for distances of 50, 100, 200, 300 and 900 m from the HDD drilling rig would correspond to noise levels of 68, 66, 59, 55 and 44 dB L_{Aeq} respectively. For work undertaken during normal day-time hours, this would correspond to a low or negligible magnitude of change when the relative short duration of the works (in any particular location) is taken into account.

12.5.9 However, if HDD/trenchless works had to be continuing over the night-time period, in the absence of mitigation, properties located within 200m of HDD works could experience a high magnitude of change, and those within 200 to 300m a medium magnitude of change due to the night-time works. Therefore, this could represent a **moderate to major temporary adverse effect** which is **significant**. For properties located more than 300 or 900m away this would represent **a minor or negligible** adverse effect respectively which is **not significant**.

12.5.10 Traffic associated with the construction works may also be associated with potential effects. This is assessed in **Chapter 14 (Transport and Access)**. The assessment explains that typical construction traffic levels associated with the Energy Park Site would be less than 60 vehicle movements per day, which is expected to include less than 20 HGV movements on the A17. When compared to the baseline traffic levels on the A17 of around 20,000 vehicles per day (including around 3000-4000 HGVs), the construction traffic would represent a negligible influence (<0.1dB) in terms of noise for properties located along the A17, based on the guidance in CRTN. Traffic movements associated with the construction of the cable route would also be similarly limited to low values with similar effects. The associated heavy vehicle traffic is considered unlikely to be routed through the village of Bicker, but if this option is used, movements will be minimised to a single trip with plant retained on site for the duration of the construction activities. This therefore represents in either case a **negligible** effect which is **not significant**.

<u>Construction vibration</u>

12.5.11 Some of the construction activities, such as piling operations, drilling or vibratory rolling techniques, can generate vibration levels in close proximity to their use. Whilst occasional momentary vibration can arise when heavy vehicles pass dwellings at very short separation distances (i.e. 10m or less), this is not sufficient to constitute a risk of significant effects and therefore traffic vibration effects are not considered further in this chapter.

12.5.12 The works associated with construction of the solar arrays could include percussive piling and ground compaction, but as this would be at least 150m from the nearest sensitive receptors, the associated worst-case vibration levels would be **negligible** (<0.3mm/s).

12.5.13 Construction of the main Energy Park Site access track may involve ground compaction at a distance of 65m from Rectory Cottages, which would be associated with worst-case vibration levels of 0.3 mm/s which would just be perceptible but associated with a low magnitude of change (**Table 12.1**) and therefore represent a **temporary minor adverse effect** which is not significant.

12.5.14 HDD works are commonly considered to be similar to auger boring in terms of vibration generation from rotary boring. BS5228-2 indicates that vibration from such activities falls to below 1 mm/s within a distance of approximately 10m to 15m. It is estimated that for distances of 50m or more, levels would reduce to less than 0.3 mm/s which would therefore represent negligible effects.

<u>Operation</u>

12.5.15 **Appendix 12.2** details the assumptions made for the noise modelling of operational noise from electrical and mechanical plant associated with the Solar Park, on-Site substations and Energy Storage area, based on manufacturer information. This includes transformers, inverters and associated cooling equipment. Potential noise from solar tracking motors was also considered but was established to have negligible levels of noise emissions, and therefore did not require inclusion in the full noise model. Noise modelling was undertaken on this basis, neglecting screening effects from the solar PV panels and battery storage containers to provide a worst-case assessment.

12.5.16 Although the plant associated with solar energy generation will mainly operate during the daytime, in which background levels tended to be more elevated, daylight periods may extend to early morning periods (05:00 to 07:00) and evening periods during the summer months. Furthermore, the energy storage equipment could operate at any time depending on associated requirements. Therefore, as a worst-case, the plant noise from the Proposed Development has been considered against evening and night-time. These quieter periods will also tend to experience lower temperatures and reduced or negligible agricultural activity, and therefore plant components providing cooling are likely to operate at reduced duty during these periods. The plant has nevertheless been assumed to operate at full duty which is also likely to be conservative.

12.5.17 One of the main potential sources of operational noise are the inverters associated with the Energy Storage Area, which may be due in part to the conservative assumptions made as the basis of the modelling. As noise from these units and the other inverters and transformers likely to be included as part of the Proposed Development Substations is likely to include a tonal character which may be clearly audible, a penalty of +4 dB has been applied to the calculated noise levels in accordance with BS 4142 (see **Appendix 12.1**). The resulting rated noise levels are then compared with background noise levels for the noise-sensitive receptors considered (**Table 12.3**) and the associated magnitude of change is assessed using the criteria of **Table 12.2**. This is set out in detail in **Appendix 12.2**, but a summary for key receptors around the Energy Park Site is set out below in **Table 12.4**.

Table 12.4: Derived background, predicted rated noise levels (dB) and BS 4142 assessment at key receptors

Property	Typical background (L_{A90})	Predicted plant noise level (L_{Aeq})	Predicted rated plant noise (L_{Ar})	Difference with background	Magnitude of Change
Day-time					
Elm Grange Farm	40	30	34	-6	negligible
Derwent Cottage	35	31	35	+0	low
Ashleigh House	40	44	48	+8	medium
Catlins Farm	30	34	38	+8	medium
Glebe Farm	30	28	32	+2	low
Mill Green Farm	30	26	30	+0	low
Maryland Bank	30	23	27	-3	low
Night-time					
Elm Grange Farm	35	30	34	-1	low
Derwent Cottage	28	31	35	+7	low
Ashleigh House	35	44	48	+13	high
Catlins Farm	23	34	38	+15	high
Glebe Farm	23	28	32	+9	low

Property	Typical background (L_{A90})	Predicted plant noise level (L_{Aeq})	Predicted rated plant noise (L_{Ar})	Difference with background	Magnitude of Change
Mill Green Farm	23	26	30	+7	low
Maryland Bank	23	23	27	+4	low

12.5.18 The assessment undertaken demonstrates that, in many cases, the worst-case predicted rated noise levels are lower or comparable to existing typical background noise levels, or are lower than 35 dB L_{Ar}. According to BS 4142 and taking into account the context of the Proposed Development in the area, this would correspond to a negligible to low magnitude of change. However, at some noise-sensitive properties to the east and south of the energy storage area, the predicted levels are higher. Although rated levels may be comparable to existing day-time background noise levels for some of the properties along the A17, during quieter periods they would be higher such that, accounting for the above comparison and the context of the Proposed Development in the area, potentially represent a medium to high magnitude of effect in the absence of further mitigation.

12.5.19 In conclusion, there is a potential for a medium to high magnitude of change due to operational noise on some highly sensitive receptors under worst-case assumptions and in the absence of any mitigation. This corresponds to **moderate to major adverse** noise effects which would therefore be **significant**.

Decommissioning

12.5.20 Decommissioning is likely to involve activities of similar or reduced intensity as for the construction phase and therefore result in comparable noise and vibration effects in the most part; however, trenchless work or piling are unlikely to be required for this phase. The corresponding effects would therefore be **temporary minor** and **not significant**.

12.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

12.6.1 The design of the Proposed Development has been developed to generally maximise the distance between the proposed Solar Park areas and noise-generating plant from noise-sensitive receptors, which are all located at least 150m away.

12.6.2 The PEIR has been drafted to assess the current layout. However, this is an iterative process and following on from the consultation process and design considerations from all technical specialisms the design assessed within the Environmental Statement may have been amended. Such design mitigations, if required for noise implications, will be discussed in the Environmental Statement.

12.6.3 The grid connection route will be designed to maximise the distance from the works (in particular trenchless works) from noise-sensitive properties, taking into account other constraints. Crossing points requiring potential HDD and associated work areas will be identified and located at the furthest possible distance from dwellings.

Additional Mitigation

Construction

12.6.4 HGV deliveries to the Site and works likely to generate substantial levels of noise, aside from potential trenchless works, shall be limited to daytime hours of 08:00 to 18:00 during Monday to Saturday, unless otherwise agreed with the local authorities. Other construction activities unlikely to generate high noise levels (*e.g.* Site access and inductions, light vehicle movements etc.) may continue during other day-time periods.

12.6.5 If percussive piling is used for the support structures/foundations for the solar array, this should be further restricted to no more than two periods of four hours each with at least one hour of no piling between these four hour periods and restricted to the hours of 08:00 to 18:00 Monday to Friday and 08:00 to 12:00 on Saturdays.

12.6.6 This would reduce the potential effects of most construction activities (aside from trenchless works) to have, at worst, a short-term, temporary, **minor** adverse effect at the nearest residential receptors which is **not significant.**

12.6.7 The effects associated with trenchless works will be assessed in the Environmental Statement based on likely working areas identified. Where possible, trenchless works that are likely to result in significant noise effects at nearby residential receptors will be restricted to daytime working hours on weekdays (i.e. 08:00 to 18:00, Monday to Friday). Trenchless works will be completed in the shortest practical timescale. No trenchless work will be carried out at locations within 100m of a residential property during night-time hours without the permission of the property resident. No trenchless works will be carried out at locations less than 50m from any residential property.

12.6.8 Temporary noise barriers will be installed around trenchless compounds in order to provide screening for sources located at low heights (note however that it is likely to be impractical to provide noise barriers that are high enough to screen an entire HDD drilling rig, for example).

12.6.9 Local residents likely to be significantly affected by noise from trenchless works will be kept informed of the likely period during which the work will take place, the times and durations of planned works and the measures that are being taken to avoid unnecessary noise. On completion of the trenchless works at a particular location, local residents will be informed that the works are complete and noise effects due to trenchless works will cease.

12.6.10 For residential properties located within 50 to 300m from trenchless work areas that could experience significant night-time noise levels due to night-time works, the following measures will be investigated:

- use of alternative techniques such as micro-bore / pipe jacking;
- monitoring noise from the works and interrupting the noisiest drilling work at night;
- offering affected residents temporary re-housing for the duration of the trenchless works.

12.6.11 The above measures can be implemented in the CTMP and/or CEMP which can be secured by a DCO requirement.

12.6.12 The feasibility of some the above mitigation measures cannot be confirmed at this stage; for example, the offer of temporary re-housing may not necessarily be taken up by the residents. Therefore, it is considered that the potential effect of night-time trenchless works would have, at worst, a short-term, temporary, **minor to moderate** adverse effect at the nearest residential receptors which is **significant**.

<u>Operation</u>

12.6.13 Selection of the final solar and electrical plant technology approach would be made on the basis of different considerations including noise. The detailed design of the Proposed Development, including final plant locations and selections, can be controlled through a requirement of the DCO that would establish suitable noise limits at the boundary of the Site. This should be determined such that total rated noise levels L_{Ar}, including the applicable character correction, do not exceed suitable plant noise limits: **Table 12.5**. These limits are defined in terms of rated noise levels, including relevant character penalties (if applicable), as assessed in line with BS 4142. The final plant selection and design to achieve the proposed noise limits can be secured through a DCO requirement.

Table 12.5: Proposed plant noise limits (rated noise levels, dB).

Type	Example properties	Quiet day-time (evening) periods	Night-time
Close to the A17 (within 200m)	Elm Grange Farm, Council Houses, The Rakes, etc.	45	39
Within 200-600 m of the A17	Derwent Cottage	39	35
Away from the A17 (1km or more)	Glebe Farm, College Farm	35	35

12.6.14 This is considered achievable in practice through measures including:

- placement of the potentially noisiest sources (such as central inverters, if used) to maximise distance to noise-sensitive receptors;
- selection of suitably quiet units based on manufacturer noise data;
- use of dedicated noise-reducing enclosures or suitably placed solid screening (through dedicated solid barriers or using buildings/containers).

12.6.15 To illustrate that the noise limits outlined in **Table 12.5** are achievable through design mitigation and selection of suitable generation equipment, **Appendix 12.2** sets out the results of noise modelling if a 3m high solid noise barrier enclosing the east, south and west edges of the energy storage area was included in the Energy Park design. In addition to this, it was assumed that a further 6 dB reduction in plant noise levels would be achieved through some of the other measures outlined in the above paragraph. The use of these two measures shows that the rated noise levels would then be compliant with the proposed limits of **Table 12.5**. For clarification, the Energy Park Layout that has been considered within this PEIR does not have the 3m high solid noise barrier within the design.

12.6.16 This is detailed in **Appendix 12.2** with a summary at key properties set out in **Table 12.6.** The resulting assessment of residual effects of operational noise, in all cases, are **minor or negligible** adverse which is **not significant**.

Table 12.6: Derived background, predicted rated noise levels (dB) and BS 4142 assessment at key receptors

Property	Typical background (L_{A90})	Predicted plant noise level (L_{Aeq})	Predicted rated plant noise (L_{Ar})	Difference with background	Magnitude of Change
Day-time					
Elm Grange Farm	40	24	28	-12	negligible

Property	Typical background (L_{A90})	Predicted plant noise level (L_{Aeq})	Predicted rated plant noise (L_{Ar})	Difference with background	Magnitude of Change
Derwent Cottage	35	24	28	-7	negligible
Ashleigh House	40	34	38	-2	low
Catlins Farm	30	25	29	-1	low
Glebe Farm	30	22	26	-4	low
Mill Green Farm	30	19	23	-7	negligible
Maryland Bank	30	16	20	-10	negligible
Night-time					
Elm Grange Farm	35	24	28	-7	negligible
Derwent Cottage	28	24	28	+0	low
Ashleigh House	35	34	38	+3	low
Catlins Farm	23	25	29	+6	low
Glebe Farm	23	22	26	+3	low
Mill Green Farm	23	19	23	+0	low
Maryland Bank	23	16	20	-3	low

Enhancements

12.6.17 Good practice management measures to minimise construction noise and vibration will also be referenced in the CEMP (which can be secured by a DCO requirement) and implemented by the contractor:

- The Site access road surface will be checked and maintained prior to use;
- Mobile plant and stationary plant items to be routed or located to maximise separation distance from noise-sensitive receptors (where possible), accounting for site-specific constraints;
- Select quieter plant units where possible;
- All plant when not in use is to be switched off;
- Operate only well-maintained construction plant selected for the specific activity; and
- Provide Site specific induction inclusive of good neighbourly behaviour and follow the Considerate Construction Scheme requirements.

12.6.18 The above would represent best practice. Further guidance in this regard in BS 5228-1 will also be referenced.

12.6.19 All proposed mitigation measures are summarised in **Table 12.7**.

Table 12.7: Mitigation summary

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured	
		By Design	DCO requirement
1	Site design maximising distances from main sources of noise (from construction and operation) to noise-sensitive receptors where possible.	X	
2	Detailed design and selection of electrical/mechanical plant, attenuation and/or screening measures to achieve suitable noise limits.		X
3	Restriction of construction and piling working hours, good practice measures to minimise construction noise and vibration (as part of CEMP).		X
4	Minimise extent and effects of trenchless work particularly for night-time work; include screening; liaise with closest affected residents; investigate alternative techniques or temporary re-housing.		X

12.7 CUMULATIVE AND IN-COMBINATION EFFECTS

12.7.1 The above assessment has demonstrated that beyond a distance of approximately 1km, construction works (within the Energy Park Site) and operational noise effects from the Proposed Development become negligible.

12.7.2 As can be seen within Table 2.7 of this PEIR there are nine cumulative sites that have been requested to be included within the cumulative assessment. Of these 3No. are within 5km of the Energy Park Site, with the Solar Farm development of Vicarage Drove (B/21/0443) being located closest to the Proposed Development as it is within the EIA Assessment area and located in close proximity to the National Grid Bicker Fen substation.

12.7.3 This scheme at Vicarage Drove was approved in February 2022, with a planning condition that works on the site must commence within 4 years. It is, therefore, likely that this scheme would be operational by the time the extension to National Grid Bicker Fen substation for the Heckington Fen proposal was being built. However, even if Vicarage Drove and the extension to the Bicker Fen substation were being built at the same time, there would be no significant cumulative operational noise issue given the separation distances involved. **Chapter 14 (Transport and Access)** considers that cumulative traffic impacts considerations are also unlikely to be significant and this would also be the case for noise.

12.7.4 The other schemes are all too far away for Heckington Fen Proposed Development to result in a cumulative noise impact from either the construction, operation or decommissioning phase.

12.8 SUMMARY

Introduction

12.8.1 This chapter has considered the potential effects of noise and vibration associated with the Proposed Development, both associated with the different construction and decommissioning activities and traffic, as well as the operational phase.

Baseline Conditions

12.8.2 The baseline conditions were determined from a combination of new survey work and reference to historical data captured at noise-sensitive receptors neighbouring the Site.

Likely Significant Effects

12.8.3 The assessment has identified potential significant noise effects if trenchless work is required and remains active at night, depending on the final locations where this may be required along the grid connection route.

12.8.4 Noise and vibration from other construction activities may be audible or perceptible at times but the worst-case levels are such that, providing construction working hours are controlled in a standard manner, their effect would be either not significant or negligible. Construction traffic is associated with negligible effects.

12.8.5 Operational noise from electrical or mechanical plant could be sufficiently high in relation to the baseline noise environment and context of the area (during quieter periods of the evening and night), on the basis of worst-case assumptions, such that this could result in a significant effect at some of the closest receptors to the Site.

Mitigation and Enhancement

12.8.6 Construction working hours would be controlled for most noise-generating activities (including restrictions on piling work for Saturday afternoons), and good practice measures would further reduce noise levels in practice.

12.8.7 The potential effects of trenchless construction if required for night-time work would be minimised and managed through the design of the grid connection route and use of localised screening, and liaison with the closest affected residents. Where these works are required in relative proximity to sensitive receptors, such that significant effects remain likely, alternative techniques, interruption of the drilling at night or offer of temporary re-housing (for the duration of these works) would be investigated. Worst-case residual effects could however remain significant should these measures not be possible to implement in practice.

12.8.8 Operational noise would be controlled to a set of proposed noise limits at the nearest noise-sensitive receptors through detailed design and selection of electrical/mechanical equipment, attenuation and/or screening measures. The residual effects would then be either not significant or negligible.

Cumulative and In-combination Effects

12.8.9 No Cumulative or In-combination Effects of noise or vibration were identified.

Conclusion

12.8.10 It is therefore concluded that the effects of the Proposed Development can be suitably controlled such that significant adverse effects are eliminated where reasonably practicable.

12.8.11 **Table 12.8** provides a summary of effects, mitigation and residual effects.

Table 12.8: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Construction								
Residential/ educational receptors	Construction activities noise – except trenchless work	Temporary direct	High	Negligible to Medium	Local	Negligible to Moderate adverse	Restriction of working hours, good practice measures.	Negligible to Minor
Residential/ educational receptors	Construction traffic noise	Temporary direct	High	Negligible	Regional	Negligible	CTMP including restriction on movement hours.	Negligible
Residential/ educational receptors	Construction trenchless work Noise	Temporary direct	High	Medium to High	Local	Moderate to Major adverse	Minimise extent and effects of trenchless work particularly for night-time; include screening; liaise with closest affected residents; investigate alternative techniques or temporary re-housing.	Minor to Moderate
Residential/ educational receptors	Construction Vibration	Temporary direct	High	Negligible to Low	Local	Negligible to Minor adverse	Restriction of working hours, good practice measures	Negligible to Minor
Operation								

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Residential/ educational receptors	Operational Noise	Permanent direct	High	Medium to High	Local	Moderate to Major adverse	Detailed design and selection of electrical/mechanical plant, attenuation and/or screening measures to achieve suitable noise limits.	Negligible to Minor adverse
Cumulative and In-combination								
None								

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 12.1- Noise Assessment Locations around the Energy Park Site

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

KEY

- Site Boundary
- Security Fence
- Construction Compound
- Primary Energy Storage
- Indicative 400kV Substation Location
- Indicative 132kV Substation Location
- 132kV Substation and Energy Storage Zone
- Noise Assessment Locations

Revisions:
First Issue- 27/05/20222 CR

FIGURE 12.1
Noise Assessment Locations Around the Energy Park Site

DRWG No: **P20-2370_33** Sheet No:_ REV: _

Drawn by : CR

Date: 27/05/2022

Scale: 1:6,000 @ A0

DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

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13 CLIMATE CHANGE

13.1 EXECUTIVE SUMMARY

13.1.1 This assessment considers the potential effects of the Proposed Development on emissions of greenhouse gases (GHGs), and both the vulnerability of the Proposed Development to climate change and the implications of climate change for the predicted effects of the project, as assessed by the other topic specialists ('in-combination climate effects').

13.1.2 The greatest volume of GHG emissions during the construction phase is as a result of the embodied carbon in construction materials, which accounts for over 98% of the total emissions. Total GHG emissions from the construction phase, when compared to applicable national carbon budgets in line with accepted guidance, equate to an effect that is not significant. The Proposed Development is considered to have a significant beneficial effect on emissions reductions during its operational phase. GHG emissions from decommissioning activities are considerably lower than construction related emissions and are not considered to be significant.

13.1.3 It is not considered that the Proposed Development could be affected by climate change to such an extent that its construction and/or operation could become unviable. Therefore, no significant adverse effects are predicted in relation to project vulnerability to climate change. With respect to 'in-combination climate effects', the assessment considered projected climate change in relation to landscape and visual amenity, cultural heritage, flooding and drainage, ecology and noise. No new significant effects were identified for these topic areas because of projected climate change.

13.2 INTRODUCTION

13.2.1 This chapter considers the potential effects of the Proposed Development with respect to climate change. Where appropriate, a distinction has been made between the 'Energy Park' (including the solar infrastructure, onsite cabling, and energy storage infrastructure), and the 'Proposed Development' which also encompasses the off-site overhead cable route and above ground works at the National Grid Bicker Fen substation.

13.2.2 In line with the EIA Regulations, the assessment considers the following:

- **Emissions reduction**[1]**:** potential effects of the Proposed Development on emissions of GHGs; and
- **Climate change adaptation:** both the vulnerability of the Proposed Development to climate change and also the implications of climate change for the predicted effects of the project, as assessed by the other topic specialists ('in-combination climate effects').

13.2.3 Climate change is a relatively new topic in EIA. Guidance is evolving and there is no prescribed way in which climate change should be incorporated into an ES. By its very nature, climate change interacts with a range of other environmental and social topics and therefore elements of this topic are considered throughout the PEIR and other application documents.

[1] Also known as 'climate change mitigation' and this is not to be confused with EIA mitigation. Climate change mitigation seeks to specifically reduce a development's greenhouse gas emissions. EIA mitigation is measures that aim to avoid, prevent, reduce or offset any identified significant adverse effects of a development.

13.2.4 To ensure that both emissions reduction and climate change adaptation are fully and consistently considered, this chapter sets out the assessment for these two elements separately, noting that GHG emissions associated with the overhead cable route and above ground works at Bicker Fen substation are not included in the PEIR but will be incorporated into the final ES, once the preferred grid route has been confirmed.

13.2.5 The assessment draws on recognised climate change projections, existing guidance and emerging good practice, as well as being informed by relevant information presented in other chapters in the PEIR and further documents which form part of the application.

13.2.6 The chapter has been written by LUC and 3ADAPT, consultants competent in climate change impact assessment. The lead author, Joanna Wright (MA MSc FIEMA CEnv), has almost 30 years of professional EIA experience with LUC and postgraduate masters level qualifications in both EIA and carbon management.

13.3 EMISSIONS REDUCTION

Legislative and Policy Framework

UK Legislation, Policy and Strategy

13.3.1 This assessment is carried out in accordance with the following legislation and relevant national policy objectives:

- **Part 2 of the National Policy Statement for Energy** (NPS EN-1)[2]: this sets out the central government policy context for major energy infrastructure. This includes the need to meet legally binding targets to cut greenhouse gas emissions, transition to a low carbon economy and decarbonise the power sector.
- Paragraph 1.1.1 of the **National Policy Statement for Renewable Energy Infrastructure** (EN-3)[3]: this underlines the importance of the generation of electricity from renewable sources by stating that electricity generation from renewable sources of energy is an important element in the Government's development of a low-carbon economy. It stresses that there are ambitious renewable energy targets in place and that a significant increase in generation from large-scale renewable energy infrastructure is necessary.
- Paragraph 152 of the **National Planning Policy Framewor**k (NPPF): this applies a number of core planning principles that are to underpin planning decision making, including to support the transition to a low carbon future in a changing climate. Planning should help to shape places in ways that contribute to radial reductions in greenhouse gas emissions, and support renewable and low carbon energy and associated infrastructure.
- **The Climate Change Act 2008:** this sets legally binding targets for reducing emissions of greenhouse gases by 2050. The net UK carbon account for 2050 must be at least 100% lower than the 1990 baseline.
- **The UK Carbon Budgets:** to support continuous efforts to achieve Net Zero by 2050 under the UK Climate Change Act 2008, a series of sequential carbon

[2] UK Government (2021) Draft Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf

[3] UK Government (2021) Draft National Policy Statement for Renewables Energy Infrastructure (EN-3). Available at:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015236/en-3-draft-for-consultation.pdf

budgets have been developed. Each budget provides a five-year statutory cap on total GHG emissions, which should not be exceeded to meet the UK's emission reduction commitments. These legally binding targets are currently available to the 6th carbon budget period (2033-2037) which became legislation under the Carbon Budget Order 2021, and which came into force on 24 June 2021 (BEIS, 2021).

- **The UK's Net Zero Strategy:** The 2021 Report to Parliament: Progress in Reducing Emissions highlighted that whilst the UK Government has made historic climate promises, it has been too slow to follow these with delivery. Therefore, sustained reductions in emissions will require a strong Net Zero Strategy. The Strategy includes policies and proposals for decarbonising all sectors of the UK economy to meet net zero by 2050.

<u>Local Policy and Strategy</u>

13.3.2 The Energy Park lies wholly within North Kesteven District, which is covered by the Central Lincolnshire Local Plan. The grid connection route lies predominantly within the Boston Borough Council boundary, which is covered by the South East Lincolnshire Local Plan.

<u>Central Lincolnshire Local Plan 2012 - 2036</u>

13.3.3 The Central Lincolnshire Local Plan, was adopted in April 2017 and states within its Vision that **"A move to a low carbon economy and society will be supported"**.

<u>Central Lincolnshire Local Plan Review – June 2021</u>

13.3.4 Policy S13: Renewable Energy Policy states that **"The Central Lincolnshire Joint Strategic Planning Committee is committed to supporting the transition to a net zero carbon future and will seek to maximise appropriately located renewable energy generated in Central Lincolnshire (such energy likely being wind and solar based)"**.

<u>North Kesteven District Council Climate Emergency Strategy and Action Plan – July 2020</u>

13.3.5 The North Kesteven Action Plan includes a number of actions specifically related to renewable energy generation. Action 4.3 is to increase renewable energy production, including to investigate available local energy data and information to understand local natural resources and to investigate land options for renewable energy projects.

<u>South East Lincolnshire Local Plan 2011-2036</u>

13.3.6 The South East Lincolnshire Local Plan highlights the importance of considering climate change in relation to new development in its vision, noting: **"New development will be of a high standard of design and will help South East Lincolnshire mitigate and adapt to climate change. The use of renewable energy technologies and sustainable drainage systems will also help minimise carbon emissions and flood risk respectively".**

13.3.7 Policy 31: Climate Change and Renewable and Low Carbon Energy states that the development of renewable energy facilities (with the exception of wind), associated infrastructure and the integration of decentralised technologies on existing or proposed structures will be permitted provided, individually or cumulatively, there would be no significant harm to the environment.

South and East Lincolnshire Councils Partnership Climate Change Strategy – Spring 2022

13.3.8 This strategy covers the sub-region of East Lindsey, Boston and South Holland and has a vision to achieve net zero emissions in advance of the UK Government targets. The strategy states that **"renewable energy generation is central to a net zero future and while this sector continues to grow there is still huge scope for small-scale domestic and commercial utilisation of the technology. Supporting residents and businesses to explore this will be vital together with ensuring the region is not left behind in the innovation needed to future-proof the energy distribution network.**"

Assessment Approach

Methodology

13.3.9 The assessment adopts a 'whole life' approach to calculating GHG emissions. This considers all major lifecycle sources of GHG emissions and includes both direct GHG emissions as well as indirect emissions from activities such as the transportation of materials and embodied carbon within construction materials.

13.3.10 The assessment will be updated for the ES to include the GHG emissions associated with the overhead cable route and above ground works at National Grid's Bicker Fen substation, once the preferred grid route has been confirmed.

13.3.1 As the calculated GHG emissions represent estimates, all numerical values presented below have been rounded according to either three significant figures for larger values, or to at least one decimal place for smaller values. To maintain accuracy, all values have been rounded direct from the calculated value, and therefore this may occasionally cause slight discrepancies where presented total figures may not add up exactly from other rounded values.

Scoping Consultation

13.3.2 In undertaking the assessment, consideration has been given to the scoping responses and other consultation undertaken as detailed in **Table 13.1** below.

Table 13.1: Consultation responses

Consultee	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
Planning Inspectorate	Formal Scoping Consultation	The assessment of climate change and greenhouse gas (GHG) emissions should be based on and refer to relevant guidance. This would include: • The Sixth UK Carbon Budget (December 2020) guidance particularly with respect to energy and transport during construction; • The British Standards Institution's Publicly Available Specification (PAS) on Carbon Management in Infrastructure (2016); and	Actioned, noting that IEMA's EIA Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance was updated in 2022.

Consultee	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
		• IEMA's EIA Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (2017).	
Planning Inspectorate	Formal Scoping Consultation	The Scoping Report states that the emissions reduction assessment will be a quantified assessment where possible. The ES should explain how emissions have been calculated and where this has not been fully quantifiable the justification for this.	Noted with quantification methodologies detailed in *Desk Based Research and Data Sources* section.
Lincolnshire County Council	Formal Scoping Consultation	The ES should consider the possible impact to the carbon footprint that would arise from the necessary transport/import of food & crops from elsewhere which would otherwise have been grown on this land. This is needed to understand the full carbon gains this development offers	Actioned. Included in assessment of operational effects. See calculation of 'Land Use Change' in section *'Assessment of Likely Significant Effects'.*
Lincolnshire County Council	Formal Scoping Consultation	The ES chapter has to consider the cumulative impact if the climate change/carbon footprint of the known NSIP solar schemes within the county from the transportation of the food that is no longer being produced on this land.	Actioned. Food production included as an operational effect; cumulative effects also considered.
North Kesteven District Council	Formal Scoping Consultation	The carbon footprint assessment needs to consider the effects of shifting the site from intensive arable to solar farms and the implications of this process	The assessment takes account of current baseline emissions associated with the site's agricultural use. See section *'Site Description and Context.*

<u>*Study Area*</u>

13.3.3 Following the latest IEMA guidance (see below), the study area for the assessment of GHG emissions is considered to be the global climate. The assessed receptor is the global atmosphere since GHG emissions are not geographically limited, having a global effect rather than directly affecting any specific local receptor(s).

<u>Guidance</u>

13.3.4 This assessment is carried out in accordance with the principles contained within the following documents:

- Institute of Environmental Management (IEMA) (2022): Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. Second Edition.
- Department for Business, Energy and Industrial Strategy (BEIS) (2021): Green Book Supplementary Guidance: Valuation of Energy Use and Greenhouse Gas Emissions for Appraisal.

- Department of Energy and Climate Change (DECC) (2013) Guidance on Annual Verification for Emissions from Stationary Installations
- British Standards Institute (BSI) (2016) PAS 2050:2016 Specification for the Assessment of the Life Cycle Greenhouse Gas Emissions of Goods and Services.
- World Business Council for Sustainable Development (WBCSD) (2015) The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.

Desk Based Research and Data Sources

13.3.5 A desk-based assessment has been completed to determine the potential effects of the Energy Park on the climate. These have been calculated in line with the GHG Protocol (WBCSD, 2015) and GHG 'hot spots' (i.e. materials and activities likely to generate the largest amount of GHG emissions) have been identified. This has enabled priority areas for mitigation to be identified. This approach is consistent with the principles set out in the IEMA guidance (2022).

13.3.6 An 18-month construction programme has been assumed for the purposes of this assessment (Spring 2026 to Autumn 2027), followed by a 40-year operational lifetime (Winter 2027 to Winter 2067) and a 6 to 12-month decommissioning phase (indicatively likely to commence in 2067 or 2068). For the purposes of this assessment, a 12-month decommissioning phase has therefore been used to represent a conservative assumption.

13.3.7 Estimated GHG emissions arising from various activities during the construction, operational and decommissioning phases of the Energy Park have been quantified using a calculation-based methodology as stated in the BEIS 2021 emissions factors guidance (BEIS, 2022).

13.3.8 Where BEIS 2021 GHG emissions factors are used in calculations, these are considered to reflect a conservative approach to project lifetime emissions. This is due to expected decarbonisation in all sectors over this time period in line with the UK's net zero carbon emissions target for 2050. This most significantly relates to transport emissions, where significant emissions reductions will be achieved form the transition to electric vehicles.

13.3.9 Where data is not available, a qualitative approach to addressing GHG effects has been followed, in line with the IEMA guidance (2022).

13.3.10 An overview of methodologies for identifying effects related to the construction phase is presented below. GHG emissions sources considered during the construction phase include the embodied carbon of products and equipment, the transportation of these materials to the site boundary, as well as the emissions associated with construction worker transport to the site.

13.3.11 Construction worker employment generation has been benchmarked from recent similar schemes, and scaled on a pro rata basis to that of the indicative capacity specifications.

13.3.12 A 1-way distance of 30km per journey has been assumed for the worker transportation calculations, which is a conservative estimate as, where possible, staff will reside much closer to the site limits, and employees not from the local area would stay in local accommodation.

13.3.13 The BEIS 2021 emissions factors for 'Average car' and 'Average van', including well-to-tank (WTT) emissions, have been applied to this distance and total worker numbers to calculate GHG emissions. This represents a conservative approach by assuming all journeys are single occupancy (driver only), not accounting for any lift sharing measures.

13.3.14 Products and equipment considered in this assessment include the solar panels, solar inverters, batteries and battery inverters, assuming a configuration that utilises AC coupled storage. Whilst the specific manufacturer and model of the PV modules has not yet been confirmed, indicative information on the number and size of modules likely to be installed is available. Respective product weights have been obtained from the corresponding supplier products catalogue (Sungrow, 2021).

13.3.15 A likely worst-case country of origin of China has been assumed as a conservative estimate for products and equipment, with distances estimated from ports with a proximity to relevant manufacturing facilities in Shanghai. Corresponding HGV and sea freight distances of 350km and 21,900km respectively have been assumed for transportation of materials.

13.3.16 For HGV transportation of materials, the BEIS 2021 emissions factor for 'Rigid HGV–7.5-17t' has been applied, including WTT emissions. It has been assumed that HGVs are 100% laden. Emissions per unit distance have been multiplied by the assumed distance above.

13.3.17 For sea freight transportation, the BEIS 2021 emissions factor for 'Products tanker–Average' has been applied, including WTT emissions. Emissions per unit distance and weight have been multiplied by the assumed distances and product weights above.

13.3.18 The embodied carbon of the solar panel modules to be installed within the Energy Park was estimated by taking their indicative size and weight from the supplier product catalogue (Sungrow, 2021), and using the embodied carbon benchmark from the Environmental Product Declaration (EPD) for a comparably sized module manufactured in China. (AB, 2020).

13.3.19 For the embodied carbon within the inverters, embodied energy benchmarks (Rajput, 2017) have been multiplied by the indicative capacity specifications. As a likely worst-case country of origin of China has been assumed, the embodied energy has then been converted from kilowatt hours (kWh) to kilograms of CO2 equivalent (kgCO2e) using an assumed energy for the country (China) in which they are assumed to be produced; (Carbon Transparency Initiative, 2016), assuming that the energy used in the factories is predominantly electricity.

13.3.20 For the embodied carbon of the batteries, embodied carbon benchmarks (Rajput, 2017) have been multiplied by the indicative energy generation specifications.

13.3.21 Assumed reference values for the construction phase calculations are provided in full in **Table 13.2** below.

Table 13.2: Construction phase assessment assumptions

Description	Value	Unit	Source
Transport Emission Factors			
HGV Rigid (>7.5 tonnes-17 tonnes)	0.687	kgCO2e/km	BEIS (2021)

Description	Value	Unit	Source
HGV Rigid (>7.5 tonnes-17 tonnes) – WTT	0.167	kgCO2e/km	BEIS (2021)
Product tanker average	0.00903	kgCO2e/ tonne.km	BEIS (2021)
Product tanker average – WTT	0.00203	kgCO2e/ tonne.km	BEIS (2021)
Average van	0.241	kgCO2e/km	BEIS (2021)
Average van – WTT	0.0590	kgCO2e/km	BEIS (2021)
Product Weights			
Battery unit	18,000	kg per unit	Sungrow (2021)
Solar panel	20	kg per unit	Sungrow (2021)
Inverter unit	1,500	kg per unit	Sungrow (2021)
Embodied Carbon			
Battery unit	155	kgCO2e/kWh	Rajput, S. K. and Singh, O. (2017)
Solar panel	0.0103	kgCO2e/kWh	EPD International AB (2020)
Inverter unit	210	kWh/kW	Rajput, S. K. and Singh, O. (2017)
Carbon intensity of energy in China	0.57	kgCO2e / kWh	Carbon Transparency Initiative, 2016

13.3.22 An overview of methodologies for identifying effects related to the operational phase is presented below. GHG emissions sources within the scope of the operational emissions include operational energy use (i.e. for auxiliary services and standby power), fuel used for the transportation of workers to the Energy Park and maintenance activities (including embodied carbon in replacement parts, plant and machinery requirements).

13.3.23 Operational energy generation data was estimated by applying an industry standard capacity factor for solar PV to the indicative capacity specifications to estimate 386,000 megawatt-hours (MWh) for the first year of operation. Efficiency losses of the PV modules over time have been accounted for based on an assumed industry benchmark degradation factor for each subsequent year. Over the 40 year lifetime, this results in an estimated total energy generation of 14,000,000 MWh.

13.3.24 It should be recognised that, in addition to the conservative lifetime assumption, the annual energy generation estimates are also considered to represent a conservative assumption. This is because they are based on a minimal installed capacity relative to the site footprint, and also do not take into account expected future increases in the performance and efficiency of solar technologies.

13.3.25 Operational energy use (i.e. for auxiliary services and standby power) for the Energy Park during the night has been estimated as a proportion of estimated energy generation. Energy requirements will be met by energy imported from the National Grid. Therefore, the night-time energy use will result in GHG emissions as a result of the production of grid electricity, using projected grid GHG intensity (BEIS, 2021) over the operational phase of the Energy Park. These GHG intensity factors are shown in more detail in **Inset 13.1** below.

13.3.26 Activities related to operational maintenance have been represented by the replacing of product components. Whilst it is assumed that some components such as the solar panels will last the entire duration of the Energy Park's operational phase, as a conservative estimate, it has also been considered that other components may require more frequent replacing and maintenance. Therefore, a typical industry standard has been assumed to represent the averaged product replacement rate.

13.3.27 To calculate the associated GHG emissions for the embodied carbon and transportation of replaced products, estimated emissions from the equivalent activities during construction have been scaled on a pro rata basis to the proportion of embodied and transportation emissions for the construction phase.

13.3.28 Emissions associated with the land use change of intensive arable to solar farm have been calculated on the basis of the carbon footprint that would arise from the necessary transport and import of food and crops from elsewhere, which could otherwise have been grown on this land. For the purpose of this assessment, the average UK annual yield for the crop of wheat has been applied to the Energy Park (Ritchie and Roser, 2013).

13.3.29 The GHG footprint of food arises from multiple sources across the production and distribution supply chain. To estimate the emissions related to the transport of the offset food production, benchmarked GHG emissions were used per kilogram of food, using only the proportion of GHG footprint related to the transport of the produced food. (Ritchie and Roser, 2013).

13.3.30 Assumed reference values for the operational phase calculations are provided in full in **Table 13.3** below.

Table 13.3: Operational phase assessment assumptions

Description	Value	Unit	Source
Energy Generation			
Capacity factor	11	%	BEIS (2016)
Annual degradation factor	0.55	%	Industry benchmark
Operation and Maintenance			
Night-time energy demand	0.01	kWh/ kWh generation	Industry benchmark
Averaged product replacement rate	0.5	% per year	Industry benchmark
Land Use Change			
Wheat yield UK 2018 (average)	7.75	tonnes / ha	Hannah Ritchie and Max Roser (2013)
Transport emissions contribution to carbon footprint of wheat and rye	0.1	tCO2e / tonne	Hannah Ritchie and Max Roser (2013)

13.3.31 An overview of methodologies for identifying effects related to the decommissioning phase is presented below. GHG emissions sources within the scope of the decommissioning emissions include the transportation of products and equipment from the Energy Park boundary, as well as the emissions associated with worker transport.

13.3.32 For HGV transportation of materials and waste to their disposal point, an average distance of 50km has been assumed to reflect a conservative estimate. Correspondingly, the BEIS 2021 emissions factor for 'Rigid HGV–7.5-17t' has been applied, including WTT emissions. It has been assumed that HGVs are 100% laden. Emissions per unit distance have been multiplied by the assumed distance above.

13.3.33 For worker transportation, it has been assumed that an equivalent number of workers will be required on site as per the construction stage. Correspondingly, a 1-way distance of 30km per journey has been assumed for the worker transportation calculations, which is a conservative estimate as, where possible, staff will reside much closer to the site limits, and employees not from the local area would stay in local accommodation. The BEIS 2021 emissions factors for 'Average car' and 'Average van', including WTT emissions, have been applied to this distance and total worker numbers to calculate GHG emissions.

13.3.34 To reduce the lifetime impact associated with the embodied carbon of all products and equipment, recycling of reclaimed materials would be strongly encouraged upon end of life decommissioning. However, this assumption has not been applied to the calculation methodologies to be consistent with the conservative approach to impact assessment.

Assessment Limitations and Additional Assumptions

13.3.35 Whilst some information gaps such as the detailed energy generation modelling have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant effects in relation to GHG emissions associated with the Energy Park.

13.3.36 Where available, product or design data specific to the Energy Park required to undertake the lifecycle GHG emissions assessment has been provided by the project design team. Where data was unavailable, reasonable assumptions have been made and industry benchmarks (representing 'good practice' performance measures) adopted, based on professional judgement. These have then fed into the assessment using methodologies and data sources previously outlined in this Section.

Assessment of Significance

Sensitivity

13.3.37 The sensitivity of the receptor (global atmosphere) to increases in GHG emissions is always considered 'High', following IEMA Guidance (IEMA, 2022). This reflects the severe consequences of global climate change and the cumulative contributions of all GHG emission sources.

Magnitude

13.3.38 The magnitude of effect on the climate has been assessed as the change in mass of GHG emissions, in units of tonnes of carbon dioxide equivalent (tCO2e).

Significance

13.3.39 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change. Major and moderate effects are considered significant in the context of the EIA Regulations.

13.3.40 The updated IEMA guidance (IEMA, 2022) has been adopted for assessing the significance of GHG effects for EIA, in addition to standard GHG accounting and reporting principles which have also been followed to assess impact magnitude. According to the IEMA guidance (2022):

> **"The crux of significance is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050."**

13.3.41 The guidance describes five distinct levels of significance **"which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero"**. The guidance also states that it is down to the professional judgement of the practitioner to determine how best to contextualise a project's GHG impact and assign the level of significance.

13.3.42 In line with IEMA guidance, UK national carbon budgets have been used for the purposes of this assessment to determine the level of significance for both the construction and decommissioning phases. Since the effects of GHG emissions cannot be geographically constrained, more localised budgets or targets can be less meaningful, especially since it is unclear as to whether emerging local authority or regional budgets will add up coherently to the UK budget. In addition, national carbon budgets have the advantage of being clearly defined and based on robust scientific evidence.

13.3.43 As shown in **Table 13.4** below, the appropriate UK national carbon budget that spans the construction programme of the Energy Park (2023 to 2024), is the 4th carbon budget (2023 to 2027).

Table 13.4 Relevant carbon budgets for this assessment

Carbon Budget	Total budget (MtCO2e)
4th (2023-2027)	1,950
5th (2028-2032)	1,725
6th (2033-2037)	965

13.3.44 In GHG accounting, it is common practice to consider the exclusion of emission sources that are <1% of a given emissions inventory, on the basis of a 'de minimis' contribution. Both Department of Energy and Climate Change (DECC, 2013) and the PAS 2050 Specification (BSI, 2016) allow emissions sources of <1% contribution to be excluded from emission inventories, and for these inventories to still be considered complete for verification purposes. The IEMA guidance (2022) also states that projects with any non-significant adverse effects should be considered in terms of their compatibility with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and in terms of compliance with up-to-date policy and 'good practice' reduction measures.

13.3.45 Therefore, the GHG intensity of the Energy Park (defined as the operational emissions divided by the energy generation) has been compared with both the forecasted 2022 GHG intensity of the electricity grid (136gCO2e/kilowatt-hour (kWh)), as well as the projected grid GHG intensity as published by BEIS (BEIS, 2021) over the operational phase of the Energy Park.

13.3.46 This assesses the relative contribution of the Energy Park to the UK's trajectory towards net zero, since the projected grid intensity takes into account key variables related to climate change policies where funding has been agreed and where decisions on policy design are sufficiently advanced to allow robust estimates of policy impacts to be made.

13.3.47 This approach to assessing the significance of construction, operational and decommissioning effects is summarised in **Table 13.5** below.

Table 13.5 Significance criteria

Significance of Effect	IEMA Guidance	Construction / Decommissioning	Operational
Major Adverse	*"..not compatible with the UK's net zero trajectory"*	Net annual GHG emissions represent more than or equal to 1% of the relevant annual National Carbon Budget.	Net annual operational GHG intensity greater or equal to the 2022 grid GHG intensity.
Moderate Adverse	*"..does not fully contribute to decarbonisation"*		
Minor Adverse	*"…compatible with the budgeted, science based 1.5°C trajectory"*	Net annual GHG emissions represent less than 1% of the relevant annual National Carbon Budget.	Net annual operational GHG intensity less than the 2022 grid GHG intensity but greater than the relevant annual projected grid GHG intensity.
Negligible	*"…goes substantially beyond the reduction trajectory"*		Net annual operational GHG intensity equal to the relevant annual projected grid GHG intensity.
Minor Beneficial		Net annual GHG emissions are net zero.	
Moderate Beneficial	*"…GHG emissions to be avoided or removed from the atmosphere"*	Net annual GHG emissions are negative (i.e.. net sequestration of GHG emissions).	Net annual operational GHG intensity less than the relevant annual projected grid GHG intensity.
Major Beneficial			Net annual operational GHG intensity less than zero (i.e. net sequestration of GHG emissions).

Baseline Conditions

Site Description and Context

13.3.48 The land within the site consists mainly of arable land and trees. Trees are present individually in some areas as well as rows of trees and small woodland areas. The baseline for the lifecycle GHG assessment is a 'do nothing' scenario whereby the Energy Park is not implemented.

13.3.49 The baseline conditions include the existing carbon stock (e.g. carbon sequestered within vegetation present) and sources of GHG emissions (e.g. from agricultural vehicles and machinery) within the site from the existing activities on-site. As the land use within the site is largely agricultural, it is assumed that the baseline conditions of the land will have minor levels of associated GHG emissions.

13.3.50 This assumption is supported by data provided by the landowner detailing the total amounts of products and fuel consumed during the agricultural production in the 2021 harvest year. This includes information on the application of products such as seeds, fertilizer, herbicides and other additives, in addition to the associated diesel fuel consumption for tractor vehicle use, and number of journeys for lorry transportation of produce out of the site.

13.3.51 Whilst the growing of crops will sequester carbon in the short term for the duration of a growing cycle, this carbon would be subsequently released in a relatively short cycle during the agricultural practices of management, harvesting and consumption.

13.3.52 These net GHG emissions of the baseline conditions are further dependent on soil and vegetation types present, as well as including fuel use for other associated vehicles and machinery. Therefore, whilst it is likely that the resulting estimate for baseline conditions would indicate at least minor levels of GHG emissions, it is anticipated that these emissions will not be material in the context of the overall Energy Park.

13.3.53 Therefore, for the purposes of the lifecycle GHG assessment, a conservative GHG emissions baseline of zero is applied, which due to the likely existing minor levels of associated GHG emissions, represents a robust worst-case approach.

Baseline Survey Information

13.3.54 The assessment has been desk based, drawing largely from published guidance and data, in addition to existing agricultural information provided by the landowner.

Future Baseline in Absence of Development

13.3.55 The future baseline in the absence of the Energy Park is assumed to be the same as that of the baseline conditions previously outlined in this Section, representing a 'do nothing' scenario whereby the Energy Park is not implemented.

Assessment of Likely Significant Effects

Construction

13.3.56 The greatest GHG impact during the construction phase is as a result of the embodied carbon in construction materials which accounts for 98.4% of the total emissions.

13.3.57 Total GHG emissions from the construction phase are estimated to equate to 370,000 tCO2e. A breakdown of estimated GHG emissions from the construction of the Energy Park is presented in **Table 13.6** below.

13.3.58 GHG emissions from construction activities will be limited to the duration of the construction programme (18 months). When annualised, the total annual construction emissions equate to 247,000 tCO2e.

Table 13.6: Summary of Construction GHG Emissions

Emissions Source	Emissions (tCO2e)	% of Construction Emissions
Products (Embodied)	364,000	98.4
Transportation of materials & waste	4,860	1.3
Worker transportation	974	0.3
Total	**370,000**	**100.0**

13.3.59 GHG emissions from construction have been assessed to identify the significance of their impact. **Table 13.7** presents the estimated construction emissions against the carbon budget period during which they arise. Construction emissions will fall under the 4th UK carbon budget.

Table 13.7: Summary of Construction GHG Emissions

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO2e)	Annual Construction Emissions During Carbon Budget Period (tCO2e)	Construction Emissions as a Proportion of Annual Carbon Budget
4th Carbon Budget (2023 to 2027)	390,000,000	247,000	0.063%

13.3.60 Annual emissions from the construction of the Energy Park do not contribute to equal to or more than 1% of the annualised 4th carbon budget. The magnitude of effect is therefore considered low. GHG emissions from the construction of the Energy Park are therefore considered to have a **negligible to minor adverse (not significant) effect** on the climate.

Operation

13.3.61 The greatest GHG emissions during the operational phase are estimated to result from maintenance activities, associated with embodied carbon and the transport of replacement parts and equipment, which account for 79.14% of the total emissions.

13.3.62 Total operational GHG emissions are estimated to equate to 93,200 tCO2e over the 40-year design life, as presented in **Table 13.8** below. On an average annualised basis, this is equivalent to 2,330 tCO2e per year of operation.

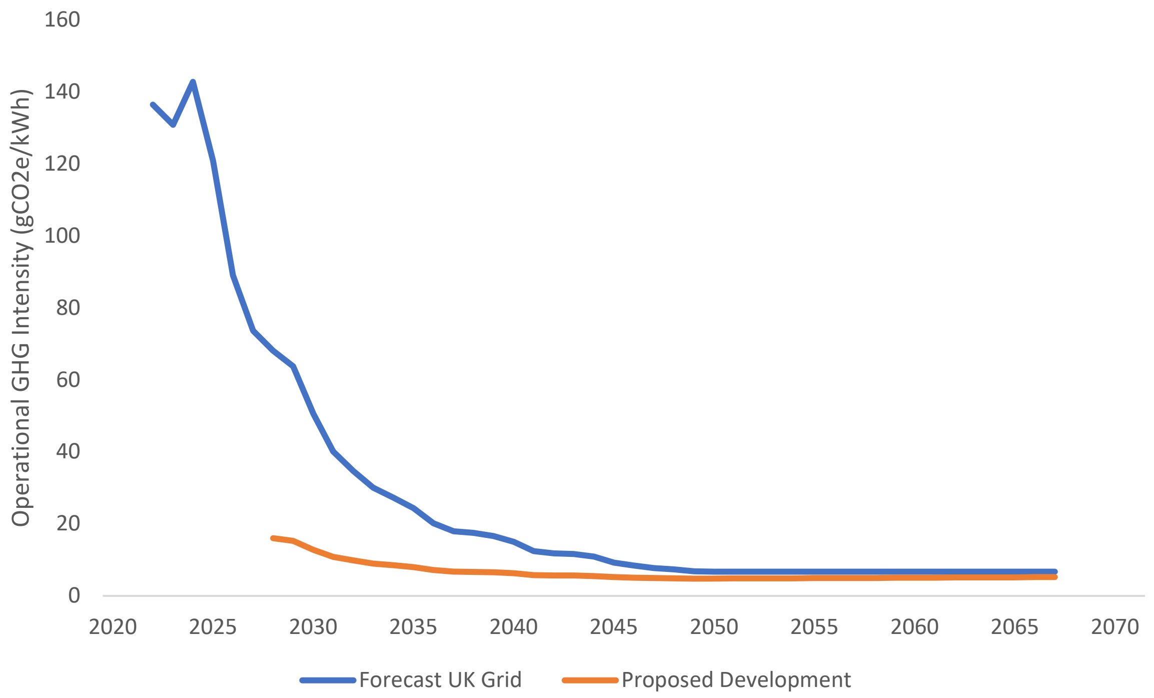
Table 13.8: Summary of Operational GHG Emissions

Emissions Source	Emissions (tCO2e)	% of Operational Emissions
Land use change	17,100	18.3
Worker transportation	195	0.2

Emissions Source	Emissions (tCO_2e)	% of Operational Emissions
Maintenance	73,800	79.1
Operational energy consumption	2,220	2.4
Total	**93,300**	**100.0**

13.3.63 The operational GHG emissions presented in **Table 13.8** are considered to reflect a robust worst-case as the calculations for worker transportation and maintenance have been carried out using current emissions factors to estimate emissions over the operational lifetime of the Energy Park. However, carbon and emissions associated with energy and fuel use throughout the supply chain are anticipated to be lower in the future as a result of grid decarbonisation and machinery and vehicle electrification in line with the UK's net zero carbon emissions target for 2050.

13.3.64 The average operational GHG intensity of the Energy Park has been calculated by dividing the total operational GHG emissions (outlined above) by the total energy generation of the Energy Park, giving an average operational GHG intensity of 6.65 grams of CO2 equivalent per kWh (gCO2e/kWh). This operational GHG intensity is well below the forecasted 2022 GHG intensity of the grid (136 gCO2e/kWh), as published by BEIS, and remains below the projected grid GHG intensity (BEIS, 2021) over the operational phase of the Energy Park, which is not projected to fall lower than 6.72 gCO2e/kWh. This comparison can be seen in **Inset 13.1** below.



Inset 13.1: Operational GHG intensity of UK grid projections and estimated operational Energy Park emissions

13.3.65 Over the 40 year operational lifetime, the Energy Park is estimated to produce a cumulative energy generation of 14,000,000 MWh. To contextualise the effects of the Energy Park GHG emissions during the operational phase, a counterfactual scenario has been assumed where the corresponding energy generation would otherwise be supplied by the National Grid, in the absence of the Energy Park.

13.3.66 Using the forecast grid projections of the GHG emission intensity for the generation of this energy supply, as shown above in **Inset 13.1**, it has been estimated that 232,000 tCO2e would be emitted to generate the equivalent amount of electricity over the operational lifetime of the Energy Park from the projected grid energy mix.

13.3.67 Based on the difference between the operational GHG emissions of the Energy Park, 93,300 tCO2e as shown above in **Table 13.8,** and the estimated emissions that would result from sourcing the equivalent energy supply from the grid, 232,000 tCO2e, (BEIS, 2021), it is therefore estimated that the Energy Park would result in avoided GHG emissions of 138,000 tCO2e.

13.3.68 Importantly, the above approach represents a conservative approach since it is comparing the operational GHG intensity of the Energy Park to a forecasted UK energy grid mix which already contains embedded assumptions around decarbonisation.

13.3.69 Whilst the national BEIS Energy Grid Mix is currently only projected to 2040, this shows a clear trend and assumption of increasing contribution of renewable energy sources such as solar power, such as the Energy Park, to the UK supply. (BEIS, 2021) This long-term trend is also expected to continue beyond 2040 and over the lifetime of the Energy Park.

13.3.70 Therefore, without low-carbon energy generation projects such as the Energy Park, the average grid GHG intensity will not fully decrease as shown projected in **Inset 13.1** above, which would also adversely affect the UK's ability to meet its carbon reduction targets.

13.3.71 In addition, it should be recognised when comparing the two operational intensities, that unlike the estimate for the Energy Park, the BEIS forecasted grid GHG intensities do not account for maintenance and worker transport requirements, and thus the GHG emission saving from the operational phase of the Energy Park is even greater.

13.3.72 Even when taking into account the conservative approach taken, **Inset 13.1** clearly shows that that the estimated annual operational GHG intensity of the Energy Park is considerably less than the relevant annual projected grid GHG intensity. Therefore, the operational phase of the Energy Park on GHG emissions is considered to have a **moderate beneficial (significant) effect**.

<u>Decommissioning</u>

13.3.73 Total GHG emissions from the decommissioning phase are estimated to equate to 1,830 tCO2e. A breakdown of estimated GHG emissions from the decommissioning of the Energy Park is presented in **Table 13.9** below.

13.3.74 GHG emissions from decommissioning activities will be limited to the duration of the decommissioning programme (6-12 months).

Table 13.9: Summary of Decommissioning GHG Emissions

Emissions Source	Emissions (tCO2e)	% of Decommissioning Emissions
Transportation of materials & waste	856	46.8
Worker transportation	974	53.2
Total	**1,830**	**100.0**

13.3.75 To contextualise the emissions associated with the decommissioning phase of the Energy Park, these are presented alongside the total emissions from the construction phase in **Table 13.10** below.

Table 13.10: Construction and Decommissioning GHG Emissions

Emissions Source	Emissions (tCO2e)
Construction	370,000
Decommissioning	1,830

13.3.76 As shown in **Table 13.10** above, the GHG emissions associated with the decommissioning phase are considerably less than those during the construction phase, with the value of 1,830 tCO2e representing less than 1% of the construction phase emissions.

13.3.77 To assess the significance of effect of the construction phase, the GHG emissions were compared to the relevant UK national carbon budgets. Using this approach, the residual effects from the construction phase were considered to be negligible to minor adverse (not significant). This approach is not possible for the timescale of the decommissioning phase (indicative decommissioning period likely to commence in 2067 or 2068), as the current UK national carbon budgets only span up to the year 2037.

13.3.78 Since the magnitude of GHG emissions from the decommissioning phase of the Energy Park is considerably less than those for the construction phase, it is therefore considered that the effect of these emissions is also low with a **negligible to minor (not significant) adverse effect** on the climate.

Mitigation and Enhancement

Mitigation by Design

13.3.79 The following mitigation measures have been assumed to apply to the construction, operational and decommissioning phases. This is because the key activities assessed during the operational phase include the maintenance requirements for product and equipment replacement and associated transport to the site, requiring similar mitigation measures to the initial construction activities.

13.3.80 Specific mitigation measures will include the following, which will be incorporated into the outline Construction Environmental Management Plan (CEMP) and outline Construction Traffic Management Plan (CTMP) which will accompany the ES:

- Designing, constructing and implementing the Energy Park in such a way as to minimise the creation of waste and maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content where feasible;
- Reusing suitable infrastructure and resources already available within the site where possible to minimise the use of natural resources and unnecessary materials (e.g., reusing excavated soil for fill requirements);
- Increasing recyclability by segregating construction waste to be re-used and recycled where reasonably practicable;
- Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHGs, from the Energy Park by employing good industry practice measures;
- Implementing staff minibuses to transport construction personnel to site or using car sharing options where possible;
- Switching vehicles and plant off when not in use and ensuring construction vehicles conform to current UK emissions standards; and
- Conducting regular planned maintenance of the construction plant and machinery to optimise efficiency.

<u>Additional Mitigation</u>

13.3.81 There will be unavoidable GHG emissions resulting from the construction phase of the Energy Park as materials, energy and fuel use, and transport will be required. Therefore it is not appropriate to define any mitigation measures further to those detailed in the section referenced above.

<u>Assessment of Residual Significant Effects</u>

<u>Construction</u>

13.3.82 The residual construction effects would remain **negligible** to **minor adverse (not significant)** as presented above.

<u>Operation</u>

13.3.83 The residual operational effects would remain **moderate beneficial (significant)** as presented above.

<u>Decommissioning</u>

13.3.84 The residual decommissioning effects would remain **negligible** to **minor adverse (not significant**) as presented above.

<u>Cumulative and In-Combination Effects</u>

<u>Cumulative Effects</u>

13.3.85 Presented below in **Table 13.11** is a list of other planned solar energy projects within Lincolnshire County Council area, alongside their corresponding generation capacities. Collectively these represent an estimated 2,050 MW of solar energy generation.

13.3.86 The assessment presented in this chapter has included all GHG emissions and has concluded that the effects would be negligible to minor adverse (not significant) for both the construction and decommissioning phases, and moderate beneficial (significant) for the operational phase. The same effects are anticipated for the other sites, utilising the same assessment methodology.

13.3.87 To further demonstrate the cumulative benefits of these projects, and the additional contribution of the Energy Park, this generating capacity has been contextualized to the UK's national targets for newly installed energy generation capacity. This data has been published by BEIS to show the projected requirements of newly installed electricity generating capacity for different types of generation in order to meet the national UK Net Zero Strategy. (BEIS, 2021).

13.3.88 Whilst this data does not specify a projected capacity of solar projects specifically, it does project a newly installed capacity of 107,000 MW across all types of renewable energy generation (including onshore and offshore wind, geothermal etc.) by 2040.

13.3.89 **Table 13.11** below shows that the contribution of the currently planned solar projects in the local area is estimated to represent 1.9% of the total national projections by 2040, and with the additional generating capacity of the Energy Park, would increase further to represent 2.3% of the total national capacity.

Table 13.11: Planned Solar Projects within Lincolnshire County Council area

Project Name	Solar Capacity (MW)	Contribution to projected UK Renewable Capacity
Cottam Solar Project	600	0.6%
Gate Burton Energy Park	500	0.5%
Little Hale Fen	49	<0.1%
Mallard Pass Solar Farm	350	0.3%
West Burton Solar Project	480	0.4%
Vicarage Drove	49.9	<0.1%
Gorse Lane	20	<0.1%
White Cross Lane	Unknown	N/A
Ewerby Thorpe	Unknown	N/A
Sub-Total	**2,050**	**1.9%**
Heckington Fen Energy Park	400	0.4%
Total	**2,450**	**2.3%**

13.3.90 This shows the beneficial effects of the Energy Park and its contribution towards meeting the UK's net zero targets, and the importance of the local area to contributing to these targets on a national scale. On this basis, cumulative operational effects are considered to be **moderate beneficial (significant)**.

In-Combination Effects

13.3.91 In-combination effects are given further consideration below.

13.4 CLIMATE CHANGE ADAPTATION (RESILIENCE)

Legislative and Policy Framework

13.4.1 This assessment reflects the legislation and relevant national policy objectives outlined below.

UK Legislation, Policy and Strategy

13.4.2 **Part 2 of the National Policy Statement for Energy** (NPS EN-1)[4]: this details the Government's energy and climate change strategy. This includes policies for adapting to climate change. Paragraph 4.8.5 of NPS EN-1 notes that **"applicants must consider the impacts of climate change when planning the location, design, build and operation, and, where appropriate, decommissioning of new energy infrastructure**." In addition, paragraph 2.3.5 of Section 4.8 of the EN-3 advises that the project's resilience to climate change should be assessed in the ES accompanying an application.

13.4.3 Paragraph 2.3.1 of **National Policy Statement for Renewable Energy Infrastructure** (EN-3)[5]: this refers to the government's energy and climate strategy in Part 2 of EN-1 and highlights the considerations that applicants and the Infrastructure Planning Commission (now the Infrastructure Planning Unit within the Planning Inspectorate) should take into account to ensure that renewable energy infrastructure is resilient to climate change.

13.4.4 Paragraph 2.4.1 of the **National Policy Statement for Electrical Networks** (EN-5): this notes that applicants are required to highlight to what extent the Proposed Development is expected to be vulnerable or resilient to the effects of climate change, for example to:

- flooding, particularly for substations that are vital for the electricity transmission and distribution network;
- effects of wind and storms on overhead lines;
- higher average temperatures leading to increased transmission losses; and
- earth movement or subsidence caused by flooding or drought (for underground cables).

13.4.5 The National Planning Policy Framework (NPPF) was revised in February 2019 and again in July 2021. Paragraphs 153 and 154 require developments to **"take a proactive approach to adapting to climate change"**. Section 14 of the NPPF 'Meeting the challenge of climate change, flooding and coastal change' emphasises the planning

[4] UK Government (2021) Draft Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf

[5] UK Government (2021) Draft National Policy Statement for Renewables Energy Infrastructure (EN-3). Available at:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015236/en-3-draft-for-consultation.pdf

system's pivotal role in sustainable development through **"minimising vulnerability and improving resilience to the impacts of climate change"**.

13.4.6 Paragraphs 159 and 160 of the NPPF state that: **"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere"**.

13.4.7 Planning Practice Guidance (PPG) was published in March 2019 as a companion document to the NPPF. Paragraph 001 Reference ID: 6-001-20140306 recognises that the planning system can **"increase resilience to climate change impact through the location, mix and design of development"**. The PPG also sets out the required approach to considering climate change in the assessment of flood risk. It provides recommendations for sensitivity ranges and allowances for future increases in rainfall, sea levels, river flows and tidal effects such as wind speed and wave height.

13.4.8 **The UK Climate Change Act 2008** requires the Government, on a five-year cycle, to compile an assessment of the risks for the UK arising from climate change, and then to develop an adaptation programme to address those risks and deliver resilience to climate change on the ground.

13.4.9 **The Climate Change Committee's 2021 Progress Report to Parliament** outlines the UK Government's progress to date on adapting to climate change. This noted that only five of the 34 sectors assessed had shown noticeable progress in the past two years, with no sector yet scoring highly in lowering its level of risk in relation to climate change adaptation in England.

Local Planning Policy

Central Lincolnshire Local Plan 2012 - 2036

13.4.10 The Local Plan places climate change adaptation as one of its key objectives. Objective o. Climate Change Adaptation and Flood Risk is **"To ensure Central Lincolnshire adapts to the effects of climate change, both now and in the future through careful planning and designs of development, including reducing and managing the risk of flooding from all sources"**.

Central Lincolnshire Local Plan Review – June 2021

13.4.11 Policy S19: Resilient and Adaptable Design states that to prevent and minimise the impacts of overheating in the built environment, applicants must demonstrate, commensurate with the scale and location of the proposal, consideration of how the design of the development minimises overheating and reduces demand on air conditioning systems, including orienting buildings to maximise the opportunities for both natural heating and ventilation and to reduce wind exposure; and considering measures such as solar shading, thermal mass and appropriately coloured materials in areas exposed to direct and excessive sunlight.

13.4.12 This policy also states that applicants should design proposals to be adaptable to future social, economic, technological and environmental requirements to make buildings fit for purpose in the long term, including resilience to flood risk, from all forms of flooding.

13.4.13 Policy S52: Design and Amenity states that development should incorporate appropriate landscape and boundary treatments to help achieve wider goals for climate change mitigation and adaptation and water management.

North Kesteven District Council Climate Emergency Strategy and Action Plan – July 2020

13.4.14 Section 9: Adaptation and Resilience has actions which include to assess how extreme weather events effect service delivery, increase permeable surfaces and improve management of land so it provides the ecosystem services that support humans and nature in being more resilient to the effects of climate change.

South East Lincolnshire Local Plan 2011-2036

13.4.15 The Local Plan highlights the importance of considering climate change in relation to new development in its vision, noting that **"New development will be of a high standard of design and will help South East Lincolnshire mitigate and adapt to climate change"**.

13.4.16 Strategic Priority 8 of the Local Plan has an action ***"to minimise the impact of and adapt to climate change by making more sustainable use of land and resources, reducing exposure to flood risk, promoting sustainable development and reducing human exposure to environmental risks"***.

13.4.17 Policy 31: Climate Change and Renewable and Low Carbon Energy notes that ***"all development proposals will be required to demonstrate that the consequences of current climate change had been addressed, minimised and mitigated"***.

Assessment Methodology

13.4.18 The assessment in relation to climate change adaptation considers both the vulnerability of the Energy Park to climate change and also the implications of climate change for the predicted effects of the project, as assessed by the other topic specialists ('in-combination climate effects').

Scoping Consultation

13.4.19 In undertaking the assessment, consideration has been given to the scoping responses and other consultation undertaken as detailed in **Table 13.11** below.

Table 13.11: Consultation responses

Consultee	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
Planning Inspectorate	Formal Scoping Consultation	The Inspectorate agrees that the Proposed Development is not likely to give rise to significant effects in relation to the following and agrees that these topics can be scoped out of the consideration of in-combination climate effects: • air quality emissions during operation	No action necessary.

Consultee	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
		• transport and access • socio-economics and human health.	
Planning Inspectorate	Formal Scoping Consultation	The Inspectorate does not agree that noise should be scoped out from the consideration of in-combination climate effects as there is insufficient information provided in the Scoping Report as to the likely significant effects from increased noise from building services equipment for cooling. This should be considered as part of the overall assessment of noise effects and cross referenced to the relevant chapters within the ES.	Noise has been scoped into the assessment of in-combination noise effects.

Study Area

13.4.20 The study areas used for the in-combination assessment is as the study area defined in each of the topic chapters of the PEIR. The assessment aims to determine the influence of climate change and project-related impacts on the identified receptors in each of the assessments in the scoped in topic chapters. The study area for the project resilience assessment is the Proposed Development itself.

Guidance

13.4.21 This assessment is carried out in accordance with the principles contained within the following document:

- IEMA (2020) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation.

13.4.22 The IEMA Guidance (2020) defines the two key elements of assessing climate change adaptation in EIA as follows:

- **Project resilience:** the risks of changes in the climate to the project, i.e., the resilience or conversely the vulnerability of a project to future climate change, both to changes in average conditions and in extreme events. This considers if the Proposed Development can withstand the projected climate changes (e.g., through design features and choice of construction materials) and can be future proofed, enabling resilience modifications to be added in the future if necessary.
- **In combination effects:** the extent to which climate exacerbates or ameliorates the effects of the project on the environment.

13.4.23 Therefore, in line with this guidance, the project resilience assessment assesses the effects of a changing climate on the Proposed Development. The in-combination assessment considers the extent to which the climate worsens or improves the effects of the Proposed Development on the environment, on a topic-by-topic basis. Topics that have been judged to have a lower sensitivity to climate change have been scoped out and are not considered further, whilst a more detailed assessment is provided for those topics that have been judged to have a higher sensitivity to climate change, and are therefore scoped into the in-combination assessment.

Desk Based Research and Data Sources

13.4.24 To establish the current climate of the Proposed Development, data was sourced from the Met Office[6] for the closest climate station located to the site. This was Waddington climate station, located approximately 30km north-east of the site.

13.4.25 As recommended in the IEMA guidance (IEMA, 2020), the UK Climate Projections 2018 (UKCP18) have been used to establish future climate change projections for the Proposed Development. The UKCP18 Projections are considered to be the most up-to-date assessment of how the UK's climate may change over the 21st century. Whilst they provide a valid assessment of the UK's future climate over land for a range of variables including temperature, precipitation and sea level rise, wind speed and storm frequency/intensity are considered separately as global modelling information is currently more limited.

13.4.26 The UKCP18 projections for temperature and precipitation are presented for the UK as a whole and also on a regional basis. The UK projections consider three variables:

- **Timeframe:** the projections are presented between the years of 2010 and 2099. These are broken down into a series of time periods including 2020-2039, 2040-2059, 2060-2079 and 2080-2099.
- **Probability:** The projections are provided as probability distributions rather than single values, with figures provided for 5, 10, 50, 90 and 95% probability.
- **Representative Concentration Pathways (RCP)**: Four pathways have been adopted; RCP2.6, RCP4.5, RCP6.0 and RCP8.5. These pathways describe different GHG and air pollutant emissions as well as their atmospheric concentrations and land use, with each one resulting in a different range of global mean temperature increases over the 21st century. RCP2.6 represents a scenario which aims to keep global warming likely below 2°C compared to pre-industrial temperatures. RCP4.5 and RCP6.0 represent intermediate scenarios while RCP8.5 describes a very high GHG emission scenario. All scenarios are considered to be equally plausible.

13.4.27 This assessment uses projections for the time period 2060-2079 and RCP8.5 and utilises the figures relating to the 10, 50 and 90% probability projections. As the most far-reaching projection, the 2060-2079 scenario is considered to be appropriate for the design life of the project. RCP8.5 is selected as a suitably precautionary approach as recommended as best practice in the IEMA guidance (2020). This RCP has been used to indicate the projected temperature, and precipitation for the East Midlands which encompasses the Proposed Development.

13.4.28 Information on wind speed and storms has also been considered, however changes in wind speeds are not currently available at the regional level and there remains considerable uncertainty in the projections, with respect to wind speed and storms.

Field Survey

13.4.29 The assessment has been desk based, drawing largely from published guidance and data.

[6]https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcrws0hwg

Assessment Limitations

13.4.30 The assessment has been carried out using the UKCP18 projections. These are not climate change predictions as they include a degree of uncertainty. As stated in the UKCP18 Science Overview Report:

> ***"While the global and regional projections of future climate use the latest climate models and are diverse, they cannot cover all potential future climate outcomes out to 2100 (or beyond in the case of sea level)….The probabilities represent the relative strength of evidence supporting different plausible outcomes for UK climate, based on the climate models, physical insight, observational evidence and statistical methodology used to produce them. However, they may not capture all possible future outcomes, because, for example, some potential influences on future climate are not yet understood well enough to be included in climate models."***

Assessment of Significance

13.4.31 This assessment considers both the vulnerability of the Proposed Development to climate change and the implications of climate change for the predicted effects of the project, as assessed by the other topic specialists ('in-combination climate effects'). Potential receptors therefore include the following:

- Solar infrastructure receptors (including building materials, equipment and construction operations/processes);
- Socio-economic receptors (e.g. construction workers, permanent employees and users of the public right of way (PRoW) crossing the site));
- Environmental receptors (e.g. habitats and species).

13.4.32 When determining the likelihood of a climate hazard occurring, a worst case scenario has been assumed, whereby all climate hazards are considered likely to occur.

13.4.33 With respect to climate change adaptation and effect significance, section 7 of the IEMA Guidance (IEMA, 2020) explains that in determining significance, account should be taken of the susceptibility of the receptor (e.g. ability to be affected by a change and the opposite of climate resilience) and the vulnerability of the receptor (e.g. potential exposure to a change).

13.4.34 A receptor with high susceptibility has no ability to withstand/not be substantially altered by the projected changes to the climate. A receptor with low susceptibility has the ability to withstand/not be altered much by the projected change to climate. A receptor with high vulnerability is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future (e.g. river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions. Climatic factors have little influence on receptors with low vulnerability (and these receptors require limited consideration through the EIA process).

13.4.35 Using professional judgement, a combination of susceptibility and vulnerability, in addition to the value/importance of the receptor is used to reach a reasoned conclusion on sensitivity. The greater the susceptibility and/or vulnerability of the receptor, the greater the probability that receptor is also of higher sensitivity.

13.4.36 Magnitude of effect is based on a combination of likelihood, which takes into account the chance of the effect occurring over the relevant time period and also consequence, which reflects the geographical extent of the effect or the number of receptors affected (e.g. scale), the complexity of the effect, degree of harm to those affected and the duration, frequency and reversibility of effect. **Table 13.12** defines the likelihood of a climate effect occurring, after taking into account the mitigation measures that have been proposed.

Table 13.13: Defining likelihood of effect

Likelihood of climate effect occurring (after considering mitigation measures)	Description of likelihood
Likely	66-100% probability that the impact will occur during the life of the Proposed Development
Possible	33-65% probability that the impact will occur during the life of the Proposed Development
Unlikely	0-32% probability that the impact will occur during the life of the Proposed Development

13.4.37 The approach to defining consequence for the in-combination climate effects assessment is set out in **Table 13.14**, whilst **Table 13.15** sets out the consequence criteria for climate change resilience. To assess the consequence of an in-combination climate change effect, for each environmental topic scoped into the assessment, a level of consequence is assigned to an effect based on the approach outlined in **Tables 13.14** and **Table 13.15** and their respective assessment methodology. For climate change resilience, professional judgement has been adopted when assigning a consequence criterion to a potential effect.

Table 13.14: Defining consequence

Consequence	Description of consequence
High	The climate change factors in-combination with the effect of the Proposed Development causes the significance of the effect of the Proposed Development on the receptor, defined by the topic, to increase to major
Medium	The climate change factors in-combination with the effects of the Proposed Development causes the significance of the effect of the Proposed Development on the receptor, as defined by the topic, to increase to moderate
Low	The climate change factors in-combination with the effects of the Proposed Development causes the significance of the effect of the Proposed Development on the receptor, as defined by the topic, to increase to minor
Negligible	The climate change factors in-combination with the effect of the Proposed Development causes no change to the significance of the effect of the Proposed Development on the receptor, as defined by the topic

Table 13.15: Consequence criteria

Consequence	Consequence criteria
High	Major damage to infrastructure and complete loss of service; and/or Major financial loss; and/or Major health and environmental effects
Medium	Partial infrastructure damages and some loss of service; and/or Moderate financial impact; and/or Adverse effect on health and the environment

Consequence	Consequence criteria
Low	Localised infrastructure disruption; and/or No permanent damage, minor restoration work required; and/or Minor financial losses and/or slight adverse health or environmental effects
Negligible	No damage to infrastructure; and/ or No adverse financial effect, and/or No effects on health or the environment

13.4.38 The significance of potential effects is then determined using the significance criteria matrix in **Table 13.16**. Where an effect has been determined to be either moderate or major, this has been deemed a significant environmental effect in the context of the EIA Regulations. For project resilience, significance should reflect the aims/purpose of the project. For example, as a solar project has the purpose of generating renewable electricity, an effect which temporarily removes this should be considered significant.

Table 13.16: Significance Criteria

Consequence	Likelihood		
	Likely	**Possible**	**Unlikely**
High	Major	Major	Minor
Medium	Major	Moderate	Minor
Low	Moderate	Minor	Negligible
Negligible	Minor	Negligible	Negligible

Baseline Conditions

Current Climate

13.4.39 The current baseline is that of the current climate. Between the years of 1991 and 2020 at the Waddington climate station, the average maximum temperature summer[7] temperature was 20.7ºC and the average minimum temperature was 11.9ºC. For the same location and over the same time period, the average maximum winter temperature was 7.3ºC and the average minimum temperature was 1.7ºC.

13.4.40 The average rainfall during the same time period (1991-2020) and same climate station noted above was 60mm and 46mm respectively. The average sunshine hours during the same time period and location noted above was 196 in summer and 70 hours in winter. The average wind speed at 10m during the same time period and location noted above was 9.3 knots in summer and 10.3 knots in winter.

Extreme Weather Events

13.4.41 A heatwave and extreme drought conditions became established over most of the UK during the late winter and early spring of 2002/2003. The spring period saw a record-breaking lack of rainfall and gave way to a long, warm summer in 2003.

13.4.42 In 2010/2012, most of the UK experienced exceptional departures from normal rainfall, runoff and aquifer recharge patterns. Generalising broadly, drought conditions developed through 2010, intensified during 2011 and were severe across much of England and Wales by the early spring of 2012. Record late spring and summer rainfall then

[7] In accordance with the UKCP18 Derived Projections of Future Climate over the UK report, winter is classified as the months of December to February and summer is classified as the months of June to August.

triggered a hydrological transformation, with seasonally extreme river flows common through the summer and extensive flooding during the autumn and early winter.

13.4.43 In July 2019, the UK experienced a short but intense heatwave. On the 25th of July, temperatures in eastern England widely reached 35 to 36 degrees. The all-time temperature record for the UK was set at Cambridge, recording 38.7 degrees. The weather station at Cranwell, Lincolnshire recorded an all-time high temperature of 36.3 degrees.

13.4.44 In November 2021, the UK experienced one of the most powerful and damaging winter storms of the last decade in the form of Storm Arwen. The storm, tracking south to the north-east of the UK, brought northerly winds gusting widely over 69mph.

Future Climatic Baseline Conditions

13.4.45 The UKCP18 projections show a general trend towards warmer, wetter winters and drier, hotter summers. However, it should be noted that both temperature and rainfall patterns across the UK are not consistent and will vary dependent on seasonal and regional scale and will continue to vary in the future (Met Office, 2018).

Temperature

13.4.46 The UKCP18 projections show that temperatures within the East Midlands are projected to increase, with projected increases in summer temperatures greatest. The central estimate of increase in winter mean temperature is 2.4°C; there is a 90% probability of temperature change exceeding 0.8°C and a 10% probability of temperature change exceeding 4.2°C. The central estimate of increase in summer mean temperature is 3.4°C; there is a 90% probability of temperature change exceeding 1.5°C and a 10% probability of temperature change exceeding 5.4°C.

Precipitation

13.4.47 Winter rainfall is projected to increase, and summer rainfall is most likely to decrease. The central estimate of change in winter mean precipitation is an increase of 15%; there is a 90% probability of precipitation decreasing by up to 3% with a 10% probability of precipitation increasing by 35%. The central estimate of change in summer mean precipitation is a decrease of 26%; there is a 90% probability of summer precipitation decreasing by as much as 54% and a 10% probability of summer precipitation increasing by 2%. It should be noted, however, that rainfall patterns across the UK are not consistent and will vary dependent on seasonal and regional scales and will continue to vary in the future (Met Office, 2018).

Wind Speed and Storms

13.4.48 There are small changes in projected wind speed (Defra, DECC and Met Office, 2010). Across the UK, near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant impacts of winds (Met Office, 2018). This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is projected to be modest.

Sunshine Hours and Cloud Cover

13.4.49 Climate change is expected to alter the amount of sunshine hours and cloud cover that different regions of the UK receive. In comparing two 30-year periods (1961-1990 and 1991-2020), the Met Office has found that sunshine has increased by 5.6% across the UK (Met Office, 2021). North-eastern and eastern England have seen increases of more than 13%. A recent study from Imperial University suggested that low clouds have a cooling effect whereas high clouds have a warming effect (Imperial, 2021). There are no robust predictions on how this will affect the UK, however clouds are likely to play a significant role in the UK's future climatic condition.

Assessment of Likely Significant Effects

13.4.50 This section gives further consideration as to whether or not the projected climate change will materially affect any impact judgements, which may lead to additional potentially significant effects, taking account of relevant mitigation measures. The Proposed Development's resilience to climate change is also considered, particularly whether the project could be affected by climate change to such an extent that the construction and/or operation of the Proposed Development was potentially no longer viable.

Topics Scoped Into the Assessment of In-Combination Effects

13.4.51 For each ES topic, consideration has been given as to the relevance of the climate change projections for receptor baseline conditions. Those with a higher sensitivity to climate change have been scoped into the climate change adaptation assessment, as follows:

- landscape and visual amenity (operational phase)
- cultural heritage (construction phase)
- flooding and drainage (construction and operational phase)
- ecology (construction and operational phase)
- noise (operational phase, included at the request of the Planning Inspectorate).

Topics Scoped Out of the Assessment of In-Combination Effects

13.4.52 ES topics where receptors have been identified to have a lower sensitivity to climate change are proposed to be scoped out of the climate change adaptation assessment. These topics, including the justification for scoping them out, are discussed further below.

13.4.53 **Air Quality**: An increase in winter rainfall and/or in heavy rain days could lead to a possible decrease in relevant pollutant concentrations, with a decrease in summer rainfall leading to a possible increase in concentrations. Overall, however, at this stage, it is not anticipated that air quality conditions will fail to meet relevant air quality objectives as a consequence of projected climate change.

13.4.54 **Transport and Access:** Increased rainfall/storms have the potential to lead to traffic disruption during flooding episodes. Increased summer temperatures may cause some disruption and discomfort, although this is unlikely to be a significant concern, particularly for the operational phase of the development.

13.4.55 **Ground Conditions:** The projected increase in rainfall/possible storm events has the potential to result in the mobilisation of ground contaminants when the soil is saturated leading to potential consequences for human health or water quality. During the projected warmer and drier summers, there is potential for soil to become airborne leading to impacts on air quality and human health. However, as the site is not considered to be contaminated, this topic has been scoped out of the climate change adaptation assessment.

13.4.56 **Socio-Economics and Human Health:** Recent flooding events in the UK highlighted the extent to which economic activity and human welfare can be affected by flooding from increased rainfall. Temperatures are also likely to increase, which may lead to overheating concerns, particularly during construction. However, it is considered that this topic can be scoped out of the climate change adaptation assessment as significant effects are not considered likely (noting that flooding is scoped in as a separate topic).

13.4.57 **Land Use and Agriculture:** The projected increase in winter rainfall and/or in heavy rain days in combination with a decrease in summer rainfall and/or an increase in drought periods could lead to potential consequences for land use and agriculture. However, as the land is being converted from its current agricultural use into primarily a renewable energy generating site, for the duration of the consent, this topic can be scoped out of the climate change adaptation assessment (noting that project resilience to climate change is considered separately).

Assessment of Potential Effects

13.4.58 This section gives further consideration as to whether or not the projected climate change will materially affect any impact judgements, which may lead to additional potentially significant effects, taking account of relevant mitigation measures. The Proposed Development's resilience to climate change is also considered, particularly whether the project could be affected by climate change to such an extent that the construction and/or operation of the Proposed Development was potentially no longer viable.

13.4.59 Receptors identified above, as potentially sensitive to a changing climate, are as follows:

- landscape and visual amenity (operational phase)
- cultural heritage (construction phase)
- flooding and drainage (construction and operational phase)
- ecology (construction and operational phase)
- noise (operational phase, included at the request of the Planning Inspectorate).

<u>Landscape and Visual Amenity</u>

13.4.60 The Landscape Institute's Position Statement on climate change acknowledges that changes in average temperatures, precipitation and extreme weather events will have an effect on the landscape. Therefore, landscape and visual effects have been taken forward for further assessment for the operational phase, noting that the landscape mitigation planting will be fully delivered towards the final stages of the construction phase.

13.4.61 Chapter 6: Landscape and Visual Amenity concludes that there will be moderate and major significant residual effects in both the construction and operational phases of the Proposed Development on the landscape of the site itself and an effect of moderate significance on The Fens Regional Landscape Character Type. During the construction phase, temporary significant (major/moderate) residual effects are anticipated through a change to views from viewpoints and public footpaths. During the operational period, temporary and long term significant (major/moderate) residual effects are predicted through a change in views from viewpoints and public footpaths also.

13.4.62 It is not expected that climate change will materially alter predicted landscape and visual effects. Proposed mitigation and enhancement measures for the Proposed

Development include protecting existing hedgerows and gapping in with native species where necessary, new native hedgerows along the southern and western edges of the solar modules and the creation of a community orchard in the south-western corner of the Energy Park that will be planted once the Proposed Development has been commissioned. The use of native species in these enhancement measures will increase the resilience of the site to climate change by increasing species diversity at the site.

13.4.63 As such, whilst it is considered possible that an in-combination climate change effect could occur during the operational phase of the Proposed Development, the consequence of a climate effect is considered to be low. Therefore, a **minor and not significant** in-combination climate change effect is predicted for Landscape and Visual Amenity during the operational phase.

Cultural Heritage

13.4.64 Changes in temperature and rainfall patterns can affect above and below ground heritage assets. For example, waterlogged archaeological sites are susceptible to changes and fluctuations within the water table and so the remains of known and unknown archaeological remains have the potential to be affected by climate change.

13.4.65 Chapter 10: Cultural Heritage and Archaeology concludes that no significant effects are likely, either direct effects of truncation or destruction of buried archaeological remains or indirect effects as a result of changes to setting. No mitigation through design is considered necessary for archaeology. Planting may be necessary to screen the Proposed Development in views from selected heritage assets.

13.4.66 It is considered unlikely that an in-combination climate change effect will occur given the conclusions outlined above. The consequences of a climate effect are considered low. Therefore, a **negligible and not significant** in-combination climate change effect is predicted for Cultural Heritage during the construction phase.

Flooding and Drainage

13.4.67 Consideration of climate change has formed an integral part of the assessment of flood risk, which is also discussed further below under 'Project Resilience'. Decreased rainfall could also lead to seasonal and prolonged drying out of watercourses which may affect groundwater recharge and aquatic ecology. Changes in rainfall patterns also has the potential to reduce water flow rates in rivers within the drainage basin. An increase of silt laden run off could increase silt deposits in rivers, altering the nature of the river.

13.4.68 Chapter 9: Hydrology, Hydrogeology, Flood Risk and Drainage states that the baseline hydrogeological regime is unlikely to change as a results of the predicted effects of climate change. This is due to the unproductive nature of the geology and absence of aquifers that would be affected by recharge rates. Whilst there is likely to be an increase in surface water run-off due to an increase in impermeable surfaces and there is also potential for surface water contamination, from the flushing of silts and hydrocarbons from areas of hardstanding, the chapter concludes that the likely effects of the Proposed Development are not significant given the 'mitigation by design'/embedded mitigation measures.

13.4.69 Proposed mitigation measures for the construction phase include best practice methods to avoid water pollution/silt laden run-off and adverse effects on the surface water drainage regime and, where required, the laying of cables at sufficient depth beneath watercourses/drains to avoid causing damage to the integrity of embankments.

13.4.70 Given the mitigation measures outlined above, it is considered unlikely that a climate effect will occur during the construction phase. The consequences of a climate effect are considered to be medium. Therefore, a **minor and not significant** in-combination climate effect is predicted for Hydrology, Hydrogeology, Flood Risk and Drainage during the construction phase.

13.4.71 Proposed mitigation measures for the operational phase include the design of surface water management infrastructure such that the surface water run-off regime replicates that existing prior to development, implementation of SuDS and the use of elevated floor levels and flood resilient construction measures as required.

13.4.72 Given the mitigation measures outlined above, it is considered unlikely that a climate effect will occur during the operational phase. The consequences of a climate effect are considered to be medium. Therefore, a **minor and not significant** in-combination climate effect is predicted for Hydrology, Hydrogeology, Flood Risk and Drainage during the operational phase.

Ecology and Ornithology

13.4.73 Increased rainfall and flooding events, coupled with rising temperatures, may modify UK flora and fauna over time, with shifts in species' ranges. Natural England's 'Climate Change Risk Assessment and Adaptation Plan' sets out the risks and threats posed by current climate change projections. In association with the RSPB, Natural England has also published a Climate Change Adaptation Manual which details the potential effects of climate change on different habitat types.

13.4.74 Chapter 8: Ecology and Ornithology concludes that there will be an overall significant residual, locally, beneficial effect on biodiversity in the area of the Proposed Development. No significant adverse residual effects are predicted on habitats, protected species, or sites designated for nature conservation interest, including the Wash Special Protection Area (SPA) during the construction and operational phase.

13.4.75 Significant beneficial residual effects are predicted at a local level for certain receptors, such as grasslands, boundary habitat, brown hare, badgers and invertebrates. The ecological enhancements within the Proposed Development will increase resilience to the ecological effects of climate change, through choosing drought resistant seed mixes for sheep grazing, increasing the habitat mix in the area and the creation of a new community orchard with a species rich meadow beneath the canopy. This will improve ecological connectivity within the site therefore increasing the ability of species to move and adapt, via the provision of habitats of high ecological value and/or those which provide a clear ecosystem service such as carbon storage through tree planting and improvements in relation to water and soil erosion through the provision of attenuation measures.

13.4.76 As the construction period of the development is 18 months, it is unlikely that a significant shift in species range will occur during this time period. Therefore, the likelihood of an in-combination climate effect occurring is considered unlikely. The consequence is considered to be low. Therefore, a **negligible and not significant** in-combination climate effect is predicted for Ecology and Ornithology during the construction phase of the development.

13.4.77 The likelihood of an in-combination climate effect occurring during the operational phase of the development is considered possible, with the consequence of a climate effect considered to be low. Therefore, a **minor and not significant** in-combination climate effect is predicted for Ecology and Ornithology during the operational phase of the development.

Noise (included at the request of the Planning Inspectorate).

13.4.78 Changes in rainfall are projected. However, as the assessment of noise effects, included in Chapter 12: Noise, has been considered against a baseline environment in the absence of rainfall, this would not affect the outcome of the assessment.

13.4.79 Chapter 12 concludes that whilst there is the potential for significant (moderate to major) adverse noise effects on residential and educational receptors under worse case scenarios and with no mitigation, this can be reduced to non- significant (negligible to minor) adverse effects with the provision of suitable mitigation. This includes consideration of noise effects at the detailed design and selection of electrical/mechanical plant stage, with further attenuation and/or screening measures as required to achieve suitable noise limits.

13.4.80 As a result of higher temperatures, any building services equipment that provides cooling for components of the Proposed Development will also be required to operate at a higher intensity and for longer periods in the future, resulting in increased noise emissions. Increased temperatures would affect the need for plant to operate ancillary cooling equipment. However, the assessment has been undertaken based on all plant (including cooling) operating at full duty during the night-time and therefore this accounts for future temperature increases.

13.4.81 Based on the above assessment assumptions and mitigation considerations, the likelihood of an in-combination effect is considered to be possible with the consequences assessed as negligible. Therefore, a **negligible and not significant** in-combination effect is predicted for Noise during the operational phase.

Project Resilience

13.4.82 In general, and taking account of design and additional mitigation measures proposed, it is not considered that the project could be affected by climate change to such an extent that the construction and/or operation of the Proposed Development could potentially become unviable. Further details are provided below.

13.4.83 The UKCP18 projections show a general trend towards drier summers and wetter winters, with more extreme weather events. Solar modules and inverters are designed to be used globally, including places with much higher ambient temperatures. The modules will typically operate from -40 to +85 degrees but derate at higher temperatures. The inverters will operate up to about 50 or 60 degrees and again will derate or shut down under very high temperatures.

13.4.84 Whilst it is possible that there would be slightly lower than expected generation with consistently higher temperatures, it is likely that this would be more than offset by less moisture in the air, and in any case, it would only be a reduction in low single digit percentages so generation would not be materially affected. A study from 2014 also suggested that climate change could lead to a mean increase in the UK’s solar resource, although with greater seasonable variability and discrepancy between geographical regions (Burnett, 2014). This could actually increase the energy output of the Proposed Development, accepting that there is a high degree of uncertainty in this projection.

13.4.85 Whilst UK near surface wind speeds are expected to increase in the second half of the 21st century, with winter months in particular experiencing more significant impacts of winds, the Proposed Development will be designed to deal with the maximum wind loading expected (this applies to both fixed and tracking solar PV systems). This will include both the provision of new hedgerows and the enhancing of existing hedgerows to fill in gaps where necessary, helping filter and slow wind speeds throughout the Proposed Development. Solar PV modules selected for installation will also be certified to withstand other severe environmental conditions through their design. This will include antireflective and anti-soiling surfaces to minimise power loss from dirt and dust, in addition to resistance mechanisms to offer protection against snow load and severe salt mist and ammonia. The system will also be designed to deal with the maximum wind loading expected. As such, it is not considered likely that the solar PV modules will be affected by extreme weather events.

13.4.86 The high voltage parts of the site will also have additional flood protection, as required, either through bunding or the use of elevated bases.

13.4.87 The UKCP18 projections show a general trend towards warmer winters and hotter, drier summers. This has been taken into consideration when designing the landscaping strategy for the Proposed Development, including to ensure that the species selected for planting on the site are resilient to wild fires.

13.4.88 As temperatures are projected to increase, in addition to the frequency and intensity of winter storms, there is an increased risk of discomfort, particularly for construction workers and the limited number of permanent employees working at the Proposed Development during its operational life[8]. To avoid employee discomfort, for example during periods of extreme temperatures or increased precipitation, construction and operational activities will be managed so that the hottest or wettest/coldest parts of the day are avoided to ensure worker safety, although it is noted that this may not always be possible during the construction phase. The design, orientation and positioning of welfare facilities for staff will also be carefully considered. Additionally, the risk of overheating/hypothermia will be incorporated into the site risk assessment and the Proposed Development will comply with all relevant UK legislation related to the work environment including The Health and Safety at Work etc. Act 1974 and The Management of Health and Safety at Work Regulations 1999 (as amended). For example, this may include measures such as ensuring appropriate personal protective equipment (PPE) is worn for the site conditions and adequate water supplies are available to ensure staff stay hydrated during hotter weather.

13.4.89 Whilst the consequence of a climate effect occurring would be high in the event of a wild fire, high winds or storm occurring, or high-medium for flood risk and employee discomfort, when the mitigation outlined above is taken into account, it is considered unlikely that these effects will occur. Therefore, **minor and not significant** effects are predicted in relation to the Proposed Development's resilience to climate change.

Mitigation and Enhancement

13.4.90 No additional mitigation measures are proposed.

Assessment of Residual Significant Effects

13.4.91 The effects remain as reported above. There are no significant in-combination climate effects and no significant effects in relation to project resilience.

Cumulative Effects

13.4.92 With respect to climate change adaptation, this is a project specific consideration, namely the resilience of the project in question to climate change and the

[8] Those employed in operations and maintenance and a shepherd.

extent to which projected climate change could alter other predicted impact judgements. More widely, in relation to potential interactions with other developments, and following the same logic with respect to required compliance with regulatory standards and accepted good practice mitigation measures, **no significant cumulative effects** are anticipated.

13.5 SUMMARY FOR EMISSIONS REDUCTION

Introduction

13.5.1 To reflect the requirements of the 2017 EIA Regulations, an assessment has been undertaken of the potential effects of the Proposed Development on greenhouse gas (GHG) emissions reduction, in accordance with recognised guidance.

Baseline Conditions

13.5.2 The land within the site consists mainly of agricultural land and trees. The baseline conditions include the existing carbon stock (e.g. carbon sequestered within vegetation present) and sources of GHG emissions (e.g. from agricultural vehicles and machinery) within the site from the existing activities on-site. Whilst the growing of crops will sequester carbon in the short term for the duration of a growing cycle, this carbon would be subsequently released in a relatively short cycle during the agricultural practices of management, harvesting and consumption.

Likely Significant Effects

13.5.3 The greatest volume of GHG emissions during the construction phase is as a result of the embodied carbon in construction materials which accounts for over 98% of the total emissions. The remaining emissions relate to the transportation of materials, waste and workers. Total GHG emissions from the construction phase are estimated to equate to 370,000 tCO2e, which when compared to applicable national carbon budgets, in line with accepted guidance, equates to an effect that is not significant.

13.5.4 The greatest volume of GHG emissions during the operational phase is as a result of maintenance activities, associated with embodied carbon and the transport of replacement parts and equipment, which account for 79.14% of the total emissions. Total operational GHG emissions equate to 93,300 tCO2e over the 40-year design life. Emissions associated with the land use change from intensive arable to solar energy generation have been calculated on the basis of the carbon footprint that would arise from the necessary transport and import of food and crops from elsewhere, which could otherwise have been grown on this land.

13.5.5 The average operational GHG intensity of the Proposed Development has been calculated by dividing the total operational GHG emissions by the total energy generation of the Proposed Development, giving an average operational GHG intensity of 6.65 grams of CO2 equivalent per kWh (gCO2e/kWh). This remains below the projected grid GHG intensity (BEIS, 2021) over the operational phase of the Proposed Development, which is not projected to fall lower than 6.72 gCO2e/kWh. Importantly, without low-carbon energy generation projects such as the Energy Park, the average grid GHG intensity will not fully decrease as projected, which would also adversely affect the UK's ability to meet its carbon reduction targets. Therefore, the Energy Park is considered to have a significant beneficial effect on emissions reductions during its operational phase.

13.5.6 GHG emissions from decommissioning activities are estimated to equate to 1,830 tCO2e and are associated with the transportation of materials, waste and workers. Whilst these emissions cannot be compared to a relevant national carbon budget as these do not yet extend to cover the date of likely decommissioning, these are considerably lower than construction related emissions, and are considered to equate to an effect that is not significant.

Mitigation and Enhancement

13.5.7 Whilst mitigation measures will be included such as designing to reduce waste and maximise the use of materials with lower embodied carbon, effects will remain as outlined above, i.e. not significant.

Cumulative and In-combination Effects

13.5.8 When considering the generation capacities of other planned solar energy projects within Lincolnshire County Council area (where known), these collectively represent an estimated 2,050 MW of solar energy generation. This is also considered to have a significant beneficial effect on emissions reductions during their corresponding operational phases.

13.5.9 In-combination effects are considered below under 'climate change adaptation'.

Conclusion

13.5.10 No significant adverse effects have been predicted with respect to GHG emissions during the construction and decommissioning phases. A significant beneficial effect has been predicted during the operational phase both for the Proposed Development in isolation and cumulatively.

13.5.11 **Table 13.17** provides a summary of effects, mitigation and residual effects.

Table 13.17: Summary of Effects, Mitigation and Residual Effects

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Construction								
Global atmosphere	GHG emissions as a consequence of construction activities	Permanent*	High	Expressed as the change in mass of GHG emissions, in units of tonnes of carbon dioxide equivalent (tCO_2e)	International	Negligible to Minor Adverse	No further mitigation required above the mitigation measures already proposed	Negligible to Minor Adverse
Operation								
Global atmosphere	Net GHG emissions as a consequence of operation of the Proposed Development	Permanent	High	As above	International	Moderate Beneficial	No further mitigation required above the mitigation measures already proposed	Moderate Beneficial
Decommissioning								
Global atmosphere	GHG emissions as a consequence of decommissioning activities	Permanent	High	As above	International	Negligible to Minor Adverse	No further mitigation required above the mitigation measures already proposed	Negligible to Minor Adverse
Cumulative (In-combination considered below)								

Global atmosphere	Net GHG emissions as a consequence of operation of the Proposed Development in addition to other solar schemes considered	Permanent	High	As above.	International	Moderate Beneficial	No further mitigation required above the mitigation measures already proposed	Moderate Beneficial

*Selected as the IPCC estimates that CO_2 remains in the atmosphere for 50-200 years.

13.6 SUMMARY FOR CLIMATE CHANGE ADAPTATION

Introduction

13.6.1 To reflect the requirements of the 2017 EIA Regulations, an assessment has been undertaken of the potential effects of the Proposed Development on climate change adaptation. In accordance with recognised guidance, this has included both the vulnerability of the Proposed Development to climate change and also any implications of climate change for the predicted effects of the project, as assessed by the other topic specialists ('in-combination climate effects').

Baseline Conditions

13.6.2 Baseline conditions have been determined with respect to average maximum and minimum summer and winter temperatures, average summer and winter sunshine hours and average summer and winter wind speeds.

13.6.3 With respect to future baseline conditions, the assessment uses the UKCP18 climate projections for the 2080s which suggest that, in future, the site and its surroundings will experience warmer, drier summers and milder wetter winters. Whilst heavy rain days are likely to increase throughout the year, there is still considerable uncertainty with respect to likely changes in both wind speed and storm frequency/intensity. All other ES topic area authors were provided with a summary of the climate change projections and were asked to consider the relevance of this for their baseline descriptions. Whilst some possible changes were noted, it was not felt that baseline conditions would be materially altered to such an extent that this would need to be reflected in the subsequent assessments of effects.

Likely Significant Effects

13.6.4 With respect to the vulnerability of the Proposed Development, it is not considered that the project could be affected by climate change to such an extent that the construction and/or operation of the Proposed Development could potentially become unviable. Therefore, no significant adverse effects are predicted.

13.6.5 With respect to 'in-combination climate effects', the assessment considered the projected climate change projections in more detail in relation to landscape and visual amenity (operational phase), cultural heritage (construction phase) flooding and drainage (construction and operational phase), ecology (construction and operational phase) and noise (operational phase). No new significant effects were identified for these topic areas as a consequence of projected climate change.

Mitigation and Enhancement

13.6.6 Whilst a number of mitigation measures will be included to ensure project resilience, effects will remain as outlined above.

13.6.7 No additional mitigation is required in relation to in-combination climate effects. Effects will remain as outlined above.

Cumulative and In-combination Effects

13.6.8 With respect to climate change adaptation, this is a project specific consideration, namely the resilience of the project in question to climate change and the extent to which projected climate change could alter other predicted impact judgements. More widely, in relation to potential interactions with other developments, and following the same logic with respect to required compliance with regulatory standards and accepted good practice mitigation measures, no significant cumulative effects are anticipated.

Conclusion

13.6.9 No significant effects have been predicted in relation to climate change adaptation, either for the Proposed Development in isolation or cumulatively.

13.6.10 **Table 13.18** provides a summary of effects, mitigation and residual effects.

Table 13.18: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	**Description of Effect**	**Nature of Effect**	**Probability**	**Conseq-uence**	**Geographical Importance**	**Significance of Effects**	**Mitigation/ Enhancement Measures**	**Residual Effects**
Construction and Decommissioning								
Proposed Development	Extreme weather conditions	Temporary	Unlikely	Medium	Regional	Minor	Mitigation through solar PV module design	Minor
Proposed Development	High winds/storms	Temporary	Unlikely	High	Regional	Minor	The planting of new and filling in of current hedgerows to filter and slow wind speeds	Minor
Proposed Development	Employee discomfort	Temporary	Unlikely	Medium	Local	Minor	Health and Safety Training Risk Assessments Staggered working to avoid adverse climatic conditions, where possible	Minor
Cultural Heritage	Changes in temperature and rainfall patterns can affect above and below ground heritage assets	Permanent	Unlikely	Low	Local to Regional	Negligible	No mitigation measures are considered necessary	Negligible
Flooding and Drainage	Flood risk, drying out of watercourses, reduced flow rates	Temporary /Permanent	Unlikely	Medium	Local to Borough/ District	Minor	Best practice methods employed to avoid surface water run-off	Minor

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Probability	Conseq-uence	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Ecology and Ornithology	Modifications of UK flora and fauna over time, with shifts in species' ranges	Permanent	Unlikely	Low	Local, with the exception of the Wash SPA/ Ramsar Site which is of international importance	Negligible	Awareness of invasive species risk	
Operation								
Proposed Development	Extreme weather Conditions	Temporary	Unlikely	Medium	Regional	Minor	Mitigation through solar PV module design	Minor
Proposed Development	High winds/storms	Temporary	Unlikely	High	Regional	Minor	The planting of new and filling in of current hedgerows to filter and slow wind speeds	Minor
Proposed Development	Wildfires	Temporary	Unlikely	High	Regional	Minor	Planting of suitably resilient plant and tree species, with reference to updated Natural England Guidance	Minor
Proposed Development	Employee discomfort	Temporary	Unlikely	Medium	Local	Minor	Health and Safety Training Risk Assessments Staggered working to avoid adverse climatic conditions, where possible	Minor

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Probability	Conseq-uence	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Landscape and Visual Amenity	Changes in average temperatures, precipitation and extreme weather events will have an effect on the landscape	Permanent	Possible	Low	Borough/ District to Regional	Minor	Use of native species in planting to increase the resilience of vegetation	Minor
Flooding and Drainage	Flood risk, drying out of watercourses, reduced flow rates	Temporary /Permanent	Unlikely	Medium	Local to Borough/ District	Minor	Design of surface water management infrastructure such that the surface water run-off regime replicates that existing prior to development, implementation of SuDS and the use of elevated floor levels and flood resilient construction measures as required	Minor
Ecology	Modifications of UK flora and fauna over time, with shifts in species' ranges	Permanent	Possible	Low	Local, with the exception of the Wash SPA/ Ramsar Site which is of international importance	Minor	Various enhancement measures which will improve ecological connectivity within the site therefore increasing the ability of species	Minor

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Probability	Conseq-uence	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
							to move and adapt	
Noise	Building services equipment that provides cooling will be required to operate at a higher intensity and for longer periods in the future, resulting in increased noise emissions.	Permanent	Possible	Negligible	Local	Negligible	The assessment has been undertaken on the basis of all plant (including cooling) operating at full duty during the night-time and therefore this accounts for future temperature increases.	Negligible
Cumulative effects not considered further as effects are largely project specific								

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 14: Transport and Access

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

14 TRANSPORT AND ACCESS

14.1 EXECUTIVE SUMMARY

14.1.1 This chapter considers the environmental impact of the Proposed Development in terms of traffic and transport. It has been prepared further to a Scoping Opinion received from PINS in February 2022.

14.1.2 This PEIR chapter considers construction vehicle routes associated with both the Energy Park and the cable route from both the A17 east and A17 west. It concludes that during the construction phase there will be direct, short-term, temporary, negative effects; and that during the operational phase there will be direct, long-term, temporary negative effects. These effects will all be negligible.

14.1.3 It is concluded that the proposed package of mitigation will ensure that the Proposed Energy Park is acceptable and that there will be no adverse significant effects.

14.2 INTRODUCTION

14.2.1 This chapter is not intended to be read as a standalone assessment and reference should also be made to the other chapters within the PEIR. Reference should also be made to the Draft Outline Construction Traffic Management Plan (OCTMP) accompanying the PEIR which provides more detailed traffic and transport information relating to the construction phase of the Proposed Development.

14.2.2 It is envisaged that construction will take approximately 18 months and that decommissioning of the Energy Park will take approximately six to twelve months. Only the construction and decommissioning phases of the development have been considered as part of this PEIR chapter, as the operational phase is likely to only be associated with around one to two vehicles per day on to the Energy Park site. These vehicles will be associated with the maintenance of the Energy Park equipment and sheep and management of the Ecological Enhancement Areas.

14.3 ASSESSMENT APPROACH

Methodology

14.3.1 The assessment has been prepared in accordance with the Institute of Environmental Management and Assessment (IEMA) document 'Guidelines for the Environmental Impact of Road Traffic'.

14.3.2 The pertinent issues for the ES in terms of transportation are the magnitude and consequences of changes at the assessment links (detailed at Section 14.4) within the study area as a result of the construction phase of the development on:

- driver severance and delay;
- accidents and safety;
- hazardous and dangerous loads; and
- dust and dirt.

14.3.3 The study area was submitted in the Scoping Request issued to PINS and included the A17 only along the Energy Park frontage.

14.3.4 The impact of noise generated by construction vehicles is considered in detail at **Chapter 12**.

14.3.5 Based on the temporary construction phase and that there are anticipated to be a relatively low number of pedestrians within the vicinity of the Energy Park Site (noting the absence of continuous footway provision on the A17), pedestrians are likely to be limited to those using footpath HECK/15/1 in the northwest corner of the Energy Park Site. It is therefore not considered necessary to consider the impacts of the development on:

- pedestrian severance;
- pedestrian delay;
- pedestrian amenity; and
- fear / intimidation.

14.3.6 The methodology parameters set out above are in accordance with the PINS Scoping Opinion.

Assessment of Significance

14.3.7 As set out in **Chapter 2**, there are four levels of impact magnitude considered which are negligible, minor, moderate and major.

14.3.8 The IEMA 'Guidelines for the Environmental Assessment of Road Traffic' sets out two rules to be considered when assessing the impact of development traffic on a highway link as follows:

- Rule 1: include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and
- Rule 2: include any other specifically sensitive areas where traffic flow (or HGV component) are predicted to increase by more than 10%.

14.3.9 The 30% threshold is based upon research and experience and the IEMA guidelines suggest that less than a 30% increase results in imperceptible changes in the environmental effects of traffic, apart from in sensitive locations.

14.3.10 Definitions of magnitude have been based on these guidelines and are shown in **Table 14.1**.

Table 14.1 – Criteria for Magnitude of Impact

Impact	Magnitude of Impact / Threshold			
	Neutral	**Low**	**Medium**	**High**
Traffic Flow	Change in peak or 24 hr traffic within study area by less than 5%	Change in peak or 24 hr traffic within study area between 5% and 15%	Change in peak or 24 hr traffic within study area between 15% and 30%	Change in peak or 24 hr traffic within study area by 30% or more
Severance	Change in peak or 24 hr traffic within study area by less than 5%	Change in peak or 24 hr traffic within study area between 5% and 15%	Change in peak or 24 hr traffic within study area between 15% and 30%	Change in peak or 24 hr traffic within study area by 30% or more
Pedestrian Delay	The guidance recommends that professional judgement is used to determine the impact on Pedestrian Delay, considering local factors such as pedestrian activity, visibility and the physical conditions of fthe site.			
Driver Delay	Change in peak or 24 hr traffic within study area by less than 5%	Change in peak or 24 hr traffic within study area between 5% and 15%	Change in peak or 24 hr traffic within study area between 15% and 30%	Change in peak or 24 hr traffic within study area by 30% or more
Pedestrian Amenity	Pedestrian Amenity is impacted by traffic flow, composition and width of pavement and is related to fear and intimidation thresholds. As suggested by national guidance a threshold of where traffic or HGV flows have halved or doubled will be used to indicate whether there is a significant effect.			
Accidents and Safety	Number of predicted personal injury collisions (PICs) does not exceed the number of observed PICs.		The number of observed PICs will be compared against the predicted number of PICs that could be expected over the time period of the observed data (e.g. 3 years) in accordance with the COBA Manual (DMRB Volume 13, Section 1, Chapter 4). The calculations will be based on variables including: observed AADT traffic flow, road speed, length of road section and type of road. This analysis will be interpreted with professional judgement and used to inform and determine the impact on Accidents and Safety.	
Fear and Intimidation	As suggested by national guidance a threshold of where traffic or HGV flows have halved or doubled will be used to indicate whether there is a significant effect.			

14.3.11 Negligible, minor, moderate and major Impact Magnitudes can have either a beneficial or adverse Impact Significance, as set by the Significance Scale included in **Chapter 2**.

<u>Sensitive Receptors</u>

14.3.12 Sensitive receptors have been identified using the principles set out in the IEMA guidelines for the categories of effect assessed in this chapter.

14.3.13 The IEMA guidelines include the following:

- The need to identify particular groups or locations which may be sensitive to changes in traffic conditions.
- The list of affected groups and special interests set out in the guidance.
- The identification of links or locations where it is felt that specific environmental problems may occur.
- Such locations "…would include accident black-spots, conservation areas, hospitals. Links with high pedestrian flows etc."

14.3.14 The criteria for assessing the sensitivity of a receptor are set out in **Table 14.2**.

Table 14.2 – Criteria for Sensitivity of Receptor

Significance	Description
High	• Schools / colleges • Care / retirement homes • Roads with no footways that are likely to be used by pedestrians • Accident black-spots
Medium	• Hospitals / surgeries / clinics • Parks and recreational areas • Retail areas • Roads with narrow footways that may be used by pedestrians
Low	• Open spaces • Tourist and visitor attractions • Places of worship
Negligible	• Links not covered by the above

14.3.15 It is understood that the Elm Grange business units located at the Energy Park Site frontage with the A17 have recently been converted to a new Special Educational Needs and Disabilities (SEND) school operated by Build-a-Future. On this basis it is considered that the extent of the A17 located within the vicinity of the temporary Energy Park construction is of high sensitivity significance. However, to provide a robust assessment is has been assumed for the purposed of this assessment that the full extent of the transport and access study area is of high sensitivity significance.

<u>Significance of Effect</u>

14.3.16 The Significance of Effect is determined by combining the predicted magnitude of impact with the assigned sensitivity of the receptor. The Significance of Effect is set out in **Table 14.3**. The shading indicates those significance ratings that are deemed to be 'significant' effects.

Table 14.3 – Significance Matrix

Magnitude of Change	Sensitivity of Receptor				
		High	**Medium**	**Low**	**Negligible**
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Legislative and Policy Framework

14.3.17 The traffic and transportation aspects of the scheme have been carried out in accordance with IEMA 'Guidelines for the Environmental Assessment for Road Traffic' and the Design Manual for Roads and Bridges (DMRB).

14.3.18 The proposals have also been considered in the context of the following documents:

- National Policy Statements (EN-1, EN-3 and EN-5);
- Draft National Policy Statement (EN-1);
- National Planning Policy Framework (2021);
- National Planning Policy Guidance (2014);
- Design Manual for Roads and Bridges (various); and
- 4th Lincolnshire Local Transport Plan (April 2013).

14.3.19 It is not considered that the Proposed Development constitutes a departure from any of these policies.

Scoping Criteria

14.3.20 This Transport and Access chapter deals specifically with the following transport and access issues pertinent to an EIA:

- The magnitude and consequences of changes in traffic flows on the local road network (along the potential routes for construction traffic), including operational and safety impacts as a result of the construction phase.

Limitations to the Assessment

14.3.21 No limitations or difficulties have been identified.

14.4 BASELINE CONDITIONS

Site Description and Context

14.4.1 The local highway network is described in detail within the draft OCTMP at **Appendix 14.1**. It is briefly described below for the purposes of the PEIR.

14.4.2 The proposal is for the construction of a new large-scale ground mounted solar photovoltaic (PV) electricity generation and energy storage facility (The Energy Park). The connecting cable route extends from the Energy Park to the connection point at the National Grid Bicker Fen substation, around nine kilometres from the centre of the site to the south. Further details of the proposal and the technology used together with the proposed site layout are provided separately as part of this submission.

14.4.3 The Energy Park Site is located to the immediate north of the A17, approximately 3.7 km to the east of Heckington and around 8.9 kilometres to the west of Boston.

14.4.4 Access to the site during the construction and operational phases is proposed from the A17 to the south of the site, approximately 900m northwest of the junction with Six Hundreds Drove via a new junction. Whilst the proposed access is under construction, a temporary construction access will be provided via an existing junction with the A17, approximately 600m southeast of B1395 Sidebar Lane junction at Elm Grange. An access in this location was previously granted planning consent as part of the previous wind farm proposals at the Site.

14.4.5 At this stage, access to the proposed Point of Connection (PoC) is not confirmed. However, it is anticipated that access to the north of the railway line will be served via Parks Farm. The preferred access option to the south of the railway is via the Triton Knoll or National Grid access points at the A17 and the A52 Bicker Road respectively. However, access will also be provided via Royality Lane.

14.4.6 The construction traffic route is detailed further in the draft OCTMP.

Baseline Survey Information

14.4.7 The sources of baseline information are included in **Table 14.4**.

Table 14.4 – Baseline Information

Baseline Topic	Data Source	Date
Automatic Traffic Count Surveys	360 Traffic Surveys Ltd	March 2022
Highway Search	Lincolnshire County Council	October 2021 and May 2022
Personal Injury Collision Data	Lincolnshire Road Safety Partnership	April 2022
Base Mapping	Ordnance Survey	October 2021

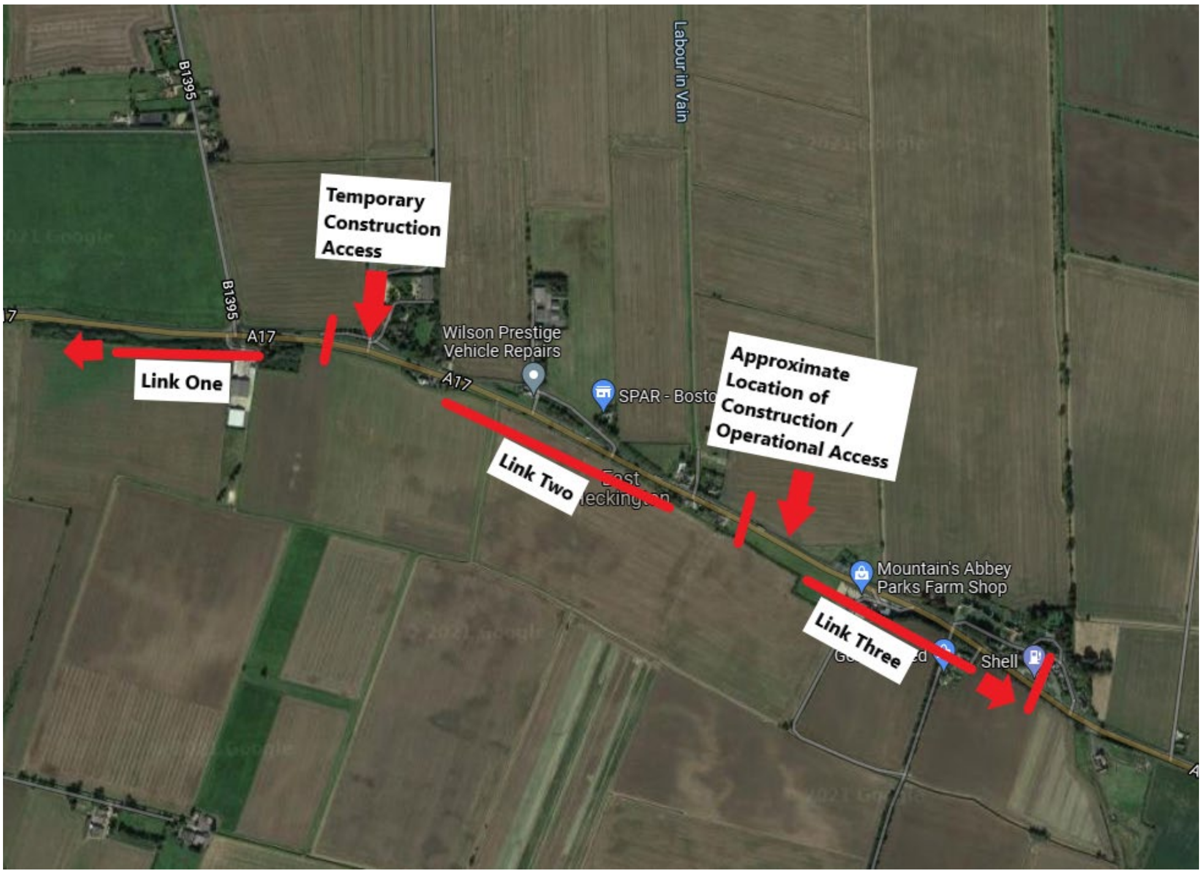
Baseline Traffic Flows

14.4.8 Automatic Traffic Count (ATC) surveys were undertaken by 360 Traffic Surveys Limited (an independent traffic surveyor) between Thursday 24th March 2022 to Wednesday 30th March 2022 at the following locations, to enable a daily profile on each of the potential routes for construction traffic to be determined:

- A17 west of proposed temporary construction access;
- A17 west of proposed construction / operational access; and
- A17 east of proposed construction / operational access.

14.4.9 The approximate link locations (as submitted with the Scoping Request) are shown at **Plate 14.1**.

Plate 14.1 – Approximate Link Locations



14.4.10 **Table 14.5** sets out the recorded baseline two-way flows for the PEIR transport study area.

Table 14.5 – 2022 Baseline AADT Flows

Link		Baseline Two-Way AADT	Baseline Number of Heavy Goods Vehicles (HGV) with %age of AADT
Link One - A17 west of proposed temporary construction access	AADT	20,373	4,350 [21.4%]
Link Two - A17 west of proposed construction / operational access	AADT	21,307	3,487 [16.4%]
Link Three - A17 east of proposed construction / operational access	AADT	21,249	3,485 [16.4%]

NOTE: HGVs included within total traffic flow. Link flows are two-way. Counts exclude pedal cycles.

Personal Injury Collisions

14.4.11 Personal Injury Collision (PIC) data has been obtained from Lincolnshire Road Safety Partnership for the most recent five-year period between 31/03/2018 and 31/03/2022. The study area comprises approximately 4.5 kilometres along the A17 between the junction with the A1121 to the east and the layby serving Garwick café to the west.

14.4.12 A summary of the PIC records is shown in **Appendix 14.2.** This confirms that there has been a total of 14 slight, three serious and one fatal incident within this five-year study period within the study area.

14.4.13 With respect to the fatal incident which occurred on 16/04/2020 at 10:00, it is understood that two vehicles were involved, including a car and a 7.5 tonne goods vehicle. The incident appears to have occurred when the car, which was travelling westbound along the A17, drove towards the nearside kerb and when correcting the direction of the vehicle, entered the opposing side of the carriageway into the path of the goods vehicle. Road conditions were dry, daylight was present, and the weather was fine without high winds.

14.4.14 Assessment of these incidents confirms that they are generally randomly located, that all incidents appear to have occurred as a result of temporary driver error or misjudgement. It is therefore concluded that there are no obvious highway safety patterns or problems within the study area.

14.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction

Traffic Flows – Energy Park

14.5.1 The number of trips by HGVs that could be associated with the construction phase of the Energy Park is set out in detail in the draft OCTMP at **Appendix 14.1** and summarised in **Table 14.6**.

Table 14.6 – HGV Development Traffic Flows to the Energy Park

Activity	Type of Vehicle	Total Number of Construction Vehicles
Solar Farm Components - Modules	16.5 metre articulated	1,875
Solar Farm Components - Frames		938
Battery Units		192
Substations		150
Spares Containers		10
Compound Containers		48
Inverters	12 metre Rigid	127
Transformer	Abnormal Indivisible Load	1
Crane		1
Access Tracks	10 metre tipper trucks	500
General	Front End JCB	10
TOTAL		**3,852 (4,045 including 5% contingency)**

NOTE: Total vehicles across full construction phase. AADT figures are set out at paragraph 14.5.5.

14.5.2 Assuming an 18 month construction period (total) and a six day working week (468 days total) equates to around nine HGV deliveries per day on average (or up to 18 two way movements per day). This could be higher or lower at times depending on the stage of construction.

14.5.3 In addition to the HGV movements identified in **Table 14.6**, there will also be a small number of construction movements associated with smaller vehicles such as the collection of skips for waste management, the transport of construction workers and sub-contractors.

14.5.4 A maximum of up to 100 construction workers are also anticipated to be on Energy Park Site at any one time during peak time of the construction period. The location where staff will travel from is unknown at this stage as it will depend on the appointed contractor. However, it is anticipated at this stage that the non-local workforce will stay at local accommodation and the vast majority of general operatives will be transported to the Energy Park Site by minibuses to minimise the impact on the local highway network. As such there could be 15 to 20 crew minibuses per day (30 to 40 two-way trips). The number of car trips to the site will be minimised to those senior staff such as project managers and the Health and Safety Executive.

14.5.5 Therefore, a total of 57 two-way movements per day on average, including 18 HGV trips, are forecast to be associated with the construction phase of the Energy Park Site. This equates to an AADT value of around 49 two-way movements ((57 x 6 days)/7 days), including 15 HGV trips.

<u>Traffic Flows – Off Site Cable Route</u>

14.5.6 It is anticipated that the construction of the cable route will be associated with the following vehicles and machinery:

i. 1x 21t Excavator - digging trench;
ii. 1x 9t+ Dumper - transporting sand / CBS;
iii. 1x 12t Excavator - backfilling trench;
iv. 1x 8t Excavator at sand storage;
v. 1x Rammax Trench compactor;
vi. 500l Towable Fuel bowser; and
vii. 1 x pick-up truck / off road vehicle for staff.

14.5.7 For the heavy and slow plant such as excavators, these would be brought to the site at the start of the project and stored overnight within a temporary fenced area at the point of work. Light plant, fuel and staff vehicles would return to the compound on a daily basis.

14.5.8 Based on the above, it is estimated that there could be between 20 and 40 daily vehicle movements associated with the cable route in total. This equates to a maximum AADT value of around 34 two-way movements ((40 x 6 days) / 7 days).

14.5.9 The proposed access arrangements will seek to ensure that no vehicles associated with the construction of the cable route will pass through the village of Bicker, as far as practicable. However, should it ultimately be necessary to route vehicles via Bicker, the number of vehicles would be considered negligible and would be on a temporary basis.

<u>Cumulative Traffic Flows</u>

14.5.10 Construction traffic routes could be from the A17 east or west, depending on the origin of the materials being transported to the site. However, a "left in – left out" arrangement will be implemented at the site access and as such any traffic arriving from either direction will ultimately result in a departure in the opposite direction. As such, it is expected that each vehicle will have a two-way movement either side of the site access junction.

14.5.11 This PEIR chapter considers construction vehicle routes associated with both the Energy Park and the cable route from both the A17 east and A17 west, and the impact on each of the potential routes is set out in **Table 14.7**. Negative refers to a negative impact magnitude and positive refers to a positive impact magnitude, in line with those parameters previously set out within the significance scale in **Chapter 2**.

14.5.12 Details of mitigation measures are summarised later in this chapter and considered in detail in the draft OCTMP at **Appendix 14.1**.

Table 14.7 – 2022 With Development Total Traffic Flows

Link		**Baseline Two-Way AADT**	**With Dev Total Traffic Flow**	**Additional Two-Way Traffic**		**Impact Significance**	
				Total Vehs	**HGVs**	**Total Vehs**	**HGVs**
Link One - A17 west of proposed temporary construction access	AADT	20,373 (4,350 HGVs)	20,457	83* [>1%]	15 [>1%]	Negligible	Negligible
Link Two - A17 west of proposed construction / operational access	AADT	21,307 (3,487 HGVs)	21,391	83* [>1%]	15 [>1%]	Negligible	Negligible
Link Three - A17 east of proposed construction / operational access	AADT	21,249 (3,485 HGVs)	21,333	83* [>1%]	15 [>1%]	Negligible	Negligible

**Including 49 vehicles associated with the Energy Park construction and 34 vehicles associated with the cable route.*

14.5.13 Environmental impact will occur as a result of construction vehicular traffic associated with the development proposals on any of the proposed routes. The implications are increases in vehicular traffic, including HGVs. Increases in traffic generally result in a temporary Negligible level of impact significance.

14.5.14 The location of the Energy Park Site is such that the levels of Impact Significance are minimised, with access and routes for construction traffic taken from principal highways. However, the draft OCTMP included at **Appendix 14.1** will seek to manage deliveries during the construction phase.

14.5.15 It should be noted that the forecast numbers of HGVs associated with the construction phase will be within the range of daily variation on the local highway network on all major routes.

14.5.16 During the construction phase there will be direct, short-term, temporary, negative effects.

Accidents and Safety – Energy Park and Off-Site Cable Route

14.5.17 As set out in **Appendix 14.2** there is not considered to be any underlying safety problem on the A17 close to the site.

14.5.18 The Energy Park access will operate on a "left in – left out" only basis and banksmen can be made available at the site access to indicate to drivers when it is safe to enter or exit the site access junction, if considered necessary. The proposed Energy Park Site access arrangement (set out in more detail in the draft OCTMP) will enable HGVs to pull off the A17 in one movement and allow two HGVs to pass one another on the internal site access road preventing the need for large vehicles to stop in the highway.

14.5.19 The off-site cable route will be accessed using existing junctions with the A17 or the A52 Bicker Road, none of which have a material highway safety patterns or problem.

14.5.20 It is therefore not considered that there will be an increase in incidents associated with the temporary 18 month construction phase.

Hazardous Loads

14.5.21 There are no dangerous or hazardous loads associated with the construction of the Energy Park or off site cable route.

Severance – Energy Park and Off-Site Cable Route / Bicker Fen Substation

14.5.22 As set out in **Table 14.7**, the change in total traffic associated with the temporary construction phase is less than 10% on all links. The overall effect is therefore considered negligible (not significant) in accordance with the significance criteria outlined in **Table 14.3** above.

Driver Delay– Energy Park and Off-Site Cable Route

14.5.23 National Highways (formerly Highways England) suggests that the threshold for detailed traffic assessment relates to those developments which generate 30 two-way peak hour vehicle trips. When assessed against the existing traffic levels in **Table 14.7** it evident that there would be no significant traffic impact on the surrounding highway network as a result of the temporary construction phase during the morning and evening peak periods.

Other Impacts – Energy Park and Off-Site Cable Route

14.5.24 The key potential impacts of construction traffic to be considered are:

- unsocial hours disturbance.
- mud on the roads; and
- dust, noise and air quality nuisance

14.5.25 It is envisaged that the construction working hours at the Energy Park and off-site cable route will generally be 0800-1800 Monday to Friday and between 09:00 to 13:00 on Saturdays. In some circumstances, such as when drilling has begun and cannot be stopped until it is complete, operational hours may be required to be extended beyond 18:00. However, it is considered that this will be an infrequent occurrence and works will typically be complete by 18:00. As no working is proposed at night on a frequent basis, it is considered that noise related to construction traffic movements will not give rise to disturbance to local receptors.

14.5.26 In hot, dry conditions dust will be managed through the provision of sprinklers. The transfer of mud on to the local highway will be managed through the provision of wheel washing facilities at the point where the access road meets the adopted highway, although this is likely to me minimal due to the use of existing tracks and the runway within the site. A road sweeper can also be provided as and when necessary.

14.5.27 Mitigation measures are set out in detail in **Section 14.5** and in the draft Outline Construction Traffic Management Plan.

Operation

14.5.28 Once operational, it is anticipated that there will be around one to two visits to the Energy Park Site per day for equipment maintenance, transportation of sheep and maintenance of Ecological Enhancement Areas. On average this equates to around one additional trip every two to three weeks. The largest vehicles that are likely to be used for this is not expected to be any larger than a 7.5 tonne van or 4x4 vehicles.

14.5.29 These vehicles frequently use the local highway network on a daily basis. It is therefore considered that there will be a negligible impact on the local highway network whilst the development is operational.

14.5.30 During the operational phase there will be direct, long-term, temporary, negative effects.

Decommissioning

14.5.31 The activities involved in the decommissioning process for the Energy Park are not yet known in detail. The likely timeframes for the Energy Park are set out in **paragraph 2.8**. The Energy Park will become operational in 2027 and is expected to be decommissioned in 2067 or 2068, with an operational life of 40 years[1]. There would be expected to be some traffic movements associated with the removal (and recycling, as appropriate) of material arising from removal. However, vehicle numbers are not expected to be any higher than those experienced during the construction period.

14.5.32 The works at Bicker Fen Substation are likely to remain in place. It is the intention with the off-site cables will be at a depth of over 1m. Therefore, it is expected that all cables will remain in place and will not need to be removed in the decommissioning process.

[1] Allows for construction to start in 2027, with 18 month construction period and the 40 year operational life starting once the whole of the Energy Park is constructed.

14.5.33 Current baseline data collected for the purposes of this assessment will not be valid at the year of decommissioning, which is currently anticipated to be in 2067 or 2068. However, it is considered unlikely that baseline traffic figures on local roads will reduce over the next 40 years or more, it is considered that the percentage increase in traffic due to decommissioning would be negligible, and that overall the effects of decommissioning traffic would be no greater than that of the construction traffic detailed above. Effects are therefore assessed as likely to be not significant.

14.5.34 A similar number of vehicles are likely to be required for the decommissioning of the Energy Park as the construction (around 8,090 two-way vehicular trips plus 15 to 20 crew minibuses per day (30 to 40 two-way trips)). Decommissioning is anticipated to be carried out over a six to twelve month period. Assuming a minimum decommissioning period of six months and a six day working week (144 days total), this equates to around 96 two-way vehicular movements per day or an AADT value of around 82 two-way movements ((96 x 6)/7). This could be higher or lower at times depending on the stage of decommissioning. The forecast development AADT associated with the decommissioning of the Energy Park represents around a 4% increase on the 2022 baseline traffic flows, which is not considered to be materially different to the impact of construction over an 18 month period. It is therefore considered that the impacts of decommissioning are likely to be negligible.

14.5.35 During the decommissioning phase there will be direct, short-term, temporary, negative effects

14.6 MITIGATION AND ENHANCEMENT

14.6.1 The impact significance of the construction phase is generally considered to be of 'Negligible or Minor Significance' on a typical construction day. The mitigation measures discussed below are forecast to reduce the residual impact of the project phase by one level of significance, resulting in overall Negligible Adverse Impact.

Mitigation by Design

14.6.2 A CTMP will be implemented during the construction phase of the project. The aim of the Plan, included at **Appendix 14.1**, is to minimise the impact of the construction phase on local residents, businesses and the highway network. Construction traffic movements will be kept to agreed working hours where practicable and designed to minimise disruption to the highway network and local residents (including during the night-time).

14.6.3 It contains a package of mitigation measures which are expected to include:

- A "left in – left out" arrangement at the permanent site access.
- Provision of contractor's compounds within the site, providing an area on site for HGVs to park and manoeuvre, off the local highway network.
- The arrival and departure of the HGVs will be strictly managed by the site manager. The drivers will adhere to a delivery schedule and will be required to call ahead to ensure that any emerging vehicles can be held within the compound. No HGVs will therefore be required, or permitted, to wait on the public highway.
- Details limiting the hours of site operation and the routing of construction traffic to protect local residential areas from construction traffic, especially from HGVs where possible. This will be discussed at the appropriate stage and if considered necessary by the County Council these could be secured separately in a final version of the CTMP, expected to be discharged prior to commencement of development.

- The introduction of wheel washing facilities, should ground condition dictate, before allowing vehicles to return to the local highway. In addition, a road sweeping vehicle could be made available to remove any site residue upon the local roads as and when necessary.
- It is envisaged that the construction working hours will generally be 08:00 – 18:00 Monday to Friday and 09:00 – 13:00 on Saturdays.
- Temporary signage will be erected in the vicinity of the Energy Park and the cable route / Bicker Fen Substation as appropriate during the construction phase to indicate that heavy construction vehicles are turning; and
- The contact details of the contractor and those of the highway department at Lincolnshire County Council will be exchanged before commencement of works on site.

14.6.4 A summary of the mitigation proposed for Transport and Access is included in **Table 14.8**.

Table 14.8 – Mitigation

Ref	**Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects**	**How measure would be secured**	
		By Design	**By DCO Requirement**
1	Left in – left out permanent access arrangements away from existing development (School and Residential)	X	
2	Construction Traffic Management Plan		X

14.7 CUMULATIVE AND IN-COMBINATION EFFECTS

14.7.1 In-combination effects arising from Transport and Access would adversely affect air and noise quality, which are considered separately within this PEIR.

14.7.2 This PEIR chapter has considered the cumulative effects of the other developments set out below, also located within Lincolnshire:

- Vicarage Drove;
- Land at Little Hale Fen;
- Land at Ewerby Thorpe;
- Land to the North of White Cross Lane;
- Land South of Gorse Lane, Silk Willoughby;
- Cottam Solar Project;
- Gate Burton Energy Park;
- West Burton Solar Project; and
- Mallard Pass Solar Farm.

14.7.3 The above sites are located some distance from the Energy Park Site. Based on the temporary nature of the Site's construction phase and the insignificant changes in AADT, it is not considered necessary to assess the cumulative transport and access impacts. There are therefore no cumulative effects relating to transport and access that need to be considered.

14.8 SUMMARY

Introduction

14.8.1 This Transport and Access PEIR chapter assesses the potential effects relating to transport and access. It considers the potential effects on vehicular traffic flows, accidents and safety, severance, driver delay, hazardous and dangerous loads and dust and dirt.

14.8.2 This PEIR chapter has been prepared alongside a supporting Draft Construction Traffic Management Plan.

Baseline Conditions

14.8.3 The Energy Park Site is located to the immediate north of the A17, approximately 3.7 km to the east of Heckington and around 8.9 km to the west of Boston.

14.8.4 Access to the Energy Park during the construction and operational phases is proposed with the A17 to the south of the site, approximately 900m northwest of the junction with Six Hundreds Drove. Whilst the proposed access is under construction, a temporary construction access will be provided via an existing junction with the A17, approximately 600m southeast of B1395 Sidebar Lane junction. The cable route will be accessed using existing junctions with the A17.

14.8.5 At this stage, the exact point of access to the proposed Point of Connection (PoC) is not confirmed. However, it is anticipated that access to the north of the railway line will be served via Parks Farm. The preferred access option to the south of the railway is via the Triton Knoll or National Grid access points at the A17 and the A52 Bicker Road respectively. However, the assessments have also considered access to the PoC via Royality Lane. Where possible, any access and routing options would seek to avoid Bicker.

14.8.6 Baseline surveys from 2022 confirm that daily (24 hour) traffic flows past the site on the A17 are up to around 21,307 vehicles with around 16 percent HGVs. Data from the most recent five-year period show that there are not any existing highway safety issues on the local highway network that would be exacerbated by the Proposed Development.

Likely Significant Effects

14.8.7 Impact Magnitudes have been defined for the construction phase with regard to 'Guidelines for the Environmental Assessment of Road Traffic', which states that a significant environmental impact may occur when traffic flows increase by more than 10% where the study area is of high sensitivity significance. This has, for the purposes of this assessment, been considered to represent a negligible impact significance.

14.8.8 The impact of the construction phase traffic is considered to be of Negligible significance.

Mitigation and Enhancement

14.8.9 Mitigation has been provided in the form of a Draft Construction Traffic Management Plan to reduce the impacts of the construction phase.

Conclusion

14.8.10 It is concluded that the proposed package of mitigation will ensure that the Proposed Energy Park is acceptable and that there will be no adverse significant effects.

14.8.11 There are therefore no highways or transportation reasons which should prevent the Proposed Development.

14.8.12 **Table 14.9** provides a summary of effects, mitigation and residual effects.

Table 14.9: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
Construction								
Link One - A17 west of proposed temporary construction access	Vehicular Traffic Flows	Temporary / Direct	High	Negligible	Local	Negligible	Provision of a Construction Traffic Management Plan	Negligible Adverse
	Accidents and Safety		High	Negligible		Negligible		
	Severance		High	Negligible		Negligible		
	Driver Delay		High	Negligible		Negligible		
	Hazardous and Dangerous Loads		High	Negligible		Negligible		
	Dust and Dirt		High	Negligible		Negligible		
Link Two - A17 west of proposed construction / operational access	Vehicular Traffic Flows	Temporary / Direct	High	Negligible	Local	Negligible	Provision of a Construction Traffic Management Plan	Negligible Adverse
	Accidents and Safety		High	Negligible		Negligible		
	Severance		High	Negligible		Negligible		
	Driver Delay		High	Negligible		Negligible		
	Hazardous and Dangerous Loads		High	Negligible		Negligible		
	Dust and Dirt		High	Negligible		Negligible		
Link Three - A17 east of proposed construction / operational access	Vehicular Traffic Flows	Temporary / Direct	High	Negligible	Local	Negligible	Provision of a Construction Traffic Management Plan	Negligible Adverse
	Accidents and Safety		High	Negligible		Negligible		
	Severance		High	Negligible		Negligible		

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
	Driver Delay		High	Negligible		Negligible		
	Hazardous and Dangerous Loads		High	Negligible		Negligible		
	Dust and Dirt		High	Negligible		Negligible		
Operation								
All	Vehicular Traffic Flows	Temporary / Direct	High	Negligible	Local	Negligible	n/a	Negligible Adverse
	Accidents and Safety		High	Negligible		Negligible		
	Severance		High	Negligible		Negligible		
	Driver Delay		High	Negligible		Negligible		
	Hazardous and Dangerous Loads		High	Negligible		Negligible		
	Dust and Dirt		High	Negligible		Negligible		
Cumulative and In-combination								
n/a								

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Chapter 15: Air Quality

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

15 AIR QUALITY

15.1 EXECUTIVE SUMMARY

15.1.1 This Air Quality PEIR Chapter focuses on the potential air quality effects at existing sensitive receptors during the construction and decommissioning phase.

15.1.2 The Proposed Development is not located within or near an Air Quality Management Area and monitored concentrations in the vicinity of the Proposed Development are consistently below the relevant Air Quality Objectives.

15.1.3 Predicted construction traffic flows have been screened against Environment Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance and considered to be not significant.

15.1.4 In addition, dust and non-road mobile machinery emissions during the construction phase will be controlled via an outline Construction Environmental Management Plan and as such are considered to be negligible with the inclusion of mitigation and therefore the effects are not significant.

15.1.5 There are not expected to be any significant cumulative and in combination effects.

15.1.6 There are expected to be no significant effects to air quality as a result of the Proposed Development.

15.2 INTRODUCTION

15.2.1 This Chapter considers the likely significant effects to air quality as a result of the Proposed Development. The focus is on the potential effects to air quality which would be generated by the Proposed Development at existing sensitive receptors during the construction and decommissioning phases of the Proposed Development.

15.2.2 As agreed in the Scoping Opinion and with reference to **Chapter 14**, due to the limited number of vehicle movements associated with the operation of a solar farm, expected to be approximately 20 per year for maintenance of the energy equipment, plus a further 1-2 movements daily to the Energy Park Site for land management infrequently as required, no further consideration is made to the operational phase within this PEIR Chapter.

15.3 ASSESSMENT APPROACH

Methodology

Legislation, Policy and Guidance Context

15.3.1 The Air Quality Chapter has been prepared with consideration of the following documents:

- National Policy Statement (NPS) EN-1 (2011)[1] and draft NPS (2021)[2];

[1] DECC (2011) Overarching National Policy Statement for Energy [online] (Last accessed: 28/04/2022), Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

[2] Department for Business, Energy and Industrial Strategy (2020) Draft Overarching National Policy Statement for Energy - [online] (Last accessed: 28/04/2022), Available at

- National Policy Statement (NPS) EN-3 (2011)[3] and draft NPS EN-3 (2021)[4];
- The Environment Act 1995[5];
- The Environment Act 2021[6];
- The Air Quality strategy for England, Scotland, Wales and Northern Ireland[7];
- The National Planning Policy Framework (NPPF) 2021[8];
- Planning Practice Guidance (PPG)[9];
- Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction[10];
- Environmental Protection UK (EPUK), and IAQM Land-Use Planning & Development Control: Planning for Air Quality[11];
- Defra Local Air Quality Management Technical Guidance (LAQM.TG(16))[19] ;
- Central Lincolnshire Local Plan (2017)[12]; and
- South East Lincolnshire Local Plan (2019)[13].

Construction

15.3.2 The impacts of vehicle emissions (nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$)) associated with the construction of the Proposed Development (Energy Park, Off-site Grid Connection and Bicker Fen extension) have the potential to effect existing sensitive receptors located at the roadside of the proposed construction traffic routes, which will mainly run along the A17 for the anticipated 18 months of construction.

15.3.3 For the construction of the Off-site Grid Connection cable the applicant has a preferred option of utilising the existing track off the A17, which was built for the RWE development of Triton Knoll. Legal discussions are ongoing with RWE to utilise this already constructed access point. If for legal reasons, this route is not used for the construction of the Off-site Grid Connection cable route then traffic would use Royalty Lane or Parks Farm which is adopted highway. Using the access point off Royalty Lane or Parks Farm would bring more traffic through Bicker Fen, which will be considered as more definitive routing options become available.

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf

[3] DECC (2011) National Policy Statement for Renewable Energy Infrastructure [online] (Last accessed: 28/04/2022), Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/37048/1940-nps-renewable-energy-en3.pdf

[4] Department for Business, Energy and Industrial Strategy (2020) - [online] (Last accessed: 28/04/2022), Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015236/en-3-draft-for-consultation.pdf

[5] The Stationery Office (1995) The Environment Act 1995 (Part IV), London

[6] The Stationery Office (2021) The Environment Act 2021, London

[7] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – [online] (Last accessed: 28/04/2022), Available at: www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1

[8] Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, Department for Communities and Local Governments, London

[9] Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance, London

10 Institute of Air Quality Management (2016) Guidance on the assessment of dust from demolition and construction v1.1 – [online], (Last accessed: 28/04/2022), Available at: iaqm.co.uk/text/guidance/construction-dust-2014.pdf

[11] Environmental Protection UK and Institute of Air Quality Management (2017), Land-Use Planning & Development Control: Planning For Air Quality v1.2 – [online] (Last accessed: 28/04/2022), Available at: iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

[12] Central Lincolnshire (2017) Central Lincolnshire Local Plan – [online] (Last accessed: 28/04/2022), Available at: https://www.n-kesteven.gov.uk/EasySiteWeb/GatewayLink.aspx?alId=54815

[13] South East Lincolnshire (2019) South East Lincolnshire Local Plan – [online] (Last accessed: 28/04/2022), Available at: http://www.southeastlincslocalplan.org/wp-content/uploads/2019/02/Local-Plan-text-March-2019.pdf

15.3.4 The EPUK/IAQM guidance sets out thresholds for traffic generation that have the potential to cause impacts to air quality at which point a detailed assessment of road traffic impacts should be undertaken. As the Proposed Development is not within or close to an Air Quality Management Area (AQMA) the criteria considered for this assessment are as follows:

- Change of light duty vehicles (LDV) flows of more than 500 annual average daily traffic (AADT); and
- Change of heavy-duty vehicles (HDV) flows of more than 100 AADT.

15.3.5 Exhaust emissions of oxides of nitrogen (NO_X), PM_{10} and $PM_{2.5}$ from Non-Road Mobile Machinery (NRMM) associated with construction sites may have a significant effect on local air quality. These emissions have been screened in line with LAQM.TG(16).

15.3.6 In addition, dust emissions associated with construction activities may impact local air quality concentrations. However, a Construction Dust Risk Assessment will inform mitigation measures within an outline Construction Environmental Management Plan (CEMP) to minimise dust emission during the construction phase and control impacts to a negligible level. On that basis, there is no further consideration of construction dust emissions within this PEIR Chapter.

Operation

15.3.7 Air quality effects at sensitive human and ecological receptors from the operational phase of the Proposed Development have been scoped out within the Scoping Opinion from the Planning Inspectorate, as traffic flows are expected to be minimal and no combustion plant will be present on the Energy Park Site.

15.3.8 The Scoping Opinion does under Section 3.12: Miscellaneous Issues, consider that the possible impacts of a Major Accident or Disaster from a fire within the batteries with the Battery And Energy Storage System (BESS) should be considered. This assessment is ongoing, as technologies are considered by the applicant. Therefore, this topic is not assessed within the PEIR, but will be considered in more detail in the Environmental Statement.

15.3.9 There will be no permanent users of the Proposed Development. The Energy Park Site will be accessed by Operations and Management personnel, as well as for land management infrequently for a short period of time as required. Therefore, no assessment of the Energy Park Site's suitability, in terms of air quality, is required.

Decommissioning

15.3.10 At this stage it is assumed that the number of construction vehicles during the decommissioning phase will be no greater than during construction.

15.3.11 However, it should be noted that solar farms have a lifespan of approximately 40 years, by which time it is expected that baseline air quality conditions will be much improved due to improving vehicle technology and emerging national policy to reduce vehicle emissions. Therefore, effects to air quality during the decommissioning of the Proposed Development are not considered further.

Key Receptors

15.3.12 Existing sensitive receptors at the roadside of the construction traffic routes, have the potential to be affected by an increase in emissions NO_2, PM_{10} and $PM_{2.5}$ from construction traffic for the duration of the construction phase, anticipated to be approximately 18 months.

15.3.13 High sensitivity receptors include residences, healthcare, schools and childcare facilities located along the proposed construction routes as well as the additional needs school, which is currently under construction next to the Energy Park Site, on its southern boundary, next to the A17. Commercial and industrial uses are a consideration; however, they are considered to be low sensitivity receptors.

15.3.14 There are no international designated ecological sites within 200m of the proposed construction routes, therefore there are no likely significant effects to national sensitive habitats or species. The closest ecological designation is South Forty Foot Drain, which is a Local Wildlife Site. However, construction traffic numbers are expected to be below the threshold to cause a likely significant effect (cumulative additional vehicle movements of greater than 1000 per day).

Assessment of significance

Construction

15.3.15 With reference to the EPUK/ IAQM guidance, if none of the criteria indicating the possibility of impacts to air quality are met, then there should be no requirement to carry out a detailed air quality assessment and the effect to air quality can be considered as negligible and leads to a not significant effect.

15.3.16 LAQM.TG(16) guidance states that, with the application of suitable control measures and site management, exhaust emissions from on-site NRMM are

> **"unlikely to make a significant impact on local air quality. In the vast majority of cases they will not need to be quantitatively assessed".**

Scoping criteria

15.3.17 This Air Quality chapter considers the following potential effects:

- Air quality effects at sensitive receptors located at the roadside of proposed construction routes for the duration of the construction phase.

Limitations to the Assessment

15.3.18 The following assumptions and limitations have been considered:

- It has been assumed that construction phase mitigation measures included in the outline CEMP and CTMP will be effectively implemented and, as such, no significant effects will arise from construction activities; and
- The ability to predict likely significant air quality effects is dependent upon the traffic flow predictions made by the Transport Consultants for the project. It has been assumed that construction traffic flows and routing are robust.

15.4 BASELINE CONDITIONS

Site Description and Context

15.4.1 A baseline air quality review has been undertaken to determine existing air quality within the vicinity of the Proposed Development with reference to the following:

- Air quality monitoring data from local authority Annual Status Reports (ASR)[14,15,16,17]; and
- Background pollution maps from the Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management (LAQM) website[18].

Local Air Quality Monitoring

15.4.2 The Proposed Development is located approximately 11.3 km west of its nearest Air Quality Management Area (AQMA), 'Haven Bridge AQMA' which is located in Boston Borough Council's (BBC) administrative area and has been declared for exceedances of the annual mean nitrogen dioxide (NO_2) air quality objective (AQO).

15.4.3 The Proposed Development is partly located within North Kesteven District Council's (NKDC) administrative area and partly within BBC's. The Proposed Development is also located in close proximity to the administrative areas of East Lindsey District Council (ELDC), South Kesteven District Council (SKDC) and South Holland District Council (SHDC).

15.4.4 Automatic monitoring is currently undertaken by SHDC, but not by NKDC, SKDC or BBC. Monitoring data for ELDC is currently unavailable and as such the number of monitoring sites that are in operation is unknown at this stage.

15.4.5 SHDC operate two automatic monitoring stations within its administrative area, the closest of which is CM1 which is located 16.2 km away from the Proposed Development. Recent monitoring data from 2015 to 2020 for automatic monitoring station CM1 is detailed in **Table 15.1** and a visual representation of the location of the automatic monitoring station is shown in **Figure 15.1**.

15.4.6 The pollutant concentrations recorded in 2020 are not considered to be representative of "normal" air quality conditions due to government enforced lockdowns during the COVID-19 pandemic. Whilst it is expected that as a result of the COVID-19 pandemic behaviours will change in the future, the impact of this on air quality long-term is currently unknown and therefore the use of 2020 data will be omitted from any analysis but has been included for information.

[14] North Kesteven District Council (2021) Annual Status Report 2021– [online], (Last accessed: 28/04/2022), Available at: https://www.n-kesteven.gov.uk/_resources/assets/attachment/full/0/123975.pdf
[15] Boston Borough Council (2021) Annual Status Report 2021 – [online], (Last accessed: 28/04/2022), Available at: https://www.mybostonuk.com/wp-content/uploads/2021/12/Boston-Borough-Council-ASR_England_2021_v2.0.pdf
[16] South Kesteven District Council (2021) Annual Status Report 2021– [online], (Last accessed: 28/04/2022), Available at: http://www.southkesteven.gov.uk/CHttpHandler.ashx?id=26527&p=0
[17] South Holland District Council (2020) Annual Status Report 2020 – [online], (Last accessed: 28/04/2022), Available at: http://shollandair.aeat.com/Reports/SouthHolland_ASR_England_2020_Final_v3.0.pdf
[18] Defra (2020) Background Pollution Maps – 2018 – [online], (Last accessed: 28/04/2022), Available at: uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Table 15.1: Automatic Monitoring Data (µg/m³)

Automatic Monitoring Station and Distance (km) from Proposed Development (approx.)	Air Quality Objective (AQO)	2015	2016	2017	2018	2019	2020
NO_2							
CM1 (SHDC), Spalding Monkhouse School, 16.2 km, Urban Background	Annual mean (µg/m³)	10.5	12.7	10.8	9.4	9.3	8.5
	Number of hours with concentrations >200 µg/m³	0	0	0	0	0	0
PM_{10}							
CM1 (SHDC), Spalding Monkhouse School, 16.2 km, Urban Background	Annual mean (µg/m³)	15.4	13.5	11.8	13.1	13.7	10.8
	Number of days with concentrations > 50 µg/m³	1	2	0	1	0	0

15.4.7 **Table 15.1** shows that there has been no exceedance of the Air Quality Objectives (AQO) between 2015 – 2019.

15.4.8 A network of diffusion tubes is utilised by BBC, NKDC, SKDC and SHDC to monitor annual mean NO_2 concentrations across their administrative areas.

15.4.9 There are no diffusion tubes located in the immediate vicinity of the Proposed Development, however there are two diffusion tubes located between approximately 2.5 km and 4.5 km away from the Proposed Development, with one situated in NKDC's administrative area and the other in SHDC's. **Table 15.2** provides the latest annual mean NO_2 concentrations at the nearest diffusion tube locations to the Proposed Development for the years 2019 and 2020. The locations of the diffusion tubes are illustrated in **Figure 15.1.**

Table 15.2: Diffusion Tube Monitoring Data (µg/m³)

Diffusion Tube ID	Diffusion Tube Name	Site Type	Distance from Proposed Development (km)	2019	2020
Heckington (NKDC)	Heckington	Kerbside	4.3	17.3	14.6
SH 11 (SHDC)	A52 Donington	Roadside	2.5	15.5	-

15.4.10 As noted above, monitoring data for 2020 has been included for information only. There have been no exceedances of the annual mean NO_2 objective of 40 µg/m³ at either diffusion tube in 2019, which is the only year with representative monitoring data available at these locations. The location with the highest NO_2 concentration in 2019 was Heckington, located at the intersection between B1394 Station Road and B1394 Boston

Road, monitoring 17.3 µg/m^3 or 43% of the annual mean objective. As such it is considered likely that no exceedances of the NO_2 annual mean objective will be experienced in the vicinity of the Proposed Development.

15.4.11 The 1-hour mean objectivefor NO_2 is 200 µg/m^3 and should not be exceeded more than 18 times within a year. In line with Local Air Quality Management Technical Guidance (LAQM.TG(16))[19], exceedances of the 1-hour mean NO_2 objective are unlikely to occur where the annual mean concentration is below 60 µg/m^3. Concentrations at nearby diffusion tubes shown in **Table 15.2** therefore show that the 1-hour mean NO_2 objective is unlikely to be exceeded at these locations.

Defra Predicted Concentrations

15.4.12 The background concentrations have been obtained from the national maps published by Defra[20]. These estimated concentrations are produced on a 1km by 1km grid basis for the whole of the UK. The Proposed Development falls into multiple grid squares. The minimum and maximum predicted concentrations at the Proposed Development for NO_2, PM_{10} and $PM_{2.5}$ are provided in **Table 15.3** for 2022, the current year.

Table 15.3: Estimated annual mean background concentrations (µg/m^3)

Year	Background		
	NO_2	PM_{10}	$PM_{2.5}$
2022	6.4 – 7.6	15.2 – 16.0	8.2 – 8.7

15.4.13 It can be seen that the modelled background NO_2 concentrations are below the objective levels for NO_2, PM_{10} and $PM_{2.5}$ in 2022.

Consultation

15.4.14 A summary of PINs comments within the Scoping Opinion is included in **Table 15.4.**

Table 15.4: Scoping Opinion Response

PINs comment	Response
The Scoping Report states that impacts on air quality would be mitigated through the outline Construction Environmental Management Plan (oCEMP). This mitigation should be agreed with the Local Environmental Health Officer, where possible. In the absence of detailed information regarding projected HGV movements, the Inspectorate does not consider that assessment of construction air quality effects can be scoped out. The ES must provide up to date information on the anticipated construction programme and the predicted number of HGV	As detailed within this PEIR Chapter, predicted construction traffic flows have been screened against the EPUK/ IAQM criteria for detailed assessment of >500 LDVs and > 100 HDVs per day outside of an AQMA.

[19] Defra (2021) Local Air Quality Management Technical Guidance (TG16) – [online] (Last accessed: 28/04/2021), Available at: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf
[20] Defra (2018) Background Pollution Maps – [online], (Last accessed: 28/04/2021), Available: http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

PINs comment	Response
movements to confirm that relevant thresholds for air quality assessment are not exceeded (e.g. as set out by the Institute of Air Quality Management and EPUK) or provide a detailed air quality impact assessment.	
The Inspectorate does not agree that emissions from NRMM can be scoped out as no information has been provided on the type, number and location of such machinery within the Proposed Development site. An assessment of effects should be provided unless robust justification is provided to demonstrate that such machinery would not give rise to significant air quality effects	Further information on NRMM will be included within the outline CEMP. All NRMM will adhere to European regulations (EU 2016/1628) demonstrating compliance with emission limits.
The Inspectorate agrees that operational vehicle emissions may be scoped out from further assessment, subject to the description of development demonstrating that vehicle numbers are sufficiently low as to not trigger the thresholds for an air quality assessment.	Operational vehicle numbers will remain under review, however it is not anticipated that EPUK/ IAQM criteria will be exceeded.
The Scoping Report states that this is to be mitigated through the outline Construction Environmental Management Plan (oCEMP). The Inspectorate agrees that this matter can be scoped out providing the ES can demonstrate the effectiveness of such measures.	A Construction Dust Risk Assessment will be carried out to inform mitigation measures included in the outline CEMP.
The Scoping Report references that NO_2 monitoring is proposed but does not reference PM_{10} or $PM_{2.5}$, the Applicant should agree whether further monitoring of these pollutants is required with the Local Planning Authority.	Agreement on monitoring will be sought from Local Authorities. Given predicted construction traffic flows, it is not considered likely that dispersion modelling will be required. On that basis, monitoring of NO_2 concentrations has not commenced. This will be confirmed with the relevant Local Authorities.

Baseline Survey Information

15.4.15 At the scoping stage, it was suggested an air quality monitoring survey may be undertaken using diffusion tubes to measure concentrations of NO_2 for use in model verification. Given the predicted traffic flows generated by the Proposed Development, it is not considered likely that dispersion modelling will be carried out and as such a monitoring survey has not been commenced. This will be agreed with the relevant Local Authorities.

Implications of Climate Change

15.4.16 Climate change can have an impact on air quality and air quality can have an impact on climate change. These interactions are complex and not fully quantifiable at a local level.

15.4.17 Higher summer time temperatures and increased solar radiation will increase the formation of ozone and other reactive compounds in the air, affecting the concentrations of both NO_2 and PM. The net effect may be an increase in background concentrations of NO_2 and PM.

15.4.18 NO_X is an indirect greenhouse gas affecting atmospheric concentrations of ozone, methane and PM in the atmosphere. Increasing concentrations of ozone and methane leads to global warming. The effect of PM (also known as aerosols) is more complex with different components having either warming or cooling effects on the climate. For example, black carbon, a pollutant from combustion (including road transport) and particulate nitrate (formed from NO_X emissions) contributes to the warming of the Earth, while particulate sulphates cool the earth's atmosphere. In addition, PM can affect cloud formation, which also affects the climate.

15.4.19 Climate change is a long-term process and the impact of emissions depends on the atmospheric lifetime of the emitted species. Compared to greenhouse gases, many substances that affect air quality have short atmospheric lifetimes. PM for example has a substantial impact but are short-lived and reductions in emissions affect the radiation balance rapidly, in contrast to any reductions in, for example, carbon dioxide.

15.4.20 Limits on direct emissions of both NO_X and PM set at an international level to control air quality, will also be beneficial for climate change. Emissions have reduced substantially over recent decades and are likely to continue to do so.

15.4.21 Changes in atmospheric composition and their impact on climate change are uncertain and it is not possible to quantify them at the local level. Therefore, these effects have not been considered further in this chapter.

15.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction

15.5.1 The impacts of vehicle emissions (NO_2, PM_{10} and $PM_{2.5}$) associated with the construction of the Proposed Development have the potential to effect existing sensitive receptors located at the roadside of the proposed construction route, along the A17 and near Royalty Farm, for the anticipated construction period of 18 months. If not possible to use the Triton Knoll of National Grid access during construction of the off-site cable, existing sensitive receptors located in Bicker Fen will also be considered.

15.5.2 The Transport Consultants for the project have provided traffic flows for the construction phase of the Proposed Development. As detailed in **Chapter 14** of this PEIR, construction vehicles will be routed along the A17 to the Proposed Development Access.

15.5.3 All vehicle movements during the construction phase will be controlled by the outline Construction Traffic Management Plan (CTMP).

15.5.4 With reference to **Table 14.7** in **Chapter 14**, there is predicted to be an average of 83 LDV AADT and 15 HDV AADT construction vehicles on any one road link during the 18-month construction period.

15.5.5 When screened against the EPUK/ IAQM criteria for the potential of effects to air quality, predicted construction traffic flows are below the screening criteria for detailed assessment. On this basis and in line with EPUK/ IAQM guidance, the effect to air quality is considered to be insignificant.

15.5.6 At this stage a definitive number of additional vehicles during the peak of the construction is unknown, however, it is expected that the number will be less than 30 two-way peak hour vehicle trips. When the Environmental Statement is progressed further if more exact information on the construction vehicle movements at peak time is known this will be reviewed and assessed.

15.5.7 Dust emission and NRMM emissions during the construction phase will be controlled by mitigation measures included in an outline CEMP. On that basis, there are expected to be no likely significant effects to air quality at existing sensitive receptors.

15.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

15.6.1 An outline CTMP and CEMP will be used to control activity during the construction phase, and as such emissions to air will be mitigated.

15.7 CUMULATIVE AND IN-COMBINATION EFFECTS

15.7.1 In line with **Section 14.6** in **Chapter 14**, it is not considered likely that there will be any cumulative effects from construction traffic associated with the Proposed Development and other developments located within Lincolnshire due to the distance located from the Proposed Development.

15.7.2 The closest cumulative development is the Vicarage Drove solar farm (Ref B/21/0443) which is within BBC area and was approved by their planning committee. This solar farm sits next to the area of land proposed for the Bicker Fen substation, with part of the site within the current Proposed Development boundary. The Proposed Development boundary crosses this land at this point as it may be necessary to run the off-site cable through the same fields to gain access to the south-west section of the Bicker Fen substation.

15.7.3 This application was granted consent in February 2022 and has been granted 4 years in which to commence the construction. Therefore, construction of the development at Vicarage Grove would need to start by February 2026.

15.7.4 There is also a further solar farm site, Land at Ewerby Thorpe, which was screened in 2014. To date this application has not progressed, but there is the potential for it come forwards as a possible development.

15.7.5 As the construction of the of the Proposed Development could take place in 2026/27 there is the potential for construction of Vicarage Grove solar farm and the Off-site Grid Connection cable and Bicker Fen substation extension taking place at the same time. It is expected that the cable route will be an open trench which is infilled shortly after the cable is laid. If the extension to Bicker Fen substation takes place in the south-west corner the section of deciduous woodland would need to be felled and a concrete pad built.

15.7.6 To determine a worst case scenario, it is assumed that the construction of Vicarage Grove solar farm and Heckington Fen solar farm would take place at the same time. An Air Quality Assessment was not submitted with the Vicarage Grove solar farm planning application. However, a planning condition for Vicarage Grove solar farm states that a CEMP must be produced to minimise dust emissions during the construction of Vicarage Grove solar farm, therefore no likely significant effects are expected due to dust or NRMM emission at local receptors. In addition, construction traffic for Vicarage Grove solar farm is expected to be routed along the National Grid access off Bicker Road. Therefore, depending on the final construction traffic routing for construction of the Heckington Fen Off-site Grid Connection, there may be a combined road traffic impact to air quality. However, it is considered unlikely that the EPUK/IAQM thresholds for the potential impact to air quality would be exceeded on any one link with existing sensitive receptors. Therefore, the effect to air quality is considered to be insignificant. This will remain under review.

15.8 SUMMARY

Introduction

15.8.1 This Air Quality PEIR Chapter focuses on the potential air quality effects at existing sensitive receptors during the construction phase.

Baseline Conditions

15.8.2 The Proposed Development is not located within or near to an Air Quality Management Area (AQMA).

15.8.3 Monitored concentrations in the vicinity of the Proposed Development show pollutant concentrations have been below the Air Quality Objectives (AQO) for the last five years of representative monitoring data.

Likely Significant Effects

15.8.4 Predicted construction traffic flows have been screened against Environment Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance and considered to be not significant.

15.8.5 In addition, dust and non-road mobile machinery emissions during the construction phase will be controlled via an outline Construction Environmental Management Plan(CEMP) and as such are considered to be negligible and therefore the effects are not significant.

Mitigation and Enhancement

15.8.6 Construction phase emissions to air will be controlled by an outline CEMP and outline Construction Traffic Management Plan (CTMP).

Cumulative and In-combination Effects

15.8.7 There are not expected to be any significant cumulative and in combination effects.

Conclusion

15.8.1 It is concluded that the proposed package of mitigation will ensure that the Proposed Development is acceptable and that there will be no adverse significant effects to air quality.

15.8.2 **Table 15.4** provides a summary of effects, mitigation and residual effects. This must be provided for each Technical Chapter.

Table 15.4: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction								
Existing sensitive receptors located on construction routes	Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of additional construction traffic movements	Temporary/ Direct	Not Applicable	Not Applicable	Local	Negligible	CTMP	Negligible
Existing sensitive receptors in the vicinity of the construction works	Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of NRMM	Temporary/ Direct	Not Applicable	Not Applicable	Local	Negligible	CEMP	Negligible
Existing sensitive receptors within 350 m of the construction works	Potential impact to human health and amenity from dust emissions	Temporary/ Direct	Not Applicable	Not Applicable	Local	Negligible	CEMP	Negligible
Operation								
N/a								
Cumulative and In-combination								
Existing sensitive	Construction of cumulative site	Temporary/ Direct	Not Applicable	Not Applicable	Local	Negligible	CTMP	Negligible

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
receptors located on construction routes	(Vicarage Grove Solar Farm) at the same time as offsite grid route and southwest Bicker Fen substation - Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of additional construction traffic movements							
Existing sensitive receptors in the vicinity of the construction works	Construction of cumulative site (Vicarage Grove Solar Farm) at the same time as offsite grid route and southwest Bicker Fen substation - Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of NRMM	Temporary/ Direct	Not Applicable	Not Applicable	Local	Negligible	CEMP	Negligible
Existing sensitive receptors within 350 m of the construction works	Construction of cumulative site (Vicarage Grove Solar Farm) at the same time as offsite grid route and southwest	Temporary/ Direct	Not Applicable	Not Applicable	Local	Negligible	CEMP	Negligible

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
	Bicker Fen substation - Potential impact to human health and amenity from dust emissions							

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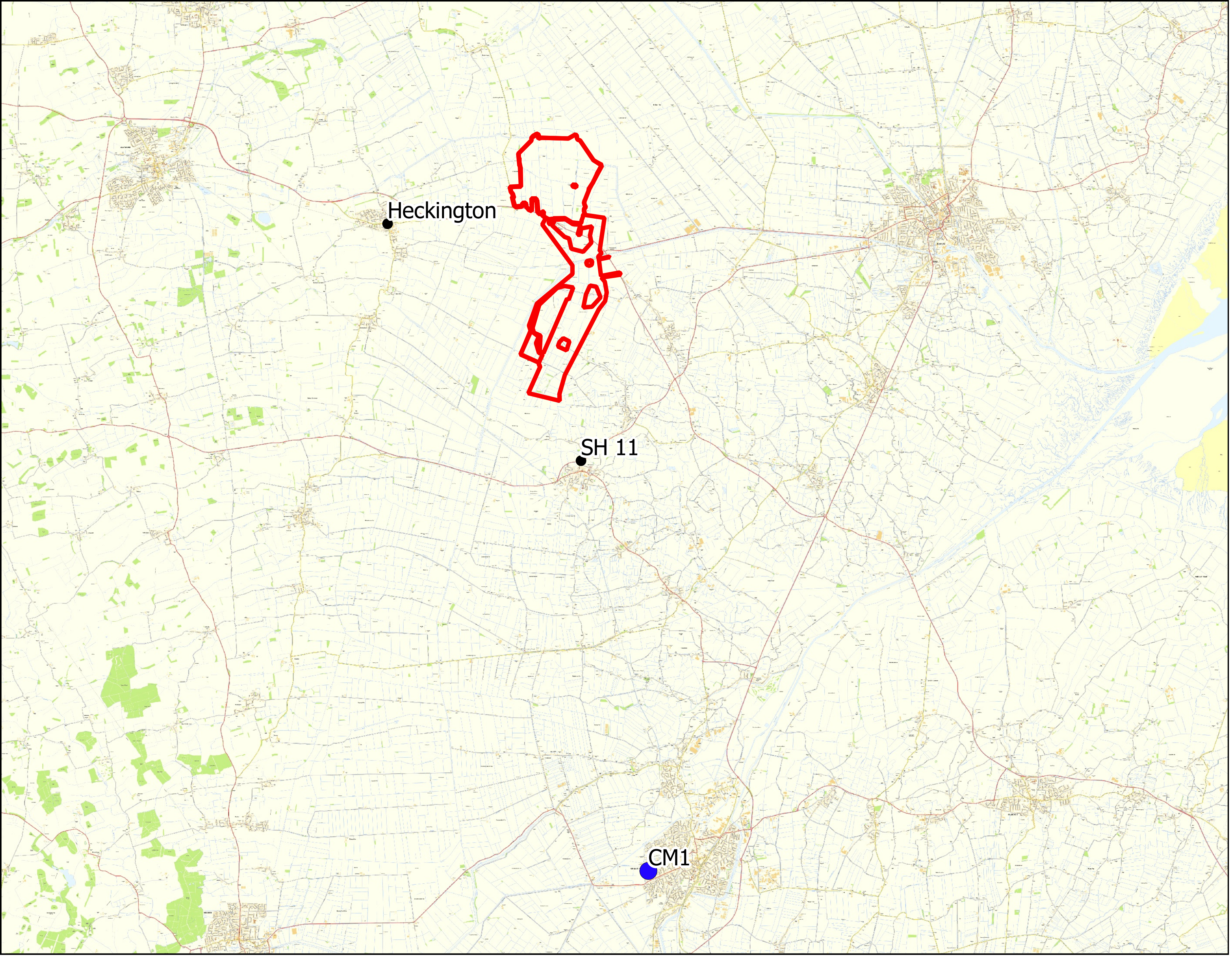
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 15.1- Air Quality Monitoring Locations in the vicinity of the Proposed Development

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Proposed Development Boundary
- Diffusion Tube Location
- Automatic Monitoring Station

FIGURE 15.1

Air Quality Monitoring Locations in the vicinity of the Proposed Development

DRWG No: 15.1_0 REV 02

Date: 10/06/22

Scale: Not to scale @ A4

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Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 16: Land Use and Agriculture

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

16 LAND USE AND AGRICULTURE

EXECUTIVE SUMMARY

This chapter considers the potential effects on the agricultural land quality of the Energy Park and whether that will be irreversibly developed or there will be land quality downgrading. It considers the potential effects on soils and agricultural businesses. It is concluded that the area of land that will be irreversibly developed is likely to be less than 5 ha of best and most versatile agricultural land, and consequently this will be a slight adverse effect. There are no significant effects on soils or farm businesses.

16.1 INTRODUCTION

16.1.1 This section considers the potential effects of the Proposed Development on agricultural land and businesses during construction, operation and decommissioning. It identifies the baseline of the Energy Park in terms of agricultural land quality, soil type and distribution, and occupying farm businesses. It identifies the potential effects, both direct and indirect and negative and positive, within the Energy Park.

16.2 ASSESSMENT APPROACH

16.2.1 The key receptors considered in respect of agriculture are:

(i) agricultural land quality. The quality of agricultural land, its pattern and distribution, and the potential effects on the land quality as a resource, are considered. Land of Grades 1, 2 and 3a of the Agricultural Land Classification (MAFF, 1988) are defined as "Best and Most Versatile" in the NPPF (MHCLG, July 2021);

(ii) soil structure. Soil has many different functions and can be affected positively or negatively by land use and management even if agricultural land quality is not affected; and

(iii) local farm businesses. Land management is influenced by many factors, and the effects on the ability to farm land may have localised implications, positive or negative.

16.3 METHODOLOGY

16.3.1 In order to determine the agricultural land quality and the type of soils across the Energy Park, a field survey has been undertaken. This has involved taking auger samples across the Energy Park at a spacing of one every 200 metres on a regular grid, resulting in 138 auger samples. These have been supplemented by periodic soil pits, dug to enable the measurement of stones and to examine the soil profile. Some soil samples have been sent for laboratory analysis of the sand, silt and clay fractions to validate field texturing.

16.3.2 Within the Scoping Response from Natural England (dated 24th February 2022) it was stated that an Agricultural Land Classification (ALC) survey was required and that this would normally be at a detailed level of one auger boring per hectare. It was advised that information about potential disturbance to soils is required.

16.3.3 Following a meeting with Natural England on the 11th May 2022 it has been agreed that further soil sampling work will take place on the Energy Park site. This soil sampling will focus on the areas of the Energy Park which have initially been identified as land that is Best and Most Versatile (BMV). These areas will be subject to additional auger sampling, to increase the sampling density to that of a detailed ALC, i.e. one auger per ha. The land within the Energy Park which has been identified as low-grade agricultural land does not require further soil testing.

16.3.4 At the time of submitting this PEIR to the Planning Inspectorate, this further soil survey work has not been undertaken, so has not been considered within the PEIR. It will be undertaken in the near future, and will be considered within the Environmental Statement when this proposal is submitted to the Planning Inspectorate for consideration. As these areas have been identified as of BMV quality already the additional survey will not result in an increase in the quantum of BMV land included in the Energy Park.

16.3.5 The need for assessment of the soil type along the Grid Route within the Proposed Development was also discussed with Natural England at the meeting on the 11th May 2022. Natural England accepted in principle that the soil along the Grid Route was capable of being restored to comparable land quality once the cable was laid and that the land quality and soil would not further be affected for the operational lifetime of the Energy Park. However, to achieve this a Soil Management Plan would be needed. This Soil Management Plan would require soil survey work to inform the works and their methodology.

16.3.6 To make this soil survey work as targeted as possible, it was agreed that this could be delayed until the preferred Grid Cable Route is known. It is expected that this will be confirmed for the preparation of the Environmental Statement. Once the preferred Grid Cable Route is known including the key fixed points for the route (e.g. crossing railway tracks, watercourses, and works at Bicker Fen Substation etc) the soils will be surveyed at and between those locations.

16.3.7 Farming circumstances have been determined by discussions with the operating company together with a walk-over survey of the farmland and examination of the farm buildings within the Energy Park area.

16.3.8 At this stage the Agricultural Land Classification (ALC) has been determined from the field survey and is therefore a semi-detailed ALC. It has encompassed the whole of the Energy Park area, which includes a number of fields for Biodiversity Net Gain in addition to areas for solar panels, energy storage and associated infrastructure.

16.4 ASSESSMENT OF SIGNIFICANCE

16.4.1 The assessment of significance is based on the tables set out in **Appendix 16.1**. In respect of soils and agricultural land quality these tables take full account of the Institute of Environmental Management and Assessment (IEMA) Guide "A New Perspective on Land and Soil in Environmental Impact Assessment" (February 2022).

16.4.2 The assessment methodology identifies the sensitivity of the various receptors in terms of their importance (land quality) and their susceptibility to damage when being trafficked (soil type). It then identifies magnitude thresholds for environmental assessment and assesses the significance using a matrix of magnitude and sensitivity.

16.4.3 The impact magnitude in the IEMA Guide is based on the "**permanent, irreversible loss of one or more soil functions or soil volumes (including the permanent sealing or land quality downgrading)**". The assessment therefore considers whether there is permanent sealing or downgrading as a result of the proposals.

16.4.4 Under the IEMA Guide the methodology considers the permanent sealing of land or ALC downgrading of more than 20 hectares to be a major adverse magnitude of impact, in line with the IEMA guide. It considers losses of 5 – 20 ha to be a moderate adverse magnitude and losses of less than 5 ha to be slight adverse.

16.4.5 The methodology considers land of ALC Grades 1 and 2 to be of very high sensitivity, and land of Subgrade 3a to be of high sensitivity.

16.4.6 The methodology considers soils of high clay content in wetter climate regions to be sensitive to damage from trafficking.

16.4.7 The methodology considers farm businesses to be more resilient to change. Full-time businesses that are terminated by proposals are a major adverse magnitude of impact, with farm businesses less affected being moderate or minor magnitude impacts.

16.5 LEGISLATIVE AND POLICY FRAMEWORK

16.5.1 Land of ALC Grades 1, 2 and 3a is defined as the "best and most versatile" agricultural land, referred to hereafter as BMV.

16.5.2 The Overarching National Policy Statement for Energy (EN-1) (DECC, July 2011) sets out "Generic Impacts" in Part 5. Paragraph 5.10.8 advises that Applicants should seek to minimise impacts on BMV agricultural land except where this would be inconsistent with other sustainability considerations. Effects on soil quality should be identified and minimised.

16.5.3 Agricultural land quality is referred to in the Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) at paragraphs 2.48.13-5, 2.50 and 2.53. It is noted that agricultural land of Grades 3b, 4 and 5 should be preferred, avoiding BMV crop land **"where possible". "However land type should not be a predominating factor in determining the suitability of the site location".**

16.5.4 The National Planning Policy Framework (2021), to the extent that it is relevant, sets out in paragraph 174 b) that the economic and other benefits of BMV agricultural land should be recognised in planning decisions.

16.5.5 The Local Plan, to the extent that it is relevant, is the Central Lincolnshire Local Plan (adopted April 2017). Policy LP19 "Renewable Energy Proposals" sets out a policy for assessing the merits and impacts of proposed schemes. These include taking account of the agricultural land classification, including a presumption against photovoltaic solar farm proposals on the Best and Most Versatile agricultural land. The policy notes that proposals will be supported where the benefits outweigh the harm, or harm can be mitigated as far as reasonably possible.

16.5.6 Policy LP55 "Development in the Countryside" Part G seeks to protect BMV agricultural land and to protect opportunities for food production and the agricultural economy. Development affecting BMV will only be permitted if:

(a) there is insufficient lower grade land available or it has other environmental considerations;
(b) the impacts on ongoing agricultural operations have been minimised through design;
(c) where feasible any development will be removed at the end of its life and the land restored to its former use and of equal quality.

16.6 SCOPING CRITERIA

16.6.1 The ES will consider the comments made in the response to the Scoping. In particular, further field surveys will be carried out to assess the soils and the agricultural land quality along the Grid Cable Route to the Bicker Fen Substation once the preferred route has been determined.

16.7 LIMITATIONS TO THE ASSESSMENT

16.7.1 At this stage the ALC survey has been carried out at a semi-detailed level. This has identified the areas of better and poorer quality across the Energy Park. Given that the insertion of legs for mounting solar PV panels is a reversible process that is not considered to result in any adverse effect on the underlying ALC grade, for much of the Energy Park this level of detail provides the appropriate level of detail for the EIA.

16.7.2 However, in areas where there is a more complex pattern of better quality land, and in areas where fixed infrastructure is to be installed where land will be disturbed by the construction process, additional survey will be carried out to determine the ALC at a detailed sampling density of one per hectare. This additional survey is to ensure that the exact breakdown of BMV land involved in the Energy Park is identified, and to inform Soil Management Plans, to ensure mitigation of any potential adverse impacts.

16.8 BASELINE CONDITIONS

Agricultural Land Quality

16.8.1 Agricultural land quality is assessed by use of the system of Agricultural Land Classification (ALC) devised by the Ministry of Agriculture, Fisheries and Food (MAFF). This is a methodology, last revised in 1988, that classifies land according to the extent to which its inherent physical or chemical characteristics impose long-term limitations on agricultural use.

16.8.2 The ALC system divides land into five grades 1 to 5, with grade 3 divided into subgrades of 3a and 3b. The NPPF (2021) places Grades 1, 2 and 3a within the definition of the 'best and most versatile agricultural land' (BMV). Natural England in their Technical Information Note TIN049 (2012) estimates that 42% of agricultural land in England is within the BMV category.

16.8.3 An ALC survey of the Energy Park was undertaken in late 2021. This was carried out at a semi-detailed level and involved examining the soils on a regular 200m grid. It involved analysis of the soils and land quality at 138 locations, from which it has been possible to map the distribution of land quality and soil types.

16.8.4 The results are presented in **Table 16.1**, **Figure 16.1** and reported in full at **Appendix 16.2**. The ALC identifies the areas in hectares and the proportions of land, in each grade. All figures are rounded to the nearest hectare or whole percentage point. The Energy Park covers an area of land which is greater than the area where solar panels and energy storage and ancillary equipment will be installed, and includes Biodiversity Net Gain areas that will be undisturbed.

Table 16.1: Agricultural Land Classification Results (Energy Park)

ALC	Area (Ha)	Area (% of total Site)
Grade 1	66	11
Grade 2	77	13
Grade 3a	175	30
Grade 3b	263	45
Grade 4	0	0
Grade 5	0	0
Non-agricultural	8	1
Urban	0	0
Not Surveyed	0	0
Total	**589**	**100**

16.8.5 The ALC results for the area proposed for the solar panel arrays within the Energy Park (i.e. excluding the Potential Biodiversity Net Gain areas where soils are to be unaffected) are presented in **Table 16.2**. The ALC identifies the areas in hectares and the proportions of land, in each grade. All figures are rounded to the nearest hectare or whole percentage point. The results take the measurements to the field edges on the basis that this reflects the limitations to agricultural use discussed below. These are shown on **Figure 16.2**.

Table 16.2: ALC Results for the Proposed Panel Areas

ALC	Area (Ha)	Area (% of total Site)
Grade 1	29	6
Grade 2	60	11
Grade 3a	164	31
Grade 3b	262	50
Grade 4	0	0
Grade 5	0	0
Non-agricultural	10	2
Urban	0	0
Not Surveyed	0	0
Total	**525**	**100**

16.8.6 In its local context, the areas are compared to the area of Lincolnshire, as set out in **Table 16.3**. These are the agricultural land areas only. This is an estimate of Subgrade 3a, based on the national average of 40% of Grade 3 being Subgrade 3a. As these statistics are based on provisional maps, they have been rounded to the nearest 100 ha.

Table 16.3: ALC Areas

ALC Grade	Solar PV Area		Lincolnshire(1)	
	Ha	%	Ha	%
1	29	6	75,800	13.4
2	60	12	186,800	33.0
3	426	82	296,200	52.3
Of which 3a*	164	31	118,500	20.9
BMV**	253	49	381,100	67.3
4	0	0	7,400	1.3
5	0	0	0	0
Total	515	100	566,200	100.0

(1) Source of data: ALC statistics derived from the Provisional ALC Map series, 1977. The total area of Lincolnshire is 591,821ha. Through DEFRA mapping it has been determined that 17,133ha are classified and Non-Agricultural and 8,487ha are Urban. When combined with the data for Agricultural Land in the table above, it can be concluded that approximately 18,400 (3%) of the County's land use is unclassified.

Subgrade 3a is estimated at 40% of Grade 3 for Lincolnshire.

*** Total of Grades 1, 2 and 3a*

Soil Integrity, Structure and Environmental Benefits

16.8.7 The semi-detailed ALC and soil survey carried out in September 2021 determined that the soils within the Energy Park are non-calcareous soils of the Wallasea 2 Association. There is a complex variety of soil textures and drainage status (Wetness Class) over this surveyed site, which reflects the variety of Tidal Flats Deposits deposited by the sea in the past (see the Geology section in **Appendix 16.2**). The texture of the topsoil ranges from medium silty claim loams through heavy clay loams to silty clay. The soil profiles range from well-drained (Wetness Class I) where the subsoil is sandy, to slightly seasonally-waterlogged (Wetness Class II) where the subsoil is slowly permeable, gleyed and mottled, silty clay. Where the depth of the slowly-permeable silty clay is closer to the surface the profiles are seasonally waterlogged and are placed in Wetness Class III.

16.8.8 Soil texture is recorded in **Appendix 16.2** for each sample location. In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, samples of topsoil were collected and were sent to an accredited laboratory for analysis of particle size distribution (PSD).

16.8.9 Soils have a number of functions beyond biomass production, for which the ALC process is relevant. Other functions can include ecological habitat, soil carbon reserves, soil hydrology as a pathway for water flow, archaeological and cultural interest and as a source of materials (IEMA, 2022).

16.8.10 Some soils are more susceptible to damage when handled during construction. There will be limited handling and moving of soils during the construction of the Proposed Development. Some soils are however more susceptible to structural damage from machinery and vehicular activity, depending upon soil type, climate and wetness class. A Soil Management Plan will be developed, as part of the CEMP, that will identify those areas within the Energy Park and the Grid Cable Route which will map the susceptibility of soils to damage when wet, and advise on the time periods when soils are suitable for being handled or trafficked. The better quality land has soils least susceptible to damage from construction traffic.

16.8.11 Further consultation and assessment with the landowners is being undertaken to understand the productivity of the soils across the Energy Park along with the levels of fertiliser, pesticides and herbicides that are used to improve the productivity / yield of the soils. The methodology of this assessment (by Savills) is presented in **Appendix 16.3**. This findings of this assessment will be presented within the ES.

Agricultural Businesses

16.8.12 The Proposed Development has the potential for both adverse and beneficial effects on the one agricultural business which owns and operates the agricultural land within the Energy Park. The land is wholly in arable cropping uses, mostly cereals with arable break crops. The farm distribution and data of relevance has been collected through interviews with the operating business.

16.8.13 The Energy Park affects part of a larger farming operation. The farm buildings within the fen but not within the Energy Park are only used in association with the surrounding farmland.

16.8.14 It is the intention that agricultural land uses will be able to continue through the operational period by the grazing of sheep over the full extent of the Energy Park and the making of hay or grazing of sheep within the areas for biodiversity enhancement to ensure development of ecologically rich grasslands.

Implications of Climate Change

16.8.15 Climate change is expected to affect agricultural practices and enterprises, due to changes in rainfall patterns and quantities, and due to increasing temperatures, which may alter cropping and stocking patterns and choices in the future. The ability of these soils to grow crops depends upon the availability of water, especially in the spring and early summer peak growing season. Climate change may necessitate different cropping in the future. The possible implications of Climate Change are looked at in more detail in the Chapter 13: Climate Change.

16.9 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

16.9.1 This section describes the potential effects on agricultural land quality and soils, and the occupying farm business, during the construction, operational and decommissioning phases of the Proposed Development. The mitigation embedded into the design was set out earlier in the PEIR.

Construction

16.9.2 The potential for adverse effects on agricultural land (both on the soils and the land quality) is greatest during the construction phase. The trafficking of agricultural land by construction vehicles and machinery, the timing of work on soils and the timing and methodology of cable laying will be required to be carried out in accordance with industry good practice and methodologies tailored specifically for the soils within the Energy Park.

16.9.3 There will be primary and secondary construction compounds, and internal access tracks. Where these are temporary there is the potential for short-term construction impacts and soil handling and management plans (which will be set out in the draft CEMP) will be required to ensure that at the end of the construction phase these areas are restored with no or minimised impact on soil structure or land quality.

This will be necessary to avoid potentially long-term, albeit localised, effects on soil structure and, in extreme cases, land quality, albeit localised.

16.9.4 There will be areas where fixed equipment is required, especially transformers. These may be placed on concrete pads or on concrete point foundations, but there is likely to be a need to remove topsoils to construct base areas. Where this is required the soils will be stored and there is the potential for these areas to be restored to comparable quality when the Energy Park is decommissioned. As the detailed design progresses these areas will be subject to detailed ALC survey work and the quantum of areas affected will be measured.

16.9.5 So far as possible and practicable, areas of fixed equipment will be located on the lowest quality agricultural land available.

16.9.6 There should not be a direct loss (permanent sealing or downgrading of land quality) of one or more soil functions by the installation of the PV Arrays. The construction process involves piling support poles into the soils but there is no disturbance to the land, and the land is not sealed.

16.9.7 Against the assessment criteria a cumulative area irreversibly damaged as a result of internal access tracks and foundations for the sub stations and transformers is expected. The size of this area is subject to the detailed design, but is expected to be less than 5ha in size and accordingly would deliver a minor magnitude effect, involving land of very high (Grade 1 and 2) down to moderate (sub-grade 3b) sensitivity. The overall effect is expected to be moderate adverse, depending on the inclusion of any land of Grade 1 or 2 for fixed infrastructure, to be determined at the detailed design stage.

16.9.8 There is potential for adverse short-term effects on farm businesses and enterprises as a result of construction, such as closure or severance of field access points at stages during the construction process. However, the Energy Park is well-contained, and access to all areas will be maintained as far as possible during construction, as set out in the CEMP. There is the potential for disruption and short-term severance within the Proposed Development, especially during construction of the Grid Cable Route. The effect on farm businesses is expected to be minor adverse.

16.9.9 The final location of the Grid Cable Route has not been determined at this time. The current design is expecting that all of the cable route will be underground and laid either through open trenching or through directional drilling where open trenching is not possible. At some key points along the Grid Cable Route there will be a need for above ground infrastructure. The locations of these above structures will be located in the corners or edges of the fields to minimise the impact on the efficient use of the field for farming.

16.9.10 As each section of cable route is laid it will be back filled and farming would be able to commence on this land. As for the above ground infrastructure the Grid Cable Route will try to be located close to field boundaries (ecology permitting) to minimise the construction impact on the agricultural activities on the land.

16.9.11 It is predicted that a trench for the cabling would be some 1-3m wide by 1.2-5m deep and would stretch for some 7 – 8km. Where directional drilling is required this could be up to 10m deep. Construction will be short term so the magnitude of change would be low. As there is no detailed soil data for the Grid Route a worst-case scenario of all land being BMV has been made. BMV land has a sensitivity of very high – high. However, it is likely that a well-managed and implemented cable laying operation, guided by a Soil Management Plan, will result in no significant adverse effect on the soils or land quality.

Operation

16.9.12 There will be areas within the Energy Park where the soils and agricultural land quality will be affected for the duration of the operation (40 years), such as internal tracks, transformers etc. These effects will have occurred during the construction phase and continue through the operational phase.

16.9.13 The effects on soils across the Energy Park, other than the localised areas described above, will be limited. There will be normal ongoing agricultural grazing land uses and agricultural management of the grassland beneath the solar arrays and the areas used for ecological enhancement, but there should be no requirement for trafficking of soils or ground disturbance relating to the operation of the energy generating infrastructure, and limited need for vehicular access across land other than any periodic maintenance requirements (including cleaning and maintenance of panels). The potential for an adverse impact on soils during the operational phase is therefore considered to be negligible.

16.9.14 The land management and farm enterprises will inevitably change. Continued agricultural use of the land, principally by grazing with sheep, and grassland management (especially to encourage nesting and flowering) can continue. This reduced-intensity use of the land and soil has the potential for overall benefits to soils as a result of arable soils reverting to seasonal pasture, through build-up of organic matter for example. The potential benefits are not well-recorded, and therefore a cautious approach is taken, but there is the potential for a slight beneficial effect during the operational phase.

16.9.15 Overall, adverse effects on soils and land quality during the operation of the Energy Park will be limited to the areas of fixed equipment and access tracks.

16.9.16 There will be changes to farming practices within the Energy Park for the duration of the Proposed Development. Arable farming will be unlikely, but grassland farming and biodiversity land management will occur. These will involve land management requirements. The preliminary view is that the effects on the farm business are not anticipated to be significant.

16.9.17 The land by area and ALC grade within the Energy Park was set out in Table 16.2 above.

16.9.18 The area of BMV agricultural land within Lincolnshire is estimated to be more than 380,000 ha. The area of BMV land within the Energy Park is a small fraction of the BMV land area of Lincolnshire. Set in this context the predicted permanent loss of less than 5 ha BMV is considered to be insignificant in a regional context.

16.9.19 The effects on the farm businesses are generally expected to be beneficial in terms of a secure, diversified source of income, and would last for the duration of the Proposed Development.

Decommissioning

16.9.20 Decommissioning would involve the dismantling and removal of the Proposed Development. It is estimated that this phase of the development would take 6-12 months. Areas of access tracks and transformers etc would be restored using soil retained onsite from the construction phase, which could have been retained on site in managed bunds, or new top soil brought to the Energy Park site.

16.9.21 For the decommissioning process all above ground infrastructure will be removed as would any concrete to a depth of 1m or less. As the underground cables will have been laid to a depth of greater than 1m, these will not be removed in the decommissioning process. Therefore, any impact to the soil quality or agricultural practices will be more limited than the construction phase of this Proposed Development.

16.9.22 There is the potential to damage soils and soil structure, and in extreme cases there is the potential to bring about localised reduction of agricultural land quality, during the decommissioning phase. The trafficking of soils when conditions are unsuitable (e.g. soils are saturated or frozen) could damage soil structure necessitating remedial activity to restore quality, but is unlikely to affect agricultural land quality Damage to soil structure is generally a short-term effect recoverable with normal agricultural cultivation equipment.

16.9.23 These effects would be mitigated by careful management of the physical activities and by timing activities to when the soils are suitable for being worked, as they were at the construction phase. Such measures would be implemented through the DEMP. With careful management the effects are capable of being minimised to a potentially low magnitude of change. The decommissioning process on the soil quality and ALC grade, if mitigation was implemented would be negative minor to moderate, but would not be considered significant.

16.9.24 There is limited potential for disruption to farm businesses during the decommissioning. This impact would be considered negligible.

16.9.25 The decommissioning process on the soil quality and ALC grade for the Grid Cable Route, if mitigation was implemented would be negative minor to moderate, but would not be considered significant.

16.9.26 The likelihood is that the land will be returned with the land quality unaltered, soil structure retained, and with an enhanced organic matter content, and available for unrestricted farming operations.

16.10 MITIGATION AND ENHANCEMENT

Mitigation by Design

16.10.1 At the detailed design stage, the permanent sealing of BMV will be minimised as far as reasonably practicable, and where operational constraints enable, by locating access tracks and fixed equipment within Grade 3b land.

16.10.2 Good soil management practices such as avoiding trafficking or handling soils when wet and restoring soils into trenches in the same order they came out (Defra (2009), BRE (2014), IQ (2021)) will be adhered to during the construction phase of the Proposed Development and would be implemented through a CEMP.

16.10.3 Whilst the potential impact on soils during the operational phase are expected to be minimal, good practice will be employed to ensure that any works (such as the maintenance of the PV Arrays and the management of the land underneath the PV Arrays) will be undertaken in a manner that prevents damage to the soil resource, so far as possible.

16.10.4 Potential short-term effects on farm businesses and enterprises as a result of construction & decommissioning, such as closure or severance of field accesses at key times of the farming year, will be mitigated by timing and liaison with landowners, and a CEMP and DEMP will be implemented to ensure effects are minimised.

Additional Mitigation

16.10.5 No additional mitigation is considered to be necessary.

Enhancements

16.10.6 There is limited research data available at the present time, but there are indications that soil health and, to a lesser degree, soil structure will be enhanced by a 40-year period of permanent grassland cover. This will be examined in more depth and will be reported in the ES.

16.11 CUMULATIVE AND IN-COMBINATION EFFECTS

16.11.1 The Heckington Fen Proposed Development is a standalone proposal not connected to any other proposed developments, solar or otherwise. As such there are no direct cumulative effects on the use of agricultural land, and on any agricultural land losses, with other developments.

16.11.2 The Scoping Response from the Planning Inspectorate asked that the cumulative impact from the other known NSIP schemes within Lincolnshire was considered specially for the potential loss of agricultural land.

16.11.3 As detailed in Table 2.7 Cumulative Schemes (Chapter 2) there are 4No. other NSIP solar schemes within the County. There are also a further 5No. solar schemes within 11km of the Heckington Fen Proposed Development. These 9No. solar sites have been considered within the cumulative assessment and are listed in the table below.

Table 16.4: Details of Cumulative Schemes

	Name of Scheme	LPA	NSIP	Reference Number	Size of Scheme	Distance from Application Site	Area of Site (ha)
1	Vicarage Drove – Approved	BBC	No	B/21/0443	49.9MW	*c.* 4.5km south of the Energy Park at its closest point but adjacent to the proposed extension to the substation at Bicker Fen	80
2	Land at Little Hale Fen-Screening	NKDC	No	21/1337/EIASCR	49.9MW	*c.* 4.6km north-east of the Energy Park at its closest point	80
3	Land at Ewerby Thorpe – Screening	NKDC	No	14/1034/EIASCR	28MW	*c.* 4.1km north-west of the Energy Park at its closest point	73
4	Land to the North of White Cross Lane – Approved	NKDC	No	19/0863/FUL	32MW	*c.* 8.4km west of the Energy Park at its closest point	20
5	Land South of Gorse Lane, Silk Willoughby – Approved	NKDC	No	19/0060/FUL	20MW	*c.* 11km west of the Energy Park at its closest point	70

	Name of Scheme	LPA	NSIP	Reference Number	Size of Scheme	Distance from Application Site	Area of Site (ha)
6	Cottam Solar Project	PINS – BDC[1] & WLDC	Yes	EN010133	50MW + (NSIP)	*c.* 43.6km north-west of the Energy Park at its closest point	1270
7	Gate Burton Energy Park	PINS – BDC[3] & WLDC	Yes	EN010131	50MW + (NSIP)	*c.*48.6km north-west of the Energy Park at its closest point	684
8	West Burton Solar Project	PINS – BDC[3] & WLDC	Yes	EN010132	50MW + (NSIP)	*c.*41.3km north-west of the Energy Park at its closest point	788
9	Mallard Pass Solar Farm	PINS - SKDC[2]	Yes	EN010127	50MW + (NSIP)	*c.*33.2km south-west of the Energy Park at its closest point	900

16.11.4 Therefore, if all of these schemes were to gain planning consent, and all of the land within the application redlines was used for solar development the total use of agricultural land would be 3,965ha. The Energy Park Area for the Heckington Fen Proposed Development is 589ha. If all 10No. schemes gained planning consent and became operational then the total use of agricultural land in Lincolnshire would be 4,554ha.

16.11.5 **Table 16.5** shows this use of agricultural land when compared to the total area of agricultural land within Lincolnshire.

Table 16.5: Total Cumulative Use of Agricultural Land in Lincolnshire (based on the 1977 MAFF Provisional ALC, see Table 16.3 above)

	Total Area (ha)	**Percentage**
Total Area of Lincolnshire	591,800	100%
Total Area of Agricultural Land within Lincolnshire	566,200	96%
Total Cumulative Area from 10No Solar Farms in Lincolnshire	4,554	0.8%

16.11.6 It can therefore be concluded that if all of these 10No. solar farms became operational and none carried out any ongoing agricultural practices within their application sites for their operational lifetimes, 0.8% of Lincolnshire's agricultural land would be used for solar farms.

16.11.7 At this time, the statistical breakdown on area of land which is BMV for all of these cumulative sites is not possible due to a lack of data. It may be possible to obtain this information from the developers of each of these sites or through public record to consider within the Environmental Statement. As Table 16.3 shows on average within

[1] Bassetlaw District Council and West Lindsey District Council

[2] South Kesteven District Council

Lincolnshire 67.3% of agricultural land in considered BMV. Using this percentage across the cumulative sites, there would be a cumulative use of 3,064ha of BMV land.

16.11.8 The details of proposed construction techniques and timing for these other sites is not known at this stage. Were these proposals to result in the loss of BMV agricultural land, this would be of major adverse significance. However it may be that, as with this proposal, the proposed developments are generally reversible and the loss of BMV agricultural land is more limited.

16.11.9 The intentions for ongoing agricultural use of these other sites is being investigated, where information is available.

16.11.10 In reality this significant impact is likely to be reduced when mitigations such as understanding the actual breakdown of BMV land on the sites, proposed construction and decommissioning works, and ongoing agricultural practices are considered.

16.11.11 The other topics where there is potential for intra-development in-combination effects to arise alongside the identified receptors are as follows:

- Ecology and Ornithology (Chapter 8); and
- Socio-economics (Chapter 11).

16.12 SUMMARY

Land Quality and Soil Resources

16.12.1 This preliminary assessment has identified that there are no significant adverse effects on agricultural land quality that cannot be mitigated. The preliminary view is that through a combination of careful mitigation, management and good practice measures, which would be implemented through the CEMP (to be secured via a requirement through the DCO), at the construction phase, the agricultural land quality will not be significantly adversely affected. The overall effects on soils and agricultural land quality are not anticipated to be significant.

16.12.2 Similarly, by a combination of good practice and careful management and mitigation, which will be implemented through the DEMP, the agricultural land quality should not be significantly adversely affected at the decommissioning phase, such that the agricultural land classification of the land is not affected and the resource is retained. The overall effect on soils and agricultural land quality is not anticipated to be significant.

16.12.3 Construction works associated with the access tracks, fixed infrastructure and cable trenches rather than the legs of the mounting structure, have the potential to adversely affect soil structure in localised areas, and in localised places the loss of agricultural land. However, for the majority of the Energy Park, where mounting structures will be installed, the adoption of well-planned and executed construction practices, working when soils are suitable (i.e. when soils are not saturated or frozen) for being trafficked, these potential impacts are capable of being mitigated and avoided.

16.12.4 There should therefore be no overall significant adverse effect on the agricultural land quality of the Energy Park or Grid Cable Route and, with carefully planned and well executed decommissioning works, the ALC resource will not be significantly adversely affected by the Proposed Development.

16.12.5 There should be no additional adverse effects on soils or land quality during the operational stage, as any need for traffic to pass over agricultural land will generally be limited to normal land and grassland management practices and maintenance.

16.12.6 A further piece of work is ongoing which considers the existing agricultural regime with regards to the amount of fertilisers, pesticides and herbicides along with the typical yields. This methodology for this assessment is included in **Appendix 16.2** of this PEIR and the full assessment will be included with the ES, together with an assessment of any enhancement to the soils that may result from grassland use for the operational phase.

Agricultural Businesses

16.12.7 The potential to use the Energy Park for different arable or livestock uses will be reduced as a result over the operational lifetime of the Proposed Development. However, a reduction in flexibility of land use is neither a policy requirement nor an environmental impact.

16.12.8 With careful planning and practice any localised effects on farm businesses can be avoided or mitigated.

Table 16.6: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction								
Effect on agricultural land during construction	BMV and lower quality agricultural land	Permanent, Adverse, Direct	Medium to Very High	Minor	UK	Moderate or large (significant)	Careful management and soil handling (CEMP)	Slight (not significant)
Effect on soil quality and structure during construction	All agricultural land	Temporary, Adverse, Direct	Mostly medium or low sensitivity	Minor	Local	Slight (not significant)	Careful management and soil handling (CEMP)	Slight (not significant)
Disruption to farm businesses during construction	Farm businesses	Temporary, Adverse, Direct	Medium	Minor	Local	Slight (not significant)	Construction Management Plan (CEMP)	Slight (not significant)
Operation								
Effect on agricultural land during operation	BMV and lower quality agricultural land	Permanent, Adverse, Direct	Medium to Very High	Negligible	UK	Slight (not significant)	Careful management (LEMP)	Slight (not significant)
Effect on soil quality and structure during operation	All agricultural land	Temporary, Adverse or beneficial, Direct	Mostly medium or low sensitivity	Negligible	Local	Slight (not significant)	Careful management (LEMP)	Slight (not significant)
Effects to agricultural businesses	Farm businesses	Temporary, Adverse/beneficial, Direct	Medium	Minor	Local	Slight (not significant)	None	Slight (not significant)

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
during operation								
Cumulative and In-combination								
Loss of Agricultural Land from Cumulative Solar Farms	Presence of Operating Solar Farms stopping any form of agricultural activity taking place on the land	Temporary, Adverse, Direct	Very High to High (assuming BMV land)	Medium	UK	Large (significant)	Determining if land is BMV and allowing agricultural activities to continue on land for operational lifetime of solar schemes	Large - Moderate (significant)
Decommissioning								
Effect on agricultural land during decommissioning	BMV and lower quality agricultural land	Permanent, Adverse, Direct	Medium to very high	Minor	UK	Potentially moderate or large (significant)	Careful management and soil handling (DEMP)	Slight (not significant)
Effect on soil quality and structure during decommissioning	All agricultural land	Temporary, Adverse, Direct	Mostly medium or low	Minor	Local	Slight (not significant)	Careful management and handling (DEMP)	Slight (not significant)
Disruption to agricultural businesses during decommissioning	Farm businesses	Temporary, Adverse, Direct	Medium	Minor	Local	Slight (not significant)	Careful management (DEMP)	Slight (not significant)

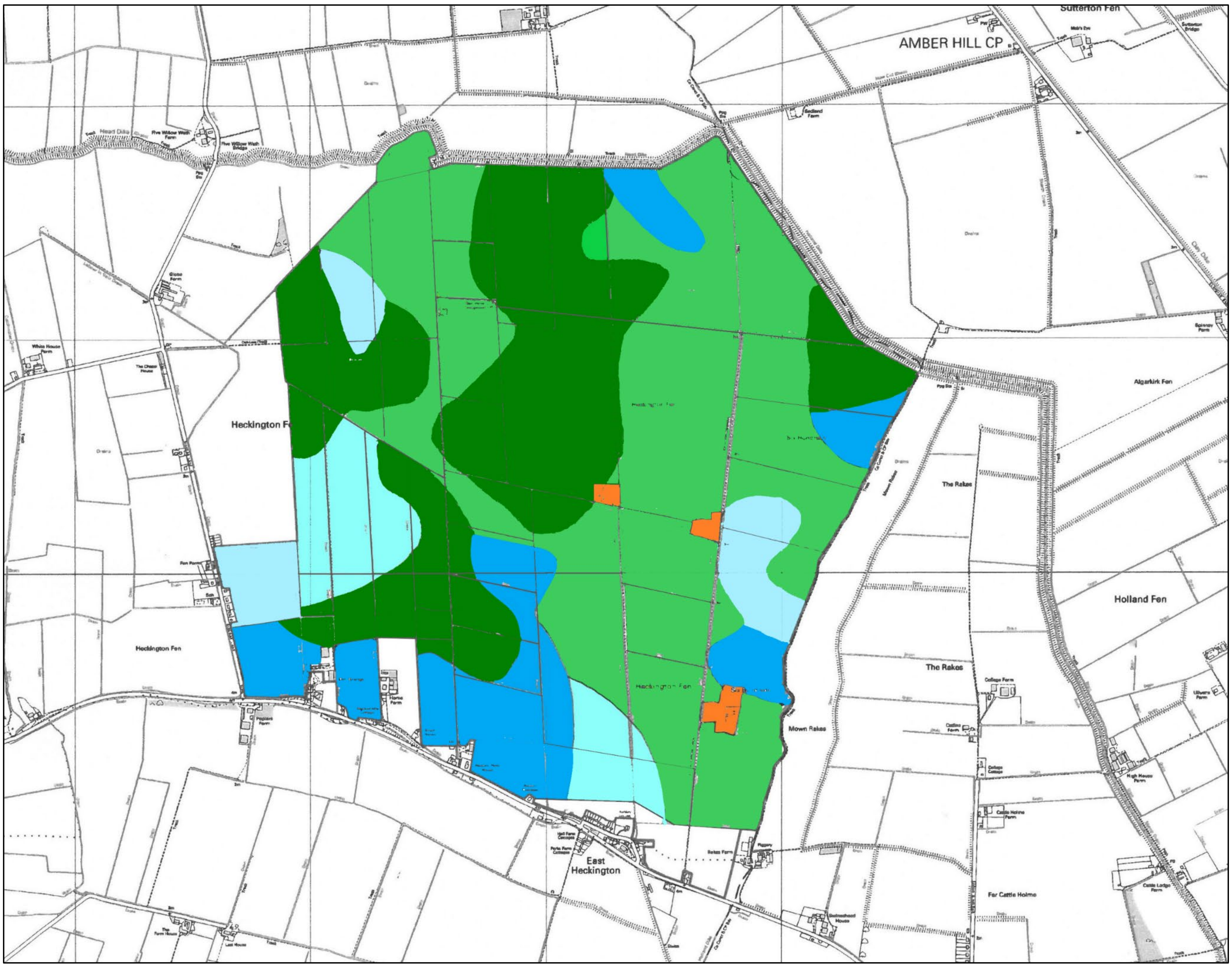
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 16.1- Semi-detailed Agricultural Land Classification Wider Site Area

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY		Ha	%
	Grade 1	66	11
	Grade 2	77	13
	Grade 3a	175	30
	Grade 3b	263	45
	Grade 4		
	Grade 5		
	Non-agricultural	8	1
	Urban		
	Not surveyed		

FIGURE 16.1

Semi-detailed Agricultural Land Classification Wider Site Area

Date: 26/05/22

Scale: NTS

N

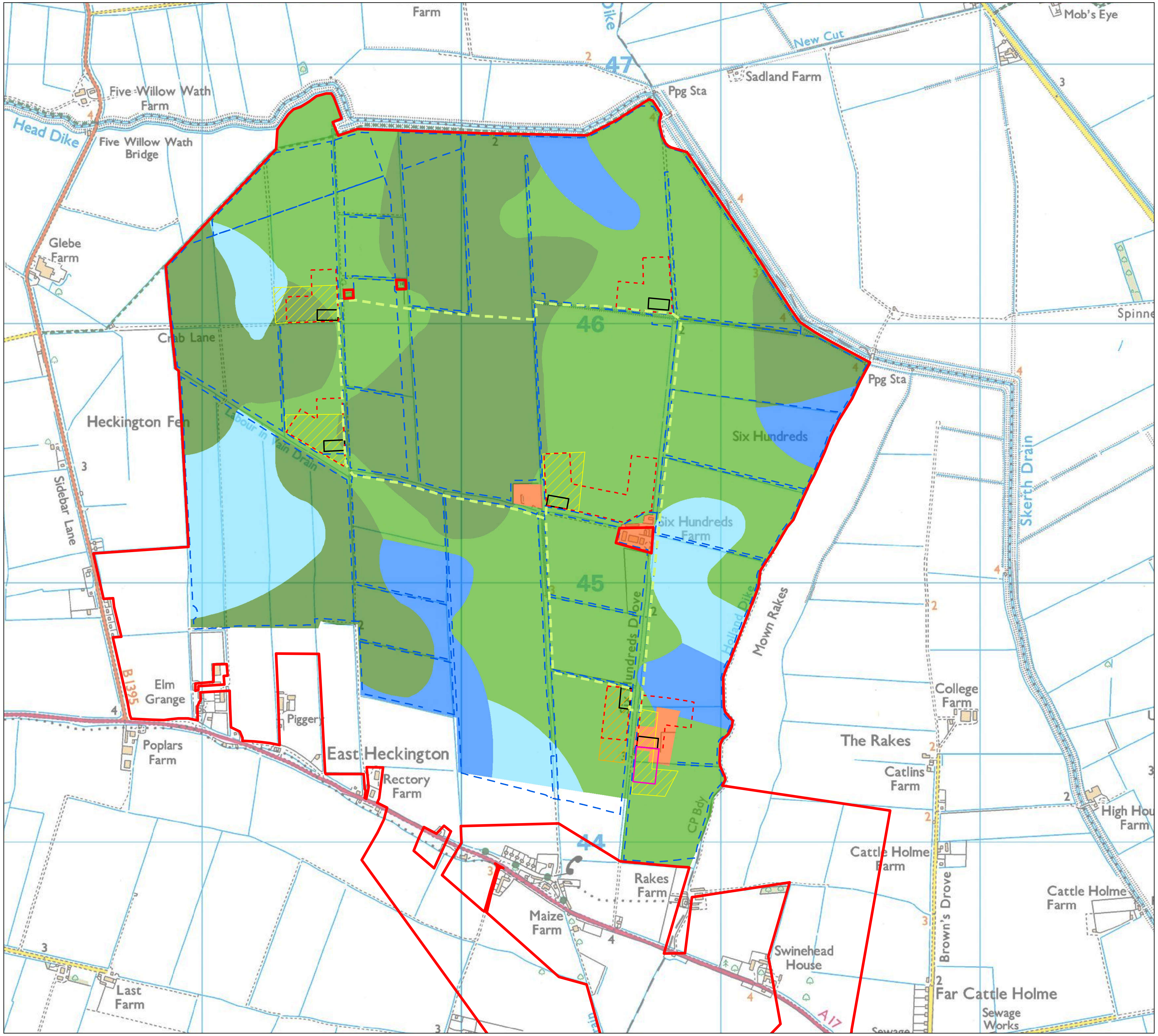
Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report

Figure 16.2- Semi-detailed Agricultural Land Classification of the Panels Area

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



KEY

- Site Boundary
- Indicative 132kV Overhead Cable Route
- Security Fence
- Primary Energy Storage
- Construction Compound
- Indicative 132kV Substation Location
- Indicative 400kV Substation Location
- 132kV Substation and Energy Storage Zone

Agricultural Land Classification

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Non-agricilutral

0 0.5 km

N

FIGURE 16.2

Semi detailed Agricultural Land Classification of the Panel Areas

DRWG No: **P20-2370_46** Sheet No: - REV: _

Date: 15/06/2022

Scale: 1:15,000 @ A3

DESIGN | ENVIRONMENT | PLANNING | ECONOMICS | HERITAGE

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 17: Glint and Glare

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

17 GLINT AND GLARE

17.1 EXECUTIVE SUMMARY

17.1.1 The Assessment has considered both fixed panel layouts and trackers.

17.1.2 There are a range of other common materials and surfaces likely to cause glint that are already present in the study area. These include, but are not limited to:

- glass in windows;
- conservatories or greenhouses;
- flashes caused by light reflecting off passing vehicles; and
- reflections off of water.

17.1.3 Since it is not possible to assess all reflective materials in the 5km study area due to the sheer number of potential reflective surfaces present, the baseline will assume there is no other glint present.

17.1.4 For both tracking and fixed panel designs, the modelling has predicted theoretical potential for 'yellow' glint. That is glint which is of medium intensity and which has potential to cause a temporary after image (i.e. an image that continues to appear in the eyes after a period of exposure to the original image). This type of glint is considered to be significant for sensitive receptors.

17.1.5 The theoretical modelling does not account for intervisibility between receptor and the Energy Park. The ZTV reveals that, based on a bare earth model (i.e. not accounting for surface features), nearly everywhere within the study area would be visible due to the very flat landscape. The ZTV is based on a maximum panel height of 4.5m and a receptor height of 1.8m.

17.1.6 In reality, screening in the form of intervening trees, hedgerows, buildings and other surface features would eliminate much of this potential for glint. Consideration has been given to the level of screening present within the intervening landscape.

17.1.7 Even accounting for screening present, some receptors still have potential to receive glint. On this basis further mitigation in the form of increased hedgerow screening around the perimeter of the Energy Park is proposed to minimise the potential for any glint effects to occur.

17.1.8 Following the implementation of such mitigation it is expected that residual effects would be negligible.

17.1.9 Following the implementation of mitigation including screening around the perimeter of the Energy Park, and given the very flat landscape, there should not be any glint received at ground-based receptors outside of the Energy Park. Therefore, there should not be any potential for cumulative glint effects to arise.

17.1.10 With suitable mitigation it is expected that all glint effects can be managed effectively and there will be no residual effects.

17.2 INTRODUCTION

17.2.1 This assessment considers the potential glint and glare effects associated with the Energy Park comprising solar photovoltaic (PV) arrays on land at Heckington Fen. The proposed installation is located to the north of the A17, halfway between Sleaford and Boston in Lincolnshire.

17.2.2 The total area of land occupied by the Energy Park is 586.85ha and the development would be expected to have a 40 year operational lifetime. The Energy Park site centre is 520000, 345360 (Easting, Northing).

17.2.3 The assessment will consider the potential effects of glint caused by the proposed PV array development on ground-based receptors, including road, rail and local dwellings. Aviation impacts on aircraft operating in the surrounding area have been scoped out of the assessment due to the distance to airfields and the lack of potential effects.

17.2.4 **Figure 17.1** shows the site boundary in blue and the surrounding land. In the final design iteration, the PV arrays may not cover the entirety of this area but for the purpose of this report it is assumed that they will.

17.2.5 Both fixed panels and panels that track the sun are under consideration for this installation, so glint effects arising from both panel layout scenarios will be considered in this PEIR assessment. For the fixed installation, the panels will be set at an angle to the horizontal of 15 degrees and at a maximum height above ground of 4.5m. For the tracker panels, this will be single axis east-west tracking, with the panel rows' oriented in the north-south direction. The maximum panel height will be 3.5m and the maximum tracking angle (i.e the maximum angle the panel can travel from the horizontal) is expect to be set at 60 degrees. Varying the angle or orientation of the proposed panels affects where and when any glint may occur.

17.3 ASSESSMENT APPROACH

Methodology

Defining Glint

17.3.1 Glint, glare and dazzle are often used interchangeably but the definitions used in this report can be found in **Chapter 20 Glossary**.

17.3.2 It should be noted that different organisations and agencies apply slightly different definitions to these terms and some refer to the terms glint and glare interchangeably.

Panel Types

17.3.3 The panels arrays would either be set out using fixed panels or using tracking panels.

17.3.4 Fixed panels would be orientated to the south (or very close to south) and inclined at a set pitch. For the purpose of this PEIR, the angle of inclination has been set at 15 degrees to the horizontal. The maximum height at the rear of the panels is assumed to be 4.5m. The actual height will be determined by the panel orientation on the frame, the number of rows of panels per arrays and the angle of inclination but the panels are not expected to exceed the 4.5m height.

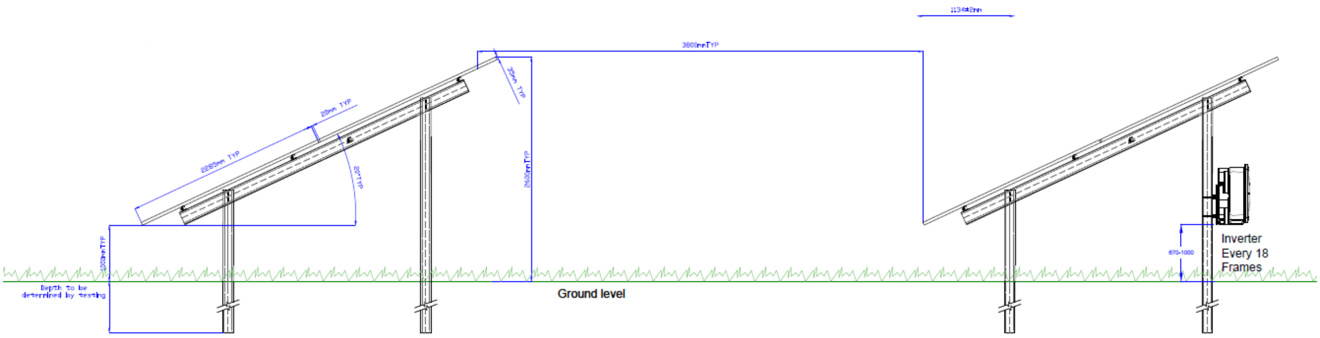


Figure 17.2: Example of a fixed panel array

(Provided by Pegasus; viewer looking from the east or west along the rows)

17.3.5 Further detailed design works will be undertaken as the project progresses and may result in refined panel angle in the final submission but the 15 degree pitch is considered indicative at this stage.

17.3.6 The tracking panels will run north to south, and track across the sky following the path of the sun from east in the morning to west in the evening. They will therefore be single axis trackers.

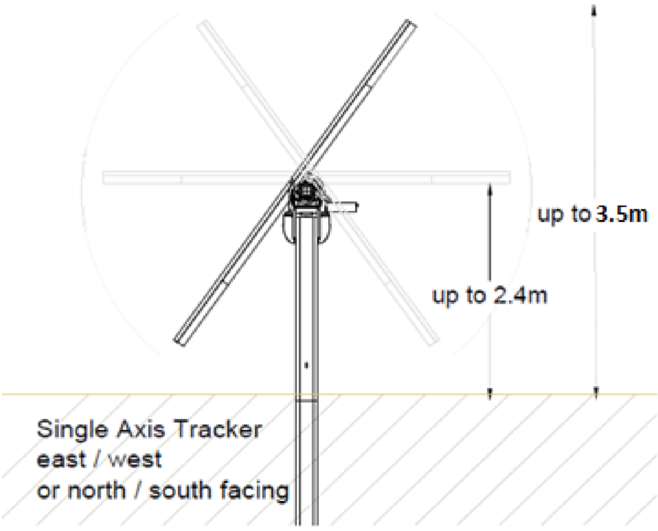


Figure 17.3: Example of a cross section of single axis tracker

(Provided by Pegasus; viewer looking from the north or south along the row)

17.3.7 The maximum angle of rotation is expected to be to 60 degrees to the horizontal, and the maximum height of the tracking array is assumed up to 3.5m above ground level.

Assessment of Significance

Sensitivity

17.3.8 For the purpose of this assessment, sensitivity of the receptor is judged based on the likely consequence of a negative effect. For example. the potential consequence of a motorist or train-driver being dazzled by glint could be, in the worst-case scenario, a collision or major accident. A receptor that is considered to present a possible health and safety risk is allocated as high sensitivity.

17.3.9 A nuisance risk, such as glint being visible from a property, where there is unlikely to be any physical harm but where residents could become annoyed, is allocated as a medium sensitivity.

17.3.10 A receptor that is uninhabited and irregularly frequented, or a building that does not have windows, such as a substation or warehouse, is considered to be low sensitivity.

17.3.11 A place where people are not usually present such as an agricultural field with no public access, is considered to have negligible sensitivity. It is unlikely to cause any issues even if glint were to be visible.

Magnitude

17.3.12 For the purpose of this assessment, the magnitude of effect is based on the output of the computer model, which, in the event that any glint is visible, provides a binary result for standard glint effects.

17.3.13 Green glint is low intensity glint with no potential for temporary after image. In this context 'after image' is the residual effect that remains temporarily visible after glancing towards and then away from a very bright light source.

17.3.14 Yellow glint is higher intensity glint that does have some potential for temporary after image.

Significance

17.3.15 The assessment is focussed on considering high and medium sensitivity receptors. It is considered that any yellow glint at these receptors should be considered significant. In general, green glint is considered to be not significant, unless the receptor in question happens to be an air traffic control tower (ATCT), which, due to its high sensitivity is not expected to tolerate even green glint.

Table 17.1: Significance Matrix

Magnitude of Change	Sensitivity of Receptor				
		High	**Medium**	**Low**	**Negligible**
	Yellow Glint	Moderate to Major	Minor to Moderate	Negligible	Negligible
	Green Glint	Minor*	Negligible	Negligible	Negligible

**Except for an ATCT where no glint can be tolerated, hence even green glint would be considered 'Major'.*

Legislative and Policy Framework

17.3.16 Specific policy and guidance on assessing glint impacts from solar farms is limited.

National Policy Statements

Overarching National Policy Statement for Energy (NPS EN-1) – July 2011

17.3.17 EN-1 does not mention solar PV development specifically, other than in passing, but in paragraph 3.3.10, it does recognise that there is significant need to increase the penetration of renewables in the UK generation mix:

> **"As part of the UK's need to diversify and decarbonise electricity generation, the Government is committed to increasing dramatically the amount of renewable generation capacity."**

17.3.18 It continues in paragraph 3.4.5:

> **"…it is necessary to bring forward new renewable electricity generating projects as soon as possible. The need for new renewable electricity generation projects is therefore urgent."**

17.3.19 In respect of civil and military aerodromes, EN-1 comments in Section 5.4:

> **"Where the proposed development may have an effect on civil or military aviation and/or other defence assets an assessment of potential effects should be set out in the ES (see Section 4.2).**
>
> **The applicant should consult the MoD, CAA, NATS and any aerodrome – licensed or otherwise – likely to be affected by the proposed development in preparing an assessment of the proposal on aviation or other defence interests.**
>
> **Any assessment of aviation or other defence interests should include potential impacts of the project upon the operation of CNS infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures. It should also assess the cumulative effects of the project with other relevant projects in relation to aviation and defence."**

17.3.20 Whilst not specifically glint related, in talking about 'artificial light', Section 5.6 mentions:

> **"The applicant should assess the potential for… artificial light to have a detrimental impact on amenity, as part of the Environmental Statement.**
>
> **In particular, the assessment provided by the applicant should describe:**
>
> - **the type, quantity and timing of emissions;**
> - **aspects of the development which may give rise to emissions;**
> - **premises or locations that may be affected by the emissions;**
> - **effects of the emission on identified premises or locations; and**
> - **measures to be employed in preventing or mitigating the emissions.**
>
> **The applicant is advised to consult the relevant local planning authority and, where appropriate, the EA about the scope and methodology of the assessment."**

17.3.21 Section 5.9 deals with Landscape and Visual Effects, and paragraph 5.9.7 mentions:

> **"The assessment should include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include light pollution effects, including on local amenity, and nature conservation."**

17.3.22 Paragraph 5.9.18 continues:

> **"The IPC will have to judge whether the visual effects on sensitive receptors, such as local residents, and other receptors, such as visitors to the local area, outweigh the benefits of the project."**

17.3.23 Paragraph 5.9.23 goes on:

> **"Depending on the topography of the surrounding terrain and areas of population it may be appropriate to undertake landscaping off site. For example, filling in gaps in existing tree and hedge lines would mitigate the impact when viewed from a more distant vista."**

17.3.24 In Section 5.13 EN-1 discusses transport impacts:

> **"If a project is likely to have significant transport implications, the applicant's ES... should include a transport assessment, using the NATA/WebTAG methodology stipulated in Department for Transport guidance, or any successor to such methodology. Applicants should consult the Highways Agency and Highways Authorities as appropriate on the assessment and mitigation."**

National Policy Statement for Renewable Energy (NPS EN-3) – July 2011

17.3.25 Similarly, because at the time when EN-3 was being written, solar PV was relatively new (to the UK market) and was more of a small-scale technology. EN-3 is therefore surprisingly silent of solar energy and does not mention glint impacts at all.

17.3.26 It does however specify a '*Criteria for "good design" for energy infrastructure*' in Section 2.4:

> **"Section 10(3)(b) of the Planning Act 2008 requires the Secretary of State to have regard, in designating an NPS, to the desirability of good design. Section 4.5 of EN-1 sets out the principles of good design that should be applied to all energy infrastructure.**
>
> **Proposals for renewable energy infrastructure should demonstrate good design in respect of landscape and visual amenity, and in the design of the project to mitigate impacts such as noise and effects on ecology."**

National Policy Statement for Electricity Networks (NPS EN-5) – July 2011

17.3.27 EN-5 provides further advice for the development of electricity networks. Whilst not directly relating to solar PV and glint impacts, EN-5 includes further information on good design and technology specific information relevant to other infrastructure that will be needed as part of the Proposed Development.

Draft Energy National Policy Statements

17.3.28 The Government is carrying out a review of the Energy National Policy Statements, which were initially published in 2010. As part of that review process new draft National Policy Statements were prepared for consultation and the feedback from the consultation is currently being analysed.

17.3.29 Of particular note, within the consultation document for draft NPS EN-3, which has been updated to include more relevance to solar PV development, is reference to glint effects and aviation. Paragraphs 2.52.4 and 2.52.5 state:

> **"2.52.4 Solar PV panels are designed to absorb, not reflect, irradiation. However, the Secretary of State should assess the potential impact of glint and glare on nearby homes and motorists.**
>
> **2.52.5 There is no evidence that glint and glare from solar farms interferes in any way with aviation navigation or pilot and aircraft visibility or safety. Therefore, the Secretary of State is unlikely to have to give any weight to claims of aviation interference as a result of glint and glare from solar farms."**

National Planning Policy Framework (July 2021) - Planning Practice Guidance

17.3.30 The National Planning Policy Framework (NPPF) planning practice guidance sets out guidance for large ground mount solar farms under the section entitled 'Renewable and Low Carbon Energy'.

17.3.31 Paragraph 013 states:

> **"What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic Farms?**
>
> **The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.**
>
> **Particular factors a local planning authority will need to consider include [inter alia]:**
> - **the proposal's visual impact, the effect on landscape of glint and glare (see guidance on landscape assessment) and on neighbouring uses and aircraft safety;**
> - **the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun;**
>
> **The approach to assessing cumulative landscape and visual impact of large scale solar farms is likely to be the same as assessing the impact of wind turbines. However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero."**

17.3.32 In the UK at the domestic level the closest guidelines regarding glint are the BRE guidelines on 'Site layout planning for Daylight and Sunlight'[1]

17.3.33 With regard to solar dazzle these state that:

> **"Glare or dazzle can occur when sunlight is reflected from a glazed façade or an area of metal cladding. This can affect road users outside and the occupants of adjoining buildings. The problem can occur where there are large areas of reflective glass or cladding on the façade, or where there are areas of glass or cladding slope back so that high altitude sunlight can be reflected along the ground. Thus solar dazzle is only a long-term problem for some heavily glazed (or mirror clad) buildings. Photovoltaic panels tend to cause less dazzle because they are designed to absorb light.**
>
> **If it is likely that a building may cause solar dazzle the exact scale of the problem should be evaluated. This is done by identifying key locations such as road junctions and windows of nearby buildings, and working out the numbers of hours of the year that sunlight can be reflected to these points. BRE information paper IP 3/87 gives details.**
>
> **Glare to motorists approaching the building can be an issue. The worst problems occur when drivers are travelling directly towards the building and sunlight can reflect off surfaces in the drivers direct line of sight (usually this will be off the lower parts of the building)."**

17.3.34 After setting out a methodology for calculating solar reflections from sloping glazed facades, BRE information paper IP 3/872 summarises effects as follows:

> **"Initial experience suggests that, in Europe and the USA at least, the greatest problems occur with facades facing within 90º of due south, sloping back at angles between 5º and 30º to the vertical. Where the façade slopes at more than 40º to the vertical (less than 50º to the horizontal) solar reflections are likely to be less of a problem, unless nearby buildings are very high; and facades which slope forward, so that the top of the building forms an effective overhang, should also cause few problems in this respect. In the northern hemisphere, north facing facades should only cause reflected solar glare on a few occasions during the year, if at all."**

17.3.35 In the domestic setting the guidelines therefore suggest that glare and dazzle are only likely to be issues if the facade (or panel in this case) is within 40 degrees of the vertical or 50 degrees of the horizontal. Beyond this angle, incident light will be reflected primarily skywards. This is because the angle of reflection of light from a point source will always be the same as the angle of incidence.

Aviation Guidance (CAA)

17.3.36 The UK Civil Aviation Authority (CAA) issued interim guidance in relation to solar farms in December 2010[2]. The formal policy was cancelled in September 2012, however

[1] Site Layout Planning for Daylight and Sunlight: A guide to good practice. (2nd Edition) Paul Littlefair, BRE Trust, First published 2011.

[2] Civil Aviation Authority, 2010. "*Interim CAA Guidance - Solar Photovoltaic Systems*"

in the absence of formal policy, the guidance is still relevant. It refers to solar farms as Solar Photovoltaic Systems (SPV)

CAA Interim Guidance

17.3.37 This interim guidance makes the following recommendations (p.2-3):

> **"8. It is recommended that, as part of a planning application, the SPV developer provide safety assurance documentation (including risk assessment) regarding the full potential impact of the SPV installation on aviation interests.**
>
> **9. Guidance on safeguarding procedures at CAA licensed aerodromes is published within CAP 738 Safeguarding of Aerodromes and advice for unlicensed aerodromes is contained within CAP 793 Safe Operating Practices at Unlicensed Aerodromes.**
>
> **10. Where proposed developments in the vicinity of aerodromes require an application for planning permission the relevant LPA normally consults aerodrome operators or NATS when aeronautical interests might be affected. This consultation procedure is a statutory obligation in the case of certain major airports, and may include military establishments and certain air traffic surveillance technical sites. These arrangements are explained in Department for Transport Circular 1/2003 and for Scotland, Scottish Government Circular 2/2003.**
>
> **11. In the event of SPV developments proposed under the Electricity Act, the relevant government department should routinely consult with the CAA. There is therefore no requirement for the CAA to be separately consulted for such proposed SPV installations or developments.**
>
> **12. If an installation of SPV systems is planned on-aerodrome (i.e. within its licensed boundary) then it is recommended that data on the reflectivity of the solar panel material should be included in any assessment before installation approval can be granted. Although approval for installation is the responsibility of the ALH10, as part of a condition of a CAA Aerodrome Licence, the ALH is required to obtain prior consent from CAA Aerodrome Standards Department before any work is begun or approval to the developer or LPA is granted, in accordance with the procedures set out in CAP 791 Procedures for Changes to Aerodrome Infrastructure.**
>
> **13. During the installation and associated construction of SPV systems there may also be a need to liaise with nearby aerodromes if cranes are to be used; CAA notification and permission is not required.**
>
> **14. The CAA aims to replace this informal guidance with formal policy in due course and reserves the right to cancel, amend or alter the guidance provided in this document at its discretion upon receipt of new information.**
>
> **15. Further guidance may be obtained from CAA's Aerodrome Standards Department via aerodromes@caa.co.uk."**

17.3.38 The CAA Civil Aviation Publication (CAP) 738 document[3] notes:

> **"In 2010 the CAA published interim guidance on Solar Photovoltaic Cells (SPCs). At that time, it was agreed that we would review our policy based on research carried out by the Federal Aviation Authorities (FAA) in the United States, in addition to reviewing guidance issued by other National Aviation Authorities. New information and field experience, particularly with respect to compatibility and glare, has resulted in the FAA reviewing its original document 'Technical Guidance for Evaluating Selected Solar Technologies on Airports', which is likely to be subject to change, see link;**
>
> **https://www.federalregister.gov/documents/2013/10/23/2013-24729/interimpolicy-faa-review-of-solar-energy-system-projects-on-federally-obligated-airports**
>
> **In the United Kingdom there has been a further increase in SPV cells, including some located close to aerodrome boundaries; to date the CAA has not received any detrimental comments or issues of glare at these established sites. Whilst this early indication is encouraging, those responsible for safeguarding should remain vigilant to the possibility."**

Aviation Guidance (FAA)

17.3.39 The most comprehensive guidance setting out a methodology for assessing solar farm developments near aerodromes was produced November 2010 by the US Federal Aviation Administration (FAA) in a document entitled '*Technical Guidance for Evaluating Selected Solar Technologies on Airports*'. This was updated in Oct 2013 in the '*Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports*'. In April 2018 the FAA released a new version (Version 1.1) of the '*Technical Guidance for Evaluating Selected Solar Technologies on Airports*', and in May 2021 it provided a further set of guidance entitled '*14CRF Part 77 - FAA Policy: Review of Solar Energy System Projects on Federally Obligated Airports*'. In this last review the FAA concluded that, contrary to its initial beliefs:

> **"...in most cases, the glint and glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass façade buildings, parking lots, and similar features. However, FAA has continued to receive reports of potential glint and glare from on-airport solar energy systems on personnel working in ATCT cabs. Therefore, FAA has determined the scope of agency policy should be focused on the impact of on airport solar energy systems to federally obligated towered airports, specifically the airport's ATCT cab."**

Consultation

17.3.40 The Scoping Opinion has been received and the Planning Inspector has agreed that aviation effects can be scoped out of the assessment.

[3] Civil Aviation Authority - Safety and Airspace Regulation Group, 2020, CAP 738, "*Safeguarding of Aerodromes*".

Specific matter raised	How matter has been addressed
The Planning Inspectorate	
Aviation receptors are proposed to be scoped out on the basis there is no evidence that glint and glare for solar farms interferes in any way with aviation navigation or pilot and aircraft visibility or safety. The Inspectorate considers that this matter may be scoped out from further consideration, however the description of development should explain how the panel design prevents the likelihood of glint and glare	The proposed Energy Park is not in close proximity to any licensed airfields. Small aerodromes exist in the local area although not immediately adjacent to the Site. These include Boston Airfield approximately 8.3km to the east and a small grass strip airfield approximately 7.5km to the northeast of the site. As the recent FAA guidance notes, there has not been any evidence of pilots on final approach experiencing effects greater than they would routinely experience from other features present in the environment.
The Glint and Glare Assessment should ensure that it assesses a worst-case scenario, which at present includes the consideration of tracking and stationary panels. The conclusions of the assessment should inform the LVIA	Considered in Chapter 6 and 7 of this PEIR.
North Kesteven District Council	
RAF Cranwell or [and] RAF Coningsby which operate as training and Quick Reaction Alert (QRA) stations respectively and which use airspace above the site. Defence Estates should therefore be consulted regarding the proposal to scope out glint and glare on aviation interests… the assessment must also consider glint and glare potential in relation to the degree/orientation and pivot of panels relative to A17 and properties within and surrounding the site (as well as RAF airspace if needed) to rule out impacts to aviation interests, motorists and sensitive receptors (specifically residential and the school).	Consultation with the Defence Infrastructure Organisation is noted below and is considered to address any concerns relating Defence Estates assets. In respect of impacts on motorists and other sensitive receptors this is picked up in the analysis carried out for this report and will be further refined as the Energy Park design clarifies.
Defence Infrastructure Organisation	
Previous consultation with the Safeguarding Manager noted: "I have conducted an assessment with the grid refs you have provided and can confirm the area indicated falls within the safeguarded aerodrome height (max 91.4m AGL) and birdstrike safeguarding zones surrounding RAF Coningsby…With the above in mind and the height of the panels proposed at 4.5m, there would be no safeguarding concerns with regards to radar or airspace infringements."	The panels will be significantly lower than the safeguarded height, and no other site infrastructure will exceed the specified height either, so it is considered that this aspect is suitably addressed though design.

17.3.41 Until a firm decision is made on which panel type will be used in the Energy Park, the assessment will consider both fixed and tracking panel variants, however, it is important to understand that the parameters for these systems have also not yet been fully fixed.

17.3.42 This makes it difficult to assess a true worst-case scenario. For example, using a steeper angle or a different orientation will not definitively lead to substantially worse effects. Instead, these changes will vary the locations and timings of where and when effects may occur, but whether this leads to a worse level of effect will depend on the locations and sensitivities of all of the individual receptors. Only by carrying out a full assessment of each of the different variants would it be possible to make a comparative judgement between the likely overall magnitude of adverse effect. Nominal values have been used for assessment at this stage, but it is expected that more definitive system parameters will be selected for the full impact assessment and this will enable more precise assessment of likely effects.

Limitations to the Assessment

17.3.43 The assessment has been based around two scenarios, one with fixed panels and one with solar trackers. For the fixed panel layout an assumed panel angle and height has been adopted for the purpose of modelling. Similarly, for the trackers, a provisional design specification has been used to inform the current modelling.

17.3.44 It should be noted that these parameters are all subject to further detailed design and may vary in the final model. The effect of changing these parameters would be to alter the times and potentially the locations where glint could occur. For this reason, the results reported in this assessment should not be considered to be the final results of the glint assessment and further works will be undertaken as the design team progress towards a design freeze.

17.3.45 There are a number of other limitations associated with the modelling that it is important to be aware of. These are summarised below.

17.3.46 The model calculates its results based on the geometric relationship between the observation point at height, the reflective plane at height (panels) and the position of the sun at each time interval. It therefore takes no account of any screening features whatsoever. Like for the Zone of Theoretical Visibility (ZTV), it does not account for surface features such as buildings or trees or intervening topography. Other tools used in the assessment will take this into consideration such as aerial photography, site visit photography, mapping and observations made by the design team.

17.3.47 The software also assumes it is sunny, at the maximum intensity possible given the season, 365 days per year. The computer model suggests when glint can happen not when it will happen, which is why further interpretation by the assessor is essential.

17.3.48 There is, at present, no way to fully incorporate screening features into the model's algorithm.

17.3.49 It will be essential to interpret results in the context of the wider assessment and the methods and limitations discussed. Results will be further refined to account for local prevailing climatic conditions such as cloud cover.

17.4 BASELINE CONDITIONS

Site Description and Context

17.4.1 The Energy Park comprises open farmland in the Fens. The land is very flat and open and hedgerow screening is intermittent and limited.

Baseline Survey Information

17.4.2 There are currently no operational solar farms in the immediate vicinity of the proposed Energy Park. However, there is a complex of glasshouses approximately 3.5km to the east of the Energy Park that does have potential to cause glint reflections in the right conditions.

17.4.3 There are a range of other common materials and surfaces likely to cause glint that are already present in the study area. These include, inter alia:

- glass in windows;
- conservatories or greenhouses;
- flashes caused by light reflecting off passing vehicles; and
- calm water.

17.4.4 In the wider area (within approximately 10km of the Energy Park) there are a number of other solar PV developments which are existing sources of potential glint, but the distance between these and the Energy Park is such that there is very little chance of any intervisibility. Similarly, there is a large pool halfway between Heckington and Sleaford but at circa 8.5km from the Energy Park any glint from the waterbody is not likely to directly impact on locations in close proximity to the Energy Park.

17.4.5 It is not possible to accurately quantify the full level of glint currently experienced by receptors in the vicinity of the Energy Park, as there are a huge variety of sources and some reflections could arise from mobile sources such as moving vehicles. For the purposes of this report, it is therefore presumed that no baseline glint currently occurs at these receptors.

Implications of Climate Change

17.4.6 The effects of climate change will have a limited impact on the likelihood of glint at a particular receptor. If the climate were to change in a way that led to more or less cloud cover, this may affect the number of hours of glint that might be recorded at a given receptor over the course of a year, but it would not change the receptors that could potentially be affected nor the maximum intensity of glint that could be recorded. It would only have potential to reduce or increase the frequency of occurrence compared to that experienced in the current climate. The model used in the assessment does not directly account for weather conditions and assumes that clear and bright weather persists all year.

17.4.7 In the next phase of assessment, once the layout design has been fixed, it is intended to apply a reduction to the annual glint durations to account for expected weather patterns based on historical records. There would be some potential for climate change to affect the magnitude of this reduction but in all cases, the direct output from the model should represent a worst-case scenario with no clouds at all.

17.5 ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

Construction

17.5.1 During the initial phase of ground preparation, there is not likely to be any reflections present other than possibly from the windscreens of vehicles used in the site preparation works.

17.5.2 It is anticipated that the Energy Park will be constructed sequentially in sections, with one part of being built out before the next is commenced. In this way different sections will help provide screening from ongoing construction activities.

17.5.3 Until such time as the panels are installed on the mounting structures, there will be some potential for the mounting structures themselves to reflect sunlight. Since the mounting structures are likely to be made of steel their reflectivity will most likely be considerably higher than the panels, so there is some chance of glint effects during this time. The surface area for the mounting structures is considerably smaller than the surface area for the panels, and the time between the installation of the mounting structures and the mounting of the panels will be minimised, so effects will be limited.

17.5.4 Detailed modelling of glint effects from the mounting structures have not been undertaken as the computer model is not designed to enable this type of analysis to take place. Any effects would be short-lived and temporary. If any particular issues are identified during the construction process, temporary screening could be used to mitigate them.

Operation

17.5.5 During the operational phase effects will vary during the course of each year as the sun attains different heights in the sky and weather patterns vary.

17.5.6 The operational phase is considered across a number of receptors separately. These include rail and road receptors, observation points (which are representative of dwellings in the surrounding area) and aviation receptors.

17.5.7 A ZTV has been modelled to show which areas potentially have visibility to the panels (See **Figure 17.1**). It is important to note here that the ZTV is based on a bare earth model, or Digital Terrain Model (DTM). This means that it does not account for surface features such as hedgerows, trees, buildings or other physical obstructions that may prevent visibility, although it does consider the terrain of the land. Whilst using a Digital Surface Model (DSM) would introduce the surface features, it would also come with additional problems in that it would assume that receptors were located on top of those surface features, rather than just at ground level. In any event, because the ground is so flat in this area, the ZTV suggests that almost everywhere around the Energy Park has theoretical line of sight to the panels.

17.5.8 It is important to note that the model predicts the amount of glint that would be delivered by all of the panels in the array but it does not account for the fact that some panels will be screened by other panels in the array. If there is visibility from the receptor across the arrays then glint can arrive from all of those panels, provided the sun attains a position to allow it, however, if the panels can not be seen from the receptor, then regardless of the potential for reflection from the panels, that receptor will not experience any glint effects

17.5.9 However, since there is also no fixed decision as to whether fixed panels or trackers will be used at the Energy Park, the effects associated with each panel type are considered for each classification of receptor.

Railways

17.5.10 The main rail receptor runs to the south of the Energy Park, between Sleaford and Boston, at a distance of approximately 1.3km. It passes to the south of Heckington, before converging with and then running adjacent to the A1121, just to the east of the Energy Park.

17.5.11 For the purpose of the assessment, it is assumed that the driver of the train would be sat at a height 2.75m above ground level. The model therefore considers whether glint effects would be observable to the driver and could compromise their ability to safely control the train.

17.5.12 There are two sections of track that have been considered in the glint assessment, both running to the south of the site, as shown in **Figure 17.4.** The ZTV, and 5km site buffer are also shown in this figure. It should be noted that one of the lines is more than 5km from the site and at this distance there are not expected to be any significant glint effects, regardless of the panel type being used. The other line crosses the buffer to the south of the site, reaching a closest distance of 1.22km.

Fixed Panels

17.5.13 With fixed solar panels the amount of low intensity 'green glint' recorded along the closest track to site is 82 minutes and the amount of 'yellow glint' is 2990 minutes. The majority of glint effects would have potential to occur to the southwest of the Energy Park in the early morning (before 7am GMT) when the sun is rising to the east, with more sporadic effects possibly visible in the afternoon to the southeast of the Energy Park after 6pm GMT, as the sun is setting.

17.5.14 There is scattered vegetation along the side of the tracks that will provide some screening as well as other scattered features in the intervening topography that would also assist. However, more substantial screening would need to provided around the boundary of the Energy Park itself to ensure there would not be visibility from the railway.

17.5.15 The more distant track which runs off to the south of the Energy Park would theoretically experience up to 339 minutes of green glint and 884 minutes of yellow glint in a year. That glint would be all to the west of the Energy Park near to Sleaford, at a distance of 8km or more. In reality, at these distances there will be no visibility and any glint effects would be so weak they can be ignored.

Trackers

17.5.16 For the rail track closest to the site, the model predicts some glint on the railway based on the position of the panels relative to the sun.

17.5.17 With the tracking panels, the amount of low intensity 'green glint' recorded along the closest track to site is 174 minutes and the amount of 'yellow glint' is 1145 minutes.

17.5.18 The same screening is present as for the fixed panels so additional screening is likely to be needed at the Energy Park.

17.5.19 The more distant rail track would theoretically experience up to 547 minutes of green glint and 39 minutes of yellow glint in a year from the trackers. As with the fixed panels, because of the distance between the Energy Park and the receptor, any glint effects would be so weak they can be ignored.

Roads

17.5.20 There are a number of roads within the study area comprising national, regional, and local roads. There are no motorways. Motorists are, as a matter of routine, used to driving towards the sun which provides a much more intense source of light than glint. Notwithstanding this, roads within the immediate vicinity of the site have been assessed for glint effects.

17.5.21 Stretches of road within the ZTV have been identified and selected for computer simulation. Although the dates and times when glint has the potential to be visible for specific stretches of the road may vary, the results reported are expected to be representative of the road in general. It should be noted that the glint results reported (dates and times) do not account for screening which will limit or eliminate the potential for glint effects, the results reported should therefore be placed in context with the discussion of screening which is provided for each road. The durations reported are the extents of when glint could be geometrically possible, but glint would not occur continuously during that period.

17.5.22 Each road that has been assessed is shown in **Figure 17.4**. The roads modelled are those closest to the Energy Park and more likely to receive glint. All the roads modelled are at least partially or completely within the ZTV and within 5km of the Energy Park.

Fixed Panels

17.5.23 Under the fixed panel system, the model predicts yellow glint being visible along a number of the routes. However, it is important to recall that the model does not account for any existing screening features. Nor is it limited to effects within 5km of the Energy Park, although clearly these are important factors in determining the potential glint impacts. The durations of theoretical green and yellow glint for each road receptor are given in **Table 17.1** below.

Trackers

17.5.24 Trackers will tend to reflect a lot more glint skywards than fixed panels and hence the comparative durations for which glint is potentially received at ground level are lower. **Table 17.1** shows this, with substantially less glint recorded than for the fixed panel layout.

17.5.25 Again, it is worth pointing out that glint can be avoided (or at least minimised) at source (by the use of different system parameters) but even if glint is theoretically being generated, provided it does not impact negatively on sensitive receptors it will not cause any adverse effects. In the case of glint, especially in a very flat landscape, using appropriate screening mitigation can prevent negative effects occurring.

Table 17.1: Summary Glint effects on Road Receptors from Fixed and Tracking Panels

Route	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
A1121	Little vegetation present on the A1121 northern boundary, giving open views towards the Site. However, closer to the site there is a little more vegetation present which is likely to provide some screening, including the hedgerow along Browns Drove, and other patches of hedgerow and trees in the surrounding landscape.	Limited	0	1311	0	2
A17	Minimal along the northern boundary of the road. Boundary vegetation is low to the ground and there are open views towards the Energy Park. Intermittent dwellings and taller vegetation is present but will not obscure all views.	Yes	0	5223	0	1339
B1395	Isolated trees and houses along the eastern boundary of the road will provide some screening but there will be large sections that are currently unscreened offering uninterrupted views into the site	Yes	0	1470	0	0
Browns Drove	Mixed – some sections are fairly heavily screened with fairly mature dense trees, while other sections are more open offering views into the site.	Limited	0	0	0	0
Claydike Bank	Existing vegetation is in places quite dense and will provide good screening towards the Site. Other sections are more open. Towards the southern end of Claydike Road in particular vegetation is quite low and can be looked over relatively easily, however this is also the section that is most distant from the Energy Park and therefore there is limited visibility of the Site itself due to other intervening vegetation. There are some more open sections to the north where visibility to the panels will potentially be possible, and additional Site screening may be required.	Limited	0	1540	0	0

Route	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
Harrisons Drove	Mixed - where the road joins Claydyke Bank there is substantial screening on the northern side of Harrisons Drove and hedgerow persists to The Cottage. Beyond this the track starts to dwindle and the hedgerow stops, leaving more visibility towards the Site.	Limited	0	1917	0	0
Littleworth Drove	Littleworth Drove runs from close to the Site's western boundary, back to Heckington. Sections of the road are very open with little screening. Vehicles travelling from Heckington towards the Site would potentially have direct views into the Site with little existing screening present to prevent this. Additional screening is likely to be required to assist with prevent glint effects.	Yes	1	4441	4	844

Observation Points

17.5.26 Due to the size of the Energy Park it is necessary to consider a large number of observation points around the perimeter of the Proposed Development to properly assess the likely effects.

17.5.27 A total of 40 observation points have been identified and assessed for likely glint effects based on the use of the fixed panels and tracking panels. The majority of these observation points represent residential dwellings, although there are a few commercial premises and churches included.

17.5.28 In many cases, the receptors selected are intended to represent more than one property in the immediate area. Although the levels of screening differ slightly for the different receptors, in general the level of glint recorded will be about the same for those surrounding properties.

17.5.29 It is important to understand the level of intervisibility between the receptor and the Energy Park as this will determine whether any glint is able to arrive at the receptor. As shown in **Figure 17.1**, nearly all of the 5km buffer around the site boundary falls within the visible area according the ZTV, however, this does not account for the level of surface feature screening present at each receptor.

Fixed Panels

17.5.30 For the fixed panel layout the glint effects will be visible to the east and west of the site, when the sun is low in the sky, with a small amount visible to the south. It will not be possible for reflections to reach receptors located towards the north of the panels as the south facing pitches of the arrays will prevent this from happening.

17.5.31 Table 17.2 includes commentary on the visibility of the Energy Park from the receptor locations and notes the results of the modelling in terms of the duration and predicted intensity of glint effects (i.e. whether green glint or yellow glint would be present).

Trackers

17.5.32 As with rail and road receptors, the duration of glint recorded at individual dwelling receptors is much lower with tracking panels, as effects are primarily directed skywards.

Table 17.2: Summary Glint effects on Point Receptors from Fixed and Tracking Panels

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP1 Rakes Farm	The building, which is located at the southern tip of the Energy Park, appears to have some large vegetation directly between it and the panels. There is also a complex of farm buildings that would potentially screen effects from the house but would be open to glint themselves.	Limited	0	0	0	0
OP2 Six Hundred Farm	The dwelling which is adjacent to the A17 is screened from most of the site by the presence of barns to its rear.	Limited	0	0	0	0
OP3 Swineshead House	The dwelling is set within a large curtilage and there are mature shrubs and a walled garden which would provide a level of screening.	Limited	0	0	0	5
OP4 Carpenters	On the far side of the A17, and slightly lower than the road, this dwelling would have limited views towards the site due to the presence of hedgerows on both sides of the road. The main aspect of the house is away from the Site and although there appear to be two small windows that face towards the Site it is unlikely that these will have any direct visibility.	Limited	0	0	0	0
OP5 Maize Farm	Again, on the far side of the A17 and behind substantial dense evergreen vegetation, it is not expected that there will be any direct visibility to the Site.	No	0	261	0	0
OP6 Large dwelling in midsection of Old Main Road	This dwelling is representative of a collection of other dwellings in the same area of Old Main Road. There are a lot of trees present in the area, including a number in the curtilage of this property, which will provide a good degree of screening. It is unlikely that there will be any direct visibility.	Limited, if any	0	879	0	0

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP7 Most easterly dwelling on Old Main Road	This dwelling is representative of several properties in the immediate area. Substantial vegetation impedes views of the majority of the Site but there is potential visibility to the most south-easterly corner of the Site, which is the area predicted to cause observable glint effects. However, boundary screening onsite at the Energy Park would prevent visibility.	Yes	0	1104	0	0
OP8 Most Westerly dwelling on Old Main Road	Again, representative of a cluster of dwellings in this area, lower floors are unlikely to have visibility due to their own boundary screening. Upper floors may well have views over this, into the Site.	Yes, from upper floors	0	833	0	0
OP9 Mountain's Abbey Parks Farm Shop	This is a commercial receptor rather than a residential receptor. Although there are mature trees on the opposite side of the A17 that will provide some level of screening this will not be sufficient to prevent some visibility directly to the site where there are large gaps in the coverage. Boundary treatment within the Site will need to be used to provide a good degree of screening.	Yes	0	2033	0	0
OP10 Rectory Cottage	Vegetation within the curtilage will provide some screening but the width of the solar development would be too great for this to mask all of the Site. There is likely to be some visibility to the Energy Park and onsite boundary planting will needed to prevent visibility.	Yes	0	1981	0	0
OP11 Rectory Farm House	Substantial vegetation will prevent visibility from lower level windows but there may be some views from upper floors out over the Energy Park. Other dwellings in the immediate vicinity ae likely to have even less (if any) visibility due to the screening provided by Rectory Farm House itself.	Limited	0	1595	0	0

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP12 Beech House	This property is likely to have views over the Energy Park from upper level windows and possibly from lower level windows as well. Onsite boundary screening will likely be required to ensure glint effects are restricted.	Yes	0	1813	0	0
OP13 Dwelling at Home Farm	As with Beech House, it is likely that screening at the property will be insufficient to prevent visibility of the Site. Boundary screening at the Energy Park will be required to prevent visibility.	Yes	0	2319	0	0
OP14 Rose Cottage	There are a number of trees and buildings present in the foreground between the dwelling and the Energy Park that will partially screen it but the extent of the solar arrays are such that panels will remain visible beyond the intervening screening. Other dwellings in the same area but to the south of the A17 will likely have slightly less visibility. Larger properties immediately to the west are enclosed by trees and will have much more limited visibility.	Yes	0	1062	0	0
OP15 Dwelling on B1395 Sidebar Lane Close to A17	The selected dwelling is representative of several dwellings located in this area. They are close to the southwestern corner of the Site and general have views out towards the east. Some of these properties appear to be bungalows so visibility may be more limited with ground floor windows not seeing past garden hedgerows, however, some are houses and upper floors will inevitably overlook the Energy Park.	Yes	0	2147	0	0
OP16 Dwelling on B1395 Sidebar Lane 250m North of OP15	OP16 is representative of several houses at this location and is broadly exposed to the same views as OP15. The buildings in this location are semi-detached houses so there will be upper floor windows, with views out towards the Energy Park.	Yes	0	2288	0	0

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP17 Dwelling on B1395 Sidebar Lane approx. 500m south of Littleworth Drove/Crab Ln.	This receptor is a bungalow on the western side of Sidebar Lane. It has open views towards the Energy Park with very little screening so any mitigation would need to be provided around the boundary of the Energy Park.	Yes	0	22	0	0
OP18	OP18 is not a residential receptor and can be ignored.	N/A	-	-	-	-
OP19 The Chapel House, Sidebar Lane	Like OP17, this property, which is located close to the junction between Sidebar Lane and Crab Lane, has views directly to the East towards the Energy Park. It appears to be single storey building with very high ceilings. Three large windows on the eastern side of the building look directly out towards the Energy Park with little to no screening. This receptor is representative of Glebe Farm House, although that building is much more heavily screened with localised vegetation.	Yes	0	1728	0	0
OP20 Five Willow Wath Farm	The main residential building is single storey with south-facing windows. There is some screening present but it is expected that there will still be views through to the Energy Park.	Yes	0	0	0	0
OP21 Pattingden House	This property has windows facing directly towards the site. However, in a fixed panel layout it will not experience any glint as the views will be of the backs of the panels, or of screening hedgerows. With tracking panels there is potential for a very small amount of glint unless there are screening hedgerows installed at the Energy Park	Yes	0	0	0	2

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP22 Mill Green Farm	This farm complex is located directly to the north of the site and has views towards the panels. In a fixed panel layout glint effects will tend to affect properties to the east and west and to the south of the Site but glint will not be reflected to the north. For tracking panels, properties lying to the north may be affected, however, here the model does not predict that any glint will be directed towards the receptor from the Energy Park.	Yes	0	0	0	0
OP23 The Farmhouse, Maryland Bank	Views from lower windows will be limited by the hedgerows around the garden but the upper floors will have oblique views towards Energy Park. The location is still north of the arrays though so glint will not be possible from a fixed panel layout and no glint is predicted from the tracker layout with the current parameters..	Limited	0	0	0	0
OP24 Six Maryland Bank	This receptor is representative of a cluster of properties in this location. Farm buildings associated with Chestnut House Farm will provide some screening, as will bands of nearby trees but there may still be glimpses of the site. The positioning of the panels means that there is not predicted to be any glint from either panel configuration	Limited	0	0	0	0
OP25 Maryland Bank	This receptor is indicative of several dwellings in the vicinity. The properties are partially screened by vegetation within the curtilage of the properties themselves. They are predominantly single storey buildings.	Limited	0	0	0	0
OP26 St John the Baptists Church	The church appears to be well screened from the surrounding area with hedgerows enclosing the graveyard. Within the Church itself there is not likely to be windows that overlook the Energy Park.	No	0	0	0	0

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP27	This dwelling is representative of several buildings at the northern end of Claydike Bank, just before it changes to Maryland Bank. The dwellings here appear to be well screened by mature trees and have little to no visibility to the Energy Park, especially from lower level windows.	Limited	0	0	0	0
OP28 22 Sutterton Drove	This location is representative of the Old Amber Hill hamlet, including the Pilgrim School, which is very well screened. Parts of the hamlet benefit from screening with mature trees, while part has more open views towards the Energy Park. The Application Site is approximately 2km away so visibility will be limited, and glint intensity will be lower than for receptors very close to the panels.	Limited	0	0	0	0
OP29 Claydike Bank	The building has a low box hedge that provides plenty of opportunity for views towards the Energy Park. It is intended to be representative of a cluster of buildings in the area but this one has some of the greatest visibility towards the Site, with other dwellings screened by a combination of vegetation and agricultural buildings. As with other receptors the lack of screening close to the Site is likely to need mitigating by applying screening along the Site boundary.	Yes	0	1063	0	0
OP30 Kepplegate, Chapel Lane	This site is indicative of the dwellings nearby. The receptor is located at the intersection of Chapel Lane with Claydike Bank. This particular property benefits from an evergreen hedge (Leylandii) surrounding the building and completely screening the Energy Park. Some of the other local buildings do have clearer visibility to Site and are more likely to be susceptible to observing glint effects.	No	0	1069	0	0

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
OP31 College Farm, Browns Drove	This property has some vegetation screening views towards the southern part of the Energy Park but there is little screening to the mid and northern parts of the Site.	Yes	0	1856	0	0
OP32	Small property on the west side of Browns Drove. This receptor is indicative of several other dwellings in the vicinity including College Cottage and Cattle Holme Farm. The building itself has limited views to the Energy Park as there is a thin hedgerow of trees to the rear of the property that will provide intermittent screening. The other properties benefit from greater screening.	Limited	0	1531	0	0
OP33 14 Brown's Drove	This receptor is one of a series of semi-detached properties arranged along the southwestern side of Brown's Drove. OP33 in particular has little screening present and will have open views towards most of the Site. Other dwellings in this cluster have varying amounts of screening present, with some being well screened and others not.	Yes	0	703	0	0
OP34 Ullyatts Farm, Ullyatt's Drove	This receptor is an isolated building approximately 1.8km to the west of the Site. It has some screening present but will likely still have views of the Energy Park.	Yes	0	1167	0	0
OP35 Kane Farm, off the A17	This receptor is almost 3km to the west of the Energy Park and is representative of more distant receptors to the west of the Site. Although this receptor is quite well screened not all of the other receptors are. The glint model still predicts a relatively high duration of impact and intensity of glint despite the distance.	Limited	0	1904	0	826
OP36 Holme House, Littleworth Drove	At approximately 1.8km from the Site this receptor is also a medium distance receptor. There is limited screening present at the dwelling to screen visibility to the Energy Park. However, there are a number of field boundaries between the receptor and the Site, which are likely to	Yes	0	66	0	29

OP#	Screening Present	Site Visibility	Fixed Panels		Tracking Panels	
			Green Glint (min)	Yellow Glint (min)	Green Glint (min)	Yellow Glint (min)
	provide some degree of screening due to the flat nature of the landscape. Screening mitigation will need to be carried out around the perimeter of the Energy Park in any areas where there is visibility.					
OP37 Vine Cottage, Littleworth Drove	This dwelling is partially screened by trees and hedges onsite but is likely to have unobstructed, if oblique, views to the Energy Park. Other nearby properties appear to be in a similar position, with some potential for visibility. However, based on the current panel configurations no glint effects are predicted.	Limited	0	0	0	0
OP38	It is not clear whether there is a residential receptor at this location or just agricultural receptors. Assuming there is a residential building it will have views partially screened by localised vegetation and trees. Views directly to the Site will have to pass numerous field boundaries, any one of which may be sufficiently robust to completely block visibility.	Limited	0	2	0	4
OP39 White House Farm	This observation point is to the north of the Energy Park and with fixed panels deployed glint effects will not be possible. There is some screening present at the Farm and this will prevent a number of the potential glint effects from occurring.	Limited	0	0	0	0
OP40 94 Clay Bank	These properties, about 1km to the north of the site, will not be able to experience any glint in the fixed panel layout as the windows would see the backs of the panels. No glint is predicted from the tracking layout either.	Limited	0	0	0	0

<u>Aviation</u>

17.5.33 As noted in the Consultation above, aviation has been scoped out of the assessment. Notwithstanding this, a brief assessment has been undertaken for the closest major aviation receptor, which is RAF Coningsby, approximately 9.2km to the north of the northern site boundary. The aerodrome is orientated such that the runways are nominally 07 and 25, meaning that flights leaving and landing from either runway will not directly overfly the Energy Park without changing direction. Glint effects have been assessed in the software and no glint is predicted on final approach.

17.5.34 It should also be noted that the FAA has undertaken a policy review in relation to solar farm impacts on aviation receptors, and its guidance has changed as of May 2021. In the absence of any detailed UK guidance from the CAA in respect of solar PV, the FAA guidance has been adopted as default best practice over the previous eight years. In the updated guidance (FAA 14 CFR Part 77), the FAA has concluded that "*in most cases the glint and glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass-façade buildings, parking lots, and similar features.*"

<u>Fixed Panels</u>

17.5.35 At this distance there are not expected to be any significant glint effects.

<u>Trackers</u>

17.5.36 At this distance there are not expected to be any significant glint effects.

<u>Other Aviation Receptors</u>

17.5.37 No other aviation receptors have been formally assessed.

17.5.38 RAF Cranwell is more than 17km from the Energy Park and at such distance will not be affected by it.

17.5.39 Boston Airfield is an unlicensed grassed airfield used for small fixed wing and microlight planes, as well as hosting an helipad used by the air ambulance. At more than 8.5km from the Energy Park it will not be directly affected by it and, as per the FAA conclusion above, pilots routinely deal with flying towards the sun and in very bright conditions. At this distance, solar panels with anti-reflective coatings will not expose those pilots to unacceptable or unusual effects.

<u>Decommissioning</u>

17.5.40 The decommissioning process will largely be the exact reverse of the construction process, with activities involving the removal of the site infrastructure piece by piece. As panels are removed from the mounting frames the mounting structures will become more visible again and these will still have potential to reflect glint. It is anticipated that the Energy Park will be decommissioned in sections with panels being removed from one section, then the mounting structures, cabling and other site infrastructure being removed before the next section of the Energy Park undergoes the same procedure.

17.5.41 Whilst the mounting structures are visible there is some potential for glint to be reflected back towards receptors but this will be a temporary effect for a short period of time and it is not considered necessary to further mitigate against it.

17.6 MITIGATION AND ENHANCEMENT

Mitigation by Design

17.6.1 Design work is ongoing for the Energy Park and opportunities to reduce glint effects through the intelligent selection of design options will be undertaken alongside further consultation as part of the iterative design process. This may include choosing between fixed and tracking panel layouts.

17.6.2 For fixed panel systems specifically varying angles of inclination and orientation in fixed panel systems, as well as the arrangement and heights of panel arrays will all affect the amount of glint that might be received at specific receptors.

17.6.3 For tracking systems varying parameters such as the height of the axis of rotation, the maximum angle of rotation, and the backtracking process will similarly vary the glint effects.

Additional Mitigation

17.6.4 Extensive hedgerow screening (over 10km) is proposed across the Energy Park Site. Should further planting be incorporated into the design this may further assist the outcome of the final glint assessment. Visibility of the Energy Park will be limited by this additional hedgerow planting.

17.6.5 Should additional screening be required until such time as any planting reaches sufficient maturity, this could be achieved with some form of physical screening such as fencing, although any requirements for such will need to be further explored as the assessment continues.

Table 17.3: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured	
		By Design	By DCO Requirement
Construction	Layout of solar panels and mounting systems. Orientation and pitch of fixed panels, system specification of trackers.	x	
Construction	Screening Construction hoarding or fencing, if glint from mounting system is too great prior to panels being installed.		x
Operation	Screening (First five years) If required additional screening in form of fences could be used until vegetation matures sufficiently		x
Operation	Screening (Full life of project) In-fill vegetation around perimeter of the Energy Park to be well-maintained and reinstated in the event of any die-back.		x

Enhancements

17.6.6 It is not anticipated that there will be any further enhancements.

17.7 CUMULATIVE AND IN-COMBINATION EFFECTS

17.7.1 As noted in the earlier discussion, there are a number of other sources of reflection within the local environment. These include glass houses to the east of the Energy Park, water bodies, windows and car windscreens, metal infrastructure, as well as more distant solar farms (i.e. >8km from the Energy Park).

17.7.2 Due to the sheer number of reflective surfaces present, it is not possible to assess all of the potential sources of glint in the local environment when considering cumulative effects.

Table 17.4: Details of Cumulative Schemes

No.	Name of Scheme	LPA	NSIP	Reference	Size	Distance from Site	Area
1	Vicarage Drove-Approved	Boston Borough	No	B/21/0443	49.9 MW	c. 4.5km south of the Energy Park Site at its closest point but adjacent to the proposed extension to the substation at Bicker Fen	80
2	Land at Little Hale Fen-Screening	North Kesteven	No	21/1337/EIASCR	49.9 MW	c. 4.6km north-east of the Energy Park Site at its closest point	80
3	Land at Ewerby Thorpe-Screening	North Kesteven	No	14/1034/EIASCR	28MW	c. 4.1km north-west of the Energy Park Site at its closest point	73
4	Land to the North of White Cross Lane-Approved	North Kesteven	No	19/0863/FUL	32MW	c. 8.4km west of the Energy Park Site at its closest point	20
5	Land South of Gorse Lane, Silk	North Kesteven	No	19/0060/FUL	20MW	c. 11km west of the Energy	70

	Willoughby - Approved					Park Site at its closest point	
6	Cottam Solar Project - Scoped	PINS to determine. Falls in administrative e areas- Nottinghamshire, Lincolnshire County, Bassetlaw District and West Lindsey	Yes	EN010133	50MW + (NSIP)	c. 43.6km north-west of the Energy Park Site at its closest point	1270
7	Gate Burton Energy Park - Statutory Consultation	PINS to determine. Falls in administrative areas- Nottinghamshire, Lincolnshire County, Bassetlaw District and West Lindsey	Yes	EN010131	50MW + (NSIP)	c.48.6km north-west of the Energy Park Site at its closest point	684
8	West Burton Solar Project - Scoped	PINS to determine. Falls in administrative areas- Nottinghamshire, Lincolnshire County, Bassetlaw District and West Lindsey	Yes	EN010132	50MW + (NSIP)	c.41.3km north-west of the Energy Park Site at its closest point	788
9	Mallard Pass Solar Farm – Statutory Consultation	PINS to determine. Falls in administrative areas- Rutland County and South Kesteven	Yes	EN010127	50MW + (NSIP)	c.33.2km south-west of the Energy Park Site at its closest point	900

17.7.3 Although more detailed assessment may be required, other solar farms present or consented in the area (as detailed in **Table 17.6**) are likely to be sufficiently far away that there will not be any cumulative glint effects present even without mitigation. Once screening mitigation has been applied there should not be any glint from the Energy Park, so any potential for cumulative effects involving the Energy Park would cease to be.

17.7.4 In combination effects where effects from glint and other environmental effects collectively affect the same receptor would theoretically be possible in an unmitigated design but, assuming the Energy Park is appropriately screened and given the flat landscape within which it is situated, it should be possible to eradicate almost all glint effects, except possibly from upper storeys windows with views down into the Energy Park.

17.8 SUMMARY

Introduction

17.8.1 The Assessment has considered both fixed panel layouts and trackers.

Baseline Conditions

17.8.2 There are a range of other common materials and surfaces likely to cause glint that are already present in the study area. These include, inter alia:

- glass in windows;
- conservatories or greenhouses;
- flashes caused by light reflecting off passing vehicles; and
- calm water.

17.8.3 Since it is not possible to assess all reflective materials in the 5km study area due to the sheer number of potential reflective surfaces present, the baseline will assume there is no other glint present.

Likely Significant Effects

17.8.4 In both cases the modelling has predicted theoretical potential for 'yellow' glint. That is glint which is of medium intensity and which has potential for temporary after image. This glint is considered to be significant.

17.8.5 The theoretical modelling does not account for intervisibility between receptor and the Energy Park. The ZTV reveals that, based on a bare earth model, nearly everywhere within the study area would be visible due to the very flat landscape. The ZTV is based on a maximum panel height of 4.5m and a receptor height of 1.8m.

17.8.6 In reality, screening in the form of intervening trees, hedgerows, buildings and other surface features would eliminate much of this potential for glint. Consideration has been given to the level of screening within the intervening landscape.

17.8.7 Even accounting for screening present, some receptors still have potential to receive glint. On this basis further mitigation in the form of increased hedgerow screening around the perimeter of the Energy Park is proposed to minimise the potential for any glint effects to occur.

Mitigation and Enhancement

17.8.8 Following the implementation of such mitigation it is expected that residual effects would be negligible.

Cumulative and In-Combination Effects

17.8.9 Following the implementation of mitigation including screening around the perimeter of the Energy Park, and given the very flat landscape, there should not be any glint received at ground-based receptors outside of the Energy Park. Therefore, there should not be any potential for cumulative glint effects to arise.

Conclusion

17.8.10 With suitable mitigation it is expected that all glint effects can be managed effectively and there will be no residual effects.

Table 17.6: Summary of Effects, Mitigation and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
Construction								
Rail Receptors	Reflection from metal frames and construction equipment. Potential safety issue from driver dazzle	Temporary Direct	High	N/A	Regional	Minor Adverse	Site Screening	Negligible
Road Receptors	Reflection from metal frames and construction equipment. Potential safety issue from driver dazzle	Temporary Direct	High	N/A	District	Minor Adverse	Site Screening	Negligible
Dwellings	Reflection from metal frames and construction equipment. Nuisance caused by glint reflections visible from house	Temporary Direct	Medium	N/A	Local	Minor Adverse	Site Screening	Negligible
Aviation	Reflection from metal frames and construction equipment. Potential safety issue from pilot dazzle or air traffic	Temporary Direct	High	None expected	National	Negligible	N/A	Negligible

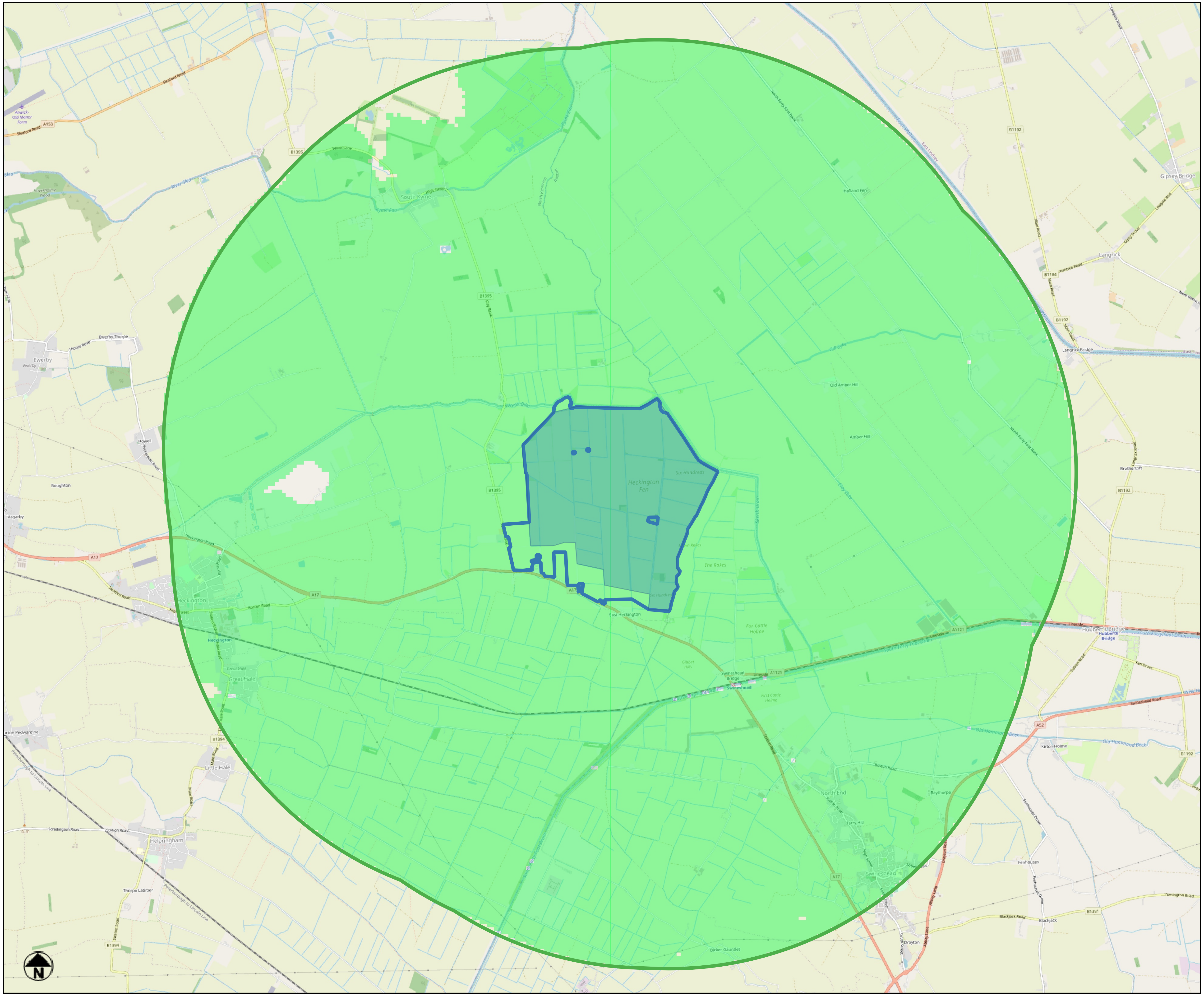
Receptor/ Receiving Environment	Description of Effect	Nature of Effect *	Sensitivity Value **	Magnitude of Effect **	Geographical Importance ***	Significance of Effects ****	Mitigation/ Enhancement Measures	Residual Effects ****
	control tower dazzle.							
Operation								
Rail Receptors	Reflection of sunlight from panels in array. Potential safety issue from driver dazzle	Permanent Direct	High	Yellow	Regional	Moderate Adverse	Site Screening	Negligible
Road Receptors	Reflection of sunlight from panels in array. Potential safety issue from driver dazzle	Permanent Direct	High	Yellow	District	Moderate Adverse	Site Screening	Negligible
Dwellings	Reflection of sunlight from panels in array. Nuisance caused by glint reflections visible from house	Permanent Direct	Medium	Yellow	Local	Minor Adverse	Site Screening	Negligible
Aviation	Reflection of sunlight from panels in array. Potential safety issue from pilot dazzle or air traffic control tower dazzle.	Permanent Direct	High	None predicted	National	Negligible	N/A	Negligible
Cumulative and In-combination								
N/A								

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 17.1- Energy Park and ZTV

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



Energy Park Boundary

Proposed Panel Area

Panel Area - 5km Buffer

Zone of Theoretical Visibility

Visibility to Application Site

ZTV is based on maximum panel height of 4.5m above ground level, and an observer height of 1.8m. An OS Terrain 50 digital terrain map (DTM) has been used to assess visibility.

FIGURE 17.1

Energy Park and ZTV

DRWG No: **BR10116_17.1**

Date: 07/06/2022

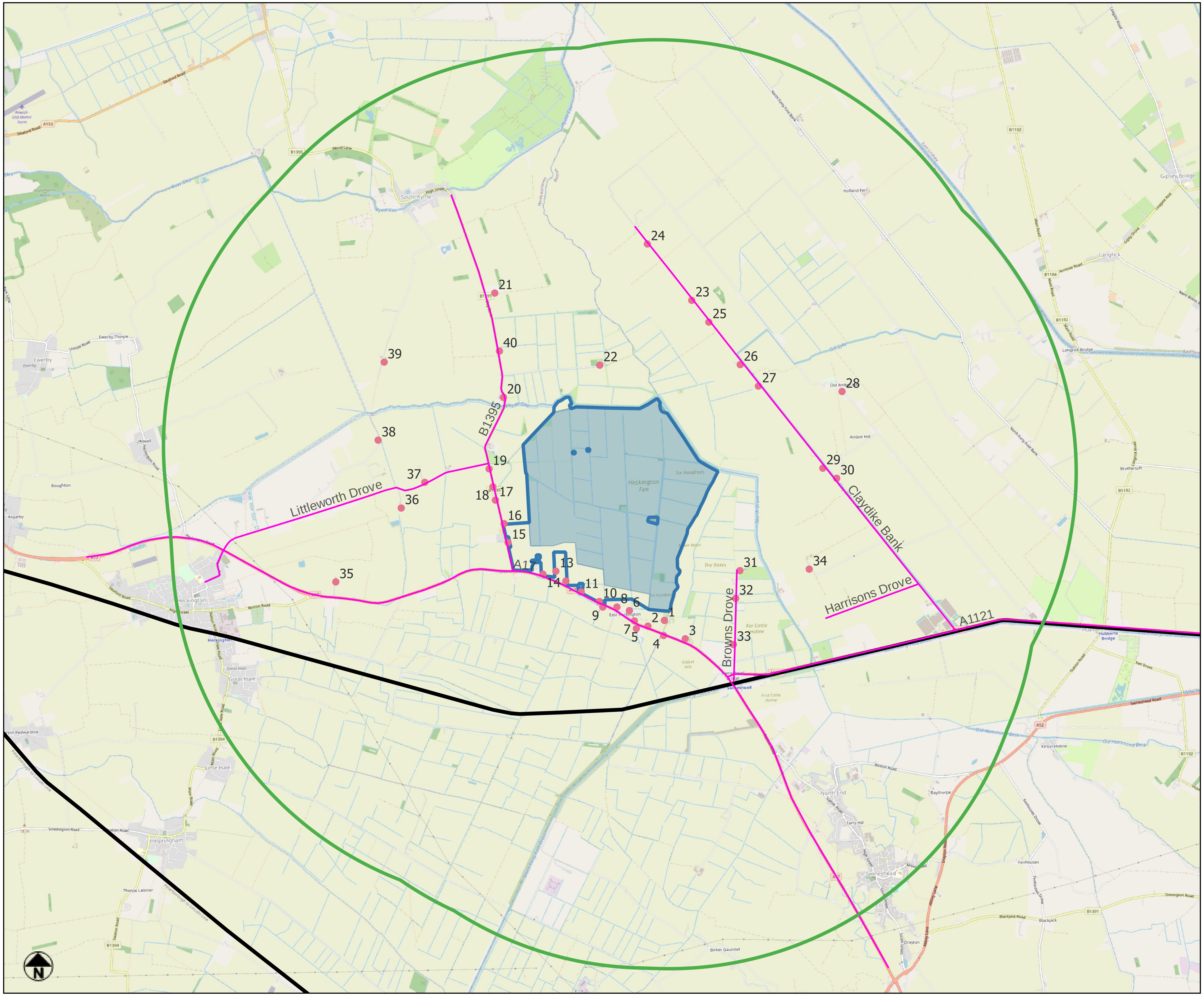
Scale: 1:50,000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Figure 17.4- Receptors of Interest

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park



Energy Park Boundary
Proposed Panel Area
Panel Area - 5km Buffer
Observation Points (Dwellings)
Road Routes
Rail Routes

Notes: This map shows the various receptors that are considered in more detail in the Glint chapter of the PEIR.

FIGURE 17.4

Receptors of Interest

DRWG No: **BR10116_17.4**

Date: 07/06/2022

Scale: 1:50,000 @ A3

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 18: Miscellaneous Issues

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

18 MISCELLANEOUS ISSUES

18.1 INTRODUCTION

18.1.1 The purpose of this chapter is to collate the assessment of other miscellaneous environmental topic areas that do not warrant individual chapters, either due to the brevity of the assessment or the small impact associated with the Proposed Development.

18.1.2 This chapter of the PEIR describes and assesses the potential effects of the Development in terms of:

- Major Accidents and Disasters (Section 18.3);
- Waste (Section 18.4);
- Electric, magnetic and electromagnetic fields (Section 18.5); and
- Telecommunications, Television Reception and Utilities (Section 18.6)

18.1.3 Baseline conditions have been established through desk-based assessment and consultation in relation to the topics covered by this chapter, where appropriate. The assessment methods used within this chapter are described in greater detail in the relevant subsections below.

18.1.4 Legislation and guidance which is relevant has been considered within the assessments.

18.2 DEVELOPMENT PARAMETERS ASSESSED

18.2.1 The Proposed Development has been assessed based on the likely worst-case parameters/scenarios as per the 'Rochdale Envelope' approach. **Chapter 4: Proposed Development** sets out the description of the scheme against which this chapter has been assessed.

18.2.2 In undertaking the assessment of all sections, consideration has been given to the scoping responses and other consultation undertaken as detailed in **Table 18.1** below.

Table 18.1: Consultation Responses

Scoping/ Other Consultation	Issues Raised	Response/ Action Taken
Planning Inspectorate		
Major Accidents and Disasters	A standalone Chapter for major accidents and disasters is not proposed on the basis that the nature, scale, and location of the Proposed Development is not considered to be vulnerable to or give rise to significant impacts in relation to the risk of accidents and major disasters. Potential effects relating to soil conditions, surface water flooding and climate change will be assessed in other Chapters where relevant. The Inspectorate has considered the characteristics of the	No standalone PEIR chapter, but section included within **Chapter 18: Miscellaneous Issues** Further consideration and assessment of risk of battery fire risk/ explosion has been undertaken

Scoping/ Other Consultation	Issues Raised	Response/ Action Taken
	Proposed Development and agrees with this approach. The Inspectorate considers that the risk of battery fire/explosion should be addressed in the ES, including where any measures designed to minimise impacts on the environment in the event of such an occurrence are secured.	
Waste	The ES should include an assessment of the likely impact of component replacement (e.g., batteries and panels) and outline what measures, if any, are in place to ensure that these components are able to be diverted from the waste chain. The ES should assess the likely significant effects from waste at decommissioning to the extent possible at this time. The Scoping Report states that a Decommissioning Plan will be agreed with the Local Planning Authority. The Inspectorate would expect to see this secured through the inclusion of an Outline Decommissioning Plan or similar with the Application. The ES should clearly set out how decommissioning is to be assessed and any components which may remain following decommissioning. The ES should address the likely significant effects from waste at decommissioning to the extent possible at this time, including consideration of any measures to ensure that component waste will avoid entering the waste chain. This should also include waste likely to be generated from replacing components.	No standalone PEIR chapter, but section included within **Chapter 18: Miscellaneous Issues** Further assessment work of the decommissioning of waste will be assessed in the ES supporting the DCO application.
Electric, magnetic and electromagnetic fields	The voltage of underground export cables between the onsite substation and the existing National Grid Bicker Fen substation is likely be 400kV. In line with relevant guidance (DECC Power Lines: Demonstrating compliance with EMF public exposure guidelines, A Voluntary Code of Practice	No standalone PEIR chapter, but section included within **Chapter 18: Miscellaneous Issues** assessing where relevant the cable systems above 132kV and have potential to cause EMF effects.

Scoping/ Other Consultation	Issues Raised	Response/ Action Taken
	2012), cables above 132kV have potential to cause electro-magnetic field (EMF) effects. The Inspectorate considers that the ES should demonstrate the design measures taken to avoid the potential for EMF effects on receptors.	
Telecommunications, Television, Reception and Utilities	The ES should explain the findings of the desk-based study and any required mitigation measures but is otherwise content to scope this matter out.	No standalone PEIR chapter, but section included within **Chapter 18: Miscellaneous Issues**
Health and Safety Executive		
Major Accidents and Disasters	According to HSE's records the proposed DCO application boundary for this Nationally Significant Infrastructure Project is not within any consultation zones of major accident hazard sites but is within 1 zone of a major accident hazard pipelines. Hazardous Substance Consent The presence of hazardous substances on, over or under land at or above set threshold quantities (Controlled Quantities) will probably require Hazardous Substances Consent (HSC) under the Planning (Hazardous Substances) Act 1990 as amended. The substances, alone or when aggregated with others for which HSC is required, and the associated Controlled Quantities, are set out in The Planning (Hazardous Substances) Regulations 2015 as amended. HSC would be required to store or use any of the Named Hazardous Substances or Categories of Substances at or above the controlled quantities set out in Schedule 1 of these Regulations. Consideration of risk assessments Regulation 5(4) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the assessment of significant effects to include,	High pressure gas pipeline assessed within Section 18.3 Major Accidents and Disasters, **Chapter 18: Miscellaneous Issues** Further information on HSC will be sought from the relevant Hazardous Substances Authority for the ES to accompany the DCO application. No further action required for explosive sites as none within the vicinity of the Proposed Development. Electrical safety is assessed in various sections of **Chapter 18: Miscellaneous Issues** Where relevant the Outline CEMP (to be submitted with the ES) will reference specific risk assessments associated with the Proposed Development and its vulnerability to major accidents.

Scoping/ Other Consultation	Issues Raised	Response/ Action Taken
	where relevant, the expected significant effects arising from the proposed development's vulnerability to major accidents. Explosives sites HSE has no comment to make as there are no licensed explosives sites in the vicinity. Electrical Safety No comment from a planning perspective.	

18.3 MAJOR ACCIDENTS AND DISASTERS

Introduction

18.3.1 This section summarises the potential effects of the Proposed Development on the risks of major accidents or disasters occurring.

18.3.2 'Accidents' are an occurrence resulting from uncontrolled developments in the course of construction, operation and decommissioning (e.g., major emission, fire or explosion).

18.3.3 'Disasters' are naturally occurring extreme weather events or ground related hazard events (e.g., subsidence, landslide, earthquake).

Policy Context

18.3.4 The EIA Regulations require consideration to be given to the risks of major accidents and disasters. The Directive and domestic Regulations cite two specific directives as examples of risk assessments to be considered within EIA. These are the Directive 2012/18/EU of the European Parliament and of the European Council (which deals with major accident hazard registered sites) and the Council Directive 2009/71/Euratom (which deals with nuclear sites). Neither of these Directives is relevant to the Proposed Development.

Assessment Methodology

18.3.5 In general, major accidents or disasters, as they relate to the Proposed Development, fall into three categories:

- Events that could not realistically occur, due to the nature of the Proposed Development or its location;
- Events that could realistically occur, but for which the Proposed Development, and associated receptors, are no more vulnerable than any other development; and
- Events that could occur, and to which the Proposed Development is particularly vulnerable, or which the Proposed Development has a particular capacity to exacerbate.

18.3.6 An exercise was undertaken to identify all possible major accidents or disasters that could be relevant to the Proposed Development. Major accidents or disasters with little relevance in the UK were not included, such as volcanic eruptions for example. See **Table 18.2** for further details.

Table 18.2: Potential Major Accidents and Disasters associated with the Proposed Development

Major Accident or Disaster	Potential Risk and Receptor	Relevant Chapter or Appendix of the PEIR
Health and Safety at Work	Risk of accidents for workers during the construction and decommissioning of the Proposed Development.	This section of this chapter.
Floods	Risk of the Proposed Development flooding and it's potential to exacerbate flooding to property and people in areas of increased flood risk.	**Chapter 9: Hydrology, Hydrogeology, Flood Risk and Drainage** (Ongoing assessment work to be provided in ES chapters submitted as part of DCO application).
Design of the equipment	Risk of fire to local residents, habitats and species.	This section of this chapter.
Road accidents	Risk posed by spillage of hazardous loads from road traffic accidents during construction/decommissioning on the environment. Risk from glint and glare to affect road users.	**Chapter 9: Hydrology, Hydrogeology, Flood Risk and Drainage** **Chapter 17: Glint and Glare** (Ongoing assessment work to be provided in ES chapters submitted as part of DCO application).
Rail accidents	Risk of rail accident as a result of the cable route corridor crossing on rail users	This section of this chapter.
Aviation disasters	Risk from glint and glare to affect pilots and aircraft	**Chapter 17: Glint and Glare** (Ongoing assessment work to be provided in ES chapters submitted as part of DCO application).
Flood defence failure	Risk of increased flooding or flooding to the Proposed Development	**Chapter 9: Hydrology, Hydrogeology, Flood Risk and Drainage** (Ongoing assessment work to be provided in ES chapters submitted as part of DCO application).
Utilities failure (gas, electricity, water, sewage, oil, communications)	Risk of utilities failure to affect employees and local residents	This section of this chapter.
Plant disease	Biosecurity risks from new planting to habitats and species	**Chapter 8: Ecology and Ornithology** (Ongoing assessment work to be provided in ES chapters submitted as part of DCO application).

Baseline Conditions

18.3.7 A number of receptors are present in the vicinity of the Proposed Development which could be vulnerable to major accidents or disasters, either because of their proximity to the Proposed Development or their importance to the surrounding area. These include:

- Towns, villages, farms and residential homes;
- Commercial sites and buildings;
- Roads;
- Railways;
- Designated ecological sites, woodland, farmland, and waterbodies; and
- Underground infrastructure services including electricity, water, communications, and gas.

18.3.8 Details of the specific receptors that fall into the above categories are provided in **Chapter 4: Proposed Development**. These receptors have been considered in this assessment.

Potential for the Development to cause Major Accidents and Disasters

Construction and Decommissioning Phase

Health and Safety at Work

18.3.9 In regard to the Overarching National Policy Statement for Energy EN-1 (DECC, 2011), and with specific reference to section 4.13 which acknowledges access to energy is clearly beneficial to society as a whole, the production, distribution, and use of energy may have negative impacts on some people's health. The policy requires the decision maker to consider potential effects of development proposals on human health, stating:

> **"where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate."**

18.3.10 Negative effects could include direct impacts on health including increased traffic, air or water pollution, dust, odour, hazardous waste and substance, noise, exposure to radiation, and increases in pests; and the indirect health impacts of access to key public services, transport or the use of open space for recreation and physical activity.

18.3.11 There are various health and safety considerations particularly for workers during construction and decommissioning of the Proposed Development. Workers are in the closest proximity to the Proposed Development as a result are considered to be the most at-risk group. However, the risk to both construction workers and the general public is low and not significant during the construction and decommissioning phases.

18.3.12 Comprehensive health and safety assessments are an essential part of the construction process and would be carried out prior to construction by the contractor in accordance with legislation. A Construction, Design and Management (CDM) co-ordinator will be appointed responsible for the provision of a pre-construction information pack, as required under the Construction (Design and Management) Regulations 2015. The appointed contractor will be required to provide a construction phase plan.

18.3.13 The construction of the Development would be managed in accordance with the Health and Safety at Work Act 1974 and would comply with all other relevant Health and Safety Regulations, including:

- The Construction (Health, Safety and Welfare) Regulations, 1996;
- Construction (Design and Management) Regulations 2015; and
- Electricity Safety, Quality and Continuity Regulations, 2002.

Design of the Equipment

18.3.14 Health and Safety on-site would be managed by the contractor during construction and decommissioning to mitigate the risk of equipment failure that could lead to a fire risk. Therefore, the Proposed Development is not expected to have an effect on the risk of a major accident occurring as a fire during construction and decommissioning.

18.3.15 It is intended that after the 40-year operational life of the solar panels, energy storage, and associated equipment will be removed from the Energy Park Site. The substation extension at Bicker Fen is likely to remain once the Energy Park Site is decommissioned. This could result in connection capacity in the future beyond the 40-year lifetime of the Proposed Development.

Rail Accidents

18.3.16 The cable route corridor for the two potential grid connection route crosses the railway line connecting Grantham to Skegness, also known as the 'Poacher line'. The construction and decommissioning of the underground cable crossing will be managed to the specific requirements of Network Rail and therefore the risk of a rail accident as a result of the crossing will be minimised. Therefore, significant effects on rail accidents are not anticipated. Liaison with Network Rail is underway, and the Applicant expects to put in place Protective Provisions for the benefit of Network Rail.

Utilities Failure

18.3.17 A high-pressure gas pipeline (Feeder 7 East Heckington to Gosberton) bisects the Site running in a north-south direction through the centre of the Site. The design of the Proposed Development has ensured the buffers that the operator has asked to be applied to the design are in place (24.4m easement), including no solar panels in this area. Liaison with National Grid is underway to understand access requirements and security fencing requirements (for the Energy Park).

<u>*Operational Phase*</u>

Health and Safety of Workers

18.3.18 The Development would operate to Health and Safety Executive "Health and safety in the new energy economy: Meeting the challenge of major change" published in August 2010.

18.3.19 Traffic during the operational phase will consist of movements by staff that will supervise the operation and maintenance of the Proposed Development, and those that attend the sheep. This is unlikely to involve HGVs and considered to be of negligible magnitude, and hence any related effects will not be significant.

Design of the Equipment

18.3.20 When operational the majority of the Proposed Development will comprise solar PV modules which are inert. Electrical infrastructure will be located across the Proposed

Development, in the form of inverters, transformers and cabling, all of which will be subject to routine maintenance such that it is not considered to pose a significant risk to creating an accident or disaster.

18.3.21 The substation compounds which will include transformers will be subject to routine maintenance such that it is not considered to pose a significant risk of creating an accident or disaster.

18.3.22 The Proposed Development has also been designed to include energy storage. The energy storage is located close to the main substation, but consideration has also been given to spreading the energy storage out around the Energy Park Site. The potential energy storage could include batteries, inverters and system controllers.

18.3.23 Any system installed will be strenuously tested during the factory and pre-commissioning testing regime before being given the final sign-off to energise. It is worth highlighting that the overwhelming majority of energy storage sites continue to operate without any problems which means that the risk is quite small.

18.3.24 If energy storage is used within the Proposed Development, there are three main battery storage options used within the industry. These are Li-ion, LIP/LEP (Lithium-Ion Phosphate) and Flow Storage technologies:

- Li-ion is an established technology that has been used in mobile phones, laptops and electric vehicles for many decades and can be scaled up to utilise it for storage on a Site such as this. The battery cells are housed in purpose-made containers, which include an extremely efficient an intelligent management system as well as state of the art cooling and fire suppression systems. The systems can detect the off gases predating the thermal runway event and shut down the malfunctioning cell/rack safely. The sensors used to do this are sensitive down to 1pmm (parts per million);
- Lithium-Ion Phosphate as a technology has a higher thermal runaway temperature threshold and hence, improved battery safety; and
- Flow Storage uses electrolytes as an aqueous form which is inherently safe and non-flammable. Flow batteries are housed in similar purpose-made containers with slightly different management and support systems but ultimately functioning the same as the Li-ion batteries.

18.3.25 There is a potential fire risk associated with certain types of batteries such as lithium ion, however the cooling systems noted above are designed to regulate temperatures to within safe conditions to minimise risk of fire.

18.3.26 Fire protection for battery technologies is outlined in the following details:

- The manufacturer undertakes extensive testing and analysis to assess fire risk;
- Do not install batteries where temperatures routinely approach or exceed $80^{O}C$ – this is not the case at the Site;
- Do not install batteries near heating equipment or heat sources – this is not the case at the Site;
- Protect the installation area from flooding, which may cause electrical fires – the risk of flooding will be assessed as part of the Flood Risk Assessment accompanying **Chapter 9: Hydrology, Hydrogeology and Flood Risk and Drainage** in the final ES application, and mitigation measures to protect it from flooding have been recommended which will be developed as part of the detailed design; and

- Ensure that installation areas comply with the appropriate local fire, electrical and building code requirements – this would be the case with the Proposed Development.

18.3.27 Fire detection and suppression features would be installed to detect (e.g. multi-spectrum infrared flame detectors) and suppress fire to minimise the effect of any fire. The Proposed Development design will include adequate separation between energy storage units to ensure that an isolated fire would not become widespread and lead to a major incident.

18.3.28 The risk of fire is small and therefore not likely to lead to any major accidents or disasters as this has been mitigated by the design of the equipment and the design of the Site.

18.3.29 Once the system is commissioned, regardless of the technology used, the whole installation will be monitored continuously at a central hub where engineers and technology experts will ensure that it is operating optimally and safely 24 hours a day, 7 days a week.

18.3.30 With the above embedded mitigation, significant effects on the risk of fire would be unlikely.

Rail Accidents

18.3.31 The cable route corridor for the two potential grid connection routes crosses the railway line connecting Grantham to Skegness, known as the 'Poacher line'. The underground cable crossing will be designed to meet the specific requirements of Network Rail and therefore the risk of a rail accident as a result of the crossing will be minimised. Therefore, significant effects on rail accidents are not anticipated.

Utilities Failure

18.3.32 A high-pressure gas pipeline (Feeder 7 East Heckington to Gosberton) bisects the Site running in a north-south direction through the centre of the Site. The design of the Proposed Development has ensured the buffers that the operators have asked to be applied to the design are in place (24.4m easement) including no solar panels in this area. The operators will run their own maintenance programme which will include their own Health and Safety programme and procedures to implement. Discussions with the operators are ongoing to understand the access requirements and security fencing requirements (for the Energy Park).

18.3.33 Through careful design consideration of the Proposed Development, and operators following implemented site management and Health and Safety procedures, the risk of impact is considered unlikely.

Mitigation Measures

18.3.34 Minimising the risk of major accidents during construction and decommissioning will be addressed through appropriate risk assessments as required in the CEMP.

Cumulative Effects

18.3.35 The shortlist of cumulative sites for this DCO application are all solar schemes.

18.3.36 The increased in traffic during construction and decommissioning phases of the Proposed Development is forecast to be within the typical AADT variation travelling on the A17. This in combination with other developments on the shortlist in close proximity such as the Vicarage Drove application (B/21/0443) is unlikely to affect the risk of road accidents. However, if necessary, this could be managed through a Health and Safety process between the two construction crews for both schemes.

18.3.37 All of the other cumulatively listed developments are not positioned in close proximity to the developable area of the DCO Site to have any notable inter-relationship of effects. Additionally, with embedded mitigation and additional mitigation listed above to reduce the risk of fire, no significant effects are expected from the Proposed Development alone. For these reasons, it is concluded that no significant cumulative effects would arise from the Proposed Development.

18.4 WASTE

18.4.1 This section sets out the approach to waste management that will be applied to the design and the expected waste streams during each phase of the Proposed Development.

18.4.2 'Waste' is defined as materials that are unwanted, having been left over after the completion of a process which would otherwise be discarded. The legal definition of waste also covers substances or objects, which fall outside of the commercial cycle or out of the chain of utility. In particular, most items that are sold or taken off site for recycling are wastes, as they require treatment before they can be resold or reused.

18.4.3 In practical terms, wastes include surplus spoil, scrap, recovered spills, unwanted surplus materials, packaging, office waste, wastewater, broken, worn-out, contaminated or otherwise spoiled plant, equipment and materials.

18.4.4 Waste minimisation is the process of reducing the quantity of such materials arising, requiring processing and/or disposal.

18.4.5 The priority at the Proposed Development will not be producing waste in the first place. To do this, the waste implications of the proposals need to be considered at the earliest possible stage.

Policy Context

18.4.6 The draft Overarching National Policy Statement for Energy (Draft EN1) considers Resource and Waste Management at 5.15. Draft EN1 notes where possible applicants are encouraged to source materials from recycled or reused sources and use low carbon materials, sustainable sources and local suppliers. Furthermore, applicants are encouraged to use construction best practices in relation to storing materials to prevent waste. The use of Building Information Management tools to record the materials used on construction can help to reduce waste during the decommissioning phase. The waste hierarchy is noted at 5.15.2 of Draft EN1 and shown below in **Figure 18.1**.

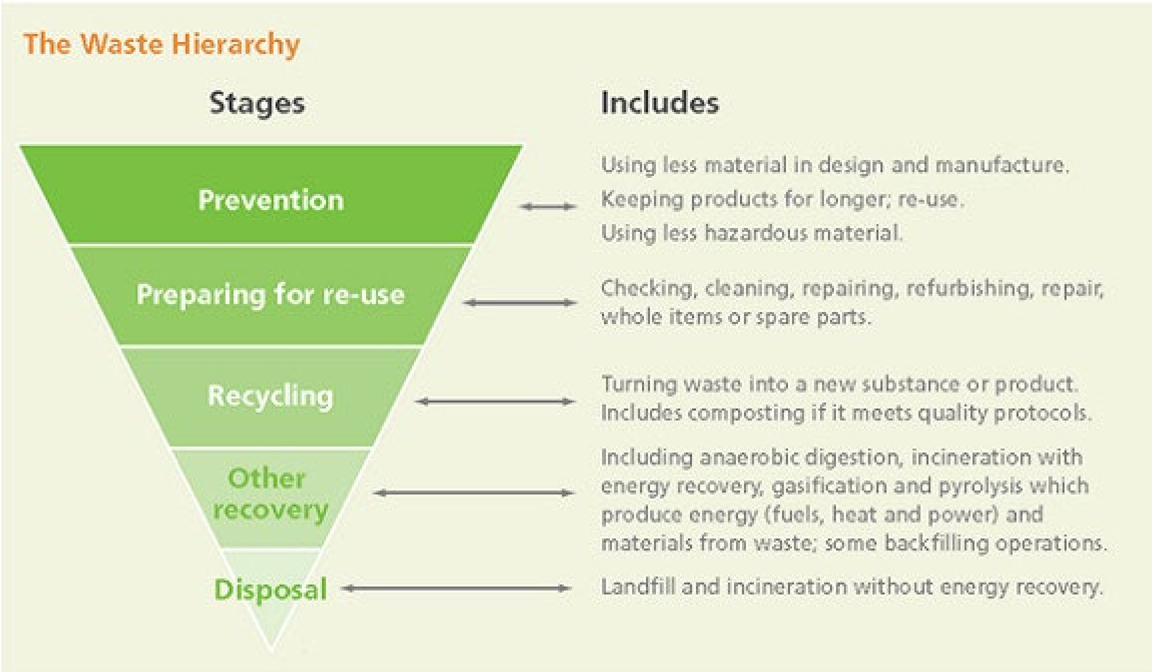
18.4.7 The Waste Framework Directive (WFD) 2008/98/EC is the legislative framework for the collection, transport, recovery and disposal of waste across the European community. The revised Directive (2018) introduces new provisions in order to boost waste prevention and recycling through the adoption of the 'Waste Hierarchy', as the guiding principle to sustainable waste management.

18.4.8 In addition, Schedule 1 of the Waste (England and Wales) Regulations 2011 (as amended) translates the provisions of the WFD into legislation and require waste prevention programmes and waste management plans that apply the 'Waste Hierarchy'.

18.4.9 The Waste Management Plan for England (WMPE) is a high-level strategy that supersedes the former Waste Strategy 2007 and supports the implementation of the objectives and provisions set out within the revised Waste Framework Directive, specifically Article 28 which requires that Member States must establish one or more waste management plans covering their territory.

18.4.10 The Waste (England and Wales) 2011 Regulations (as amended) require that everyone involved in waste shall take all reasonable measures to apply the waste hierarchy except where, for specific waste streams, departing from the hierarchy is justified.

Figure 18.1- Waste Hierarchy



Assessment Methodology

18.4.11 Waste streams and quantities have been estimated using industry standards, based on activities, material requirements and staff requirements during the construction, operation, and decommissioning phases.

Baseline Conditions

18.4.12 Waste at the Proposed Development's site area is currently associated with agricultural practice. Potential waste streams currently could include left over crop and straw bales, fertiliser sacks and chemical containers.

18.4.13 The plastic waste associated with the Proposed Development's site area is currently sent to Lindum Waste Recycling Centre (c.39km north-west) for baling. Approximately 2.5 tonnes of plastic waste are removed from the Proposed Development's site area annually.

18.4.14 The additional straw bales are sold to a third-party trader and are likely to be used as 'energy from waste' burned at biomass power stations.

18.4.15 The waste carriers and landfill sites used for the Proposed Development will be determined by the contractor pre-construction.

Assessment of Effects

18.4.16 The nature of the Proposed Development and the known construction processes indicate no significant quantities of waste are anticipated.

18.4.17 A Construction Environmental Management Plan (CEMP) will be prepared for the construction and decommissioning phases. These will include measures to control and manage waste on-site. These will be secured through a DCO Requirement.

Construction Phase

18.4.18 Waste materials can be generated during the Site preparation stage of construction and during the installation of infrastructure and erection of buildings.

18.4.19 The majority of construction equipment will be delivered to Site for assembly and installation (mounting structures) and connection (solar panels).

18.4.20 Exact quantities and types of waste likely to be generated during the construction phase are unknown, however it is expected that waste streams could include:

- Welfare facility waste;
- Waste chemicals, fuels and oils;
- Waste metals (iron and steel);
- Waste water from dewatering of excavations;
- Waste water from cleaning activities (e.g., wheelwash);
- Packaging; and
- General construction waste (paper, cardboard, wood, etc.).

18.4.21 Destinations of the above waste streams would be where applicable through recycling plants, landfill sites for construction and demolition waste and landfill for hazardous waste.

18.4.22 The generation of construction-related waste can be significantly reduced through the choice of materials and other opportunities pre-construction phase will be explored as far as possible. Possibilities to reuse or recycle materials will be explored before resorting to landfill options.

18.4.23 Construction operations will also generate waste materials as a result of general handling losses and surpluses and these wastes can be mitigated through good site practices, including proper storage and handling of materials to avoid damage, and accurate quantity estimates and efficient purchasing arrangements to avoid over ordering.

18.4.24 Design considerations will seek to minimise wastage from the construction phase and are likely to follow these approaches:

- Maximise the use of reclaimed materials in the construction;
- Maximise recycling opportunities in the decommissioning phase (further details below);
- Use prefabricated and standardised components in the standard product sizes (e.g., panels, mounting structures). As these are made in factory-controlled environment, they tend to generate less waste and if standard product sizes are made use of, this minimises wastage on site.
- Segregation of construction waste on site to maximise potential for reuse/recycling;
- Use of suppliers who collect and reuse/recycle packaging materials;

- The off-site separation and recycling of materials where on site separation is not possible; and
- Training of contractors in waste minimisation and materials reuse.

18.4.25 Toxic and / or hazardous waste must be treated by an authorised operator. Transportation of hazardous waste will also require an authorised carrier. Materials are to be dealt with in accordance with the CEMP which will be secured through a DCO Requirement. With these in place and the appropriate control measures followed, no effects are anticipated.

18.4.26 Re-usable waste includes soil excavated for trenches, roads, compound areas and foundations. Soils are an important resource, and to minimise effects to this resource, engineers must carry out precise take off calculations. To avoid wastage, with reference to DEFRA's Soil Strategy (2009), stripped soils will be stored in separate resource bunds no more than 3m high, and kept grassed free from construction traffic, to ensure that the soil can be re-used elsewhere on site.

18.4.27 The primary measures to mitigate against the loss of soil resources will be to reuse as much of the surplus resources on-site and to dispose of any surplus soils thereafter in a sustainable manner (i.e., as close to the Proposed Development as possible and to an after-use appropriate to the soil's quality). However, surplus resources requiring removal off site are not expected.

18.4.28 All waste transported off site will be delivered to the appropriately licenced receivers of such materials. Operators receiving any waste materials resulting from the Proposed Development will be subject to their own consenting procedures.

Operational Phase

18.4.29 During the operational phase of the Proposed Development waste arising is expected to be substantially less than during the construction phase.

18.4.30 It is estimated there will be up to 5 permanent staff, and due to the scale of the Proposed Development maintenance personnel would be expected to be present on-site most days. Waste arisings are expected to minimal, and would include:

- Welfare facility waste;
- Equipment needing replacing;
- Waste metals; and
- General waste (paper, cardboard, wood, etc.).

18.4.31 Should equipment fail and need replacement, it is anticipated that the part would be returned to the manufacturer if still under warranty for refurbishment if possible or recycled if facilities allow. Like all electrical equipment producers have legal obligations under the Waste Electrical and Electronic Equipment Directive legislation. Solar panels contain aluminium which can be recycled, and the remaining glass and silicon mix can be ground up into other building materials and industrial applications. Information obtained from GreenMatch noted 96% of materials can be reused for produced new solar panels[1]. The electrical infrastructure, should it need replacing is also likely to be taken apart and recycled.

[1] GreenMatch, The Opportunities of Solar Panel Recycling. Source: https://www.greenmatch.co.uk/blog/2017/10/the-opportunities-of-solar-panel-recycling Accessed June 2022

18.4.32 The operational phase effects associated with waste are anticipated to be not significant with waste generated during operation assessed that it will be adequately managed.

Decommissioning Phase

18.4.33 During the decommissioning phase it is expected that a number of waste streams will be created. They are likely to include the following:

- Solar panels and mounting structures;
- Waste materials from foundations;
- Electrical equipment;
- Energy storage i.e., batteries;
- Cables;
- Welfare facility waste;
- Waste chemicals, fuels and oils;
- Waste metals;
- Waste water from dewatering of excavations; and
- Wastewater from cleaning activities (e.g. wheel wash).

18.4.34 As the Proposed Development seeks to convert solar radiation into electricity, there will not be any hazardous waste created on the site (resulting in no requirement for an environmental remediation strategy).

18.4.35 The photovoltaic modules will be recycled or reused, where possible. With regards to the supporting structures, the structures will be unscrewed/unbolted, and then removed from the ground using a piling machine. Once the supporting structures have been removed, they will either be re-used or recycled, where possible. Only a small amount of backfilling will be required to fill the holes of the supporting structures.

18.4.36 Other associated infrastructure, such as the inverters will be removed from their concrete foundations and will be transported via HGVs off site. The equipment will either be re-used or recycled, where possible.

18.4.37 When removing the substations, it will be loaded onto a single abnormal indivisible load vehicle (AILs) and removed from site in much the same way as it was delivered to site. The area will be returned to its former condition and the substations themselves likely to be refurbished and re-used on another site or taken to a recycling facility.

18.4.38 The inverter platforms and concrete foundations will be broken up and removed off site. The crushed foundations will be provided to a licensed waste transfer station for appropriate disposal or solar as recycled aggregate. Any uneven ground will be reinstated to its former condition.

18.4.39 The customer switchgear containers do not have foundations and, therefore, will simply be transported off site. The containers will be re-used or recycled, where possible.

18.4.40 All tracks will be restored to the previous condition. The aggregate used for the internal tracks will be recovered, loaded onto HGVs and transported off site for re-use at another site or to a recycling facility.

18.4.41 Underground cables will be disconnected from the local electricity network to be capped off and left *in situ*.

18.4.42 The applicant is dedicated to ensuring that, where possible, as much of the equipment proposed is either re-used or recycled. As such, the quantum of non-recyclable waste will be limited.

18.4.43 Recycling of all materials after end use will include panels (which are covered by the Waste Electrical and Electronic Equipment Directive), screws, mounting frames and wiring. Any non-recyclable waste will be stored in a skip for regular removal to an appropriate landfill.

18.4.44 Restoring the site will involve some minor ground works. Any residual soil which cannot be accommodated on site, will be removed and disposed of at an appropriate landfill or sold to a landowner needing additional soil. However, this is not expected to be required due to the size of the Site.

18.4.45 All waste transported off site will be delivered to the appropriately licenced receivers of such materials. Operators receiving any waste materials resulting from the Proposed Development will be subject to their own consenting procedures. It is worth noting that it is not possible to forecast the capacity of the landfill sites for decommissioning at this stage due to potential change in waste generation and operators at that time.

Mitigation Measures

18.4.46 As part of the embedded mitigation, a CEMP will be secured through a DCO Requirement, and will be applicable for the commencement of construction; similar measures will then be included in a decommissioning scheme.

18.4.47 Waste arisings will be prevented and designed out where possible. Opportunities to re-use material resources will be sought where practicable. Where re-use and prevention are not possible, waste arisings will be managed in line with the Waste Hierarchy.

Cumulative Effects

18.4.48 There are a number of potential schemes that, depending on construction dates, may have cumulative effects with the Proposed Development. The shortlist of cumulative sites for this Proposed Development to be assessed against, when considering waste, are solar schemes, and therefore there may be cumulative volumes of waste associated with solar generation and decommissioning. This could create pressure on the capacity of local recycling plants or landfill sites.

18.4.49 There is a new industry emerging for recycling solar panels, and the resale of any operational phases. These waste streams would be explored during the decommissioning phase.

18.4.50 Management of the potential cumulative volumes of waste would be managed through the CEMP and decommissioning scheme. Consultation with waste providers would be undertaken to ensure waste can be accommodated.

18.4.51 Additionally, cumulative effects may occur from increased HGVs transporting waste to recycling plants and landfill. This will be further assessed in the ES supporting the DCO application.

18.5 ELECTRIC, MAGNETIC AND ELECTROMAGNETIC FIELDS

18.5.1 This section sets out the approach to the potential of electric, magnetic and electro-magnetic fields (EMFs) produced by the Proposed Development.

18.5.2 EMF is produced both naturally and as a result of certain human activities. The earth has a magnetic field produced by currents deep inside the core of the planet; the earth is also subject to electric fields produced by electrical activity in the atmosphere such as thunderstorms.

18.5.3 EMFs are inevitable wherever electricity is produced, distributed, and used, including electrical substations, power lines and electric cables and around domestic, office or industrial equipment that uses electricity.

18.5.4 Electric fields are produced by voltage. Voltage is the pressure behind the flow of electricity. Electricity inside UK homes is at 230 volts (V) whereas electrical distribution systems in the UK utilise much higher voltages generally from 11,000 to 400,000 volts (11kV to 400kV). The higher the voltage the greater the electric field, which is measured in volts per metre (V/m). Fences, shrubs and buildings can block electric fields.

18.5.5 Magnetic fields are produced by the flow of electric current; however most materials do not readily block magnetic fields. The intensity of both electric fields and magnetic fields diminishes with increasing distance from the source. Magnetic fields depend on the electrical currents flowing and are not significantly limited by most common materials. Typically, ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line, but can be higher at small distances from the cable.

Policy Context

18.5.6 There is no direct statutory provision in the planning system relating to protection from EMFs.

18.5.7 However, the National Policy Statement for Electricity Networks Infrastructure (EN-5) and the draft National Policy Statement for Electricity Networks Infrastructure (EN-5) requires the applicant to consider the following aspects, with regard to Electric and Magnetic Fields:

- Compliance with Electricity Safety Quality & Continuity Regulations 2002 (ESQCR);
- Health Protection Agency (HPA) guidance[2]; and
- Optimal phasing of high voltage overhead power lines is introduced wherever possible and practicable in accordance with the Code of Practice to minimise effects of EMFs. The Code of Practice is used to show compliance with guideline public exposure limits for NSIPs in England and Wales.

18.5.8 Section 2.10 of NPS EN-5 acknowledges that all overhead lines produce both electric fields and magnetic fields. The fields will be highest directly under the conductors and will reduce dramatically as the distance from the line increases. The electric fields produced by overhead lines are also attenuated significantly by structures such as fences, walls, trees and hedges. As recognised by EN-5 and draft EN-5, putting cables underground eliminates the electric field but underground cables can still produce magnetic fields. Again, the magnetic fields produced by underground cables drop rapidly as the distance from the cable increases.

18.5.9 The Electricity at Work Regulations 1989 place duties on employers and employees with respect to health and safety when working on or with electrical equipment and particularly those involved in the design, construction, operation or maintenance of electrical systems and equipment.

[2] HPA (2009) Application of ICNIRP Exposure Guidelines for 50 Hz Power Frequency Fields

18.5.10 The Electricity Safety, Quality and Continuity Regulations (SI 2665/2002) and subsequent amendments (SI 1521/2006 and SI 639/2009) specify certain requirements for electrical infrastructure and equipment, including overhead lines and underground cables, intended for the safety and protection of workers and safeguarding of the general public from danger.

18.5.11 There are no statutory regulations in the UK that limit the exposure of the general public to power-frequency electric or magnetic fields, responsibility for implementing appropriate measures for the protection of the public from EMF lies with the UK Government.

18.5.12 In 2004, the Government adopted guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP)[3] in line with the terms of the 1999 EU Council recommendation on limiting public exposure to EMF. These guidelines were transposed into the HPA guidance[4]. The criteria establish acceptable limits for exposure of the public to EMF that adopt a precautionary approach taking into account various scenarios and potentially more vulnerable groups (such as infants).

18.5.13 Guidance documents on EMF exposure and appropriate design of electrical infrastructure, including:

- Power Lines: Demonstrating compliance with EMF public exposure guidelines – a Voluntary Code of Practice (DECC, March 2012).
- Power Lines: Control of microshocks and other indirect effects of public exposure to electric fields - a Voluntary Code of Practice (DECC, July 2013).

18.5.14 The DECC (March, 2012) guidance states that **'overhead power lines at voltages up to and including 132 kV, underground cables at voltages up to and including 132 kV and substations at and beyond the publicly accessible perimeter'** are not capable of exceeding the ICNIRP exposure guidelines and therefore no assessment is required for these and other types of infrastructure listed on the Energy Networks Association website.

18.5.15 National Grid guidance[5] states that, **"Underground cables, whether directly buried or in a tunnel, produce no external electric field."**

18.5.16 Therefore electric fields are not considered further in this assessment. Magnetic fields for the underground 400kV cabling system will be considered further in this assessment.

Assessment Methodology

18.5.17 The scope of the assessment of EMFs is limited to consideration of any cables associated with the Proposed Development which exceed 132kV. The only part of the Development to exceed this voltage is the underground export cable between the Proposed Development 400kV Substation and the existing National Grid Bicker Fen Substation which will be an underground 400kV cable system.

18.5.18 The ICNIRP 'reference levels' for the public are:

- 100 microteslas (μT) for magnetic fields; and
- 5 kilovolts (kV) per metre for electric fields.

[3] ICNIRP (1998) ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz).

[4] HPA (2009) Application of ICNIRP Exposure Guidelines for 50 Hz Power Frequency Fields

[5] National Grid Website (EMFs.info) (2018), Underground Power Cables.

18.5.19 The occupational limits are double for electric fields and five times higher for magnetic fields:

- 500 microteslas (μT) for magnetic fields; and
- 10 kilovolts (kV) per metre for electric fields.

18.5.20 If people are not exposed to field strengths above these levels, direct effects on the central nervous system would be avoided and indirect effects such as the risk of painful spark discharge will be small. The reference levels are not in themselves limits but provide guidance for assessing compliance with the basic restrictions and reducing the risk of indirect effects.

18.5.21 This ICNRP guidelines outlines an assessment methodology as a structured approach below:

- Stage 1 – comparison of external fields to ICNIRP reference levels;
- Stage 2 – if stage 1 identifies that an exceedance is above the reference levels, the results of the evaluation should be compared with the values of external fields required to produce the basic restrictions in the body; and
- Stage 3 - to demonstrate compliance with basic restrictions, a detailed assessment should be carried out taking into account factors that represent the actual exposure conditions.

18.5.22 Following each stage of evaluation, if the results of the assessments are at or below the reference values, then compliance with the basic restrictions can be assumed.

18.5.23 Magnetic fields are not simply added together where they may be generated by separate sources and are typically dominated by the biggest source[6], therefore it is appropriate to consider the magnetic field generated by the 400 kV cable system in isolation in areas where a magnetic field may be present from multiple sources. This is the approach taken in this assessment.

Baseline Conditions

18.5.24 The underground 400 kV cable system will be located predominately on private land that is not publicly accessible (although crossing roads and railway underground), however the public and occupational exposure reference levels have been used in this assessment to ensure that there are no adverse effects on the closest publicly accessible areas and residential areas.

18.5.25 A proposed connection point for the underground 400 kV cable system will be to the existing National Grid Bicker Fen Substation approximately 6km south of the Proposed Development, which connects to the existing 400 kV overhead transmission network. This infrastructure also has the potential to generate EMFs as it includes equipment of greater than 132kV.

Assessment of Effects

Construction and Decommissioning Phase

18.5.26 Effects during the construction and decommissioning phases of the Proposed Development are scoped out of the assessment as the cables will not produce any significant EMFs until the Proposed Development is generating electricity when it is operational.

[6] National Grid Website (EMFs.info) (2018), Adding fields together.

Operational Phase

18.5.27 An underground high voltage 400 kV cable system, buried underground, will be installed to connect the Proposed Development substation with the existing National Grid Bicker Fen Substation. The 400 kV cable system is described in **Chapter 4: Proposed Development.**

18.5.28 The highest EMFs produced by underground cables are located directly above the buried cables, and field strength decreases with distance from the source.

18.5.29 National Grid gives examples of magnetic fields for underground cables calculated at 1m above ground level[7], as seen in **Table 18.3**

Table 18.3: Magnetic Fields for direct buried underground cables at 1m above ground level

Voltage	Specifics	Location	Load	Magnetic Field in µT at Distance from Centreline			
				0m	5m	10m	20m
400kV	Direct Buried	0.5m spacing, 0.9m depth	Maximum	96.17	13.05	3.58	0.92
			Typical	24.06	3.26	0.90	0.23

18.5.30 The ICNIRP guidelines for occupational exposure are 500 µT and for public exposure 100 µT. **Table 18.3** demonstrates that even directly above the cable under maximum load, neither the occupational nor public limits will be breached.

18.5.31 Underground cables do not produce any external electric fields.

18.5.32 The exact cable route is not known but the nearest residential receptor is located more than 100m from the likely route of the underground cable. Due to the magnitude of effect upon the receptors, in accordance with ICNIRP exposure limit values, EMFs will have no effect on local residents therefore the effect is not significant in terms of the EIA Regulations.

Mitigation Measures

18.5.33 The requirement to consider EMF exposure guidance is fully understood by the Applicant and has been factored into the consideration of the route alignment from an early stage.

18.5.34 The final route alignment and design of the electrical infrastructure will consider the measures required to ensure compliance with the Electricity Safety, Quality and Continuity Regulations 2002 (as amended), and any new advice that may emerge from the Department of Health relating to Government policy for EMF exposure guidelines.

18.5.35 It has been shown that the relevant electrical infrastructure will comply with the current public exposure guidelines, and so no further mitigation is necessary.

Cumulative Effects

18.5.36 As set out in the Assessment Methodology, magnetic fields are not added together where they may be present from multiple sources, therefore there will be no cumulative effects with other developments.

[7] National Grid Website (EMFs.info) (2018), A guide to the debate on electric and magnetic fields and health.

18.6 TELECOMMUNICATIONS, TELEVISION RECEPTION AND UTILITIES

18.6.1 This section evaluates the effects of the Proposed Development on telecommunication infrastructure, television reception and existing utilities.

18.6.2 The Proposed Development has the potential to affect the existing telecommunications and utility infrastructure below ground.

Policy Context

18.6.3 Effects relating to existing infrastructure are not environmental effects and there is no requirement to include an assessment of these effects under the EIA Regulations. However, given the nature of the Proposed Development, they have the potential to affect existing infrastructure above and below ground.

Assessment Methodology

18.6.4 To identify any existing infrastructure constraints, both consultation and a desk-based study has been undertaken. Consultation with relevant telecommunication and utilities providers is a routine part of solar development. Consultees include water, gas and electricity utilities providers and telecommunications providers.

18.6.5 Telecommunications and television providers are unlikely to be affected by Electromagnetic Interference (EMI) unless transmitters are near electrical infrastructure associated with the solar PV array, in particular inverters[8].

18.6.6 A desk-based search has been undertaken for the presence of telecommunications, television reception and utilities infrastructure within the Energy Park Site and within the vicinity. A qualitative approach undertaken by competent experts is used to assess the likelihood of significant effects on telecommunications, television reception and utilities.

Baseline Conditions

Telecommunications

18.6.7 There are understood to be no buried telecommunication infrastructure beneath the Energy Park.

Television Reception

18.6.8 The area surrounding the Proposed Development receives television signals that were made exclusively digital after the digital switchover was completed in the Yorkshire region in 2011[9].

18.6.9 The area within and surrounding the Proposed Development is predominantly served by the Belmont transmitter[10] (Lincolnshire), which is located approximately 37km north-east of the Proposed Development.

18.6.10 Additional searches were undertaken for the presence of analogue radio, digital radio and freeview transmitter masts in the vicinity of the Development. The following transmitters were identified within 25km:

[8] Pager Power (2014) News: Electrical Compatibility: solar farms and wireless transmissions

[9] UK Digital Switchover Explained: https://www.frequencycast.co.uk/godigital.html

[10] Full service- Freeview Transmitters: https://ukfree.tv/maps/freeview

- Boston Wyberton (Lincolnshire) DAB transmitter is located approximately 13km east;
- Callans Lane Wood (Lincolnshire) DAB transmitter is located approximately 21km south-west; and
- Grantham New Gate Lane (Lincolnshire) DAB transmitter is located approximately 25km south-west of the Proposed Development.

Utilities

18.6.11 On-site utilities could include water, sewers, a high-pressure gas pipeline and electrical cables. Knowledge of the utilities during design and construction allows any effects to be negated by avoiding them or by use of suitable structures, such as pipe bridges.

18.6.12 Statutory undertakers including Cadent, Anglian Water, National Grid, Network Rail, Western Power Distribution, and Environment Agency, have been informed of the Proposed Development. Further details on those consulted are within the Statement of Community Consultation.

18.6.13 Through consultation and a desk-based search of existing datasets, the following utilities and infrastructure that have the potential to be affected by the Proposed Development have been identified:

- High pressure gas pipeline (Feeder 7 East Heckington to Gosberton);
- Electricity transmission underground cables and associated equipment;
- 11kV distribution network overhead lines on-site; and
- Above ground electricity sites and installations.

Assessment of Effects

Telecommunications – Construction, Operational and Decommissioning Phase

18.6.14 No telecommunication infrastructure has been identified beneath or close to the Proposed Development.

18.6.15 Therefore, the Proposed Development is unlikely to interfere with telecommunications infrastructure and therefore no effects are anticipated in the construction, operation and decommissioning phase.

Television Reception – Construction, Operational and Decommissioning Phase

18.6.16 The Proposed Development consists of fixed low-lying infrastructure and is therefore unlikely to interfere with digital television signals and therefore no effects are anticipated in the construction, operation and decommissioning phases.

Utilities – Construction and Decommissioning Phase

18.6.17 The potential exists for utilities to be affected during the construction and decommissioning of the Development through damage caused as a result of excavation and engineering operations. In the absence of precautionary measures to avoid damage to utilities, this could lead to a short-term adverse effect. However this risk has been mitigated through:

- mapping infrastructure that crosses the Proposed Development and avoiding it through the design of the Development;
- the use of ground penetrating radar before excavation to identify any unknown utilities; and

- consultation and agreement of construction/ demobilisation methods prior to works commencing. Protective Provisions will also be in place for those affected statutory undertakers and included within the DCO application.

18.6.18 These measures, along with those listed within the CEMP, would reduce the likelihood of effects on utilities during construction. Therefore, no adverse effects are expected during construction.

18.6.19 The underground cabling to the National Grid Bicker Fen Substation will remain *in situ* with no decommissioning works needed.

18.6.20 Embedded mitigation measures used during construction would also apply during decommissioning. Therefore, no adverse effects are predicted during decommissioning.

Utilities- Operational Phase

18.6.21 No effects on utilities are predicted as a result of the operational phase of the Development because no below-ground works will be required during operation.

Mitigation Measures

18.6.22 The risk of damage to utilities during construction would be minimised through embedded mitigation, which would involve those measures listed above and mapping infrastructure that crosses the Proposed Development and avoiding it through the design. No further mitigation would be required.

Cumulative Effects

18.6.23 Cumulative effects will not occur in combination with other proposed developments, as the Development is predicted to have no effect on telecommunication, television or utilities.

18.6.24 It is expected that the other solar developments included within the cumulative sites shortlist would also have no effect on telecommunications and television reception and would adhere to the same mitigation as set out above to reduce the risk of damaging utilities.

18.7 SUMMARY

18.7.1 As the above environmental topics have been scoped out of the PEIR as part of the Heckington Fen Solar Park Scoping Report (**Appendix 1.1**) and confirmed in the Planning Inspectorate Scoping Opinion (**Appendix 1.2**), these topics are not likely to cause significant effects and does not require a full chapter within the PEIR and subsequent ES. Therefore, no summary table of significant effects, mitigation and residual effects is presented within this chapter.

Development Consent Order Application for Ground Mounted Solar Panels, Energy Storage Facility, Below Ground Grid Connection to Bicker Fen Substation and All Associated Infrastructure Works.

Preliminary Environmental Information Report
Chapter 19: Summary

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

19 SUMMARY

19.1.1 This chapter of the PEIR provides a summary of the various technical assessments which have been undertaken as part of the EIA (Environmental Impact Assessment) process.

19.1.2 The residual effects are analysed as part of the Proposed Development. The residual effects are defined as those effects that remain following the implementation of mitigation measures. Residual effects and mitigation measures are discussed in full in the relevant technical chapters of this PEIR (**Chapters 6 to 18**).

19.1.3 The assessment of effects are preliminary and likely to be revised in the ES for the DCO application as further clarity of the potential environmental effects as a result of the Proposed Development will be gained as the EIA process progresses alongside the development of the project design.

19.1.4 Each technical chapter contains detailed consideration of both the beneficial and adverse residual effects identified as likely to arise from the Proposed Development. The criteria applied to define the significance of residual effects are outlined within **Chapter 2: EIA Methodology and Public Consultation** of this PEIR, with further detail provided within the individual technical chapters

19.1.5 The residual effects listed within the technical chapters of this PEIR (**Chapters 6 to 18**) are described with reference to the scale of effect (i.e., moderate or major) and whether this is significant or not, and the nature of the effect (i.e., adverse, negligible or beneficial). Residual effects assigned a rating of 'major' or 'moderate' are considered as significant, and are identified in this summary chapter.

19.1.6 The design of the Proposed Development is an iterative process and will continue to develop with consultation with statutory and non-statutory consultees. The final design parameters will be considered in detail by technical chapter authors and the results of the assessments will be reported in the individual topic chapters of the ES.

19.2 SUMMARY OF RESIDUAL EFFECTS

19.2.1 A summary of the identified significant residual effects for each topic are presented in **Table 19.1.** A description of the effect on the resource or receptor, initial significance of effect, proposed mitigation measure and remaining residual effect with mitigation measure implemented is outlined in **Table 19.1.**

19.2.2 Prior to mitigation, significant effects are anticipated in relation to:

- Landscape and Visual;
- Residential Amenity;
- Socio-Economics; and
- Land Use and Agriculture.

19.2.3 Prior to the implementation of the proposed mitigation measures, significant effects are not anticipated in relation to the following topics, and these are therefore not discussed further in this chapter:

- Ecology and Ornithology;
- Hydrology, Hydrogeology and Flood Risk and Drainage;
- Cultural Heritage;
- Climate Change;

- Noise and Vibration;
- Transport and Access;
- Air Quality; and
- Glint and Glare.

19.3 CONCLUSIONS

19.3.1 The PEIR explains the interim findings of the EIA process that has been undertaken for the Proposed Development.

19.3.2 A number of environmental impact avoidance, design and mitigation measures have been identified to mitigate and control environmental effects during construction, operation (including maintenance) and decommissioning of the Proposed Development. It is proposed that these will be secured through appropriate requirements and other controls within the DCO application, should this be granted.

19.3.3 Feedback from the formal consultation process will be taken into account when preparing the DCO application and in undertaking the EIA process. Assessment work will continue and progress for the submission of the ES to accompany the DCO application. It is expected with further assessment work most of the anticipated significant effects in the PEIR will be mitigated and are likely to be not significant following further assessment work. The ES will present the final findings and conclusions associated with the EIA process, based on the proposed layout and design.

Table 19.1: Summary of Significant Effects, Mitigation Measures and Residual Effects of the Proposed Development

Receptor/ Receiving Environment of Effect	Significance of Effect	Mitigation	Residual Effect
Landscape and Visual			
Construction and Operation - Fens LCT and associated Fenland Landscape Character Sub-Area	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction and Operation - Reclaimed Fen Landscape Type A and associated LCA A1 Holland Reclaimed Fen	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction and Operation - East Heckington	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction and Operation - Sidebar Lane	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Major (significant)
Construction and Operation- Public Footpath Heck15/1, Swhd/14/1, Heck/13/1, SKym/2/1, and SKym/1/1 and Other Route with Public Access that coincides with Bicker	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)

Receptor/ Receiving Environment of Effect	Significance of Effect	Mitigation	Residual Effect
Drove, located near Public Bridleway Bick/1/1			
Construction and Operation- Viewpoint 1 Public Footpath SKym/2/1 and Sidebar Lane overbridge at Head Dike.	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Major (significant)
Construction and Operation- Viewpoint 2 Public Footpath Heck/15/1, near the north eastern edge of the Energy Park	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Major (significant)
Construction and Operation - Viewpoint 3 Littleworth Drove, near White House Farm and The Barns	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction and Operation - Viewpoint 4 Sidebar Lane, near telecommunication mast	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction and Operation - Viewpoint 6 Footway in East Heckington, near Six Hundred Farm House	Moderate-Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction and Operation- Viewpoint 8 Claydike Bank, Amber Hill	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate-Major (significant)
Construction - Viewpoint 9 Bicker Drove at Bicker Fen	Major (adverse)	Mitigation by Design- physical extent of the construction zone geographically limited	Major (significant)
Construction - Viewpoint 14 Junction of Timm's Drove and Tilebarn Lane, West Low Grounds	Major (adverse)	Mitigation by Design- physical extent of the construction zone geographically limited	Major (significant)
Construction-Viewpoint 15 Junction of Bicker Drove and Vicarage Drove along Mill Drain	Major (adverse)	Mitigation by Design- physical extent of the construction zone geographically limited	Major (significant)
Cumulative and In-combination (operational stage)- The Fens Regional Landscape Character Type and the associated Fenland Landscape Character Sub-Area	Major (adverse)	Mitigation by Design (secured by DCO requirement) - Hedgerow planting and enhancement	Moderate (significant)
Residential Amenity			
Nine residential properties scoped into Residential Visual Amenity Assessment. Only five	No effects- Major (adverse)	Mitigation planting	No effects - Major

Receptor/ Receiving Environment of Effect	Significance of Effect	Mitigation	Residual Effect
properties have a significant residual effect (listed below)			(non-significant-significant)
Elm Grange	Major (adverse)	Mitigation planting	Major (significant)
4 New Cottages	Major (adverse)	Mitigation planting	Major (significant)
The Cottage, East Heckington, PE20 3QF	Moderate (adverse)	Mitigation planting	Moderate (significant)
Home Farm, East Heckington PE20 3QF	Major (adverse)	Mitigation planting	Major (significant)
Six Hundred Farm, Six Hundred Drove, East Heckington, PE20 3QA	Major (adverse)	Mitigation planting	Moderate (significant)
Socio-Economics			
Decommissioning - Employment (increase in employment in the construction sector)	Moderate (beneficial)	N/A	Moderate (beneficial) (significant)
Decommissioning - Gross value added (increased contribution to economic output)	Moderate (beneficial)	N/A	Moderate (beneficial) (significant)
Land Use and Agriculture			
Loss of Agricultural Land from Cumulative Solar Farms	Major (adverse)	Determining if land is BMV and allowing agricultural activities to continue on land for operational lifetime of solar schemes, as secured by DCO Requirement	Moderate (significant)

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Preliminary Environmental Information Report
Chapter 20: Glossary

June 2022

https://www.ecotricity.co.uk/our-green-energy/heckington-fen-solar-park

20. GLOSSARY AND ACRONYMS

Term / Acronym	Description
AADT	Annual Average Daily Traffic
AEP	Annual Exceedance Probability
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale.
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
AOD (Above Ordnance Datum)	Baseline standard for measuring height usually measured in metres AOD (mAOD)
AONB	Area of Outstanding Natural Beauty
AQAP	Air Quality Action Plan
BAP	Biodiversity Action Plan. UK strategy for the conservation of biological resources, now largely succeeded by The 'UK Post-2010 Biodiversity Framework' but lists of priority species and habitats and forms the basis of much biodiversity work.
Baseline	Existing environmental conditions which are described in the Environmental Statement.
Battery Energy Storage System (BESS)	Rechargeable energy storage system consisting of batteries, battery chargers, controls, power conditioning systems and associated electrical equipment designed to provide electrical power to a building or to provide electrical grid-related services.
bgl	Below Ground Level
BGS	British Geological Society
Best and Most Versatile Agricultural Land (BMV)	Land in grades 1, 2 and 3a of the Agricultural Land Classification
Biodiversity	The biological diversity of the earth's living resources. The variety and abundance of species, their genetic composition, and the natural communities, ecosystems, and landscapes in which they occur.
Birds Directive	EC Directive on the conservation of wild birds (2009/147/EC)
BMP	Biodiversity Management Plan
BMV	Best and Most Versatile (agricultural land). This is land that is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non-food uses such as biomass, fibres and pharmaceuticals. Grade 1, 2 and 3a land is classified as BMV land under government guidance.
Characterisation	The process of identifying areas of similar landscape character, classifying and mapping them and describing their character.

Term / Acronym	Description
Chartered Institute for Archaeologists (CIfA)	Professional organization for archaeologists working in the U.K
Chartered Institute of Ecology and Environmental Management (CIEEM)	Professional body of which most professional consultant ecologists are members. Its aim is to raise the profile of professional ecological and environmental management and to promote the highest standards of practice for the benefit of nature and society.
Construction Environmental Management Plan (CEMP)	A site or project specific plan designed to ensure best practice and/or appropriate environmental management practices are applied throughout the construction, operation and/or demolition phases of a project.
Countryside and Rights of Way (CROW) Act 2000	Primarily relates to public access to the countryside, but also amended existing law (the Wildlife and Countryside Act) relating to nature conservation and the protection of wildlife under Part III, which is concerned with the introduction of improved protection and management of Sites of Special Scientific Interest (SSSIs).
Conservation Area	Nearly always applies to an area (usually urban or the core of a village) considered worthy of preservation or enhancement because of its special architectural or historic interest.
Controlled Waters	Controlled waters are defined as virtually all freshwater including relevant territorial waters (extending 3 miles seawards from baseline), coastal waters (water inland of baseline), inland waters, surface water, public supply reservoirs and groundwater.
Construction Traffic Management Plan (CTMP)	Sets out how the construction phase (including deliveries to the Site) will be managed.
Dazzle	An effect caused by intense glint and glare, which can cause distraction, and if strong enough reduce the ability of the receptor (pilot or otherwise) to distinguish details and objects.
dB	Decibel – A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
dB (A), L_{AX}	(noise quality) 1. Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Design and Access Statement (DAS)	A statement accompanying an application that sets out the rationale for the design approach and how the Proposed Development would be accessed for a range of users.

Term / Acronym	Description
Design Manual for Roads and Bridges (DMRB).	A comprehensive manual which accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads.
Designated Landscape	Areas of landscape identified as being of importance at international, national or local levels, either defined by statute or identified in development plans or other documents.
Development Consent Order (DCO)	The means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP) under the Planning Act 2008.
EA (Environmental Agency)	An executive non-departmental government body working with responsibilities to protect and improve the environment, including flood risk management.
Ecological Impact Assessment (EcIA)	Assesses the potential effects of a development on habitats and species, particularly those protected by national and international legislation or considered to be of particular nature conservation importance.
Ecological feature/receptor	An ecological feature is a living system or entity that exists because of specific limiting factors such as the soils and nutrients, availability of water, climate, etc. An ecological receptor is a feature that is sensitive to or has the potential to be affected by an impact.
eDNA	Environmental DNA is DNA that is collected from a variety of environmental samples such as soil, seawater, or even air rather than directly sampled from an individual organism.
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended)
Elements	Individual parts which make up the landscape, such as, for example, trees, hedges and buildings.
Emissions Factor Toolkit	Published to assist local authorities in carrying out Review and Assessment of local air quality as part of their duties under the Environmental Act 1995
Energy Park	The area within the Proposed Development being considered for potential ground mounted solar photovoltaic (PV) electricity generation and energy storage facility
EIA (Environmental Impact Assessment)	Process for identifying the likely significance of environmental effects (beneficial or adverse) arising from a Proposed Development, by comparing the existing environmental conditions prior to development (the baseline) with the environmental conditions during/following the construction, operational and decommissioning phases of a development should it proceed.
Environmental Statement	Document setting out the findings of an Environmental Impact Assessment.
EPS	European Protected Species
Extended Phase 1 Habitat Survey	A habitats survey method originally published by the Nature Conservancy Council in 1990. It is intended to rapidly provide a record of semi-natural vegetation and wildlife habitat over large areas of countryside. It has been modified slightly, or extended,

Term / Acronym	Description
	for the purposes of carrying initial assessments as to the likely ecological value of a site and its potential to support protected or notable species.
Fixed Solar PV Panel	PV Tables that are mounted to fixed Mounting Structures that face south.
Flood Zone 1	Low Probability – Land having a less than 1 in 1,000 annual probability of river flooding.
Flood Zone 2	Medium Probability – Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.
Flood Zone 3a	High Probability – Land having a 1 in 100 or greater annual probability of river flooding.
Flood Zone 3b	The Functional Floodplain – This zone comprises land where water has to flow or be stored in times of flood.
FRA (Flood Risk Assessment)	An assessment as to the current and future flood risk of an area where development is proposed.
GCN	Great Crested Newt
Geographical Information System (GIS)	A system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.
Glare	A scattered reflection of light. Glare is significantly less intense than glint and is produced from rougher surfaces such as concrete, tarmac, and vegetation.
Glint	Also known as a specular reflection is produced as a direct reflection of the sun on the surface of the solar panel. It occurs with the reflection of light from smooth surfaces such as glass, steel, and calm water.
GLVIA3	'Guidelines for Landscape and Visual Impact Assessment - Third Edition'. Published in April 2013 by the Landscape Institute and the Institute of Environmental Management and Assessment. Guidance providing advice on the process of assessing the landscape and visual effects of developments.
Green Infrastructure (GI)	Network of green spaces and watercourses and water bodies that connect rural areas, villages, towns and cities.
Groundwater	Water below the surface of the ground and in direct contact with the ground or found subsoil in cracks and spaces in soil, sand and rock.
Groundwater Daughter Directive	Clarifies certain objectives of the Water Framework Directive relating to prevention and control of groundwater pollution and establishes groundwater quality standards.
ha	Hectare – unit of measurement 100m x 100m, or 10,000m^2
Habitat connectivity	Linkage between areas of habitats, such as corridors to allow dispersal of wildlife.
Habitat of Principal Importance	Identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). Statutory lists of priority habitats in England, are provided under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (England).

Term / Acronym	Description
Habitat Suitability Index (HSI)	A numerical index that represents the capacity of a given habitat to support a selected species. Most commonly used for pond habitats and great crested newts following a method developed by Oldham et al. (2000)
Hard Standing	Ground surfaced with a hard material suitable for supporting vehicular movement (e.g. tarmac, compacted gravel, concrete).
IDB	Internal Drainage Board
IEMA (Institute of Environmental Management and Assessment)	Professional body for EIA and environmental practitioners.
Impact Risk Zone	A GIS tool developed by Natural England to make rapid initial assessment of the potential risks posed by development proposals to: Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites.
Indirect Effects	Effects that result indirectly from the proposed project as a consequence of the direct effects, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects.
Invasive Non-native species	An alien plant or animal which is listed under Schedule 9 of the Wildlife and Countryside Act, making it an offence to allow the species to be spread into the wild.
Inverters	Inverters convert the direct current (DC) electricity collected by the PV Modules into alternating current (AC), which allows the electricity generated to be exported to the National Grid.
Iterative Design Process	The process by which project design is amended and improved by successive stages of refinement which respond to growing understanding of environmental issues.
Local Biodiversity Action Plan (LBAP).	Local strategy for the conservation of biological resources, now largely succeeded by The 'UK Post-2010 Biodiversity Framework' but lists of priority species and habitats and forms the basis of much biodiversity work.
Landform	An area, as perceived by people, the character of which is the result of the action and interaction of natural and /or human factors.
Land Use	What land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landscape and Visual Impact Assessment (LVIA)	A tool used to identify and assess the likely significance of the effects of change resulting from development both on the landscape and as an environmental resource in its own right and on people's views and visual amenity (GLVIA 3, 2013 p157).
Landscape Character Assessment	The process of identifying and describing variation in the character of the landscape, and using this information to assist in managing change in the landscape. It seeks to identify and explain the unique combination of elements and features that

Term / Acronym	Description
	make landscape distinctive. The process results in the production of a Landscape Characterisation Assessment.
LCA (Landscape Character Area)	Single unique areas which are the discrete geographical areas of a particular landscape type. Each has its own individual character and identity, even though it shares the same generic characteristics with other types.
LCT (Landscape Character Type)	These are distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation, historical land use, and settlement pattern.
Landscape Effects	Effects on the landscape as a resource in its own right.
Landscape quality (condition)	A measure of the physical state of the landscape. It may include the extent to which typical character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
Landscape receptors	Defined aspects of the landscape resource that have the potential to be affected by a proposal.
Landscape value	The relative value that is attached to different landscape by society. A landscape may be valued by different stakeholders for a whole variety of reasons.
Listed Building	Marks and celebrates a building's special architectural and historic interest, and also brings it under the consideration of the planning system, so that it can be protected for future generations.
LLFA	Lead Local Flood Authority
Local Planning Authority (LPA)	The Council (County, Borough or District) that is empowered by law to exercise statutory town planning functions for a particular area (administrative boundary) of the UK.
LNR	Local Nature Reserve
Local Wildlife Site (LWS)	Non statutory designated site identified and selected for their local nature conservation value and protected through planning policy.
Main River	Main rivers are usually larger rivers and streams. The Environment Agency carries out maintenance, improvement or construction work on main rivers to manage flood risk.
MAGIC	'Multi Agency Geographic Information for the Countryside' website – Government sponsored website containing environmental data from several public bodies including Natural England, the Environment Agency, English Heritage, Forestry Commission, Marine Management Organisation and the Department for Environment, Food and Rural Affairs.
Magnitude (of effect)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.

Term / Acronym	Description
Module Mounting Structure	The structure that is fixed to the ground and onto which the PV Modules are attached.
National Character Areas	Previously known as Joint Character Areas developed by the then Countryside Agency. These are areas that share similar landscape characteristics. See also LCA.
National Policy Statement	National Policy Statements are produced by government. They give reasons for the policy set out in the statement, and must include an explanation of how the policy takes account of government policy relating to the mitigation of, and adaptation to, climate change. They comprise the government's objectives for the development of nationally significant infrastructure in a particular sector and state
National Planning Policy Framework	Document setting out the Government's planning policies for England and instruction on how they are expected to be applied. Latest version published in July 2021.
National Planning Practice Guidance	On-line resource to support the implementation of the NPPF
Natural Environment and Rural Communities (NERC) Act 2006	It requires local authorities and government departments to have regard to the purposes of conserving biodiversity in a manner that is consistent with the exercise of their normal functions such as policy and decision-making.
National Nature Reserve (NNR)	Established to protect the most significant areas of habitat and of geological formations.
Non-Technical Summary (NTS)	Summary document in a non-technical language
NSIPs	NSIPs are major infrastructure projects such as new harbours, roads, power generating stations (including offshore wind farms) and electricity transmission lines, which require a type of consent known as 'development consent' under procedures governed by the Planning Act 2008. Development consent, where granted, is made in the form of a Development Consent Order (DCO).
Onsite Substations	Comprising electrical infrastructure such as the transformers, switchgear and metering equipment required to facilitate the export of electricity from the Proposed Development to the National Grid.
Ordinary watercourse	A watercourse that is not part of a Main River. All rivers and streams, ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.
Ordnance Survey	National mapping agency in the United Kingdom which covers the island of Great Britain
Phase 1 Habitat Survey	A habitats survey method originally published by the Nature Conservancy Council in 1990. It is intended to rapidly provide a record of semi-natural vegetation and wildlife habitat over large areas of countryside. It has been modified slightly, or extended, for the purposes of carrying initial assessments as to the likely ecological value of a site and its potential to support protected or notable species.

Term / Acronym	Description
Photomontage	A visualisation which superimposes an image of a Proposed Development upon a photograph or series of photographs.
Priority habitat or species	Identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). Statutory lists of priority species and habitats in England, are provided under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (England)
Proposed Development	A Nationally Significant Infrastructure Project (NSIP) for the installation of the Energy Park, cable route to, and above ground works at, the National Grid Bicker Fen Substation which would allow for the generation and export of electricity at land at Six Hundreds Farm, Six Hundreds Drove, East Heckington, Sleaford, Lincolnshire. The Proposed Development encompasses all areas with the red line site boundary.
Public Right of Way (PRoW)	Footpath, bridleway or byways over which members of the public have a right to use.
PV String	A row of PV Modules mounted onto the Mounted Structure that are connected to one another to form a PV string which is either connected to a string inverter or a central inverter
PV Tables	Solar PV Modules mounted onto the Mounting Structure, forming tables, which are then set out in rows
Reasonable Avoidance Measures (RAMS)	Outlines how a task should be undertaken to avoid impacts on an ecological receptor.
Ramsar Site	A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975.
Receptor	A location, feature (ground, watercourse) or individual (person, plant, bird, animal etc) upon which the effects of a proposed development is assessed, i.e. the receiving environment.
Residual effect	Those impacts that remain following the implementation of mitigation measures
RPA	Root Protection Area.
Royal Society for the Protection of Birds (RSPB)	Nature conservation charity engaged in managing reserves, undertaking research and working to improve the value and management of land for wildlife, with particular focus on birds.
Special Area of Conservation (SAC)	Sites chosen to conserve the natural habitat types and species of wild flora and fauna listed in Annex I and II of the Habitats Directive. They are the best areas to represent the range and variety of habitats and species within the European Union.
Scheduled Monument	"Nationally important" archaeological site or historic building, given protection against unauthorised change.
Scoping	The process of identifying the issues to be addressed by an EIA. It is a method of ensuring that an EIA focuses on the important issues and avoids those that are considered to be less significant.

Term / Acronym	Description
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
Special Protection Area (SPA)	European Designation designated under Article 4 of the EC Directive on Conservation of Wild Birds (Directive 2009/147/EC) for the protection of rare or vulnerable birds (as listed on Annex I of the Directive) and for regularly occurring migratory species.
Significance	A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Site of Special Scientific Interest (SSSI)	Conservation designation denoting a protected area in the United Kingdom. An area of land of special interest by reason of its flora, fauna, geology or physiographical features notified under the Wildlife and Countryside Act 1981 (as amended).
Solar Farm	Electricity generating station comprising of solar PV modules connected to the National Grid via a substation.
Solar PV Modules	A panel comprising a grouping of photovoltaic cells connected to each other and set within a single physical frame. The PV Panel is attached to a Mounting Structure. Also referred to as a PV Module.
Susceptibility (or vulnerability)	How susceptible or vulnerable the landscape receptor is to accommodate the Proposed Development without undue negative consequences for the maintenance of the baseline situation
Sustainable Drainage System (SuDS)	Management practices and control structures designed to drain surface water in a more sustainable fashion, mimicking natural processes.
Surface water runoff	Rainwater (including snow and other precipitation) which is on the surface of the ground and has not entered a watercourse, drainage system or public sewer.
String Inverters	String Inverters are located throughout the Energy Park, mounted on the Mounting Structures underneath the PV Modules.
Swale	A shallow vegetated channel designed to convey, treat or store surface water and facilitate infiltration.
Switchgears	Switchgears are the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment
Time depth	Historical layering – the idea of a landscape as a 'palimpsest, a much written –over manuscript.
Tracker Solar PV Panel	PV Modules that are mounted to Mounting Structures that allow the PV Table to rotate and track the movement of the sun.
Transformers	Transformers control the voltage of the electricity generated across the Energy Park before it reaches the primary onsite substations
Tranquility	A state of calm and quietude associated with peace, considered to be a significant asset of landscape.

Term / Acronym	Description
UKBAP	UK Biodiversity Action Plan (UKBAP), as succeeded by The 'UK Post-2010 Biodiversity Framework'. BAPs identify habitats and species of nature conservation priority on a UK (UK BAP) and Local (LBAP) scale. UK BAPs formed the basis for statutory lists of priority species and habitats.
Visual amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual effects	Effects on specific views and on the general visual amenity experienced by people.
Visual receptors	Individuals and/or defined groups of people who have the potential to be affected by a proposal.
Visualisation	A computer simulation, photomontage or other technique illustrating the predicted appearance of a development
Water Framework Directive (WFD)	A European Union Directive which commits European Union member states to achieve good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile from shore) by 2015.
Water Resources Act 1991	An Act of the Parliament of the United Kingdom that regulates water resources, water quality and pollution, and flood defences.
WCA	Wildlife and Countryside Act (1981) (as amended). The primary legislation which protects animals, plants and habitats in the UK.
Zone of Theoretical Visibility (ZTV)	A map, usually digitally produced, showing areas of land within which a development is theoretically visible. (GLVIA 3, 2013 p159). Used within Landscape and Visual Asessments (LVIAs) to identify areas of interest for further investigation and assessment.

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