Tillbridge Solar

Tillbridge Solar Project

EN010142

Volume 6
Environmental Statement
Appendix 1-1: EIA Scoping Report
Document Reference: EN010142/APP/6.2

Regulation 5(2)(a)
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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1. Introduction

Background

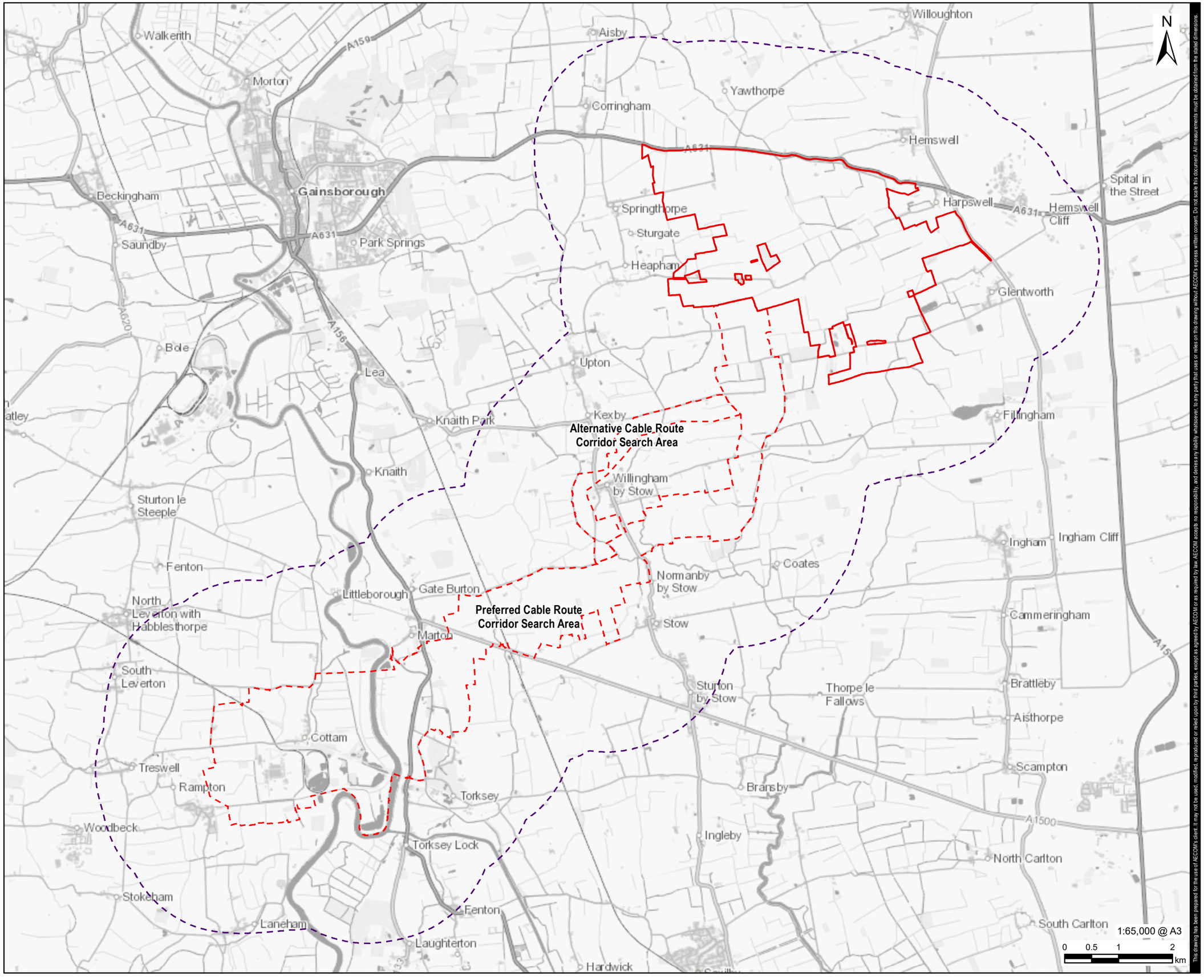
1.1 Tillbridge Solar Ltd (hereafter referred to as 'the Applicant') has commissioned this Environmental Impact Assessment (EIA) Scoping Report for the Tillbridge Solar scheme (hereafter referred to as the 'Scheme'). The Scheme comprises the installation of solar photovoltaic (PV) generating panels and on-site energy storage facilities within Lincolnshire and associated infrastructure for connection to the national grid at Cottam sub-station in Nottinghamshire. The Scheme would allow for the generation, storage, export and import of electricity with an anticipated capacity greater than 50 megawatts (MW).

1.2 This EIA Scoping Report forms a formal request for an EIA Scoping Opinion under Regulation 10(1) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the 'EIA Regulations') (Ref 1-1).

1.3 The Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) under Section 14(1)(a) and 15(2) of the Planning Act 2008 (Ref 1-2) as an onshore generating station in England with a capacity, exceeding 50 MW. The Planning Act 2008 requires the Applicant to apply for a Development Consent Order (DCO) to develop the NSIP.

1.4 The Scheme is located on land to south, east and south east of Gainsborough and to the north west of Lincoln. The Scheme location is shown in Figure 1-1 which indicates the Principal Site Boundary, the Preferred Cable Route Corridor Boundary and Alternative Cable Route Corridor Boundary. The Principal Site and the Cable Route Corridor Search Area are collectively referred to as the 'Scheme Boundary' and is described in *Chapter 3: Description of the Scheme* of this EIA Scoping Report. It is important to note at this stage that Figure 1-1 shows the maximum extent of land that would be included within the DCO application and is likely to be refined as the Scheme design progresses, taking into account the findings of the ongoing environmental and technical assessments, and consultation responses.

Figure 1-1 Site Location



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LEGEND
- Principal Site
- 2km Buffer
- Cable Route Corridor Options

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EIA Scoping Report

PROJECT NUMBER
60677969

FIGURE TITLE
Site Location

FIGURE NUMBER
Figure 1-1

Legislative Context and Need for Environmental Impact Assessment

1.5 The EIA requirement for NSIP developments is transposed into law through the EIA Regulations. The EIA Regulations specify which developments are required to undergo EIA and schemes relevant to the NSIP planning process are listed under either of 'Schedule 1' or 'Schedule 2'. Those developments listed in Schedule 1 must be subject to EIA, while developments listed in Schedule 2 must only be subject to EIA if they are considered 'likely to have significant effects on the environment by virtue of factors such as its nature, size or location'. The criteria on which this judgement must be made are set out in Schedule 3 of the EIA Regulations.

1.6 The Scheme is a 'Schedule 2' development 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'. The Applicant wishes to confirm under Regulation 8(1)(b) of the EIA Regulations that an Environmental Statement (ES) will be provided in respect of the application for development consent for the Scheme, as it is considered that the Scheme meets the criteria set out in Schedule 3 of the EIA Regulations.

1.7 Following the completion of the surveys, assessments, and consultation processes outlined in this EIA Scoping Report, and taking account of the EIA Scoping Opinion, an application for development consent will be made to the Secretary of State for Business Energy and Industrial Strategy (SoS) for determination in accordance with the Planning Act 2008. The DCO application will be accompanied by an ES and a copy of the EIA Scoping Opinion, in accordance with Regulation 5(2)(a) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 ('APFP Regulations') (Ref 1-3). The ES will set out the methods and findings of a comprehensive EIA undertaken in line with the EIA Regulations.

1.8 The Planning Act 2008 prescribes that the SoS is responsible for determining the DCO application, with the power to appoint an Examining Authority of appointed persons to manage and examine the application. In this role, the appointed Examining Authority, normally appointed through the Planning Inspectorate (the government agency responsible for operating the DCO process for NSIPs as appointed through the Localism Act 2011), will make procedural decisions and examine the DCO application and make a recommendation to the SoS who will then decide whether to grant a DCO.

National Policy Statements

1.9 In accordance with Section 104(2) of the Planning Act 2008, the SoS is required to have regard to any relevant National Policy Statement (NPS) where it has effect, amongst other matters, when deciding whether or not to grant a DCO. NPSs set out the policy basis for NSIP developments. For energy NSIPs, as well as an overarching NPS, the relevant NPSs refer to specific technologies and there is currently no adopted NPS that includes solar development. Therefore, there is no specific technology NPS that "has effect" for the Scheme. Where this is the case, DCO applications are determined in accordance with Section 105 of the Planning Act 2008.

1.10 Section 105(2) of the Planning Act 2008 provides that in deciding DCO applications, the Secretary of State must have regard to any local impact report prepared by the relevant Local Planning Authorities, matters that may be prescribed and any other matters that the SoS "*thinks are both important and relevant*" to their decision. The Applicant considers that Overarching NPS for Energy (EN-1) (Ref 1-4), NPS for Renewable Energy Infrastructure (EN-3) (Ref 1-5), and NPS for Electricity Networks Infrastructure (EN-5) (Ref 1-6) are important and relevant to the SoS's decision.

1.11 It should however be noted that the suite of energy NPSs are currently being reviewed and updated with draft NPSs having been published for consultation in September 2021. The DCO application may therefore be determined in accordance with Section 104 of the Planning Act 2008 by the time it is submitted. The updated draft NPSs include Draft NPS for Renewable Energy Infrastructure (EN-3) (Ref 1-7); sections 2.47-2.54 of which includes specific policies for solar development.

1.12 Given the importance and relevance of these NPSs, the EIA approach adopted takes account of these adopted and emerging NPS documents; as well as national and local planning policy and other important and relevant considerations in relation to decision making. The broad national and local planning policy context is set out below and with a summary provided of the relevant considerations for each technical assessment within each environmental topic (*Chapters 7 to 17)* of this EIA Scoping Report.

National Planning Policy Framework

1.13 The National Planning Policy Framework (NPPF) (Ref 1-8), last updated in July 2021, sets out the Government's planning policies for England and how these are to be applied. It is a material consideration in planning decisions. Paragraph 5 of the NPPF makes it clear that the document does not contain specific policies for NSIPs and that applications in relation to NSIPs are to be determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant NPSs, as well as any other matters that are considered both important and relevant. However, Paragraph 5 goes on to confirm that the NPPF may be a matter that is both important and relevant for the purposes of assessing DCO applications. The EIA for the Scheme will therefore have regard to the relevant policies of the NPPF as part of the overall framework of national policy.

Local Planning Policy

1.14 Policies in Local Plans are frequently considered 'important and relevant' matters and can influence the content of local impact reports (which the Local Planning Authorities will produce following submission of the DCO application), and which the SoS must have regard to in its decision making in accordance with Sections 104(2) or 105(2) of the Planning Act 2008, depending upon which is applicable at the time of the consideration of the DCO application.

1.15 The Scheme is located within the administrative areas of West Lindsey District Council; Lincolnshire County Council; Bassetlaw District Council and Nottinghamshire County Council. The local planning policy relevant to the Scheme consists of the following:

West Lindsey District Council

- Central Lincolnshire Local Plan (2017) (Ref 1-9);
- Corringham Neighbourhood Plan (2022) (Ref 1-10);
- Glentworth Neighbourhood Plan (2019) (Ref 1-11); and
- Sturton by Stow and Stow Neighbourhood Plan (2022) (Ref 1-12).

Lincolnshire County Council

- Lincolnshire Minerals and Waste Local Plan: Core Strategy and Development Management Policies (2016) (Ref 1-13); and
- Lincolnshire Minerals and Waste Local Plan: Site locations (2017) (Ref 1-14).

Bassetlaw District Council

- Bassetlaw District Core Strategy and Development Management Policies Development Plan Documents (DPD) (2011) (Ref 1-15);
- Rampton and Woodbeck Neighbourhood Plan (May 2021) (Ref 1-16); and
- Treswell and Cottam Neighbourhood Plan (February 2019) (Ref 1-17).

Nottinghamshire County Council

- Nottinghamshire Minerals Local Plan (adopted March 2021) (Ref 1-18); and
- Nottinghamshire and Nottingham Replacement Waste Local Plan: Part 1: Waste Core Strategy (adopted 2013) (Ref 1-19).

1.16 The Local Planning Authorities of West Lindsey, North Kesteven and the City of Lincoln are currently reviewing the Central Lincolnshire Local Plan. The plan was submitted to the Planning Inspectorate for Examination on 8th July 2022. Following Examination, it is likely that the Local Plan will be adopted in 2023.

1.17 Bassetlaw District Council is also reviewing its Local Plan. The submission plan was submitted to the Planning Inspectorate for Examination on the 18th July 2022. It is expected that the Local Plan will be adopted by Summer 2023.

1.18 A review of the Lincolnshire Minerals and Waste Local Plan is underway with consultation on Issues and Options having closed in August 2022. The published Local Development Scheme sets out a timetable for review with the Preferred Options Plan to be published in Spring 2023, the plan to be submitted to the Secretary of State in Summer 2024 followed by adoption in 2024/25.

1.19 A full review of the joint Nottinghamshire and Nottingham Waste Local Plan is underway with the first stage of the new Plan having been completed (Issues and Options) in 2020. Consultation on the Draft Plan ended on 4th April 2022 with the Minerals and Waste Local Development Scheme confirming the publication of the submission plan in Autumn 2022/January 2023 with examination to be held in February/March 2023 and adoption by July 2023.

1.20 Within West Lindsey District Council there are two made Neighbourhood Plans that fall within the Principal Site (Corringham and Glentworth Neighbourhood Plans) and one within the Cable Route Corridor Search Area (Sturton by Stow).

The Hemswell and Harpswell Neighbourhood Plan also falls within the Principal Site. This Neighbourhood Plan has reached examination stage. It is likely to be made prior to the DCO application being submitted. The parish of Upton and Kexby, fall within Cable Route Corridor Search Area and is designated as a Neighbourhood Plan Area (2019). The plan has not progressed.

1.21 Within Bassetlaw District Council, there are two made Neighbourhood Plans located within the Cable Route Corridor Search Area. This includes Treswell and Cottam Neighbourhood Plan, which contains the majority of the Cottam sub-station and land to the east up to the River Trent; and the Rampton and Woodbeck Neighbourhood Plan, which covers the south-western extent of the Cable Route Corridor Search Area to the south and east of the Cottam sub-station. A review of the Treswell and Cottam Neighbourhood Plan is underway with a pre-submission plan published for consultation in January 2022. South Leverton has a designated Neighbourhood Plan Area, but this plan has not progressed. This area includes a small parcel of land associated with the Cable Route Corridor Search Area located to the north-west of Cottam sub-station.

Consideration of Planning Policy in EIA

1.22 The EIA Scoping Report describes the national and local planning policies relevant to the assessment with a summary provided for each environmental topic. The purpose of the EIA Scoping Report is not to assess the Scheme against planning policy, this will be undertaken and set out in a Planning Statement. The Planning Statement will be a separate document that will be submitted as part of the DCO application. The purpose of considering planning policy at the EIA scoping stage is twofold:

- To identify policy that could influence the sensitivity of receptors (and therefore the significance of effects) and any requirements for mitigation; and
- To identify planning policy that could influence the methodology of the EIA. For example, planning policy that may require the assessment of an impact or the use of a specific methodology.

1.23 A summary of national and local planning policy relevant to each technical assessment is provided within relevant chapters for each environmental topic.

Purpose and Structure of the EIA Scoping Report

1.24 The EIA Regulations set out the requirements for an applicant who proposes to request an EIA Scoping Opinion from the Planning Inspectorate on behalf of the SoS. Regulation 10(3) of the EIA Regulations requires an EIA Scoping Request to include:

- A plan sufficient to identify the land;
- A description of the proposed development, including its location and technical capacity;
- An explanation of the likely significant effects of the proposed development on the environment; and
- Such other information or representations as the person making the request may wish to provide or make.

1.25 The purpose of this EIA Scoping Report is therefore to:

- Provide a summary of the Scheme;
- Set out the proposed scope of the EIA (i.e. identify which environmental topics are to be 'scoped in' or 'out'), taking into account what is currently known about the site and the proposed development;
- Facilitate consultation with statutory consultees and other relevant statutory bodies on the environmental issues to be addressed as part of the EIA and design development process;
- Identify potentially significant environmental impacts and effects and opportunities for mitigation;
- Set out what additional information needs to be collected (i.e. through desk-based studies or field survey work) to characterise the baseline environment of the site;
- Define the assessment methods to be used to determine the likely significant environmental effects of the Scheme; and
- Set out the proposed structure and coverage of the ES to be submitted with the DCO application.

1.26 This EIA Scoping Report is set out in accordance with guidance provided by the Planning Inspectorate's Advice Note 7 'Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements' (Ref 1-20). Table 1-1 lists the suggested requirements identified in Advice Note 7 and details where they are presented in this EIA Scoping Report. The requirements of the EIA Regulations regarding the content of the ES are also covered within the contents tabulated below.

Table 1-1: Contents for the EIA Scoping Report based on Advice Note 7

Suggested Scoping Report Contents	Location in this Scoping Report
Transboundary Screening Matrix	Appendix A
The Proposed Development	
An explanation of the approach to addressing uncertainty where it remains in relation to elements of the Proposed Development e.g. design parameters.	Chapter 3 (Description of the Scheme)
Referenced plans presented at an appropriate scale to convey clearly the information and all known features associated with the Proposed Development.	Figure 1-1 (Scheme Location) Figure 1-2 (Environmental Constraints Plan)
EIA Approach and Topic Areas	
An outline of the reasonable alternatives considered and the reasons for selecting the preferred option.	Chapter 4 (Alternatives Considered)
A summary table depicting each of the aspects and matters that are requested to be scoped out allowing for quick identification of issues.	Chapter 18 (Proposed Scope of the EIA)
A detailed description of the aspects and matters proposed to be scoped out of further assessment with justification provided.	Chapters 7 to 17 (Technical Topics)

Suggested Scoping Report Contents	Location in this Scoping Report
Results of desktop and baseline studies where available and where relevant to the decision to scope in or out aspects or matters.	Chapters 7 to 17 (Technical Topics)
Aspects and matters to be scoped in, the report should include details of the methods to be used to assess impacts and to determine significance of effect e.g. criteria for determining sensitivity and magnitude.	Chapter 18 (Proposed Scope of the EIA)
Any avoidance or mitigation measures proposed, how they may be secured and the anticipated residual effects.	Chapters 7 to 17 (Technical Topics)
Information Sources	
References to any guidance and best practice to be relied upon.	Chapters 7 to 17 (Technical Topics)
Evidence of agreements reached with consultation bodies (for example the statutory nature conservation bodies or Local Planning Authorities).	Chapter 5 (Consultation), Chapters 7 to 17 (Technical Topics)
An outline of the structure of the proposed ES.	Chapter 19 (Proposed Structure of the Environmental Statement)

1.27 An abbreviation / glossary list is presented at the back of this report.

IEMA Quality Mark

1.28 AECOM is an Institute of Environmental Management and Assessment (IEMA) Registered Impact Assessor and also holds the IEMA EIA Quality Mark as recognition of the quality of its EIA product and continuous training of its environmental consultants. A Statement of Competence will be included within the ES, outlining the relevant expertise or qualifications of the experts who prepared the ES, in line with Regulation 14(4) of the EIA Regulations.

2. Site Description and Context

Overview

2.1 The Scheme comprises two distinct sections as shown on Figure 1-1. These sections are:

- 'the Principal Site', which is the location where ground mounted solar photovoltaic (PV) panels, electrical sub-stations and energy storage facilities will be installed; and
- 'the Cable Route Corridor', which will comprise the underground electrical infrastructure required to connect the Principal Site to national transmission system.

2.2 The Scheme lies to east and south-east of Gainsborough in Lincolnshire. The site is located approximately five kilometres to the east of Gainsborough and approximately 13 kilometres to the north of Lincoln. The Principal Site covers an area of approximately 1,400ha and is located entirely within the administrative area of West Lindsey District Council. The Cable Route Corridor at this stage is presented as an initial search area (therefore referred to more broadly as 'the Cable Route Corridor Search Area') with considerable design refinement needed and crosses the administrative areas of West Lindsey District Council and Bassetlaw District Council.

2.3 The maximum area of land potentially required for the construction, operation and decommissioning of the Scheme is shown in Figure 1-1. It is important to note that this may be subject to change, but Figure 1-1 shows the envisaged maximum extent of temporary and permanent land take. The land-take for the Cable Route Corridor will be refined as the Scheme design progresses, taking into account environmental and technical factors, and consultation responses. At this stage of the process, there is no known existing infrastructure to be removed.

2.4 An environmental constraints plan is provided in Figure 1-2.

Figure 1-2 Environmental Constraints Plan

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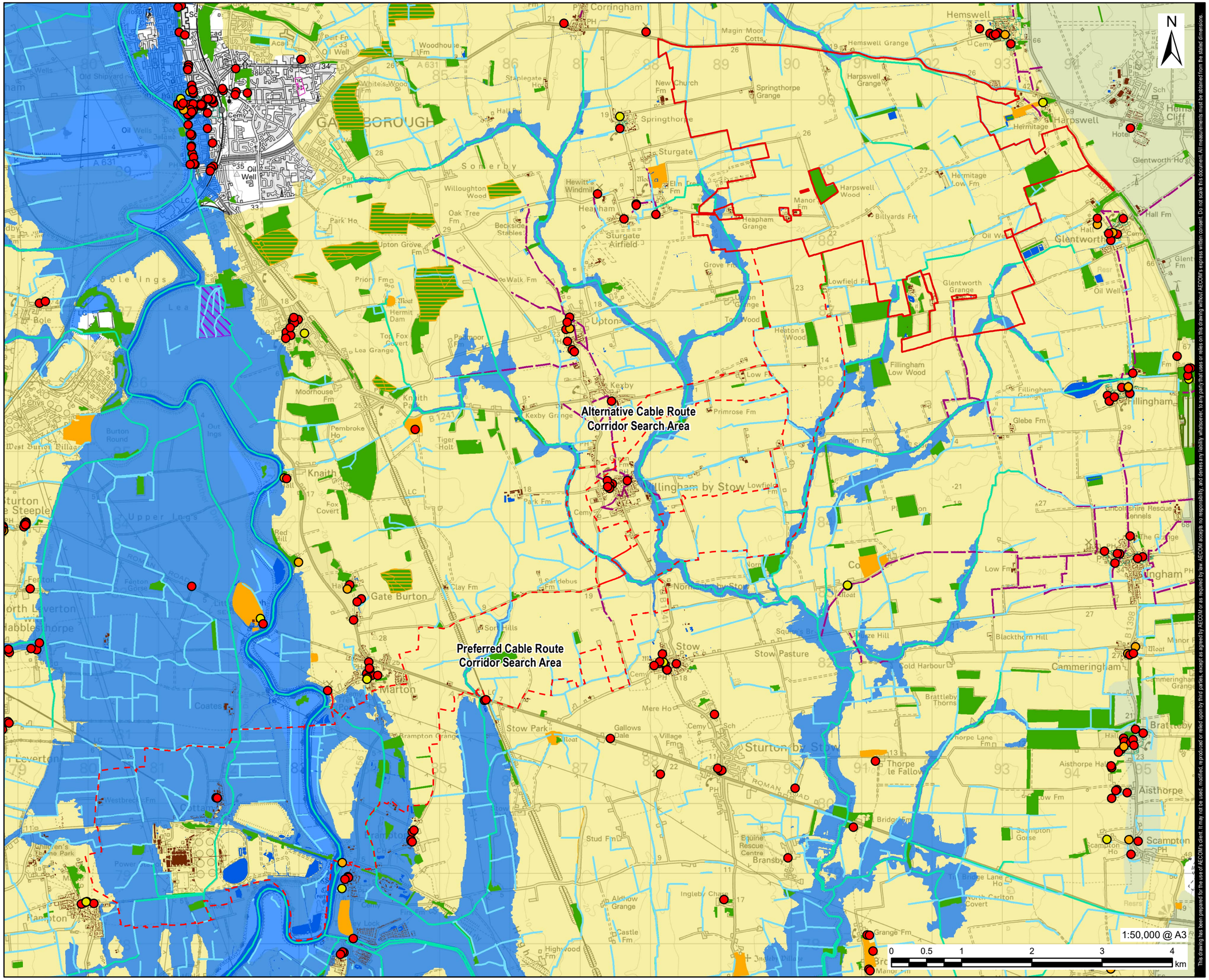

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LEGEND

- Principal Site
- Cable Route Corridor Options
- Stream
- River
- Indicative PROW Boundary
- Buildings
- Waterbody
- Ancient Woodland
- National Forest Inventory
- Scheduled Monument
- Registered Park and Garden
- SSSI
- Local Nature Reserve (LNR)
- Conservation Area
- Flood Zone 3

Listed Building (Grade)

- I
- II*
- II

Agricultural Land Classification (Grade)

- Grade 2
- Grade 3

NOTES

ISSUE PURPOSE

EIA Scoping Report

PROJECT NUMBER

60677969

FIGURE TITLE

Environmental Constraints Plan

FIGURE NUMBER

Figure 1-2

Principal Site

2.5 The Principal Site is located to the south of Harpswell Lane (A631), to the west of Middle Street (B1398) and largely to the north of Kexby Road and to the east of Springthorpe.

2.6 Harpswell Lane (A631) and Middle Street (B1398) form the extent of the northern and eastern boundaries of the Principal Site. A thin strip of land on the western side of Middle Street is included within the Scheme to provide landscape screening. The Principal Site extends to the south of Kexby Road with the inclusion of five field parcels that are located to the south of the road. The eastern, southern and western boundaries of the site are irregular in shape.

2.7 Harpswell Lane (A631) is a strategic highway route providing east to west vehicular links to Gainsborough to the west and to the A46 to the east, providing connections with Lincoln to the south and Grimsby to the north-east. Approximately two kilometres from the Principal Site to the east, the A631 connects with the A15. The A15 provides further access to the strategic highway network with the M180 located approximately six kilometres to the north and Lincoln located around six kilometres to the south.

2.8 There is a network of bridleways and Public Rights of Way (PRoWs) located between the villages of Ingham and Fillingham positioned to the west of Middle Street and there is a network of PRoWs to the west connecting the villages of Kexby, Upton, Heapham and Springthorpe. These fall outside of the Principal Site. The Principal Site comprises existing farm tracks that provide access to the existing arable fields.

2.9 Middle Street is characterised by a series of villages interspersed along or close to the route. This includes Harpswell (to the north), Glentworth, Fillingham and Ingham (to the south). Springthorpe and Heapham are located to the west of the Scheme.

2.10 The villages are of historic interest indicated by the presence of statutory listed buildings and Conservation Areas (Glentworth and Ingham). There is also a Scheduled Monument at Harpswell and a Registered Park and Garden associated with Fillingham Castle. Springthorpe located to the west is also protected by a Conservation Area.

2.11 Middle Street is defined in landscape terms by its ridge known as Lincolnshire Edge (and Lincoln Cliff). This area is relatively elevated compared to the general character of the area which is characterised by its flat rural landscape. The Principal Site comprises numerous field parcels used for arable farming. The fields are large with limited hedgerows and trees. Where there are hedgerows, these generally form the boundaries of fields as they adjoin roads. The northern boundary of the site adjoining the A631 is largely well screened with mature hedgerows and trees. Common Lane and Kexby Lane comprise a mix of open field boundaries and some fields defined by hedgerows. There are some small-scattered areas of woodland located within the Principal Site.

2.12 There are no international, national, regional, or locally designated nature conservation sites within the Principal Site. The nearest Sites of Special Scientific Interest (SSSIs) to the Principal Site are Lea Marsh, located to the south of Gainsborough approximately six kilometres from the Principal Site; a series of

commons located to the north-west (Laughton Common SSSI, Scotton Common SSSI, Scotton and Laughton Forest Ponds SSSI and Scottone Beck Fields SSSI) around ten kilometres from the Principal Site; and Cliff House SSSI located on the A15 to the north-east of the Principal Site approximately six kilometres away. The nearest Special Area of Conservation (SAC) is Hatfield Moors (SSSI and SAC) located around eighteen kilometres to the north-west. The Humber Estuary SAC is located in the region of thirty kilometres from the Principal Site to the north.

2.13 Within the Principal Site, there are some dwellings generally located off minor roads that broadly dissect the Principal Site in an east-west direction. This includes properties located off Common Lane (connecting Heapham in the west with Harpswell to the north-east), School Lane (running eastwards out of Springthorpe before joining the A631 to the north) and Kexby Road leading to Glentworth Road (connecting Fillingham in the east to Kexby to the west). There are also agricultural buildings and associated dwellings dispersed across the Principal Site.

2.14 Most of the Principal Site is at a low risk of flooding from fluvial sources and surface water. There are some watercourses located within the southern and western extent of the Principal Site area as tributaries of the River Till with some areas at a high risk of flooding (Flood Zone 3). There are also land drains, ponds and covered reservoirs located across the Principal Site area.

Cable Route Corridor

2.15 The Scheme will connect the Principal Site to the national transmission system at the existing Cottam National Grid sub-station, which is located at the decommissioned Cottam Power Station in Cottam near the Nottinghamshire border.

2.16 The Cable Route Corridor is approximately 16km long (approximate distance between the Principal Site and Cottam) and is shown on Figure 1-1. This shows the location of the preferred Cable Route Corridor alongside an alternative Cable Route Corridor to the north of Willingham by Stow. The electrical connection to the site will comprise underground cables and is described further in *Chapter 3: Description of the Scheme* of this EIA Scoping Report. At this stage of the application process, the preferred and alternative route corridors as shown on Figure 1-1 have been identified following earlier feasibility and optioneering work.

2.17 There are no international, national, regional, or locally designated nature conservation sites within the Cable Route Corridor Search Area. The nearest SSSIs are Ashton's Meadow SSSI, which is located 1.3km west of the Cable Route Corridor Search Area, and Lea Marsh SSSI, located to the south of Gainsborough approximately 5.2km northwest of the Cable Route Corridor Search Area. There are no SACs within 10km of the Cable Route Corridor Search Area.

Preferred Cable Route

2.18 Heading south from the Principal Site, the cable route crosses Common Lane, Cow Lane, Kexby Road and Fillingham Lane before turning to the west crossing South Lane, Stone Pit Lane and Stow Road (B1241) (located to the south of Willingham by Stow). The Cable Route Corridor continues in a westerly direction

before crossing the East Midlands Railway line that provides services between Doncaster and Lincoln and runs in a broad north-south direction to the west of Willingham by Stow and to the east of Gate Burton. The route then continues westwards crossing the A1500 (Stow Park Road), followed by the A156 (Gainsborough Road) before crossing the River Trent to connect with Cottam.

Alternative Cable Route

2.19 The alternative Cable Route Corridor (shown on Figure 1-1) only relates to the direction of the cable route around Willingham by Stow, with the alternative Cable Route Corridor located to the north of the village following the alignment of Glentworth Road towards Willingham by Stow before travelling south crossing Willingham Road (B1241) before joining the preferred route to the south of the Willingham by Stow.

2.20 Both the preferred Cable Route Corridor and the alternative Cable Route Corridor are considered within the scope of each environmental topic outlined in the technical sections of this report.

3. Description of the Scheme

Overview of Solar Infrastructure

3.1 The Scheme will consist of the following principal infrastructure:

- Solar PV modules;
- PV module mounting structures;
- String combiner boxes;
- Solar DC/AC Inverters;
- Battery Energy Storage System (BESS);
- Battery DC/DC convertors;
- LV/MV transformer stations including switchgear;
- MV/HV transformer stations;
- MV and HV switch gear;
- On-site cabling;
- Weather monitoring stations;
- Fencing and security measures;
- Building with control room and operation/maintenance facilities, including storage;
- Grid connection and HV cable route;
- Main access into the site for construction purposes off the main highway; and
- Access tracks for construction and maintenance.

3.2 During the construction phase, one or more temporary construction compound(s) will be required as well as temporary roadways to facilitate access to all land within the Scheme Boundary.

3.3 In areas around the arrays and on other land within the Scheme Boundary, appropriate landscaping, biodiversity enhancements and habitat management will be undertaken.

3.4 At this stage, the solar PV modules and BESS are proposed to be Direct Current (DC) coupled.

Solar PV Infrastructure

3.5 Solar PV panels convert sunlight into electrical current as DC. Individual panels (or modules) are typically just over 2m in length and just over 1m in width and typically consist of a series of photovoltaic cells beneath a layer of toughened glass (as shown in Plate 3-1). The module frame is typically built from anodised aluminium.

Plate 3-1: Illustrative Solar PV panels

3.6 Each module could have a watt-peak capacity of between 400-900 watts as technology evolves. Modules will be fixed with aluminium clamps onto tracker sub-structures. The modules are fixed to a mounting structure in groups known as strings. The number of modules which will make up each string is 30 modules per string. 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 (refer to the 'Rochdale Envelope' section at the end of this Chapter of the EIA Scoping Report).

3.7 At this stage, it is anticipated that the strings of PV will be either secured on single axis trackers that are configured north-south and will track 60 degrees east-west, where the modules will turn from east to west during the course of the day or will be a fixed sub-construction system southward oriented.

3.8 The row pitch of the tracker system (which is the distance of the row-to-row lower-edge of the panels) is not yet defined but is likely to be between 4.25m and 5m. The separation distance between each row of racks will typically be between 1.87m and 2.62m.

3.9 The row pitch of the fixed-south system would be between 8m and 10m. The separation distance between each row of racks will typically be between 3.57m and 5.57m.

3.10 Row pitch may vary across the Scheme taking account of terrain and potential environmental constraints.

3.11 The clearance of the PV panels above the ground for both types will generally be no less than 0.6m with the resultant height of the panels up to 3.5m above ground level.

3.12 All dimensions referred to above are indicative at this stage with the design at an early stage. The design will be modified as the Scheme progresses to have regard to the outcome of environmental surveys, topography and configuration.

Solar Stations (Inverter, transformer and switchgear)

3.13 A Solar Station (refer to Plate 3-2) comprises a DC/AC inverter and a LV/MV transformer, including switchgear. It is envisaged that there will be around 140 Solar Stations within the Scheme, but this will not be confirmed until later design phases. Solar Stations will be located across the Scheme at regular intervals. The image below provides an illustration of a Solar Station.

3.14 The Solar Station is typically externally finished in keeping with the prevailing surrounding environment. As the Scheme design develops, the likely configuration of equipment will be determined based upon environmental and technical factors. A reasonable worst-case scenario will be assessed and presented in the ES.

Plate 3-2: Illustrative Solar Station DC/AC inverter, transformer and switchgear

3.15 The following sections describe inverters, transformers and switchgear in more detail. It is anticipated that plant would be installed on concrete bases.

Inverters

3.16 Inverters are required to convert the DC electricity collected by the solar PV modules into alternating current (AC), which allows the electricity generated to be exported to the National Grid. Inverters are sized to deal with the level of voltage and intensity, which is output from the strings of solar PV modules. It is currently expected that the inverters will be around 3m in length x 2m in width x 3m in height.

LV/MV Transformers

3.17 LV/MV transformers are required to control the voltage of the electricity generated across the site before it reaches the sub-station. The transformers could be outdoor or indoor. Transformers can be positioned outdoors or housed in containers. Indoor transformers are generally housed in container type housing, around 6m in length x 2.5m in width x 3m in height.

3.18 Outdoor transformers are currently preferred. An outdoor transformer could be around 4m in length x 3.5m in width x 3.5m in height.

Switchgear

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

downstream. Similarly, switchgear are generally located within or next to the transformer housing. The switchgear together with the transformer housing will have a typical footprint of 7m in length x 4m in width x 3.5m in height.

Energy Storage Facility

3.20 The Scheme will include a Battery Energy Storage System (BESS) as an associated development and is primarily required for the operation of the solar PV panels. The BESS is designed to provide peak generation and grid balancing services to the electricity grid by allowing excess electricity generated either from the solar PV panels, or imported from the electricity grid, to be stored in batteries and dispatched when required.

Battery System

3.21 There are a number of different designs for the BESS that will be explored as part of the iterative design process. Maximum parameters for the compound layouts will be defined in order to present and assess a worst case in the EIA.

3.22 Batteries will be either in individual containers or housed within a larger building or buildings. The precise number of individual battery storage containers will depend upon the level of power capacity (currently estimated at 4.6 MWh per 1 MW grid capacity) and duration of energy storage that the Scheme will require; investigations are ongoing to determine this.

3.23 The exact locations of the BESS, transformers, and dedicated switchgear are yet to be determined, but it is anticipated that the BESS is DC-coupled. This means they will be spread across the site and located alongside the Solar Stations. This concept considers minimal system and cable losses between the components. The footprint for each battery energy storage container would be around 12.2m in length x 2.5m in width x 4m in height. An illustrative battery container is shown in Plate 3-3.

Plate 3-3: Illustrative Battery Container

3.24 Each battery container will require a heating, ventilation and cooling (HVAC) system to ensure the efficiency of the batteries, which are integrated into the

containers. This could involve an air cooled solution or a liquid cooled solution. The air cooled HVAC system would be external to the containerised unit located either on the top of the unit or attached to the side of the unit. If this uses air to heat and cool it will have a fan built into it that is powered by auxiliary power. The HVAC system will be designed to operate with an ambient temperature range of -30C to 55C; alternatively, this may involve liquid cooling. Liquid cooling of the container is likely to be the chosen solution.

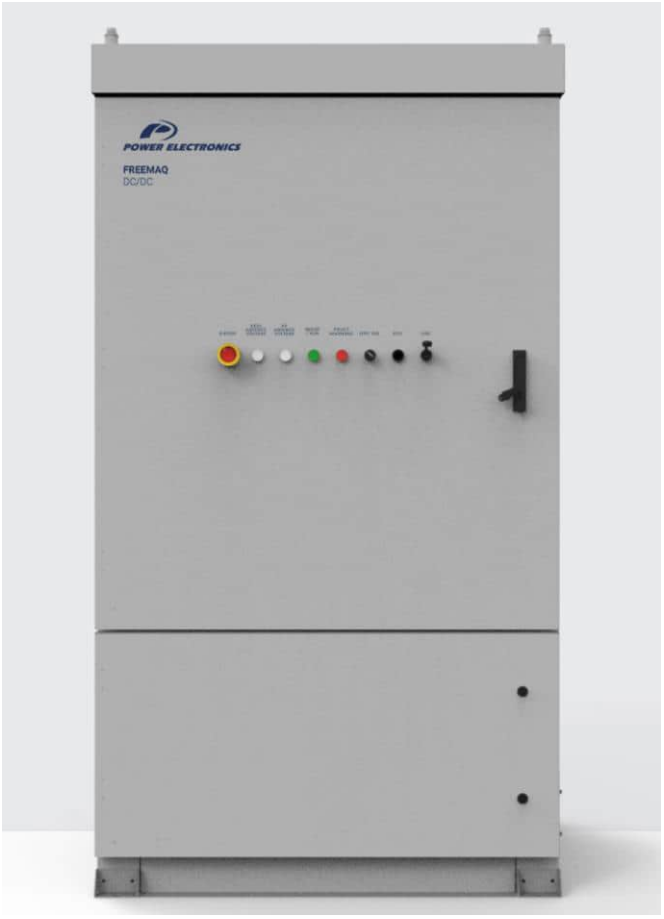
DC/DC Converter

3.25 Every DC-coupled BESS will need an active electrical device which is the DC/DC converter (shown in Plate 3-4). The DC/DC converter manages the charge and discharge of the battery following the demand profile of the plant operator. The DC/DC converter takes either the power to charge the battery from the solar PV panels or, for instance at night, from the grid. Discharge of the battery can be manged also following specific demands by the operator.

3.26 The DC/DC converter will be installed next to every battery to keep cables short and losses low. The footprint for each DC/DC converter would be around 2.5m in length x 1m in width x 2.8m in height.

3.27 The battery will utilise the inverter, transformer and switchgear within the Solar Station to operate, isolate and control the imported and exported power to and from the BESS.

Plate 3-4: Illustrative Battery Container



3.28 As the Scheme design develops, the likely configuration of equipment will be determined based upon environmental and technical factors. A reasonable worst-case scenario will be assessed and presented in the ES.

On-site Cabling

3.29 Low voltage on-site electrical cabling is required to connect the solar PV modules and BESS(s) to inverters (typically via 1.5 kV cables), and the inverters to the transformers on-site (typically via 0.6/1 kV cables). The dimension of the trenches will vary depending on the number of ducts they contain but could typically be around 4m in width and around 1.2m in depth. The worst-case scenario will be assessed in the next stages of the EIA.

3.30 Higher rated cables (likely 33 kV) are then required between the transformers and the switchgear and from switchgear to the on-site sub-stations. The dimension of the trenches will vary depending on the number of ducts/cables they contain but could be typically around 5m in width and around 2m in depth. In limited places, it may be necessary to install the cables in precast concrete troughs around 3m in width by 2m in depth.

3.31 Cabling between solar PV modules and the inverters will typically be required to be above ground level (along a row of racks), fixed to the mounting structure, and then underground (between racks and the Solar Stations). All other on-site cabling will be underground wherever possible.

3.32 Data / fibre optic cables will also be installed, typically alongside electrical cables to allow for monitoring during operation, such as the collection of solar data from pyranometers.

On-site Sub-stations

3.33 The sub-stations will consist of electrical infrastructure such as the transformers, switchgear and metering equipment required to facilitate the export of electricity from the Principal Site to the National Grid. The sub-stations will operate at 400kV/33kV and there will be two sub-stations on the Principal Site. Each sub-station compound would have a footprint of around 150m in length x 100m in width x 12m in height. A shunt reactor requirement has been identified at this stage.

3.34 Within each sub-station compound there will be a 400kV switchgear building, two 33kV switch room buildings and a control building. The 400kV switchgear building will be up to 40m in length x 20m in width x 10m in height. It is likely to be a portal steel structure with coloured profile steel cladding, selected to minimise visual impact. The 33kV switch rooms will each be up to 30m in length x 10m in width x 6m in height. The control building would be around 20m in length x 10m in width x 6m in height, and will include office space and welfare facilities as well as operational monitoring and maintenance equipment.

3.35 The 33kV switch rooms and control building would be painted block buildings with external colours and finishes to be confirmed prior to construction. Maximum parameters for the compound will be defined in the DCO application, and a reasonable worst case scenario will be assessed and presented in the ES. Each sub-station will need to be enclosed in a steel palisade fence, around 3m in height. Car parking will be provided within the sub-station fenced area.

Solar Farm Control Centre

3.36 A Solar Farm Control Centre will be included within the Scheme. The Solar Farm Control Centre will allow around 10 to 12 staff to operate and maintain the plant,

in day-shifts only. The plant staff will also grant access to parts of the plant for operations and maintenance works which are typically CCTV surveyed to prevent unauthorized access. The Solar Farm Control Centre will consist of:

- Central Control Room where all operational data of the whole plant will be controlled and monitored: the individual Solar Stations (including the array of trackers) and their components including the BESS, on-site sub-stations, the 400kV cable and the main 400kV grid connection at Cottam National Grid sub-station.
- Central CCTV and security control of the whole plant including access gates to fenced areas.
- Welfare facility for staff and subcontractors.
- Parking area for staff and subcontractors.
- Own power supply including emergency power supply.

3.37 The Solar Farm Control Centre will be around 20m in length x 15m in width x 6m in height.

Equipment Storage

3.38 The Scheme will require spare parts for operation over time. Storage for spare solar PV modules, trackers, inverters, 400V/33kV transformer, switchyard, BESS, CCTV and metrological stations spare parts, as well as extra spare cable reels, will require an area equivalent to 32 of 40 feet High cube ISO containers: around 12m in length x 2.5m in width x 3m in height or equivalent shaded open storage area using a 3.2m high shade. A total area of around 1,200 m^2 is foreseen.

Fencing and Security

3.39 A security fence will enclose the operational areas of the Site. The fence is likely to be a deer fence, approximately 1.8 to 2.5m in height. Pole mounted internal facing CCTV systems are also likely to be deployed around the perimeter of the operational areas of the Site. It is anticipated that these would be around 5m high. CCTV cameras would have fixed views and will be aligned to face along the fence and therefore would not encroach on any private land.

3.40 To comply with British Standard (BS) EN 62271-1:2017 (Ref 3-1), if outdoor transformers are used, they will be surrounded by a secure wire mesh fence. This fence is likely to be around 1.8 to 2.5m in height.

3.41 It is likely that lighting sensors for security purposes will be deployed around the electrical infrastructure and potentially at other pieces of critical infrastructure. No areas are proposed to be continuously lit.

Surface water drainage

3.42 The detailed operational drainage design will be carried out pre-construction with the objective of ensuring that drainage of the land to the present level is maintained. It will follow either the design of a new drainage system taking into account the proposed new infrastructure (access tracks, cable trenches, structure foundations) to be constructed, or, if during the construction of any of

the infrastructure, there is any interruption to existing schemes of land drainage, then new sections of drainage will be constructed.

3.43 The design of new drainage systems will be based on the Flood Risk Assessment (FRA) and hydrological assessment to be undertaken.

3.44 Infiltration drainage design will be in accordance with Building Research Establishment (BRE) Digest 365: Soakaway Design and Sewers for Adoption (Ref 3-2) and infrastructure will be placed at least 10m away from watercourses.

Electricity Export Connection to National Grid

3.45 The electricity generated by the Scheme is expected to be imported and exported via interface cables from the on-site sub-stations to the Cottam sub-station. The Cable Route Corridor would be directed along highway verges and field margins/boundaries where possible. The Cable Route Corridor will require crossings over roads (single track and main roads), watercourses (Upper Witham and River Trent and their associated tributaries), land drains, East Midlands Railway providing services between Doncaster and Lincoln and potential utilities/statutory undertaker assets.

3.46 To connect the Principal Site to Cottam sub-station, 400kV cables would be installed. The total length of the cable run within the Cable Route Corridor is approximately 16km (approximate distance between the Principal Site and Cottam). A further 400kV underground cable circuit approximately 8km long will be required within the Principal Site to interconnect the two 400kV/33kV sub-stations.

3.47 In terms of installation, the cables will either be laid directly into trenches or into ducting that will be installed with the cables pulled through the ducting. The cables will be installed within a corridor, with an expected width of 20m to 30m (this includes both the permanent installation area and temporary working area) and a typical trench depth of around 2m and trench width of around 3.5m. Where the Cable Route Corridor encounters obstacles such as tree root systems, the width of the cable route (both permanent and temporary) may change locally. Where the Cable Route Corridor crosses other infrastructure and natural features such as rivers or streams, the cables will need to be installed deeper, with occasional use of Horizontal Directional Drilling (HDD) techniques or other similar trenchless techniques to cross these obstacles when open trenching is not practical.

3.48 It is likely that jointing pits will be required every 800m to 1,000m to join sections of cable together. The dimensions of these are determined by how many circuits will be in the jointing pit. For a single 400kV circuit, the dimensions of the jointing pit would be around 19m in length x 3m in width x 2.5m in depth. A link box pit of around 2m in length x 2m in width would also be required. The distance between jointing pits will be determined through the design process and is dependent on existing infrastructure along the Cable Route Corridor, the cable specification and cable delivery limitations.

3.49 The Cable Route Corridor is subject to an iterative design process. A range of constraints will determine the final optimal cable routing with a number of options being explored currently. These include: physical, ecological, cultural heritage

and human interactions, technical engineering, legal and commercial considerations.

Construction Programme and Activities

Construction Programme

3.50 Subject to the DCO being granted, the earliest construction could start is 2025, with planned operation by 2027. Operation in 2027 is the earliest date that the Scheme could be connected under the proposed agreement with National Grid.

3.51 It is anticipated that the Scheme will be constructed over a continuous period rather than being phased. At this stage, it is considered that a construction programme of approximately 24 months could be achieved if the Scheme was built in one continuous phase.

3.52 A reasonable worst-case scenario for the construction programme will be assessed and presented in the ES.

Construction Activities

3.53 The ES will provide further details of the proposed construction activities, their anticipated duration, along with an indicative programme of each phase of the works. The sections below provide an overview of these activities.

3.54 The types of construction activities that are likely to include (not necessarily in order):

- Site preparation:
  - Import of construction materials, plant and equipment to site;
  - The establishment of a construction compound(s);
  - Upgrading of existing site tracks / access roads and construction of new tracks;
  - The upgrade or construction of crossing points (bridges / culverts) over drainage ditches; and
  - Marking out the location of the infrastructure.
- Energy farm construction:
  - Import of components to site;
  - Erection of module mounting structures;
  - Mounting of solar PV modules;
  - Installation of electric cabling;
  - Installation of transformer cabins;
  - Installation of BESS units; and
  - Construction of sub-station compound.
- Cable installation:
  - The establishment of mobilisation areas and running tracks;

- Temporary construction compounds (to be located within the Cable Route Corridor);
- Stripping of topsoil in sections;
- Trenching in sections;
- Appropriate storage and capping of soil;
- Appropriate construction drainage with pumping where necessary;
- Sectionalised approach of duct installation;
- Excavation and installation of jointing pits;
- Link box installation;
- Cable pulling; and
- Implementation of crossing methodologies for watercourses, infrastructure (including roads and rail), and sensitive habitats (e.g. HDD, cable bridging, etc.)

- Testing and commissioning.
- Site reinstatement and habitat creation.

Construction Site Access

3.55 It is anticipated that the main construction and decommissioning access points to Principal Site will be off the A631, which forms the northern boundary. Swept path analysis will be undertaken to determine if land take or road widening is required. It is anticipated that abnormal loads will be required for the transformers for the on-site sub-stations.

3.56 All construction and decommissioning access will be confirmed as the Scheme design progresses and in consultation with the County Highways Authorities and National Highways, as appropriate.

3.57 Access tracks will be constructed across the site. These would typically be around 3.5m to 5m in width compacted stone tracks with 1:2 gradient slopes on either side to accommodate drainage.

3.58 At this stage, it is anticipated that as a worst case during the peak construction period, there could be up to 64-66 HGV deliveries per day and on average 47-49 HGV deliveries per day. This is based upon a 24 month construction programme. In addition, there will be Light Goods Vehicle (LGV) delivery vehicle movements associated with construction worker arrivals and departures. Construction traffic predictions will be confirmed in the ES.

Construction Environmental Management

3.59 A Construction Environmental Management Plan (CEMP) will be prepared to describe the mitigation measures to be followed. The aim of the CEMP is to reduce impacts and promote best practice such as those listed below:

- Use of land for temporary laydown areas, accommodation, etc;
- Construction traffic (including parking and access requirements) and changes to access and temporary road or footpath closure (if required);

- Noise and vibration;
- Utilities diversion;
- Dust generation;
- Soil removal;
- Ecological mitigation;
- Water pollution prevention measures; and
- Waste generation.

3.60 A Framework CEMP will be prepared to accompany the DCO application. A detailed CEMP will be produced by the appointed construction contractor following grant of the DCO and as agreed with the Local Planning Authorities prior to the start of construction. This may be produced as part of a requirement attached to the DCO.

3.61 Contracts with companies involved in the construction works will incorporate environmental control, health and safety regulations, and current guidance and will ensure that construction activities are sustainable and that all contractors involved with the construction stages are committed to agreed best practice and meet all relevant environmental legislation including: Control of Pollution Act 1974 (COPA) (Ref 3-3), Environment Act 1995 (Ref 3-4), Hazardous Waste Regulations 2005 (as amended) (Ref 3-5) and the Waste (England and Wales) Regulations 2011 (Ref 3-6).

3.62 Records will be kept and updated regularly, ensuring that all waste transferred or disposed of has been correctly processed with evidence of signed Waste Transfer Notes (WTNs) that will be kept on-site for inspection whenever requested. Furthermore, all construction works will adhere to the Construction (Design and Management) Regulations 2015 (CDM) (Ref 3-7).

Site Reinstatement and Habitat Creation

3.63 Following construction, a programme of site reinstatement and habitat creation will commence. A Framework Biodiversity and Landscape Management Plan will set out the principles for how the land will be managed throughout the operational phase, following the completion of construction. A detailed Biodiversity and Landscape Management Plan will be produced following grant of the DCO and prior to the start of construction (for example, as part of a requirement attached to the DCO).

Operational Site Access

3.64 During the operational phase, activity on-site will be minimal and would be restricted principally to vegetation management, equipment maintenance and servicing, replacement of any components that fail, and monitoring to ensure the continued effective operation of the Scheme. It is anticipated that, as a reasonable worst-case, there will be 10 to 12 staff on-site daily during the operational phase. In addition, it is anticipated that there could be an average of 10 to 20 visits per year with four wheel drive vehicles, HGVs or transit vans for maintenance.

3.65 A Framework Operation Environmental Management Plan (OEMP) will accompany the DCO application, which will describe the framework of operational mitigation measures as identified in the ES to be followed, and carried forward to a detailed OEMP prior to operation.

Decommissioning

3.66 The design life of the Scheme is expected to be at least 40 years. Should the Scheme be decommissioned, this would allow the land (that has previously been intensively farmed) to recover and become productive again, ultimately safeguarding the agricultural usage of this land for future generations. Equipment will be reviewed the end of the design life of the Scheme to determine whether it remains in a viable condition to continue operation after that time.

3.67 When the operational phase ends, the Scheme will require decommissioning. All PV modules, mounting poles, on-site cabling, inverters and transformers would be removed from the Principal Site and recycled or disposed of in accordance with good practice and market conditions at that time. The 400kV cable will remain in situ. The future of the sub-station and control building would be agreed with the relevant Local Planning Authority prior to commencement of decommissioning. A Decommissioning Environmental Management Plan (DEMP), to include timescales and transportation methods, would be agreed in advance with the relevant Local Planning Authority.

3.68 Decommissioning is expected to take between 12 and 24 months and could be undertaken in phases. The effects of decommissioning are often similar to, or of a lesser magnitude than, construction effects and will be considered 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 Scheme, and assumptions will therefore be made, where appropriate.

The Rochdale Envelope

3.69 The Planning Inspectorate's Advice Note 9: Using the 'Rochdale Envelope' (Advice Note 9) (Ref 3-8) provides guidance regarding the degree of flexibility that may be considered appropriate within an application for development consent under the Planning Act 2008 (Ref 3-9) and the application of the 'Rochdale Envelope' to ensure a robust assessment of the likely significant environmental effects of the Scheme. Several technical parameters have yet to be finalised for the Scheme.

3.70 The amount of flexibility required will depend upon the progress of the design at the stage that the detailed EIA work is undertaken. Certain aspects of the Scheme still require design flexibility. It is therefore necessary for the technical assessments to assess an 'envelope' within which the works will take place. As such, the DCO application and EIA will be based on maximum and, if relevant, minimum parameters or limits of deviation. To remain in accordance with the EIA Regulations, it will be essential that the parameters are as 'limited' as possible to ensure that the 'likely significant effects' are identified, rather than unrealistically amplified effects, which could be deemed to be unlikely. It is proposed to use the defined parameters for the Scheme in each relevant technical assessment, with

each technical assessment defining their reasonable worst-case basis of assessment.

3.71 The key elements of Advice Note 9 in relation to the Scheme are set out below:

- The application should acknowledge the need for details of a project to evolve, within clearly defined parameters;
- The EIA should take account of the need for evolution within those parameters, and reflect the likely significance of such a flexible project in the ES;
- Within those defined parameters, the level of detail of the proposals must be such as to enable a proper assessment of the likely significant environmental effects and the identification of mitigation measures, if necessary considering a range of possibilities: "*the assessment may conclude that a particular effect may fall within a fairly wide range. In assessing the 'likely' effects, it is entirely consistent with the objectives of the Directive to adopt a 'worst case' approach. Such an approach will then feed through into the mitigation measures envisaged. It is important that these should be adequate to deal with the worst case, to optimise the effects of the development on the environment*"; and
- It is for the decision maker in granting consent, to impose conditions to ensure that the process of evolution keeps within the parameters applied for the assessed.

3.72 The advice outlined above has been followed during the EIA scoping process for this Scheme to identify and refine the scope of environmental topics.

4. Alternatives Considered

4.1 Schedule 4 (2) of the EIA Regulations requires '*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*' to be presented in the ES.

4.2 The ES will therefore include a description of the alternatives relevant to the Scheme that have been considered and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. The alternatives analysis to be presented in the ES is likely to focus on different Scheme layouts, sizing, technologies and design parameters.

4.3 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*'. A 'no development' alternative would not deliver the additional electricity generation capacity and other benefits associated with the Scheme and is therefore not considered a reasonable alternative. This does not preclude the use of the 'no-development' also referred to as a 'do nothing' scenario in certain technical chapters of the ES where this is required to present future baseline conditions in relation to the impact assessment.

5. Consultation

Context

5.1 Effective stakeholder engagement and consultation is intrinsic to the Planning Act 2008 (Ref 5-1) and fundamental to the success of the Scheme.

5.2 The process of consultation is critical to the development of a comprehensive and balanced ES. The views of statutory and non-statutory consultees serve to focus the environmental studies and to identify specific issues that require further investigation. Consultation is an ongoing process, which enables mitigation measures to be incorporated into the project design thereby limiting adverse effects and enhancing environmental benefits.

5.3 The Scheme has a wide range of stakeholders (including landowners, statutory consultees, local communities, and specialist interest groups) with differing interests that will require consultation. Specific communication activities therefore need to be focussed to meet the needs of individuals and groups. This requires an understanding of the stakeholders and their interests in the Scheme.

5.4 Stakeholder engagement for the Scheme is based on the following principles:

- Early and ongoing engagement to inform and influence the design process.
- Seeking feedback in the iterative design process and ensuring that comments received are taken into consideration.
- Building of long-term relationships with key stakeholders throughout the different stages of the Scheme to help better understand their views.
- Having regard to the consultation responses received; and
- Ensuring appropriate statutory consultation is undertaken in compliance with requirements of the Planning Act 2008, EIA Regulations (Ref 5-2) and associated guidance.

DCO Consultation Requirements

5.5 The DCO process has several statutory requirements regarding consultation. These requirements stipulate that certain stakeholder groups and the community must be consulted as part of the pre-application process, as set out in Sections 42, 47 and 48 of the Planning Act 2008 and Regulation 13 of the EIA Regulations. Further requirements set out how the Scheme must be publicised; and specific documents produced, including a Statement of Community Consultation (SoCC), Preliminary Environmental Information Report (PEIR) and a Consultation Report.

Consultation to Date

5.6 A number of meetings with statutory consultees have already taken place to introduce the proposals, including:

- Lincolnshire County Council;
- Nottinghamshire County Council;
- West Lindsey District Council; and

- Bassetlaw District Council.

5.7 The Applicant has also spoken directly with Members from each of the Local Planning Authorities and sent letters directly to local MPs as a means of introducing the Scheme to them. Regular meetings will be set up with the Local Planning Authorities and other key stakeholders, such as Statutory Environmental Bodies, as the Scheme progresses.

5.8 In addition, a project website has been set up to provide up to date information for stakeholders: www.tillbridgesolar.com; along with the provision of a project email (info@tillbridgesolar.com), freephone and freepost contact details providing a wide variety of communication channels for stakeholders to make contact.

5.9 A non-statutory consultation event (collaboration workshops) was held in local village halls between the 20th-22nd July 2022 on an invitation only basis to stakeholders (political, interest groups and technical). A total of 110 individual stakeholders and/or organisations were invited to attend one of the collaboration workshops on the date most suitable to them. These stakeholders included:

- Relevant county, district and ward councillors across the Districts of West Lindsey and Bassetlaw and Counties of Lincolnshire and Nottinghamshire.
- Wider Council Members, portfolio holders, and technical/planning officers.
- Representatives of the local community, including parish councils and local interest/community groups.
- Statutory consultees and wider environmental/technical stakeholders.

5.10 These workshops were hosted as a means of introducing the Scheme and providing an opportunity for comments with respect to the scoping of the EIA and key considerations in relation to the potential design of the Scheme. The format of the workshops included a presentation by the Applicant, including the communications and environmental consultants working on the project, which then lead to interactive sessions with those in attendance to seek comments on:

- Cumulative Impact;
- Site Selection;
- Ecology and Biodiversity;
- Cultural Heritage;
- Landscape and Visual;
- Traffic and Access;
- Water Environment;
- Socio-Economics and Land-use;
- Community Benefits; and
- Other topics.

5.11 Feedback was obtained at the workshops through taking verbal questions, attendees interacting/marking-up plans to indicate areas that required further consideration and the completion of comment sheets to provide additional feedback to the team. The responses received have been collated and have

been published within a report. This will be available the project website and will be factored into the on-going development of the Scheme.

5.12 The next stage of engagement will include sharing information on the Scheme more widely with local communities and stakeholders through the circulation of a newsletter. On-going engagement will also continue with statutory consultees and other stakeholders following feedback/requests from the collaboration workshops. This includes meetings with Parish Councils in particular.

5.13 The above approach ensures that local residents' and local community groups are aware of the Scheme and already engaged with the process in advance of the submission of this EIA Scoping Report.

5.14 In addition, during July 2022 and September 2022, the Applicant's landscape and visual consultant and land agent met face to face with local residents close to the Scheme to discuss the proposals.

EIA Scoping Consultation

5.15 The Planning Inspectorate (on behalf of the SoS) will consult on this EIA Scoping Report under Regulation 10 of the EIA Regulations. Views from consultees will be considered and used to inform the EIA Scoping Opinion to be issued by the Planning Inspectorate.

5.16 Under Regulation 10(6) of the EIA Regulations, the SoS must undertake consultation with statutory consultation bodies, including Statutory Environmental Bodies (such as Natural England, the Environment Agency, and Historic England) and relevant planning authorities (Lincolnshire County Council, West Lindsey District Council, Nottinghamshire County Council and Bassetlaw District Council), before adopting an EIA Scoping Opinion.

Public Statutory Consultation

5.17 In accordance with Section 47(1) of the Planning Act 2008, the Applicant will prepare a SoCC. The Applicant is required to consult the Local Planning Authorities identified pursuant to Section 43(1) of the Planning Act 2008 on the draft SoCC, and they will have a period of at least 28 days following receipt of the request to comment on a draft SoCC prior to its publication for inspection by the public.

5.18 In preparing the SoCC, regard will be had to responses received in relation to consultation under Section 47(2) of the Planning Act 2008. The SoCC will then be published and the consultation carried out. The SoCC will also outline how the Applicant intends to consult with people living in the vicinity of the Scheme, including, in accordance with Regulation 12 of the EIA Regulations, how it intends to publicise and consult on the PEIR. The format of statutory consultation has not yet been finalised but there are key objectives that will be sought:

- Build on ongoing relationships with communities and stakeholders (established during the collaboration workshops and first stage consultation);
- Formally consult with communities and stakeholders (including statutory consultees) on proposals for the Scheme;

- Update politicians and elected representatives and formally engage with Local Planning Authorities during the SoCC process; and
- Seek views on the preliminary design of the Scheme from consultees.

5.19 Methods of engagement associated with statutory consultation will include:

- Preview briefings for MPs, elected members and media;
- A second newsletter to all properties within an agreed radius of the proposed solar farm and grid connection corridor to provide an update on the process and invite people to take part in the statutory consultation;
- Dedicated project website containing updated Scheme proposals, full suite of consultation materials, including details of online and in-person community events, digital feedback form and community relations contact centre;
- Online feedback form (paper copies available on request) seeking views from consultees on the more developed proposals for the project;
- Online community engagement events;
- Face-to-face community engagement events;
- Media engagement with local and regional news outlets; and
- Targeted social media advertising.

5.20 During the statutory consultation, consultation will also be undertaken with prescribed consultation bodies as well as affected landowners, in accordance with Sections 42 and 48 of the Planning Act 2008 and Regulation 13 of the EIA Regulations.

5.21 Section 42 requires the Applicant to consult with 'prescribed persons', which includes certain consultation bodies such as relevant local authorities, Statutory Environmental Bodies, relevant statutory undertakers, those with an interest in the land, as well as those who may be affected by the Scheme.

5.22 Section 48 places a duty on the Applicant to publicise the proposed application in the 'prescribed manner' in a national newspaper, The London Gazette and local newspapers circulating within the vicinity of the land.

5.23 All responses received during consultation will be carefully considered and regard had to them in the development of the Scheme in accordance with Section 49 of the Planning Act 2008. Details of any responses received during consultation and the account taken of those responses will be included in a Consultation Report.

5.24 This Consultation Report will be submitted with the DCO application to the SoS and, if the DCO application is accepted, will be available for public review. The Consultation Report will demonstrate how the Applicant has complied with the consultation requirements of the Planning Act 2008 and EIA Regulations and will be considered by the SoS when determining whether to accept the DCO application.

6. Environmental Impact Assessment Methodology

Introduction

6.1 The ES will be based on a number of related activities, as follows:

- Establishing existing baseline conditions;
- Consultation with statutory and non-statutory consultees throughout the DCO application process;
- Consideration of relevant local, regional and national planning policies, guidelines and legislation relevant to EIA;
- Consideration of technical standards for the development of significance criteria;
- Review of secondary information, previous environmental studies and publicly-available information and databases;
- Desk-top studies;
- Physical surveys and monitoring;
- Computer modelling (where required); and
- Professional judgement.

6.2 The ES will set out the process followed during the EIA including the methods used for the collection of data and for the identification and assessment of impacts. Any assumptions made will be clearly identified.

6.3 The EIA process is designed to be capable of, and sensitive to, changes that occur as a result of design development, including any mitigation measures that are incorporated during the EIA. This will be particularly important for this EIA as the design and layout of the Scheme is still being refined, and changes are likely to be made following submission of this EIA Scoping Report. It is not, however, anticipated that the Scheme that is the subject of the EIA and DCO application will be materially different from the Scheme that is the subject of this EIA Scoping Report, and it will be within the parameters / options set out in *Chapter 3: Description of the Scheme* of this EIA Scoping Report.

6.4 Impacts will be considered on the basis of their magnitude, duration, and reversibility. Cumulative and combined effects will also be considered where appropriate. Significance will be evaluated on the basis of the scale of the impact and the importance or sensitivity of the receptors, in accordance with standard assessment methodologies. More information on the assessment methodology is provided below.

6.5 Where potentially significant adverse environmental effects are identified in the assessment process, measures to mitigate these effects will be put forward in the form of recommendations to be undertaken as part of the project development as far as practicable.

Determining the Baseline Conditions

6.6 In order to predict the potential environmental effects of the Scheme, it will be necessary to determine the environmental conditions that currently exist within the Scheme Boundary and surrounding area, in the absence of any development. These are known as ‘baseline conditions’.

6.7 Detailed, environmental baseline information will be collected and the methodology for the collection process will be detailed within the ES. The baseline information will be gathered from various sources, including:

- online/digital resources;
- data searches, e.g. Historic Environment Record, etc.;
- baseline site surveys; and
- environmental information submitted in support of other planning applications for developments in the vicinity.

6.8 Consideration will also be given to how the baseline conditions would evolve in the absence of the Scheme, known as the ‘future baseline’.

Embedded Measures

6.9 Measures will be identified in order to avoid, reduce and, if possible, offset significant adverse effects identified during the EIA process. Where possible, these measures will be incorporated into the form or design of the Scheme.

6.10 Once these measures are incorporated into the design, they are termed ‘embedded measures’. Embedded measures relevant to the construction phase will be described within a Framework CEMP, and within the ‘Embedded Design Mitigation’ section of each technical chapter. For the operational phase, such embedded measures will be represented primarily in the design. Embedded measures are therefore either incorporated into the design from the outset or identified through the assessment process.

6.11 The ES assesses effects with embedded measures in place. Where significant adverse effects are identified after considering these embedded measures, ‘additional mitigation measures’ will be proposed.

Timescales and Assessment Years

Construction Phase Effects

6.12 For the construction assessment, these effects will be taken to be those for which the source begins and ends during the construction stage, and the effects do not endure beyond the completion of the construction phase. 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 in respect of the whole construction period, whereas the construction of energy infrastructure and landscaping activities are likely to persist throughout the entire construction period.

Operational Phase Effects

6.13 For the operational assessment, these are the effects that, although they may start during construction, are either permanent, endure for a substantial period beyond construction or decommissioning, or represent an extended cumulative effect of construction or decommissioning activity. 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 – endures for up to 12 months after completion of construction or decommissioning;
- Medium term – endures for 1-5 years;
- Long term – endures for 5-15 years;
- Reversible Long Term Effects – long-term effects, which endure throughout the lifetime of the Scheme but which cease once the Scheme has been decommissioned (operational effects will all fall into this category); and
- Permanent Effects – effects which cannot be reversed following decommissioning (e.g. where buried archaeology is permanently removed during construction).

Decommissioning Period Effects

6.14 For the decommissioning assessment, these effects will be taken to be those for which the source begins and ends during the decommissioning stage, and the effects do not endure beyond the completion of the decommissioning phase. 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, for example. As with construction phase effects, some aspects of decommissioning will endure for longer than others.

Assessment Years

6.15 In order to ensure the EIA is robust in considering the likely significant effects of the Scheme, appropriate assessment scenarios and years have been identified and are discussed below.

6.16 The peak construction year for the purpose of the EIA is anticipated to be 2026; this assumes commencement of construction in 2025, with completion in 2027 (anticipated 24-month construction period). This is based on the assumption that the Scheme is built out rapidly. This would for example be a worst case from a traffic generation point of view because it compresses the trip numbers into a shorter duration. This would therefore also be the worst case in terms of effects on drivers, pedestrians and cyclists, and traffic-related air quality and noise effects.

6.17 The Scheme may be built in phases over a longer period, which may be worse, for example, for landscape and visual amenity and the setting of heritage assets, as there will be a longer time over which construction activity could affect receptors.

6.18 The phasing of the Scheme will be subject to a number of factors. Therefore, the peak construction assessment year will be reviewed as the anticipated

construction programme is considered in more detail during design development. A full justification for the reasonable worst case scenario that is assessed will be provided in the ES.

6.19 The proposed operational assessment year for the purpose of the EIA is 2027.

6.20 A future year of 2042 will also be considered for specific topics including landscape and visual amenity, in terms of the maturation of vegetation (i.e. 15 years after the operational assessment year).

6.21 The decommissioning assessment year for the purpose of the EIA is 2067, based on the design life of the Scheme, recognising that the operational life may extend beyond this date.

Effect Significance Criteria

6.22 The evaluation of the significance of an effect is important, since it is the significance that determines the resources that should be deployed in avoiding or mitigating a significant adverse effect, or conversely, the actual value of a beneficial effect. The overall environmental acceptability of the Scheme is a matter for the SoS to determine, having taken into account, amongst other matters, the environmental information that is set out in the ES, including all likely beneficial and adverse environmental effects. Where it has not been possible to quantify effects, qualitative assessments will be carried out, based on available knowledge and professional judgment. Where uncertainty exists, this will be noted in the relevant topic chapter and if necessary any assumptions made will be clearly stated (and are likely to comprise a reasonable worst case scenario).

General Assessment Methodology

6.23 The following section outlines the standard EIA methodology and defines the standardised terminology to be used throughout the ES for a consistent identification of likely significant environmental effects. For those environmental topics scoped into the EIA, details relating to the specific assessment methodology to be used in the ES are provided within the technical sections of this EIA Scoping Report. In summary, each technical chapter of this ES will follow a three-stage approach, as set out below.

Stage 1: Determining the value / sensitivity of the receptor or environmental resource

6.24 The technical ES chapters will define the baseline conditions against which the likely significant environmental effects of the Scheme are determined and identify receptors and environmental resources that may be impacted. Each receptor and/ or environmental resource will be assigned a value on the basis of its importance or sensitivity to potential impacts, according to the methodology set out in the relevant technical chapter.

6.25 The sensitivity, value or importance of a resource or receptor is normally derived from:

- Designated status within the land use planning system;
- Reference to standards in environmental assessment guidance;
- The number of individual receptors, such as residents;

- An empirical assessment on the basis of characteristics such as rarity or condition; and
- Its ability to absorb change.

6.26 The terminology that will be used to categorise the sensitivity of resources/receptors is as follows:

- High;
- Medium;
- Low; and
- Very Low.

Stage 2: Determining the magnitude and attributes of impacts

6.27 The technical ES chapters will identify the potential impacts of the Scheme from the construction phase, operational phase and on decommissioning. The magnitude of the impact or scale of change in comparison to baseline conditions will be determined in line with the topic specific methodology, while taking into account any embedded mitigation that either forms an inherent part of the Scheme (also defined as 'primary mitigation' by IEMA), is considered as standard practice or is a legislative requirement for managing commonly occurring environmental effects (defined as 'tertiary mitigation' by IEMA (Ref 6-1)). Where it has not been possible to quantify impacts, qualitative assessments will be carried out, based on expert opinion and professional judgement. This will be identified within the relevant ES chapter. Where uncertainty exists, this will be set out in the relevant ES chapter.

6.28 The terminology that will be used to categorise the magnitude of impact is as follows:

- High;
- Medium;
- Low; and
- Very Low.

Stage 3: Classification of the effect significance

In each technical ES chapter, the assessment will consider the sensitivity of the resources/receptors that could be affected and the magnitude of impacts in order to classify the effect. Each technical topic has its own method for classifying effects, based on industry standards, accepted criteria and legislation where available, for example, the Air Quality Dust Impact Assessment uses a classification method based on Institute of Air Quality Management (IAQM) guidance. A generic example of how this might be undertaken is given in

6.29 Table 6-1 below. Where topic-specific classification of effect significance has been applied, this will be set out in the relevant technical chapter.

Table 6-1: Example Classification and Significance of Effects

Importance of the Resource/Sensitivity of Receptor	Magnitude of Potential Change/Impact			
	High	**Medium**	**Low**	**Very Low**
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

Following the classification of an effect, clear statements will be made within the topic chapters as to whether that effect is significant or not significant. As a general rule, major and moderate effects are considered to be significant (as shown by the shaded cells in Table 6-1 above), whilst minor and negligible effects are considered to be not significant. However, professional judgement will be applied, including taking account of whether the effect is permanent or temporary, its duration/frequency, whether it is reversible, and/or its likelihood of occurrence. Generic definitions for the classification of effects are shown in Table 6-2.

6.30

Table 6-2: Generic effect descriptions

Effect	Generic description
Major	These effects may represent key factors in the decision making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to resources or features which are unique and which, if lost, cannot be replaced or relocated.
Moderate	These effects, if adverse, are likely to be important at a local scale and on their own could have a material influence on decision making.
Minor	These effects may be raised as local issues and may be of relevance in the detailed design of the project, but are unlikely to be critical in the decision making process.
Negligible	Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, these effects are unlikely to influence decision making, irrespective of other effects.

6.31 Where mitigation measures are identified to eliminate, mitigate or reduce adverse impacts, these have either been incorporated into the design of the Scheme; translated into construction commitments; or operational or managerial standards / procedures. The ES will highlight 'residual' effects, which remain following the implementation of suitable mitigation measures, and classify these in accordance with the effect classification terminology given above.

6.32 The following terminology will be used in the ES to define residual effects:

- Adverse – detrimental or negative effects to an environmental/socio-economic resource or receptor; or
- Negligible (also referred to as 'neutral' for some topics) – imperceptible effects to an environmental/socio-economic resource or receptor; or
- Beneficial – advantageous or positive effect to an environmental/socio-economic resource or receptor.

Assessment of Construction and Decommissioning Effects

6.33 The identification of construction and decommissioning effects will be made on the basis of 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.

6.34 The assessment of construction and decommissioning effects will assume the implementation of standard good practice measures, for example the use of temporary noise barriers to reduce noise levels as appropriate and, where practicable, control of dust on haul roads, etc. The purpose of this is to focus on the Scheme specific effects, rather than generic construction effects that can be easily addressed using generic best practice mitigation measures. Construction and decommissioning assumptions, including what has been assumed in terms of good practice measures, will be set out within the ES, and the Framework CEMP and Framework DEMP. The ES will identify and assess construction and decommissioning effects that are likely to remain after these mitigation measures are in place.

Interaction and Accumulation of Effects

6.35 In accordance with the EIA Regulations, 'cumulative effects' will be considered. By definition, these are effects that result from incremental changes caused by other past, present or reasonably foreseeable actions together (i.e. cumulatively) with the Scheme.

6.36 For the cumulative impact assessment, two types of impact will be considered:

- The combined effect of individual impacts from the Scheme, for example noise or pollutants on a single receptor (these will be referred to as 'effect interactions'); and
- The combined effects of several development schemes which may, on an individual basis be insignificant but, cumulatively with the Scheme, have a new or different likely significant effect.

Effect Interactions

6.37 There is no established EIA methodology for assessing and quantifying effect interactions that lead to combined effects on sensitive receptors, however, the European Commission (EC) has produced guidelines for assessing effect interactions "*which are not intended to be formal or prescriptive, but are designed to assist EIA practitioners in developing an approach which is appropriate to a project*…" (Ref 6-2).

6.38 AECOM has reviewed these guidelines and has developed an approach which uses the defined residual effects of the Scheme to determine the potential for effect interactions that lead to combined effects.

6.39 The EIA will predict beneficial and adverse effects during construction, operation and decommissioning of the Scheme, which are classified as minor, moderate or major. Several effects on one receptor or receptor group could theoretically interact or combine to produce a combined significant overall effect.

6.40 An exercise which tabulates the effects on receptors or receptor groups will be undertaken to determine the potential for effect interactions and therefore any combined effects. Only adverse or beneficial residual effects classified as minor, moderate, or major will be considered in relation to potential effect interactions. Residual effects, which are classified as negligible will be excluded from the assessment of the effect interactions as, by virtue of their definition (see Table 6-2), they are considered to be imperceptible effects to an environmental / socio-economic resource or receptor.

Cumulative Effects with Other Developments

6.41 The Planning Inspectorate's Advice Note 17 on the assessment of cumulative effects (Ref 6-3) identifies a four stage approach as follows:

Stage 1 – Establish the NSIP's Zone of Influence (ZOI) and identify long list of 'other development'

6.42 A review of other developments will be undertaken, initially encompassing a 'zone of influence' defined by the environmental topic specialists to prepare a long list of 'other development'. At this stage, it is anticipated that the long list will be based on up to a 10km area of search.

6.43 The long list of 'other development' to be included in the assessment of cumulative effects will be reviewed and developed in consultation with the local planning authorities, statutory consultees and other relevant organisations.

6.44 Development will be included in the initial long-list based on the following criteria:

- Development currently under construction;
- Approved applications which have not yet been implemented (covering the past five years and taking account of those that received planning consent over three years ago and are still valid but have not yet been completed);
- Submitted applications not yet determined;
- Refused applications, subject to appeal procedures not yet determined;
- On the National Infrastructure Planning Programme of Projects;
- Development identified in the relevant Development Plan (and emerging Development Plans); and
- 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.

6.45 Criteria will be developed and applied to filter development which may be excluded from the initial long list, having regard to the size and spatial influence

of each development. These criteria will be documented and set out within the ES.

Stage 2 – Identify shortlist of 'other development' for Cumulative Effects Assessment

6.46 At Stage 2, any developments of a nature or scale without the potential to result in cumulative impacts will be excluded, following discussion with the Local Planning Authorities and consideration of the likely zone of influence for each environmental topic. The justification for including or excluding developments from the long list will be provided in a matrix, modelled on the example given within Appendix E of the Planning Inspectorate's Advice Note 17.

Stage 3 – Information gathering

6.47 Information relating to other developments will be collected from the appropriate source (which may include the Local Planning Authorities, the Planning Inspectorate or directly from the applicant/developer) and will include, but not be limited to:

- Proposed design and location information;
- Proposed programme of demolition, construction, operation and/or decommissioning; and
- Environmental assessments that set out baseline data and effects arising from 'other development'.

Stage 4 – Assessment

6.48 The assessment will include a list of those developments considered to have the potential to generate a cumulative effect together with the Scheme, and this will be documented in a matrix which includes the following:

- A brief description of the development;
- An assessment of the cumulative effect with the Scheme;
- Proposed mitigation applicable to the Scheme including any apportionment; and
- The likely residual cumulative effect.

6.49 The criteria for determining the significance of any cumulative effect will be based upon:

- The duration of effect, i.e. will it be temporary or permanent;
- The extent of effect, e.g. the geographical area of an effect;
- The type of effect, e.g. whether additive or synergistic;
- The frequency of the effect;
- The 'value' and resilience of the receptor affected; and
- The likely success of mitigation.

6.50 Particular consideration will be given to other solar developments proposed within the 10km area of search and information available at the time of assessment will be used to infrom the assessment of cumulative effects.

7. Air Quality

Introduction

7.1 This chapter sets out the approach to the assessment of the Scheme's impacts on air quality. The purpose of the assessment will be to identify and characterise any relevant sensitive receptors, to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.

Study Area

7.2 The study area includes features likely to be at risk from possible direct and indirect impacts that might arise from the Scheme. For air quality, this includes consideration of sensitive receptors within 350m of the Scheme Boundary; within 50m of the roads expected to be affected by the construction phase traffic; and up to 500m from the site access points. These study areas are in line with IAQM Guidance (Ref 7-1).

Relevant Legislation, Planning Policy and Guidance

7.3 Legislation, planning policy and guidance relating to Air Quality and pertinent to the Scheme comprises:

Legislation

7.4 The Environment Act 2021 (Ref 7-1) amends the Environment Act 1995 (Ref 7-2). On 9th November 2021, the Act was approved after being first introduced to Parliament in January 2020 to address environmental protection and the delivery of the Government's 25-year environment plan following Brexit. It includes provisions to establish a post-Brexit set of statutory environmental principles and ensure environmental governance through an environmental watchdog, the Office for Environmental Protection (OEP). The Environment Act 2021 establishes a legally binding duty on government to bring forward at least two new air quality targets in secondary legislation by 31 October 2022. This duty sits within the environmental targets framework outlined in the Environment Act (Part 1). These targets have not yet been set.

7.5 The current assessment criteria applicable to the protection of human health and local Air Quality Management is the UK's national Air Quality Strategy. The objective values for the pollutants of relevance to this assessment are summarised in Table 7-1.

Table 7-1: Key National Air Quality Strategy Objectives

Pollutant	Objective (µg/m^3)	Averaging Period	Not to be Exceeded More Than
Nitrogen dioxide (NO_2)	200	1 hour	18 times per year (i.e. 99.79th percentile)

Pollutant	Objective (µg/m^3)	Averaging Period	Not to be Exceeded More Than
	40	Annual	Not applicable
Particulate matter (PM_{10})	40	Annual	Not applicable
	50	24 hour	35 times per year (i.e. 90.4th percentile)
Particulate matter ($PM_{2.5}$)	20*	Annual	Not applicable

* Note an amendment of the Air Quality Standards Regulations was released in 2020 updating the $PM_{2.5}$ limit value (Ref 7-3).

National Guidelines

The 25 Year Environment Plan

7.6 The 25 Year Environment Plan, published in January 2018 (and updated in October 2021), sets out the actions the UK Government will take to help the natural world regain and retain good health (Ref 7-4). This references several actions that are being taken to improve air quality, most notably the publication of the Clean Air Strategy (Ref 7-5) and tighter control on Medium Combustion Plant. Emphasis is also placed on the 'Future of Mobility', in the establishment of flexible regulatory framework to encourage new modes of transport and encouraging opportunities to move toward zero emission transport.

7.7 The 25 Year Environment Plan reinforces the demand for high environmental standards for all new build development. Resilient buildings and infrastructure will more readily adapt to a changing climate, and by extension have a lesser impact on local air quality.

UK Clean Air Strategy

7.8 In 2019, the UK Government released its Clean Air Strategy (Ref 7-5), part of its 25 Year Environment Plan. The Strategy places greater emphasis on improving air quality in the UK than has been seen before and outlines how this is to be achieved (including the development of new enabling legislation). In recent years, air quality management has primarily focused on NO_2 and its principal source in the UK, which is road traffic. However, the Clean Air Strategy broadens the focus to other areas, including domestic emissions from wood burning stives and agricultural emissions. This shift in emphasis is a part of a goal to reduce the levels of $PM_{2.5}$ in the air to below the World Health Organisation (WHO) guideline level (Ref 7-6); which is far lower than the current EU limit value.

7.9 The Clean Air Strategy includes the provision of a clear effective guidance on how Air Quality Management Areas (AQMAs), Clean Air Zones (CAZs) and Smoke Control Areas (SCAs) interrelate and how they can be used by local government to tackle pollution. The UK Clean Air Strategy sets the following reduction target:

- Nitrogen oxides (NO_x) – reduce emissions against the 2005 baseline by 55% by 2020 and 46% by 2030; and

- $PM_{2.5}$ – reduce emissions against the 2005 baseline by 30% by 2020 and 46% by 2030.

7.10 It is noted within the Clean Air Strategy document that the "*current legislative framework has not driven sufficient action at a local level*". New legislation will seek to shift the focus towards prevention of exceedances, rather than tackling pollution when limits have been surpassed. The shift of focus encourages more of a proactive, rather than reactive, policy framework at regional and local levels on air quality. This legislation is now in place in the form of the Environmental Act 2021. However, the new air quality standards have not yet been set.

National Planning Policy

7.11 As outlined in *Chapter 1: Introduction* of this EIA Scoping Report, the Scheme must have regard to the relevant policies within NPSs and the NPPF. Key aspects of the relevant NPSs and NPPF, which have been considered during the development of this chapter, are outlined below:

7.12 Section 5.2 of NPS EN-1 (Ref 7-7) sets out national planning policy with respect to air quality and emissions in relation to energy development. Section 5.2 of draft NPS EN-1 (Ref 7-8), also refers to emerging national policy with respect to air quality and emissions, including details in relation to potential mitigation.

7.13 In terms of the NPPF (Ref 7-9), paragraph 186 relates to air quality. This states that planning decisions should:

> *"…sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement."*

7.14 In addition, the different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 183:

> *"The focus of planning policies and decisions should be on whether Proposed Development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

National Planning Practice Guidance (2021)

7.15 The Planning Practice Guidance (PPG) web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6th March 2014 to support NPPF and make it more accessible (Ref 7-10). The PPG was updated on 1st November 2019 with specific reference to air quality to support the NPPF and further updated on 20 July 2021.

7.16 The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to

adversely affect the implementation of air quality strategies and action plans and/or lead to a breach of EU legislation (including that applicable to wildlife). In addition, air quality may also be considered to be material if a new development would be particularly sensitive to poor air quality in its vicinity.

7.17 When deciding whether air quality is relevant to a planning application, the PPG states that the following criteria may be required to be taken into consideration by:

> *"the 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
>
> *whether the Proposed Development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
>
> *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."*

7.18 On how detailed an air quality assessment needs to be, the PPG states:

> *"Assessments should be proportionate to the nature and scale of the development proposed and the level of concern about air quality... Mitigation options where necessary will be locationally specific, will depend on the Proposed Development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented."*

Local Planning Policy

7.19 The Central Lincolnshire Local Plan (adopted 2017) (Ref 7-11), with particular reference to Policy LP26: Design and Amenity, sets out criteria that new development will be expected to meet. This includes consideration of amenity with respect to the siting of new development adjoining neighbouring land and buildings with the need to consider whether there would be an adverse impact upon air quality.

7.20 Policy S14: Renewable Energy of the Central Lincolnshire Submission Plan (2022) (Ref 7-12) sets out the commitment to supporting the transition to net zero through supporting renewable energy schemes subject to them meeting criteria. This includes consideration of the impacts on the amenity of sensitive neighbouring uses, including air quality. Policy S53 relates to the consideration of design and amenity in relation to new developments. This includes reference to ensuring that new development does not result in an adverse impact upon air quality.

7.21 Bassetlaw Core Strategy and Development Management Policies (Ref 7-13), with particular reference to Policy DM10: Renewable and Low Carbon Energy, which confirms support for new developments that result in carbon reduction subject to demonstrating compliance with a series of criteria,

7.22 Policy ST44 of the emerging Bassetlaw Submission Plan (Ref 7-14) sets out policy measures to promote healthy, active lifestyles. This includes ensuring that the current air quality in the District is maintained, and where possible improved.

Policy 48 sets out considerations to ensure that new developments protect amenity, this includes ensuring that new developments do not result in the generation of adverse air quality that cannot be mitigated to an appropriate standard. Policy ST50 relates to reducing carbon emissions, climate change and adaptation setting out criteria for new developments to meet. This includes ensuring that new developments incorporate measures that address issues of climate change mitigation through ensuring that there is no adverse impact on local air quality.

Other Relevant Guidance

7.23 There is currently no statutory guidance on the method by which an air quality assessment should be undertaken. The IAQM (Ref 7-6) and the Department for Food Environment and Rural Affairs (Defra) (Ref 7-7) have published guidance for carrying out air quality assessments for development control purposes. These guidance documents have been used in the air quality assessment described in this chapter to present best practice for mitigation measures and in determining the significance of effects for the construction and operational phases of the Scheme.

Baseline Conditions

7.24 There are no AQMAs declared in West Lindsey District Council or Bassetlaw District Council. Concentrations of nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}) are considered to meet the UK objectives across the District, which is rural with no large conurbations.

7.25 West Lindsey District Council undertakes routine ongoing monitoring of NO_2 as part of their Local Air Quality Management responsibilities under Part IV of the Environment Act (2021) (Ref 7-15) at 12 locations in the District.

7.26 All 12 existing NO_2 diffusion tube monitoring sites operated by West Lindsey District Council recorded concentrations below the relevant annual mean objective value of 40 micrograms per cubic metre ($\mu g/m^3$) since monitoring began (Ref 7-15). These monitoring locations are all in Gainsborough (approximately 5km west of the site) and Market Rasen (approximately 15km east of the site). Therefore, there are no monitoring locations surrounding the Scheme Boundary. Air quality monitoring using nitrogen dioxide diffusion tubes is currently being undertaken in the vicinity of the Site for a period of 3 months in order to inform model verification. These short term monitoring results will be adjusted following guidance in LAQM.TG (Ref 7-16) to produce annual mean equivalent concentrations. Locations have been selected on the basis of their suitability for model verification (which is their purpose) rather than public exposure, which will be predicted using the adjusted dispersion model.

Potential Effects and Mitigation

Construction

7.27 During construction (and to a lesser extent, decommissioning), the potential air quality impacts of the Scheme are considered to be:

- Impacts of dust arising during the construction and decommissioning phases of the Scheme; and

- Impacts of vehicle emissions during the construction and decommissioning phases of the Scheme.

7.28 The impacts of plant related emissions during construction are anticipated to represent a small source of emissions relative to ambient local conditions in the vicinity of the Site Boundary based on the scale of construction that will occur and the number of plant vehicles that will be required. An assessment of plant related emissions is therefore **scoped out**. Suitable mitigation measures for plant and motorised equipment will be recommended based on advice prescribed in in the IAQM (2014) (Ref 7-1) guidance and incorporated into the Framework CEMP.

7.29 On the basis of the above, a qualitative construction phase dust assessment and a quantitative construction phase local air quality assessment are **scoped in** and will be assessed further in the EIA.

Operation

7.30 During operation, no effects are anticipated due to the low number of vehicle movements anticipated to be required for maintenance. Due to the nature of the Scheme, no emissions of local air quality pollutants are anticipated from any on-site infrastructure. Draft NPS EN-3 (Ref 7-17) paragraph 2.54.10 states that:

> *"Once solar farms are in operation, traffic movements to and from the site are generally very light, in some instances as little as a few visits each month by a light commercial vehicle or car. Should there be a need to replace machine components, this may generate heavier commercial vehicle movements, but these are likely to be infrequent. Therefore, it is very unlikely that traffic or transport impacts from the operational phase of a project would prevent it from being approved by the Secretary of State."*

7.31 Therefore, further assessment of air quality impacts during operation of the Scheme is proposed to be **scoped out** of the EIA.

Sources of Information

7.32 The following sources of information will be reviewed and form the basis of the assessment of likely significant effects on air quality:

- Scheme Boundary as shown in Figure 1-1;
- Review of Defra Air Quality Background Concentration Maps (Ref 7-17);
- Examination of Local Authority Review and Assessment Reports (Ref 7-15); and
- AECOM's NO_2 diffusion tube monitoring survey.

Assessment Methodology

Qualitative construction phase dust assessment

7.33 The potential impacts from dust emissions arising from activities during the construction and decommissioning phases of the Scheme will be considered as part of the ES using an approach based on the IAQMs guidance (2014) (Ref 7-

1) for assessing impacts from such activities. This is a screening assessment and risk-based qualitative assessment approach and is applied for air quality assessments throughout the UK. Mitigation measures will be identified and incorporated into the Framework CEMP and Framework DEMP.

7.34 As part of this assessment, potential sensitive receptors will be identified for the construction and decommissioning of the Scheme based on a review of aerial photography, construction and decommissioning phasing plans and Ordnance Survey (OS) mapping, and with consideration to current guidance, including:

- Institute of Air Quality Management (IAQM) (2014) Guidance on the Assessment of Dust from Demolition and Construction (Ref 7-1); and
- Defra (2018) Local Air Quality Management Technical Guidance (TG16) (Ref 7-16).

Quantitative construction phase local air quality assessment

7.35 The anticipated number of vehicles that will be in operation during the construction and decommissioning phases of the Scheme will be considered in the context of the guidance published by Environmental Protection UK (EPUK) / IAQM (2017) (Ref 7-19), IAQM (2014) (Ref 7-1) and EPUK (2010) (Ref 7-20). The latter sets out the criteria to establish the need for an air quality assessment for the construction phase of a development as being "*Large, long-term construction sites that would generate large HGV flows (greater than 200 movements per day) over a period of a year or more*."

Sensitivity of receptor

7.36 Sensitive receptors for air quality are generally public exposure receptors (sensitive locations where relevant exposure for the air quality criteria being assessed could occur, e.g. residential properties or schools) and ecological sites sensitive to dust deposition and nitrogen deposition. There are some areas of Ancient Woodland that are potentially close enough (within 350m) to the Scheme Boundary to be considered as receptors for air quality, but all other ecological sites are a sufficient distance from the site as to be discounted as sensitive receptors. This selection will be confirmed with the ecology team and checked on receipt of the traffic data network.

7.37 The AQS objectives (as set out in the Air Quality Standards Regulations 2010) have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such the sensitivity of receptors was considered when setting the objectives and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

Magnitude of change

7.38 A comparison of the modelled concentration at each receptor between the with and without the Scheme will be undertaken. This magnitude of change at each receptor is classified as:

- Imperceptible – where the change in concentration is less than 0.2 $\mu g/m^3$ for NO_2 and PM_{10} and less than 0.1 $\mu g/m^3$ for $PM_{2.5}$;

- Very Small – where the change in concentration is more than 0.2 µg/m^3 for NO_2 and PM_{10} and more than 0.1 µg/m^3 for $PM_{2.5}$;
- Small – where the change in concentration is more than 0.6 µg/m^3 for NO_2 and PM_{10} and more than 0.3 µg/m^3 for $PM_{2.5}$;
- Medium – where the change in concentration is more than 2.2 µg/m^3 for NO_2 and PM_{10} and more than 1.1 µg/m^3 for $PM_{2.5}$; or
- Large – where the change in concentration is more than 4 µg/m^3 for NO_2 and PM_{10} and more than 2 µg/m^3 for $PM_{2.5}$.

Significance of effect

7.39 For consideration of a change in annual mean concentrations of a given magnitude, the EPUK and IAQM have published recommendations for describing the effects of such impacts at individual receptors, as set out in Table 7-2 and Table 7-3 for long-term average concentrations of all modelled pollutants. Moderate and major impacts are deemed to be significant impacts (coloured grey), negligible and minor are deemed to be not significant.

7.40 The EPUK / IAQM guidance includes seven explanatory notes to accompany the terminology for the effect descriptors. In particular, it is noted that the descriptors are for individual receptors only and that overall significance is determined using professional judgement. Additionally, it is noted that it is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the objective value. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the objective value, rather than being exactly equal to it.

Table 7-2: Effects Descriptors at Individual Receptors – NO_2 and PM_{10}

Long Term Average Concentration at Receptor in Assessment Year (µg/m^3)	Change in Concentration Relative to Air Quality Assessment Level (AQAL) (µg/m^3)				
	<0.2 (Imperceptible)	0.2 - <0.6 (Very Small)	0.6 - <2.2 (Small)	2.2 -<4.0 (Medium)	>4.0 (Large)
<30.2	Negligible	Negligible	Negligible	Minor	Moderate
30.2 - <37.8	Negligible	Negligible	Minor	Moderate	Moderate
37.8 - <41.0	Negligible	Minor	Moderate	Moderate	Major
41.0 - <43.8	Negligible	Moderate	Moderate	Major	Major
≥43.8	Negligible	Moderate	Major	Major	Major

7.41 A change in predicted annual mean concentrations of NO_2 or PM_{10} of less than 0.5% (0.2 µg/m^3) is considered to be negligible. A change (impact) that is negligible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

Table 7-3: Effects Descriptors at Individual Receptors – $PM_{2.5}$

Long Term Average Concentration at Receptor in Assessment Year (µg/m³)	Change in Concentration Relative to Air Quality Assessment Level (AQAL) (µg/m³)				
	<0.1 (Imperceptible)	0.1 - <0.3 (Very Small)	0.3 - <1.1 (Small)	1.4 - <2.0 (Medium)	>2.0 (Large)
<15.1	Negligible	Negligible	Negligible	Minor	Moderate
15.1 - <18.9	Negligible	Negligible	Minor	Moderate	Moderate
18.9 - <20.5	Negligible	Minor	Moderate	Moderate	Major
20.5 - <21.9	Negligible	Moderate	Moderate	Major	Major
≥21.9	Negligible	Moderate	Major	Major	Major

7.42 A change in predicted annual mean concentrations of $PM_{2.5}$ of less than 0.5% (0.1 µg/m³) is considered to be negligible. A change (impact) that is negligible, given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

7.43 Additionally, the EPUK / IAQM guidance also includes the potential for minor to major air quality effects as a result of changes in pollutant concentrations between 2% and 5% of relevant air quality objectives. For annual average nitrogen dioxide concentrations, this relates to changes in concentrations ranging from 0.6 – 2.1 µg/m³. In practice, changes in concentration of this magnitude, and in particular changes at the lower end of this band are likely to be very difficult to distinguish through any post operational monitoring regime due to the number of sources of nitrogen dioxide in an urban environment and the inter annual effects of varying meteorological conditions. Therefore, in the overall evaluation of significance the potential for significant air quality impacts within this band will be considered in this context.

7.44 Changes in concentration of more than 5% (the two highest bands) are considered to be of a magnitude that is far more likely to be discernible and as such carry additional weight within the overall evaluation of significance for air quality.

7.45 It is understood from the EPUK / IAQM guidance that it is the intention of the effect descriptors to capture the potential risk associated with cumulative developments, whereby changes of 1% of a relevant air quality objective could, under the EPUK / IAQM guidance, result in minor to moderate air quality effects at individual receptors. In practice, this assessment inherently considers cumulative impacts through the use of traffic data, Defra background concentrations and predictions at other development schemes. Therefore, it is considered highly unlikely that significant air quality impacts could occur with the Scheme for changes in concentrations of 1%.

7.46 The significance of the reported likely effects is then considered for the Scheme in overall terms. The potential for the Scheme to contribute to or interfere with the successful implementation of policies and strategies for the management of

local air quality are considered if relevant, but the principal focus is in determining the significance of any change to the likelihood of future achievement of the air quality objective values for NO_2, PM_{10} and $PM_{2.5}$.

7.47 The achievement of Local Planning Authority goals for local air quality management are directly linked to the achievement of the air quality objective values and as such this assessment focuses on the likelihood of future achievement of the air quality objective values as a result of the Scheme.

Assumptions, Limitations and Uncertainties

7.48 The dust risk assessment will be undertaken on a whole-site basis, assuming works can be undertaken at any point within the Scheme Boundary. This provides a worst-case assessment, ensuring that if works are undertaken in a different location than anticipated the assessment has covered this potential.

8. Climate Change

Introduction

8.1 This chapter sets out the approach to the assessment of the impact of the Scheme on the climate and the impact of climate change on the Scheme. The purpose of the assessment will be to identify and characterise any relevant climate change factors, to consider the nature and scale of potential impacts arising from and on the Scheme, and to assess the significance of any likely effects.

8.2 To align with the requirements of the EIA Regulations (Ref 8-1) and IEMA Guidance for assessing climate mitigation (Ref 8-2) and adaptation (Ref 8-3) in EIAs, consideration has been given within this chapter to three aspects of climate change assessment:

- **Lifecycle greenhouse gas (GHG) impact assessment**: the impact of GHG emissions arising from the Scheme on the climate over its lifetime;
- **In-combination climate change impact (ICCI) assessment**: the combined impact of the Scheme and future climate change on the receiving environment; and
- **Climate change resilience**: the resilience of the Scheme to climate change impacts.

Study Area

Lifecycle GHG Impact Assessment

8.3 The study area for the lifecycle GHG impact assessment covers all direct GHG emissions arising from activities within the Scheme Boundary undertaken as part of the Scheme during construction, operation and maintenance, and decommissioning. It also includes emissions arising outside the Scheme Boundary for example emissions embedded within the construction materials arising as a result of the energy used for their production, as well as emissions arising from the transportation of materials, waste and construction workers to and from site.

8.4 The study area also includes activities that may be avoided or displaced as a result of the Scheme such as other grid electricity production activities.

8.5 The environmental impact associated with GHG emissions is a national and global issue. Consequently, the potential significance of the proposed Scheme's lifecycle GHG emissions will be assessed by comparing the estimated GHG emissions from the Scheme against the reduction targets defined in the Climate Change Act 2008 (2050 Target Amendment) Order 2019 (Ref 8-4) and associated five year, legally binding carbon budgets. The Scheme's lifecycle GHG emissions will also be assessed by identifying whether the Scheme is aligned with the UK's trajectory to net zero, either directly or indirectly when compared to the baseline, as identified as best practice in IEMA Guidance.

In-Combination Climate Change Impact Assessment

8.6 The study area for the in-combination climate change impact assessment will be defined in each discipline's assessment within the ES, and includes all environmental receptors identified within the assessments undertaken by the environmental disciplines.

Climate Change Resilience Assessment

8.7 The study area for the climate change resilience assessment is the land within the Scheme Boundary, i.e., it covers the construction, operation and decommissioning of all assets and infrastructure which constitute the Scheme.

Relevant Legislation, Planning Policy and Guidelines

8.8 Legislation, planning policy and guidance relating to climate change and pertinent to the Scheme includes:

Legislation

- The Climate Change Act (2008) (Ref 8-5) and Climate Change Act (2050 Target Amendment Order 2019) (Ref 8-4). The Climate Change Act 2008 set a legally binding target for the UK to reduce its GHG emissions from 1990 levels by at least 80% by 2050. This target is supported by a system of legally binding five-year 'carbon budgets' and an independent body to monitor progress, the Climate Change Committee (CCC). The UK carbon budgets restrict the amount of GHG emissions the UK can legally emit in a defined five-year period. The Act was amended in 2019 to revise the existing 80% reduction target and legislate for Net Zero emissions by 2050 (through the Climate Change Act 2008 (2050 Target Amendment) Order 2019).
- The Carbon Budgets Order 2009 (Ref 8-6). This sets the carbon budget totals for the First (2008-2012), Second (2013-2017) and Third (2018-2022) Carbon Budget periods.
- Carbon Budget Order 2011 (Ref 8-7). This Order sets the carbon budget total for the Fourth (2023-2027) Carbon Budget period.
- Carbon Budget Order 2016 (Ref 8-8). This Order sets the carbon budget total for the Fifth (2028-2032) Carbon Budget period.
- The Carbon Budget Order 2021 (Ref 8-9). This sets the carbon budget total for the Sixth (2033-2037) Carbon Budget period.

International Planning Policy

- The Paris Agreement (Ref 8-10) is a legally binding agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with GHG emissions mitigation, adaptation and finance starting in the year 2020. It requires all signatories to set a target, known as a nationally determined contribution (NDC) and to strengthen their climate change mitigation efforts to keep global warming to well below 2°C this century and to pursue efforts to limit global warming to 1.5°C. The agreement contains a 'ratchet' mechanism by which NDCs must be strengthened every five years.

The UK updated its NDC in the first half of 2021. Under Article 7, the agreement requires all signatories to engage in adaptation planning and implementation.

National Planning Policy

- National Planning Statement for Energy (NPS EN-1) (Ref 8-11), with particular reference to paragraphs 2.2.6, 2.2.9 and 4.8.2 in relation to climate impacts and adaptation; paragraphs 4.1.3 to 4.1.4 in relation to adverse effects and benefits; paragraphs 4.2.1, 4.2.3, 4.2.4, 4.2.8 to 4.2.10 and 5.1.2 in relation to EU Directive and ES requirements; paragraphs 4.5.3 and 4.8.1 to 4.8.12 in relation to adaptation measures in response to climate projections; and paragraphs 5.7.1 to 5.7.2 in relation to climate projections, flood risk and the importance of relevant mitigation. The draft overarching National Policy Statement for Energy (EN-1) (Ref 8-12) includes guidance for the appraisal of sustainability in paragraph 1.7.4, climate change adaptation in paragraphs 4.9.1 to 4.9.14, net zero in paragraphs 2.2.1 to 2.2.5 and generic impacts on the climate in Part 5.3.
- National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (Ref 8-13) – paragraph 2.4.1 regarding NPS EN-1 and the importance of climate change resilience, and paragraph 2.4.2 in relation to ES requirements regarding climate change resilience. The draft overarching National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref 8-14) includes considerations for climate change adaptation and resilience in paragraphs 2.6.1 and 2.6.2.
- NPPF (Ref 8-15) – paragraphs 8, 20 and 149 in relation to adaptation, mitigation and climate change resilience; paragraphs 148 and 157 in relation to flood risk and damage to property and people; paragraphs 150 and 153 in relation to reduction of CO_2 emissions through design and reduced energy consumption; and paragraphs 155 to 165 in relation to climate projections, associated flood risk and adaptation.

National Planning Practice Guidance

- Planning Practice Guidance, Climate Change (Ref 8-16).

Local Planning Policy

- Central Lincolnshire Local Plan (Ref 8-17) – vision ‘m’ on climate change effects and energy, including developing the area’s renewable energy resources and to reduce greenhouse gas emissions from the area. Section 5.3 explores climate change and low carbon living, recognising the causes of climate change from greenhouse gas emissions and the need for adaptation to the effects of climate change. Policy LP18 (Climate Change and Low Carbon Living) states that proposals will be considered more favourably if a Scheme makes a positive contribution towards a number of elements, including energy production, carbon off-setting, resource efficiency and reducing demand. Particular reference is made to the positive contribution of renewable energy infrastructure in supporting a move towards net zero. The emerging Central Lincolnshire Submission Local Plan (2022) sets out policies to address challenges relating to climate change, such as to minimise the effects of climate change and minimise vulnerability. Policy

S14 specifically relates to renewable energy to support the transition of Lincolnshire to a net zero future. Policy S16 recognises the need to support, in principle, the need for significant investment in new and upgraded energy infrastructure subject to the mitigation of any harm arising from such proposals.

- Policy DM10 of the Adopted Bassetlaw Local Plan (Ref 8-18) states that the Council will be supportive of proposals that seek to utilise renewable and low carbon energy to minimise CO_2 emissions subject to meeting various criteria. Policy ST50 of the Bassetlaw Submission Plan sets out policies to reduce carbon emissions, climate change mitigation and adaptation.

8.9 The national planning policies identify the requirement for consideration of climate change resilience. Climate projections should be analysed, and appropriate climate change adaptation measures considered throughout the design process. Specific climate change risks identified within these policies include flooding, drought, coastal change, rising temperatures and associated damage to property and people.

8.10 Local planning policies identify the importance of tackling climate change by reducing GHG emissions and highlight the need to consider and, where appropriate, mitigate GHG emissions associated with new development. New development should aim for reduced or zero-carbon development by incorporating renewable or low-carbon energy sources and maximising energy efficiency where practicable, and should build in resilience to projected climate change impacts. Local policy clearly supports development of new renewable projects to help reduce the use of fossil fuels and to support the transition to net zero.

Other Relevant Guidance

- Providing for Lincolnshire's Future (2005) (Ref 8-19) – A Sustainability Framework incorporating Environmental Stewardship Strategy – a key objective under the sustainability vision is to effectively protect the environment which will take into consideration impacts to global climate from greenhouse gas emissions.
- Lincolnshire County Council Carbon Management Plan (2019) (Ref 8-20) – Chapter 2 considers the importance of carbon management and drivers for tackling climate change. Chapter 4 identifies carbon management projects and the importance of prioritising opportunities for carbon emission savings across the County.

Baseline Conditions

Lifecycle GHG Impact Assessment

8.11 For the GHG assessment, the baseline is a 'business as usual' scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the Scheme Boundary of the existing activities, as well as the emissions that may be avoided as a result of the Scheme, i.e., existing emissions from the generation of grid electricity if the Scheme does not go ahead.

8.12 The current land use within the site consists of arable land, minor watercourses, managed hedgerows and trees. Trees within the site are present as individuals and within small woodland areas. The abundance of vegetation within the site suggests a relatively high carbon sink potential. Also, current land use within the Scheme Boundary has minor levels of associated GHG emissions as the land use is largely agricultural. Baseline agricultural GHG emissions are dependent on soil and vegetation types present, and fuel use for the operation of vehicles and machinery.

In-Combination Climate Change Impact Assessment

8.13 The receptors for in-combination climate change impact are receptors within the surrounding environment that will be impacted by the Scheme in combination with future climatic conditions. Baseline conditions for the in-combination climate change impact assessment are determined using the climate change projections data.

8.14 An initial review of UK Climate Projections 2018 (UKCP18) data (Ref 8-21) under the high emissions RCP8.5 scenario and using the 50% confidence level has been done, For the 25km grid square (487500.00, 387500.00) within which the Scheme is located, projections suggest that by the 2050s time period (2040 – 2069), the region could experience an increase of around 2.2°C in the summer mean air temperature at 1.5m above ground and an increase of 1.6°C in the winter mean air temperature at 1.5m above ground, compared to a 1981-2010 baseline period. For the same time period, summer mean precipitation is expected to decrease by around 19%, whilst in winter it is expected to increase by 7%.

Climate Change Resilience Assessment

8.15 The baseline for the Climate Change Resilience (CCR) assessment will consider previous climate conditions at the site determined from historic data from the Met Office along with future climate conditions at the site determined using the Met Offices United Kingdom Climate Change Projections 2018 (UKCP18) (Ref 8-21). The receptor for climate change resilience is the Scheme itself, including its construction, operation and decommissioning. The climate resilience assessment will provide a description of how the Scheme will be designed to be more resilient to the climate change impacts.

8.16 A more detailed assessment of climate change projections will be conducted for the land within the site as part of the ES.

Potential Effects and Mitigation

Lifecycle GHG Impact Assessment

8.17 In line with IEMA guidance for assessing the significance of GHG emissions from a project, it is considered that any increase in GHG emissions compared to the baseline has the potential to have an impact, due to the high sensitivity of the receptor (global climate) to increases in GHG emissions. Table 8-1 provides the lifecycle stages, related activities and primary emission sources to be considered for the GHG assessment.

Table 8-1: Potential sources of GHG emissions

Lifecycle stage	Activity	Primary emission sources
Product stage	• Raw material extraction and manufacturing of products required to build the equipment for the Scheme. Due to the complexity of the equipment, this stage is expected to make a significant contribution to overall GHG emissions. • Transportation of materials for manufacturing.	• Embodied GHG emissions from energy use in extraction of materials and manufacture of components and equipment. • Emissions of GHG from transportation of products and materials.
Construction process stage	• On-site construction activity including emissions from construction compounds. • Transportation of construction materials (where these are not included in product-stage. • Travel of construction workers.	• Consumption of energy (electricity; other fuels) from plant, vehicles, generators and worker travel. • Fuel consumption from transportation of materials to site, where these are not included in product-stage embodied emissions. Due to the nature of the equipment, this could require shipment of certain aspects over significant distances.
	• Disposal of waste materials generated by the construction process. • Land use change. • Water use.	• GHG emissions from transportation and disposal of waste. GHG emissions from net loss of carbon sink. Provision of clean water, and treatment of wastewater.
Operation stage	• Operation and maintenance of the Scheme.	• GHG emissions from any energy consumption, provision of clean water and treatment of wastewater. These operational emissions are expected to be negligible in the context of the overall GHG impact. • Leakage of potent GHGs, such as SF_6, during operation. These emissions are also expected to be negligible as most gas insulated components are sealed-for-life and contain minimal SF_6. • GHG emissions from material use and waste generation resulting from ongoing site maintenance. Emissions from routine maintenance are expected to

		be negligible, but the periodic replacement of components has the potential to have significant impacts given the complexity of the equipment involved.
Decommissioning stage	• On-site decommissioning activity. • Transportation and disposal of waste materials. • Worker travel.	• Consumption of energy (electricity and other fuels) from plant, vehicles and generators on site. • Emissions from the disposal and transportation of waste. This has the potential to be significant give the complexity of the equipment. • GHG emissions from transportation of workers to site.

8.18 A range of best practice construction measures will be incorporated into the Framework CEMP, such as:

- Specification of alternative choice of materials with lower embodied GHG emissions; and
- Low-carbon design specifications such as energy-efficient lighting and durable construction materials to reduce maintenance and replacement cycles.

8.19 The final selection of any mitigation measures, if required, will be detailed as part of the lifecycle GHG impact assessment in the ES. This may include GHG emission mitigation measures concerning construction, operation and decommissioning of the Scheme.

8.20 A lifecycle GHG impact assessment has therefore been **scoped in** and will be assessed further in the EIA.

In-Combination Climate Change Impact Assessment

8.21 In-combination climate impact assessment identifies how the resilience of various receptors in the surrounding environment is affected by a combination of future climate conditions and the Scheme. The climate parameters relevant to the Scheme are detailed in Table 8-2 below together with the rationale for scoping.

Table 8-2: Climate parameters for the in-combination climate change impact assessment of the Scheme

Parameter	Scoped in/ out	Rationale for scoping conclusion
Temperature change	Out	While impacts are expected as a result of projected temperature increases, these temperature increases in combination with the Scheme are not expected to have a significant impact upon receptors identified by other environmental disciplines.

Sea level rise	Out	The Scheme is not located in an area that is susceptible to sea level rise.
Precipitation change[3]	Out	Climate change may lead to an increase in substantial precipitation events that could lead to flash flooding or changes to groundwater levels. However, no significant impacts on surface water or groundwater levels are expected as a result of precipitation changes, in combination with the Scheme, as the flow of precipitation to ground will not be significantly hindered. The Scheme, in combination with projected changes in precipitation, is also not expected to have a significant impact upon receptors identified by other environmental disciplines.
Wind	Out	The Scheme, in combination with projected changes in wind patterns, is not expected to have a significant impact upon receptors identified by other environmental disciplines.

8.22 Based on the information presented in Table 8-2, on the basis that any identified in-combination climate change impacts will be address in other relevant chapters of the ES and supporting planning documents, an in-combination climate change impact assessment is proposed to be **scoped out** of the EIA.

Climate Change Resilience Assessment

8.23 Climate parameters relevant to the climate change assessment are detailed in Table 8-3 below.

Table 8-3: Parameters scoped into the climate change resilience review

Parameter	Scoped in/ out	Rationale for scoping conclusion
Extreme weather events	In	The Scheme may be vulnerable to extreme weather events such as storm damage to structures and assets.
Temperature	In	Extremes in temperatures may result in heat stress of materials and structures.
Precipitation	In	The Scheme may be vulnerable to changes in precipitation, for example, land subsidence and damage to structures and drainage systems during periods of heavy rainfall.
Wind	In	The Scheme may be vulnerable to changing wind patterns, for example, high winds and falling trees could damage structures and assets
Sea level rise	Out	The Scheme is not located in an area that is susceptible to sea level rise.

8.24 Based on the information presented in Table 8-3, a climate change resilience assessment is proposed to be **scoped in** and will be assessed further in the EIA.

8.25 The climate change resilience review will qualitatively assess the Scheme's resilience to climate change. This will be completed in liaison with the project

design team and the other EIA technical disciplines by considering the climate projections for the geographical location and timeframe of the Scheme.

8.26 A statement will be provided within the ES to describe how the Scheme will be adapted to improve its resilience to future climate conditions.

Sources of Information

Lifecycle GHG Impact Assessment

8.27 Where available, data required to undertake the lifecycle GHG impact assessment will be provided by the project design team and analysed using the methodology outlined below in this section. Where data is unavailable, reasonable worst case assumptions will be made based on professional judgement, details of which will be outlined in the ES.

Climate Change Resilience Review

8.28 Historic climate data will be obtained from the Met Office website (Ref 8-21) to determine the historic baseline conditions. In line with NPS EN1 requirements to use the latest credible scientific evidence in relation to climate change, UK Climate Projections 2018 (UKCP18) (Ref 8-22) data will be obtained to determine the future baseline conditions.

8.29 CCR measures will be built into the Scheme design when determined through liaison with the project design team and relevant environmental discipline leads.

Assessment Methodology

Lifecycle GHG Impact Assessment

8.30 For the GHG assessment, the baseline is a ‘business as usual’ scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the Scheme Boundary of the existing activities on-site, as well as the emissions that may be avoided as a result of the Scheme, i.e., existing emissions from the generation of grid electricity if the Scheme does not go ahead.

8.31 The current land use within the site consists of arable land, minor watercourses, managed hedgerows and trees. Trees within the Site are present as individuals and within small woodland areas. The abundance of vegetation within the Scheme Boundary suggests a relatively high carbon sink potential. Also, current land use within the Scheme Boundary has minor levels of associated GHG emissions as the land use is largely agricultural. Baseline agricultural GHG emissions are dependent on soil and vegetation types present, and fuel use for the operation of vehicles and machinery.

8.32 The GHG assessment will follow a project lifecycle approach to calculate estimated GHG emissions arising from the construction, operation and decommissioning of the Scheme and to identify GHG ‘hot spots’ (i.e., emissions sources likely to generate the largest amount of GHG emissions). This will enable the identification of priority areas for mitigation in line with the principles set out in IEMA guidance.

8.33 In line with the World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines (Ref 8-23), the GHG assessment will be reported as tonnes of carbon dioxide equivalent (tCO_2e) and will consider the seven Kyoto Protocol gases:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Sulphur hexafluoride (SF_6);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF_3).

8.34 Expected GHG emissions arising from the construction activities, embodied carbon in materials and operational emissions of the Scheme, as well as baseline emissions, will be quantified using a calculation-based methodology as per the following equation, and aligned with the GHG Protocol:

Activity data x GHG emissions factor = GHG emissions

8.35 Primary data sources for calculating GHG emissions include the Defra 2021 emissions factors (Ref 8-24) and embodied carbon data from the University of Bath Inventory of Carbon and Energy (ICE) (Ref 8-25).

8.36 The following significance criteria in Table 8-4 will be used to determine the projects whole life GHG emissions and how these align with the UK's net zero compatible trajectory. When evaluating significance of the GHG emissions, all new GHG emissions contribute to a negative environmental impact; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible. The crux of significance therefore 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. In the context of a solar scheme, this will likely be a comparison of the estimation of the electricity generation from the Scheme to the emissions associated with the grid-mix electricity generation baseline scenario.

8.37 Major or moderate adverse effects and beneficial effects are considered to be significant. Minor adverse and negligible effects are not considered to be significant.

Table 8-4: Significance criteria

Level of significance	Description
Major adverse	The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in

	emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
Moderate adverse	The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
Minor adverse	The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
Negligible	The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
Beneficial	The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

8.38 The UK carbon budgets are currently only available to 2037 (6th Carbon Budget). Where further carbon budgets are not available (7th, 8th and 9th Carbon Budget periods), these will be projected based on data published by the CCC. Totals for these periods have not been approved or ratified and aren't legally binding, but indicative figures can provide valuable context at this stage.

Climate Change Resilience Assessment

8.39 The Scheme's resilience to climate change will be completed in liaison with the project design team and the other ES technical specialists by considering the climate projections for the geographical location and timeframe of the Scheme. Assessment will be undertaken in line with 2020 IEMA guidance (Ref 8-3) on climate change resilience. In line with best practice from IEMA, the significance of climate resilience will not be assessed, instead a statement will be provided to describe how the Scheme has been designed to be as resilient as is reasonably practicable to future climate change.

8.40 The baseline for the CCR assessment will consider previous climate conditions for the Scheme determined from historic data from the Met Office along with future climate conditions at the site determined using the Met Offices United Kingdom Climate Change Projections 2018 (UKCP18). The receptor for climate change resilience is the Scheme itself, including its construction, operation and decommissioning. The climate resilience assessment will provide a description of how the Scheme will be designed to be more resilient to the climate change impacts.

8.41 A more detailed assessment of climate change projections will be conducted for the land within the Scheme Boundary as part of the ES.

Assumptions, Limitations and Uncertainties

8.42 The Scheme's resilience to climate change will be completed in liaison with the project design team and the other ES technical specialists by considering the climate projections for the geographical location and timeframe of the Scheme. Assessment will be undertaken in line with 2020 IEMA guidance on climate change resilience. The significance of climate resilience will not be assessed.

8.43 The ES will set out how the Scheme has been designed to be as resilient as is reasonably practicable to future climate change.

9. Cultural Heritage

Introduction

9.1 This chapter sets out the approach to the assessment of the Scheme's impacts on cultural heritage (comprising built heritage, archaeology and the historic landscape). The purpose of the assessment will be to identify and characterise any relevant cultural heritage resources, to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.

Study Area

9.2 The study area will extend to a distance of 3km from the Scheme Boundary for designated assets and 1km for non-designated assets. This will allow for all cultural heritage assets to be set within their wider context and allow for the assessment of archaeological potential within the Scheme Boundary.

9.3 A flexible approach will be taken whereby the study area for high value designated assets may be extended to 5km where an impact on setting has been identified. Assets beyond this distance may also be considered, where identified as necessary by the county archaeologist or other ES chapter authors. This will be guided by the Scheme's Zone of Theoretical Visibility (ZTV) (to be prepared as part of *Chapter 13: Landscape and Visual Amenity* of this EIA Scoping Report) but will also consider physical and historical connectivity and relationships with other monuments and the wider landscape.

Relevant Legislation, Planning Policy and Guidelines

9.4 Legislation, planning policy and guidance relating to cultural heritage and pertinent to the Scheme comprises:

Legislation

- Infrastructure Planning (Decisions) Regulations 2010 (Ref 9-1);
- Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 9-2), with specific reference to sections 66 and 72 that set out the principal statutory provisions that must be considered in the determination of any application affecting listed buildings and conservation areas; and
- Ancient Monuments and Archaeological Areas Act 1979 (amended by the National Heritage Act 1983 and 2002) (Ref 9-3), which imposes a requirement for Scheduled Monument Consent for any works of demolition, repair, and alteration that might affect a designated Scheduled Monument.

National Planning Policy

- The overarching NPS for Energy (EN-1) (Ref 9-4) sets out the overall national planning policy for delivering major energy policy for delivering major energy infrastructure. Part 5 of the document sets out guidance on generic impacts for the Applicant's assessment and decision making on the

application. These impacts concern, amongst other matters, the historic environment. Section 5.9 provides further detail on the assessment of the historic environment and requires Applicants to identify the significance of an asset (both designated and non-designated) and to establish the potential impact. Guidance is given on means of reducing any impact which should be considered through the design process. Consideration wll also be given to Section 5.9 of the emerging NPS EN-1 (Ref 9-5) with respect to the historic environment;

- In considering the impact on the historic environment as set out in Section 5 of NPS EN-1 and whether it is satisfied that the substantial public benefits would outweigh any loss or harm to the significance of a designated asset, NPS EN-3 (Ref 9-5) states in paragraph 2.12.4 that the Infrastructure Planning Commission (IPC) should take into account the positive role that large-scale renewable projects play in the mitigation of climate change, the delivery of energy security and the urgency of meeting net zero;
- Relevant policies within the draft NPS EN-3 will also be considered. This seeks to introduce national policies in relation to solar photovoltaics with Section 2.53 setting out specific considerations in relation to cultural heritage. Paragraph 2.53.2 states that:

  "The impacts of solar PV developments on the historic environment will require expert assessment in most cases. Solar PV developments may affect heritage assets (sites, monuments, buildings, and landscape) both above and below ground. Above ground impacts may include the effects of applications on the setting of Listed Buildings and other designated heritage assets as well as on Historic Landscape Character. Below ground impacts may include direct impacts on archaeological deposits through ground disturbance associated with trenching, cabling, foundations, fencing, temporary haul routes etc. Equally archaeological finds may be protected by a solar PV farm as the site is removed from regular ploughing and shoes or low-level piling is stipulated."

- NPS EN-5 (Ref 9-7) provides the primary policy for decisions relating to electricity networks infrastructure. Under Section 2 of the document, Applicants are reminded that site selection needs to have regard to Section 9 of the Electricity Act 1989, which requires new electricity networks infrastructure to have regard to the desirability of protecting sites, buildings and objects of architectural, historic or archaeological interest and that they do what they reasonably can to mitigate any effects on them. Section 2.11.14 highlights the potential disruptive effects to archaeological and heritage sites of underground works. Draft NPS EN-5 (Ref 9-7) retains the same stance in paragraph 2.2.5 as the current NPS EN-5 with respect to new electricity network infrastructure having regard to the protection of cultural heritage; and
- The NPPF (Ref 9-8), with particular reference to Section 16: Conserving and Enhancing the Historic Environment, sets out the Government's planning policies for England and how these should be applied to contribute to the achievement of sustainable development. The NPPF sets out the importance of being able to assess the significance of heritage assets that may be affected by a development. Paragraph 194 of the NPPF states that in

determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. Paragraphs 199 to 203 of the NPPF introduce the concept that heritage assets can be harmed or lost through alteration, destruction or development within their setting. This harm ranges from less than substantial through to substantial.

National Planning Practice Guidance (2021)

- Planning Practice Guidance, specifically Section 16: Conserving and enhancing the historic environment (Ref 9-9). The PPG is an interactive on-line document that provides further advice and guidance to accompany policies in the NPPF.

Local Planning Policy

9.5 The Central Lincolnshire Local Plan 2012-2036 (Ref 9-10) was adopted by the Central Lincolnshire Joint Strategic Planning Committee (CLJSPC) on 24 April 2017.

9.6 The strategy for the historic environment is achieved through the implementation of Policy LP25. The key points are:

- 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;
- 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; and
- 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.

9.7 Policy S57 of the emerging Central Lincolnshire Submission Local Plan (Ref 9-11) sets out how development proposals should protect, conserve, and seek opportunities to enhance the historic environment of Central Lincolnshire.

9.8 Bassetlaw Core Strategy & Development Management Policies DPD (Ref 9-12) was adopted by Bassetlaw District Council on 22 December 2011. The strategy for the historic environment is achieved through the implementation of Policy DM8: The Historic Environment.

9.9 The key points are:

- Support will be given to development proposals or regeneration schemes (particularly in central Worksop, Retford and Tuxford) that protect and enhance the historic environment;
- Such proposals must recognise the significance of heritage assets as a central part of the development; and
- There will be a presumption against development, alteration, advertising or demolition that will be detrimental to the significance of a heritage asset.

9.10 The setting of an asset is an important aspect of its special architectural or historic interest and proposals that fail to preserve or enhance the setting of a heritage asset will not be supported.

Other Relevant Guidance

- Historic England has published a series of Good Practice Advice (GPA) of which those of most relevance to this appraisal are: GPA2 - Managing Significance in Decision-taking (March 2015) (Ref 9-13); GPA3 - The Setting of Heritage Assets (2nd Edition) (December 2017) (Ref 9-14); and Advice Note 12 Statements of Heritage Significance (Oct. 2019) (Ref 9-15). GPA2 emphasises the importance of having a knowledge and understanding of the significance of heritage assets likely to be affected by the development and that the 'first step for all applicants is to understand the significance of any affected heritage asset and, if relevant the contribution of its setting to its significance' (para 4). Early knowledge of this information is also useful to a local planning authority in pre-application engagement with an applicant and ultimately in decision making (para 7). GPA3 (Second Edition) provides advice on the setting of heritage assets and consolidates and supersedes earlier advice on that matter published by Historic England in 2015 and 2011.
- Historic England have also produced specific guidance relating to Commercial Renewable Energy Development and the Historic Environment. Historic England Advice Note 15 (2021), which describes the potential impacts on the historic environment of commercial renewable energy proposals (Ref 9-16).
- Documents produced by the Chartered Institute for Archaeologists (CifA), including Standard and Guidance for Historic Environment Desk-Based Assessment (Ref 9-17) and the Code of Conduct (Ref 9-18), which provide industry best practice when working within the historic environment.
- Institute of Environmental Management and Assessment (IEMA), the Institute of Historic Building Conservation (IHBC) and the Chartered Institute for Archaeologists (CifA), Principles of Cultural Heritage Impact Assessment in the UK (Ref 9-19).

Baseline Conditions

9.11 To assist with the scoping assessment, data has been considered form the National Heritage List (Ref 9-20), the Lincolnshire and Nottinghamshire Historic Environment Records (HERs), and the Nottinghamshire HER to gain an understanding of the designated and non-designated built heritage assets within the study area.

Summary of Designated Heritage Assets

9.12 Elements of two Scheduled Monuments extend into the redline boundary of the Scheme Boundary:

- The Fleet Plantation moated site (NHLE 1008594) which lies within the redline boundary of the Cable Route Corridor Search Area, just to the south of Cottam power station.

- Harpswell Hall – (NHLE 1019068) is a post medieval house and gardens which overlies earlier (medieval) remains. The remains constitute a number of earthworks and buried remains of the hall and associated garden, many of which are visible at ground level. It is worth noting that the designated portion of the asset appears to sit just outside of the redline boundary of the main solar element of The Scheme, however the wider extent of the asset, as indicated in the Lincolnshire HER (MLI51004) sits just inside it. For this reason, the asset is being treated as if it is within the redline boundary.

9.13 In addition, there are a further 17 designated assets which sit within the 1km study area of the Scheme, but outside of the Scheme Boundary. These rangefrom Roman to Post Medieval in date, with the majority being Medieval (1066–1504AD). These are illustrated on Figure 1-2 and include:

- A Moated manorial complex immediately northwest of Elm Tree Farm (NHLE 1016920), which lies approximately 800m to the west of the Principal Site;
- Near to this (also outside of the Scheme Boundary) is the post-medieval Dovecote at Elm Tree Farm (NHLE 1020196);
- The site of Torksey medieval town (NHLE 1004991) in Nottinghamshire, which lies to the far south east of the Scheme near the River Trent and close to Cottam sub-station, just outside of the Cable Route Corridor Search Area (to its east);
- The Roman fort south of Littleborough Lane (NHLE 1004935) is located on the eastern side of the River Trent, approximately 530m to the north west of the Cable Route Corridor Search Area;
- The scheduled Roman town of Segelocum (NHLE 1003669) is on the western bank of the River Trent, approximately 2km to the west of the Cable Route Corridor Search Area. This asset, along with the one listed above, relate to evidence for extensive Roman (AD43 – 409) presence within the study area; and
- The post-medieval remains of the ruins of a 16th century (post-medieval) Elizabethan mansion (NHLE 1005056), which lies to the far south east of the Scheme near the River Trent and close to Cottam sub-station, just outside of the Cable Route Corridor Search Area (to its east).

9.14 Within the study area, there are also approximately 185 listed buildings. These tend to cluster in / near the villages which run along the A156, the B1241 and the B1398 with significant clusters around Gate Burton, Marton, Torksey, Corringham, Upton, Stow, Hemswell, Glentworth, Fillingham, Ingham, Springthorpe and Brattleby. Of these, Hemswell, Glentworth, Springthorpe and Fillingham are also designated conservation areas.

9.15 The listed buildings consist of 15 Grade I buildings and 14 Grade II* buildings, with the remainder Grade II buildings. Included in these is the Grade I listed Fillingham Castle (NHLE 1166045) that also lies within a Grade II registered park and garden (NHLE 1000977). A second registered park and garden lies to the east at Norton Place (Grade II; NHLE 1470334).

Summary of Non-Designated Heritage Assets

9.16 In addition to the designated assets, the HER records that there are approximately 400 non-designated archaeological assets, nearly 180 non-

designated buildings of historical interest and two non-designated gardens of historic interest, within the 1km study area. Assets recorded on the HER range in date from the Middle Palaeolithic (70000-40000 BC) to the modern period (1900 to present).

9.17 Evidence of the prehistoric periods include flint nodules found on the bed of the River Trent (MNT5792) which showed clear evidence of being worked and are thought to date from as early as the Middle Palaeolithic. Flint artefacts including near Springthorpe (MLI51357) and near Rampton (MNT11694) date to the Mesolithic period (10000 – 3500 BC), whilst stone axes (MLI 52528, 52495 and 52435) near Torksey and Stow represent Neolithic activity in the area. The Bronze Age (2500 – 700 BC), is relatively well represented with evidence of Bronze Age settlement and funerary activities around Rampton (MNT26008, 11695 and 11694). Other finds of this period include two bronze axes, one (MLI50983) being found near Hemswell and the other (MLI510455) being located south of the River Trent near Cottam power station. There is significant increase in evidence of the development of the area during the Iron Age (700BC – AD43), particularly in the later phase of the period leading into the transition into the Roman period (AD43 – AD409). This includes settlement sites at Rampton (MNT10528, 10526, 10525, 26007 and 11692) as well as occupation and funereal activity near Harpswell (MLI86049). The study area is crossed by Till Bridge Lane, a Roman road (MLI50575) linking Ermine Street north of Lincoln to a ford crossing the River Trent at Matron to Segelocum Roman town (1003669). Evidence of settlement (MLI51369, MLI84315, MLI51104, MNT11703), agricultural practices (MLI52472, MLI125068) and a military presence in the form of forts (1004935, MLI50544), as well as numerous individual finds, contribute to the understanding of the significance of the Roman presence in this area.

9.18 There is evidence of development of the landscape through the early medieval (AD409 – 1066) period. Early Medieval activity is attested to in small number of find spots chiefly focused around Torksey (MLI507489). The reason for this is that Torksey is the site of the winter camp of the Viking Great Army (MLI25067). Extensive scatters of early medieval metalwork and coins have been found in the area. A possible small cemetery was identified to the west of the site overlooking the River Trent. A surface scatter of some seventy fragments of human bone was recovered from an area of about fifty square metres.

9.19 A number of the villages in the area have origins in the medieval period (1066 – 1500), along with evidence for deserted medieval settlements and widespread evidence of ridge and furrow (e.g. MLI52538). Many of the extant settlements, such as the extant villages of Torksey, Glentworth and Kexby have origins during this time and remnants of these changes are preserved in the landscape. The remains of a moated site at Fleet plantation dates to the medieval period (1008594). Heyning Priory (1008685) was founded in AD1135 and survives as scheduled earthworks. Many of the churches within the study area, such as St Margaret's Church in Marton (1064050), also have their origins in the medieval period.

9.20 Archaeological evidence of post-medieval (1500–1900) date comprises the sites of domestic buildings and farms / farm outbuildings as well as industrial activity including windmills, quarries, kilns, and brick yards. In addition, the majority of the built heritage assets within the study area date to the post-medieval period. The historic landscape also underwent change during this period, including

changes is agricultural practices and transport improvement, such as the arrival of the railway. Notable during this period was the establishment of the parklands at Fillingham and Norton Place in the late 18th century, with their wider estates also marking changes in the landscape.

9.21 Evidence of modern (1900 – present) date is largely limited to improvements to buildings and infrastructure.

Potential Effects and Mitigation

9.22 There are a number of designated and non-designated heritage assets within the study area that may be affected by the Scheme, which may include:

- Partial or total removal of heritage assets;
- Compaction of archaeological deposits by construction traffic and structures; and
- Effects upon the significance of a heritage asset due to changes to its setting.

9.23 In terms of buried archaeology, there is potential for previously unrecorded archaeological deposits to survive within the Scheme Boundary. These remains could potentially be affected during excavation works required during construction including, but not limited to, the construction of the solar module mounting structures, the foundations of any on-site infrastructure (such as transformers, inverters, battery storage and sub-stations), trenches for cabling and the establishment of a construction compounds and access tracks. The setting of archaeological assets may also be affected. Once the Scheme is operational, further impacts on buried archaeology are not anticipated, although there may still be impacts on the setting of archaeological assets.

9.24 In terms of built heritage, there is potential for effects on the setting of built heritage assets within the study area to be impacted during construction and operation of the Scheme.

9.25 On the basis of the above, given the potential for effects on both buried archaeology and built heritage during construction, operation and decommissioning, cultural heritage is **scoped in** and will be assessed further in the EIA.

Source of Information

9.26 Sources of information that will be consulted include:

- National Heritage List for England (NHLE) database;
- Lincolnshire and Nottinghamshire Historic Environment Records (HERs) and Historic Landscape Characterisation (HLC);
- Various online resources including the British Geological Survey (BGS) Geology of Britain Viewer (Ref 9-21) and the local planning portal for the Local Plan and other planning information;
- Published and unpublished literature (including a detailed review of reports for previous fieldwork carried out within the proximity to the Scheme Boundary);
- Existing geotechnical data;

- Available LiDAR and aerial photography;
- Documentary, cartographic and other resources as deposited within the local Archives and Local Studies Library and the National Archives at Kew;
- Local Planning Authority Plans, Guidance and Lists.

9.27 Consultation will be undertaken with the following bodies as part of the assessment process:

- The County Archaeologists for Lincolnshire and Nottinghamshire
- Relevant Conservation Officers; and
- Historic England.

Walkover Survey

9.28 A walkover survey will be undertaken including a survey of known archaeological and built heritage assets within the Scheme Boundary and the immediate vicinity to record their survival, extent, condition, setting and significance.

9.29 A site visit will also be undertaken to the wider 3km study area to assess the setting of assets which could potentially be affected by the Scheme. This visit will establish the key features of the asset's setting, alongside any intervisibility with the Scheme or between assets.

Field Investigation

9.30 The desk-based research will be supported by a programme of archaeological evaluation and survey. An initial geophysical survey will be undertaken within all areas of the Scheme Boundary that are suitable for survey and where land access can be obtained by way of landowner agreement. Where access cannot be obtained for this initial assessment, survey and / or evaluation work (as appropriate) will take place at a later date, once access has been arranged, but prior to main works commencing.

9.31 Further archaeological evaluation and detailed setting assessments will be undertaken as part of the assessment process. The precise scope and nature of the archaeological evaluation work will be informed via further analysis of the desk-based assessment, combined with the new information derived from the initial survey work. This may include archaeological trial trenching, further non-intrusive survey work or even small areas of archaeological excavation (strip map and sampled). All work will be proportionate, appropriate and agreed with the County Archaeologist.

Assessment Methodology

9.32 The assessment of potential effects as a result of the Scheme on cultural heritage will be undertaken using the methodology set out below.

9.33 The value of a heritage asset (its heritage significance) is guided by its designated status, but is derived also from its heritage interest which may be archaeological, architectural, artistic or historic (NPPF Annex 2, Glossary). Each identified heritage asset can be assigned a value in accordance with the criteria set out in Table 9-1. Using professional judgement and the results of consultation,

heritage assets are also assessed on an individual basis and regional variations and individual qualities are taken into account where applicable.

Table 9-1: Criteria for assessing the value of heritage assets

Asset value	Description
High	• World Heritage Sites • Scheduled Monuments • Grade I and II* listed buildings • Registered battlefields • Grade I and II* registered parks and gardens • Conservation areas of demonstrable high value • Non-designated heritage assets (archaeological sites, historic buildings, monuments, parks, gardens or landscapes) that can be shown to have demonstrable national or international importance • Well preserved historic landscape character areas, exhibiting considerable coherence, time depth or other critical factor(s)
Medium	• Grade II listed buildings • Conservation areas • Grade II registered parks and gardens • Non-designated heritage assets (archaeological sites, historic buildings, monuments, park, gardens or landscapes) that can be shown to have demonstrable regional importance • Averagely preserved historic landscape character areas, exhibiting reasonable coherence, time-depth or other critical factor(s) • Historic townscapes with historic integrity in that the assets that constitute their make-up are clearly legible
Low	• Locally listed buildings • Non-designated heritage assets (archaeological sites, historic buildings, monuments, park, gardens or landscapes) that can be shown to have demonstrable local importance • Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade • Historic landscape character areas whose value is limited by poor preservation and/ or poor survival of contextual associations
Very low	• Assets identified on national or regional databases, but which have no archaeological, architectural, artistic or historic value • Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade • Landscape with no or little significant historical merit

9.34 Having identified the value of the heritage asset, the next stage in the assessment will be to identify the level and degree of impact to an asset arising from the development. Impacts may arise during construction, operation and decommissioning, and can be temporary, reversible, or permanent. Impacts can occur to the physical fabric of the asset or affect its setting. The contribution of the setting to the significance of any affected assets will be subject to assessment. and can be temporary, reversible, or permanent. Impacts can occur to the physical fabric of the asset or affect its setting. The contribution of the setting to the significance of any affected assets will be subject to assessment.

9.35 The level and degree of impact (impact rating) will be assigned with reference to a four-point scale as set out in Table 9-2. The assessment of the level and degree of impact will be made in consideration of any design mitigation (embedded mitigation). If no impact is identified, no impact rating will be given and no resulting effect reported.

Table 9-2: Factors influencing the assessment of magnitude of impacts

Magnitude of Impact	Description of Impact
High	Changes such that the significance of the asset is totally altered or destroyed Comprehensive change to, or total loss of, elements of setting that would result in harm to the asset and our ability to understand and appreciate its significance
Medium	Change such that the significance of the asset is significantly altered or modified Changes such that the setting of the asset is noticeably different, affecting significance and resulting in changes in our ability to understand and appreciate the significance of the asset
Low	Changes such that the significance of the asset is slightly affected Changes to the setting that have a slight impact on significance resulting in changes in our ability to understand and appreciate the significance of the asset
Very Low	Changes to the asset that hardly affect significance. Changes to the setting of an asset that have little effect on significance and no real change in our ability to understand and appreciate the significance of the asset

An assessment to classify the effect, having taken into consideration any embedded mitigation, is determined using the matrix as presented in

9.36 Table 6-1. Major and moderate effects will be considered significant. Within the NPPF (section 16, paragraphs 199 - 204) and NPS EN-1 (section 5.8, paragraphs 5.8.14-5.8.15), impacts affecting the value of heritage assets are considered in terms of harm, and there is a requirement to determine whether the level of harm amounts to ‘substantial harm’ or ‘less than substantial harm’. There is no direct correlation between the significance of effect as reported in the ES and the level of harm caused to heritage significance in accordance with the NPPF. A major (significant) effect on a heritage asset would, however, more often be the basis by which to determine that the level of harm to the significance of the asset would be substantial. A moderate (significant) effect is unlikely to meet the test of substantial harm and would therefore more often be the basis by which to determine that the level of harm to the significance of the asset would be less than substantial. A minor or negligible (not significant) effect would still amount to a less than substantial harm. However, a neutral effect is classified as no harm.

9.37 Pursuant to NPS EN-1, Paragraph 5.8.17, any harmful impact to the significance of a designated heritage asset should be weighed against the public benefit of

the Scheme, whilst Regulation 3 of the Infrastructure Planning (Decisions) Regulations 2010 requires the SoS to have regard to the desirability of preserving a designated asset (listed building, conservation area or Scheduled Monument) and their setting. In all cases, the determination of the level of harm to the significance of the asset arising from development impact is one of professional judgement.

9.38 This baseline assessment will be undertaken in accordance with guidance set out by the CifA and Historic England, in particular the Standard and Guidance for Historic Environment Desk-Based Assessment and the Code of Conduct.

9.39 Principles of Cultural Heritage Impact Assessment in the UK is a guide to good practice in cultural heritage impact assessment published jointly by the IEMA, the IHBC and the CifA. The document provides guidance on understanding cultural heritage assets and evaluating the consequences of change and will be considered when undertaking the assessment.

Assumptions, Limitations and Uncertainties

9.40 It is assumed that there will be access to all required land to undertake both intrusive and non-intrusive archaeological surveys and evaluation, and that the results will be available to incorporate within the ES. In the event that access is not available, professional judgement will be used, based on available research and data, to assess the archaeological potential of the area.

9.41 It is assumed that the data provided by external sources are accurate.

10. Ecology

Introduction

10.1 This chapter sets out the approach to the assessment of the Scheme's impacts on ecology. The purpose of the assessment will be to identify and characterise any ecological features (including nature conservation designations, priority habitats and protected/notable species), to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.

10.2 Ecological surveys commenced in March 2022 and will continue into 2023, to gather detailed baseline ecological information. The requirement and extent of these surveys have been informed by desk study data and a Preliminary Ecological Appraisal (PEA) included in Appendix B, together with professional judgement and local knowledge of the geographical area and range of important ecological features.

Study Area

10.3 The study area for ecological surveys includes the land within the Scheme and appropriate buffer zones, as determined by the relevant guidance for each designated site, priority habitat and protected species. These are defined below and in Table 10-2.

10.4 The boundaries and zones for the ecology study area reflect standard industry good practice and the scoping distances that statutory consultees would typically expect to be considered for identification of features external to the Scheme that could be affected. This is informed by published guidance and professional judgement.

10.5 The desk study search was undertaken from the Scheme Boundary and included:

- Sites of international nature conservation value (e.g., SAC, Special Protection Areas (SPA) and Ramsar sites, as well as proposed or potential sites) within 10km (see Figure 2 within Appendix B (Preliminary Ecological Appraisal)), as well as any SACs within 30km where bats are noted as the, or one of the qualifying features (due to their highly mobile nature and extensive foraging/sustenance areas);
- Statutorily and non-statutorily designated sites of nature conservation value (e.g., SSSI, Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs) (which includes ancient woodland)) within 2km (see Figure 3 within Appendix B (Preliminary Ecological Appraisal));
- Ancient woodland and other notable habitats within 2km; and
- Records of protected or notable species up to 2km.

10.6 The desk study enabled determination of an appropriate study area, within which all important ecological features requiring assessment, as well as ecological features that could be directly or indirectly affected by the Scheme, will be subject to field survey. The study area varies according to the spatial characteristics of each species or habitat potentially impacted. A 'zone of potential influence'

representing the areas within which effects could occur from the Scheme and associated activities will be identified and detailed in the assessment.

Relevant Legislation, Planning Policy and Guidelines

10.7 Legislation, planning policy and guidance relating to protected nature conservation sites, significant habitats and protected and/or notable species pertinent to the Scheme is outlined below.

Legislation

10.8 The applicable legislation includes:

- Regulation (EU) 1143/2014 on the introduction and spread of invasive alien species (IAS) (Ref 10-1).
- The Environment Act 2021 (Ref 10-2). The Act sets out the UK Government's objectives to restore natural habitats and increase biodiversity and includes proposals to make Biodiversity Net Gain (BNG) a mandatory requirement within the town and country planning system in England. The Environment Act requires all developments to achieve a minimum 10% net gain in biodiversity units relative to the site's baseline biodiversity value.
- The Wildlife and Countryside Act (WCA) 1981, as amended (Ref 10-3). The Act 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 Act also defines a list of invasive non-native species, making it illegal to spread them in the wild.
- The Countryside and Rights of Way Act 2000 (Ref 10-4). The Act 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 legislative provisions relating to designated sites and flora and fauna affected by the Scheme will be considered in the assessment.
- The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref 10-5). The Habitats Regulations (as amended) transposed the requirements of the EC Habitats Directive and Birds Directive into UK law, and provide for the designation and protection of European Sites (and adapt 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. 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. The latest 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 Natural Environment and Rural Communities (NERC) Act 2006 (Ref 10-6). Section 40 of the 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. The occurrence of habitats and Species of Principal Importance (SPI) will be identified in the assessment through a desk study and field surveys, and the design of the Scheme will include measures for their conservation and enhancement.
- The Protection of Badgers Act 1992 (Ref 10-7). The Act provides specific legislation to protect Badgers from cruelty. The protection of Badgers through best working practices, including the legal requirement for licences from Natural England (where required), will be considered as part of the assessment.
- The Hedgerows Regulations 1997 (Ref 10-8). The Act introduced protection for countryside hedgerows that are defined as 'important' because they meet specific wildlife or landscape criteria. The assessment will evaluate hedgerows potentially affected by the Scheme by way of field survey, to determine whether any qualify as important under the ecological criteria.
- Animal Welfare Act 2006 (Ref 10-9). The Act protects vertebrate animals from harm. The provisions of the Act will be taken account of within the assessment by ensuring the welfare of any animals potentially affected by the Scheme are considered.
- Salmon and Freshwater Fisheries Act 1975 (Ref 10-10). The Act relates to the protection of freshwater fish, including Salmon and Trout species and their habitats. The assessment will consider the provisions of the Act in relation to the risk of mortality, migration barriers, pollution and the degradation of habitats potentially resulting from the Scheme.
- Eels (England and Wales) Regulations 2009 (Ref 10-11). The assessment will consider the provisions of the Regulations in relation to safe an unobstructed passage for Eel, and consideration regarding channel alterations, river crossings and culverting.
- Invasive Alien Species (Enforcement and Permitting) Order 2019 (Ref 10-12). The Order came into effect on 1st December 2019. This implemented the EU Invasive Alien Species Regulation 1143/2014 on the prevention and management of invasive alien plant and animal species in England and Wales, including the relevant licenses, permits and rules for keeping invasive alien species. If it is not a species of special concern, then the Wildlife & Countryside Act 1981 as amended (Section 14, Schedule 9) still applies.
- The WFD is transposed into environmental legislation in England by the Water Environment (Water Framework Directive, WFD) (England and Wales)

Regulations 2017 (Ref 10-13). 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.

10.9 The above legislation will be considered when identifying potential constraints to the Scheme, design options and mitigation. Compliance with the above legislation may require obtaining relevant protected species licences prior to the implementation of the Scheme.

10.10 As part of the assessment of a development, it is necessary to consider whether the Scheme is likely to have a significant effect on areas that have been internationally designated for nature conservation purposes (i.e., European sites) under the Conservation of Habitats and Species Regulations 2017 (as amended; relevant to England and Wales) (Ref 10-14). The Habitats Regulations Assessment (HRA) will be undertaken with reference to the general EC guidance on HRA (Ref 10-15), general guidance on HRA published by the UK government in July 2019 (Ref 10-16) and Planning Inspectorate (PINS) Advice Note 10 (Ref 10-17). Whilst the HRA decisions must be taken by the competent authority (the Secretary of State, informed by the recommendations of the appointed Examining Authority), the information needed to establish whether there are any Likely Significant Effects (LSEs) from the Scheme must be provided by the Applicant.

National Planning Policy

10.11 The ES chapter will take account of relevant National Policy Statements (NPS) which were ‘designated’ in 2011, and as far as they are applicable. These NPSs are, in the process of being updated and therefore, relevant sections of the draft NPSs are also included below, where relevant. The following NPSs are considered applicable to the Scheme:

- Overarching NPS for Energy (EN-1) (2011) (Ref 10-18), with particular reference to paragraphs 4.2.2 and 4.2.3, which provide national policy on what an ES for a 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 (Ref 10-14) consider when granting a DCO; 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. The Draft Overarching National Policy Statement for Energy (EN-1) (Ref 10-19) (2021) includes guidance for biodiversity net gains in paragraphs 4.5.1 to 4.5.3 and generic impacts on biodiversity in Part 5.4.
- The Draft NPS for Renewable Energy EN-3 (2021) (Ref 10-20) now includes sections 2.47 to 2.54 (inclusive) which set out policy requirements specific to solar generation.
- Part 2.8 and 2.10 of the Draft NPS for Renewable Energy EN-3 (2021) (Ref 10-20). Draft EN-5 (Ref 10-21) details biodiversity considerations when choosing an underground electricity line. This includes the environmental consequences as underground cables can disturb sensitive habitats.

10.12 The Draft NPSs have not yet been designated by the Secretary of State, although they have been subject to consultation. It is considered that the draft NPSs are relevant to the preparation of the ES as set out in Section 1 of this report.

10.13 The NPPF (Ref 10-22), with particular reference to Section 15 and paragraphs 174, 175, 179, 180 and 181, which state 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. The NPPF is clear that pursuing sustainable development includes moving from a net loss of biodiversity to achieving 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. The NPPF also specifies the obligations that the Local Planning Authorities and the UK Government have regarding statutory designated sites and protected species under UK and international legislation and how this is to be delivered in the planning system. Protected or notable habitats and species can be a material consideration in planning decisions and may therefore make some sites unsuitable for particular types of development, or if development is permitted, mitigation measures may be required to avoid or minimise impacts on certain habitats and species, or where impact is unavoidable, compensation may be required.

National Planning Practice Guidance (2021)

10.14 NPPG sets out a series of guidelines to explain how national planning policy should be applied to ensure good practice and consistency. Regard will be had to the NPPG in relation to ecology particularly in terms of considering the potential impacts of the development on protected and priority species and the scope to avoid or mitigate impacts.

Local Planning Policy

10.15 Local planning policies that are relevant to the Scheme and ecology are:

- Central Lincolnshire Local Plan 2012-2036, adopted 24 April 2017, specifically Policies LP20: Green Infrastructure Network and Policy LP21: Biodiversity and Geodiversity (Ref 10-23). The emerging Central Lincolnshire Submission Local Plan (2022), specifically Policy LP21 (Biodiversity and Geodiversity) will be of relevance as the proposals progress towards submission; and
- Bassetlaw District Council Core Strategy and Development Management Policies DPD, adopted 22 December 2011, specifically Policy DM9: Green Infrastructure, Biodiversity & Geodiversity, Landscape; Open Space & Sports Facilities (Ref 10-24). Policy ST40 (Biodiversity and Geodiversity) of the emerging Bassetlaw Submission Local Plan (2022) is also of relevance (Ref 10-25).

Other Guidance

10.16 Other guidance documents relevant to the assessment of the impacts of the Scheme on ecology and biodiversity include:

- The 25-year Environment Plan (Ref 10-26);
- Natural England and Defra Standing Advice (protected species) (Ref 10-27);
- UK Post 2010 Biodiversity Framework (Ref 10-28);
- Lincolnshire Biodiversity Action Plan (3rd edition) (Ref 10-29); and

- Nottinghamshire Biodiversity Action Plan (Ref 10-30).

Biodiversity Net Gain

10.17 When the relevant provisions come into force, the Environment Act 2021 will include a mandate for at least 10% biodiversity net gain for projects, including for NSIPs.

10.18 BNG is defined as "*development that leaves biodiversity in a better state than before*" and involves an approach where developers work with local governments, wildlife groups, landowners and other stakeholders in order to support their priorities for nature conservation. BNG is achieved when measurable improvements for biodiversity are delivered in association with a development, through the creation of new habitats or enhancement and management of existing habitats either on-site, off-site or through a combination of on-site and off-site measures.

10.19 A BNG assessment will be undertaken (using Defra Metric 3.1 or the most up to date metric) to identify opportunities for contributing to BNG. These opportunities will be identified and set out within the ES, in line with the requirements of the Environment Act (Ref 10-26), the NPPF (Ref 10-22) and local planning policy: Central Lincolnshire Local Plan (Ref 10-23) and Bassetlaw District Council Core Strategy and Development Management Policies DPD (Ref 10-24).

Baseline Conditions

10.20 The known or predicted ecological baseline conditions are summarised in the following sections.

Statutory Sites

10.21 Statutory sites that are designated for nature conservation were identified through a review of the Multi-Agency Geographic Information for the Countryside (MAGIC) (Ref 10-31) website within the study area. There are no international sites designated for nature conservation within 10km of the Scheme Boundary and there are no SAC sites that list bats as a designated feature within 30km. There is one SSSI that is designated for biodiversity reasons and located within 2km of the Site. This is Ashton's Meadow SSSI which is a grassland area bordered by hedgerows. The SSSI is 1.3km to the west of the Cable Route Corridor Search Area. The location of statutory sites is presented in Figure 2 within Appendix B (Preliminary Ecological Appraisal).

Non-statutory Sites

10.22 There are 14 non-statutory sites designated for nature conservation identified within 2km of the Scheme Boundary. These sites have been designated as LWSs for their biodiversity value at a local level and are known to have supporting value to a wide variety of protected and ecologically important species and, or habitats. These sites are shown on Figure 3 within Appendix B (Preliminary Ecological Appraisal) and summarised in Table 10-1.

Table 10-1: Non-Statutory Designated Sites within 2km of the Site

Site Name	Description (as copied from site designation)	Distance and direction from closest point of the Site
Upton Grange Road Verges LWS	The north and east verges are exceptionally species-rich. This rich assemblage is all the more remarkable as there is very little species-rich grassland in the immediate vicinity due to agricultural intensification. The south and west verges comprises linear herb-rich neutral grassland with adjacent species-poor hedgerows. It is considered that the invertebrate diversity on these verges is likely to be high given the floral diversity and abundance of nectar resources.	Within the Cable Route Corridor Search Area
Cottam Wetlands LWS	Part of the former Cottam Power Station, this excellent wetland mosaic comprises lagoons, marshy grasslands, swamp and a representative length of the River Trent.	Within the Cable Route Corridor Search Area
Cottam Ponds LWS	A number of ponds supporting abundant wildlife.	Within the Cable Route Corridor Search Area
Cow Pasture Lane Drains LWS	Drains with notable aquatic and bankside vegetation including Branched Bur-reed *Sparganium erectum*, Amphibious Bistort *Persicaria amphibia*, Blunt-fruited Water-starwort *Callitriche obtusangula*and stands of Reed Sweet-grass *Glyceria maxima*. The lower reaches of the bank support Wild Angelica *Angelica sylvestris* and False Fox-sedge *Carex otrubae*.	Within the Cable Route Corridor Search Area
Torksey Ferry Road Ditch LWS	A drain of interest for water beetles, including the near threatened water beetle *Agabus ulignosus, Cercyon convexiusculus, Cymbiodyta marginellus* and *Ilybius montanus.*	Within the Cable Route Corridor Search Area
Coates Wetland LWS	The River Trent meanders around this site comprising a mosaic of habitats including wetland, developing woodland and grassland enclosed within a flood bank.	Adjacent to Cable Route Corridor Search Area

Site Name	Description (as copied from site designation)	Distance and direction from closest point of the Site
Willingham to Fillingham Road Verges LWS	This length of road, marked by sharp bend sat each end, is flanked by verges 3-3.5m wide on both sides. Both verges are level, receive full sun and run alongside ditches with a species-rich hedgerow. *Nitrophiles* are occasional but never dominating. Coarser grasses are frequent but not dominating. Both verges are flailed with cuttings left in late summer by the adjacent landowner. This management maintains current biodiversity but could be improved through collection of cuttings. The site is therefore best described as being in favourable condition but under negative management.	120m to the east of the Cable Route Corridor Search Area
Broad Lane Grassland, North Leverton LWS	This small neutral grassland is bordered by Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa* hedgerows and a linear broadleaved woodland, separating it from a railway line.	470 m to the north of the Cable Route Corridor Search Area
Mother Drain Upper Ings LWS	Mother Drain is notable for supporting 46 water beetle species and 11 water bug species, the nationally near threatened *Hydrochus elongates* at it's only Nottinghamshire location and Nationally scarce *Hygrotus quinquelineatus*.	810 m to the north of the Cable Route Corridor Search Area
Ashton's Meadow LWS	This meadow is also a SSSI owned and managed by the Nottinghamshire Wildlife Trust. The sward is unimproved and species-rich with a range of characteristic grasses and forbs.	1.3 km to the west of the Cable Route Corridor Search Area
Bushstocks, Lane Meadow LWS	This old hay meadow has a sward containing many plant species indicative of unimproved neutral grassland. Ridge and furrow running in an east-west direction influences the composition of the sward. Damper hollows support abundant Meadow Foxtail *Alopecurus pratensis* whilst the drier ridges are dominated by Common Knapweed *Centaurea nigra*.	1.5 km to the west of the Cable Route Corridor Search Area
Thornhill Lane Drain LWS	No description provided.	1.5 km to the north of the Cable Route Corridor Search Area
Littleborough Lagoons CWS	No description provided.	1.7 km to the north of the Cable Route Corridor Search Area.

Site Name	Description (as copied from site designation)	Distance and direction from closest point of the Site
Retford Road Wood LWS	A mature deciduous woodland set in an arable landscape has a mixed canopy of Beech *Fagus sylvatica*, Sycamore *Acer pseudoplatanus* and some Large-leaved Lime *Tilia platyphyllos*.	1.8 km to the west of the Cable Route Corridor Search Area.

10.23 In addition, one area of ancient or semi-natural woodland was identified within 2km of the Scheme This is:

- Burton Wood, 550m north of the Cable Route Corridor Search Area;

Habitats

10.24 The PEA (Appendix B) identified the following priority habitats under Section 41 of the NERC Act 2006 (Ref 10-6) as present or likely to be present (where determination by further survey is required) within the Principal Site or associated survey area: ancient and/or species rich hedgerows, rivers, standing water/ponds, arable field margins and lowland mixed deciduous woodland. These habitats have potential to support a large range of protected and notable species. Further survey of the Cable Route Corridor Search Area is required to identify the presence of any priority habitats. The results of these surveys will be presented in the ES.

Species

Desk study data

10.25 The desk study identified records of protected or notable species of flora and fauna within the 2km study area. These include:

- Several notable plant species (Bluebell Hyacinthoides non-scripta and *Persicaria mitis*);
- Four amphibian species (Great Crested Newt *Triturus cristatus*, Smooth Newt *Lissotriton vulgaris*, Common Frog *Rana temporaria*, and Common Toad *Bufo bufo*);
- Ninety-nine bird species, including Peregrine *Falco peregrinus*, Hobby *Falco subbuteo*, Barn Owl *Tyto alba*, Kingfisher *Alcedo atthis* and Red Kite *Milvus milvus*;
- One invertebrate species (Willow Emerald Damselfly *Chalcolestes viridis*);
- Two reptile species (Grass Snake *Natrix natrix* and Common Lizard *Zootoca vivipara*);
- At least eight bat species (Brown Long-eared *Plecotus auritus*, Common Pipistrelle *Pipistrellus pipistrellus*, Noctule *Nyctalus noctule*, Brandt's bat *Myotis brandtii*, Natterer's bat *Myotis nattereri*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Nathusius's Pipistrelle *Pipistrellus nathusii*, Daubenton's Bat *Myotis daubentonii*, Pipistellus sp and Myotis sp). Details of bat roosts occurring within 2km of the Site included roosts for Common Pipistrelle and Brown Long-eared bat;

- Five notable mammal species (Eurasian Badger *Meles meles*, European Water Vole *Arvicola amphibius*, Eurasian Otter *Lutra lutra*, Brown Hare *Lepus europaeus* and West European Hedgehog *Erinaceus europaeus*);
- Two fish species (European Eel *Anguilla anguilla*, Roach *Rutilus rutilus*); and
- Five invasive species, including Mitten Crab *Eriocheir sinensis*, American Mink *Neovison vison*, New-Zealand Pigmyweed *Crassula helmsii*, Himalayan Balsam *Impatiens glandulifera* and Japanese Knotweed *Reynoutria japonica*.

10.26 Several of these species are offered full or part protection under the Wildlife and Countryside Act 1981. Several species recorded within the study area are also listed on the UK Biodiversity Action Plan (UKBAP); on Section 41 of the NERC Act 2006 as being of priority conservation concern and listed as a priority habitat or species in Nottinghamshire or Lincolnshire.

10.27 Historic records of fish, aquatic macroinvertebrate and aquatic macrophyte species within the last ten years are available from the Environment Agency (EA) through their routine ecological monitoring programme via the EA Ecology and Fish Data Explorer.

10.28 No EA fish monitoring sites are present within 2km of the study area, however, EA monitoring sites for aquatic macroinvertebrates and macrophytes are present. A total of 157 aquatic macroinvertebrate taxa and 34 aquatic macrophyte taxa have been recorded by the EA within the study area, none of which are protected or notable. However, the Invasive Non-Native Species (INNS) Nuttall's Waterweed *Elodea nuttallii* and Canadian Waterweed *Elodea canadensis* have both been recorded.

10.29 Canadian Waterweed and Nuttall's Waterweed are both listed in both Schedule 9 of the Wildlife and Countryside Act 1981, as amended (Ref 10-3), whilst Nuttall's Waterweed is additionally listed in the Invasive Alien Species (Enforcement and Permitting) Order 2019 (Ref 10-12). Taken together, the legislation referenced makes it an offence to plant, or otherwise cause to grow (including allowing to spread), listed plant species in the wild. If transported off site, there is a duty of care with regards to the disposal of any part of the plant that may facilitate establishment in the wild and cause environmental harm (as per the Environmental Protection Act 1990). The legislation also makes in an offense to release, or allow to escape, listed species (or species not ordinarily resident in and is not a regular visitor to Great Britain in a wild state) into the wild.

10.30 Furthermore, the non-native species New Zealand Mud Snail *Potamopyrgus antipodarum* and the freshwater amphipod *Crangonyx pseudogracillis/floridanus* have also been recorded by the EA. Whilst these species are non-native to the UK, none are legislated as invasive and thus are not subject to statutory obligations.

Further survey requirements

10.31 To support the ecological impact assessment, the following surveys are proposed:

Table 10-2: Study Areas and methods to be used during further ecological surveys

Survey	Survey Area	Survey Method	Survey Period	Justification for survey Areas
Phase 1 Habitat	The Scheme Boundary and to a maximum of 50m from the Scheme Boundary, where viewable or access permitted.	Walkover survey recording the habitat types and boundary features present following followed the standard JNCC method (Ref 10-32).	Commenced in March 2022 and informed the requirement for further detailed botanical surveys, where necessary.	50m is an appropriate Survey Area, acknowledging that habitats that are likely to be directly impacted by the Scheme are within the Scheme Boundary.
Terrestrial Habitats and Flora (including invasive non-native species)	The Survey Area will be the Scheme Boundary and areas of terrestrial habitat to be surveyed in further detail are those with the potential to be affected by the Scheme and potential priority habitats, as identified from the initial Phase 1 Habitat survey and desk study information.	Surveys for arable flora will involve walking arable field boundaries to record notable species as listed in Great Britain (Ref 10-33) and England (Ref 10-34) Red Data Lists or rated as locally, regionally or nationally scarce in '*A vascular plant red list for England'*. Grasslands (including set-aside and verges) will be surveyed in more detail (i.e.: species lists with abundance ratings) for notable species and species composition to help inform mitigation, habitat compensation and enhancement proposals, with the rarity of higher plants given based on '*New Flora of the British Isles' (Ref 10-35)*.	Between June and September	Habitat within the Scheme Boundary is an appropriate Survey Area, acknowledging that habitats that are likely to be directly impacted by the Scheme are within the Scheme Boundary.

Survey	Survey Area	Survey Method	Survey Period	Justification for survey Areas
Hedgerows	Hedgerows potentially affected by the Scheme within the Scheme Boundary.	Selected hedgerows, where likely to be impacted, will be surveyed and assessed for their 'importance' against the Wildlife and Landscape Criteria, detailed in the Hedgerow Regulations.	Between June and September	The Scheme Boundary is an appropriate Survey Area, acknowledging that the majority of hedgerows will be retained or avoided.
Aquatic habitat and species surveys including for any invasive non-native species (potentially including River Habitat Surveys, pond PSYM, macrophytes, macroinvertebrates and fish surveys)	1km from the proposed Scheme Boundary.	An aquatic scoping survey comprising a desk-based assessment of available aquatic ecology data and a walkover survey will inform site selection for further survey. Selected waterbodies (ponds, ditches, rivers) likely to be impacted will be surveyed and assessed using relative standard methodologies for habitat condition (Ref 10-36), aquatic macrophytes (Ref 10-37, (Ref 10-38), aquatic macroinvertebrates (Ref 10-39), (Ref 10-40) and PSYM specifically for ponds (Ref 10-41).	Between May and September	At least 250m from the Scheme Boundary is an appropriate Survey Area to determine any potential impacts arising from the Scheme both upstream and downstream (the desk study will assess a wider 1km area).
Terrestrial Invertebrate scoping survey	The Survey Area will be the Principal Site and the scoping survey will identify habitats suitable to support notable terrestrial invertebrates. Areas subject to any further detailed surveys, if required, will be those which have the potential to be affected by the Scheme.	Desk-based study using satellite imagery and the Phase 1 Habitat map, followed by a walkover survey by a specialist entomologist, if required.	May to September	Habitat within the Principal Site is an appropriate Survey Area, acknowledging that habitats that have the potential to be permanently impacted (i.e. lost) by the Scheme and potentially supporting notable terrestrial invertebrates or assemblages are within this area. The surveys will identify any areas likely to be important for terrestrial invertebrates and inform avoidance, mitigation and enhancement.

Survey	Survey Area	Survey Method	Survey Period	Justification for survey Areas
				Initial interrogation of aerial imagery suggests that surveys within the Cable Route Corridor are not necessary as habitats are predominantly arable or grazed grassland and unlikely to support notable terrestrial invertebrates.
Amphibians, including Great Crested Newt	Ponds within 500m of the Scheme Boundary were identified during the desk study. Further surveys, such as Habitat Suitability Index (HSI) will be undertaken on all water bodies within 250m of the Scheme Boundary and, where further survey is identified as being required, using eDNA methods, will be undertaken on all water bodies within 250m of the Scheme Boundary that are most likely to support Great Crested Newt and potentially impacted upon by the Scheme.	HSI evaluates suitability of ponds for Great Crested Newt following the standard method. eDNA method will strictly adhere to the standard survey technique for eDNA.	HSI surveys between mid-April and June eDNA surveys between mid-April and June	Habitats within the Scheme Boundary could constitute significant foraging areas, hibernation or resting sites for Great Crested Newts, which can utilise terrestrial habitat up to 500m from their breeding ponds (Ref 10-42). All waterbodies within 500m will be identified through desk based assessment, with all waterbodies within 250m subject to further assessment. It is recognised that there is a notable decrease in abundance of Great Crested Newt beyond a distance of 250m from a breeding pond (Ref 10-43), and so this will form the focus of the Survey Area.
Reptiles	Suitable habitat for reptiles (such as grassland) within the Principal Site.	Reptile surveys will involve recording reptile species presence, or absence, using artificial refugia in accordance with Froglife's Advice Sheet 10 for Reptile Surveys and Natural England's Standing Advice Sheet for Reptiles.	August to September	The Survey Area will provide sufficient information on reptile presence or absence within the Principal Site, acknowledging that habitats that have the potential to be permanently impacted (i.e., lost) by the Scheme and potentially supporting reptiles are within this area. Initial interrogation of aerial imagery suggests that surveys

Survey	Survey Area	Survey Method	Survey Period	Justification for survey Areas
				within the Cable Route Corridor are not necessary as habitats are predominantly arable or grazed grassland and therefore unlikely to support reptiles. Should suitable reptile habitat be found along the Cable Route Corridor then standard construction avoidance measures, e.g. timings of works and habitat manipulation, should be adequate to avoid impacts to reptiles.
Wintering (non-breeding) birds (including farmland birds)	The Scheme Boundary and to a maximum of 50m from the Scheme Boundary.	Wintering bird surveys utilised transect-based walkovers following method detailed in 'Bird Monitoring Methods' (Ref 10-44) and 'Bird Census Techniques' (Ref 10-45).	October to March	Standardised survey buffers for assessing the impacts of development on bird populations do not exist, however, the Survey Area used provides information on the wintering (non-breeding) birds within the area immediately surrounding the Scheme Boundary and includes areas contiguous with the Scheme Boundary, where birds may potentially be adversely affected and is sufficient to determine the likely impacts of the Scheme on the majority of wintering bird species occurring or likely to occur in the area.
Breeding birds (including farmland birds)	The Scheme Boundary and to a maximum of 50m from the Scheme Boundary for the general breeding bird assemblage. Appropriate Scheme buffer will be extended	Surveys for breeding birds will be based on a standard territory mapping method for surveying breeding birds as detailed in '*Bird Monitoring Methods'* and '*Bird Census Techniques*' and will be	April to September	Standardised survey buffers for assessing the impacts of development on bird populations do not exist, however, the Survey Area will provide information on the breeding birds within the area immediately

Survey	Survey Area	Survey Method	Survey Period	Justification for survey Areas
	out from the Scheme Boundary for species specific surveys, e.g.: Hobby *Falcoubbuteo* and Barn Owl *Tyto alba.*	adapted where necessary to include species-specific methods for other species, as required.		surrounding the Scheme Boundary and includes areas contiguous with the Scheme Boundary, where birds may potentially be adversely affected. Depending on the sensitivity of the species, birds occurring outside of the survey area may also be adversely affected (such as those listed on Schedule 1 of the WCA) and therefore where any such species are recorded beyond the 50m survey buffer (up to 200 m from the Scheme Boundary), these will also be recorded. However, the 50m survey buffer is sufficient to determine the likely impacts of the Scheme on the majority of breeding bird species occurring or likely to occur in the area.
Bats	Bat activity – Principal Site. Bat roosts – Scheme Boundary and to a maximum of 50m.	Surveys for bat activity will be undertaken within the Principal Site and will be based on standard methods for bat activity transect surveys as described in the Bat Conservation Trust (BCT) guidelines (Ref 10-46). Following a Preliminary Roost Assessment survey of trees and buildings within the Scheme Boundary, any trees or buildings with potential to support roosting bats and only those that may be impacted upon by the Scheme, will be surveyed following standard method for bat	PRA survey – any time of year Activity surveys: May to September Roost characterisation surveys (if required): May to September	The Survey Areas will provide sufficient information on bat usage of the Scheme and where impacts are predicted, assessing commuting and foraging habitat and nearby roosts to enable determination of impacts on bat populations occurring within, or adjacent to, the Scheme

Survey	Survey Area	Survey Method	Survey Period	Justification for survey Areas
		emergence/ re-entry surveys as described in the BCT guidelines.		
Riparian mammals (including invasive non-native species, such as Mink *Neovison vison*)	All waterbodies and watercourses within the Scheme Boundary (and to a maximum of 100m from the Scheme Boundary where access is permitted), identified during the desk study and Phase 1 Habitat survey as being potentially suitable for Water Vole *Arvicola amphibius* and Otter *Lutra lutra*.	Water Vole surveys will involve searching watercourses for signs of Water Vole activity as described in the 'Water Vole Conservation Handbook' (Ref 10-47) and 'The Water Vole Mitigation Handbook' (Ref 10-48). Otter surveys will involve searching watercourses for signs of Otter activity, following guidance in the 'New Rivers and Wildlife Handbook' (Ref 10-49); the 'Fifth Otter Survey of England 2009-2010 (Ref 10-50)' and the 'Ecology of European Otter' (Ref 10-51).	Water Vole – between May and September Otter – between May and September	Surveying riparian habitats up to 100m from the Scheme Boundary is sufficient to determine presence or absence of riparian mammals within, or adjacent to, the Scheme Boundary.
Badger *Meles meles*	The Scheme Boundary and to a maximum of 50m from the Scheme Boundary.	Surveys for Badger involved a walkover survey searching for signs of Badger activity as described in the Mammal Society publication '*Surveying Badgers (Ref 10-52; Ref 10-53)'* and in the National Badger Survey method with additional reference to '*Surveying for Badgers: Good Practice Guidelines' (Ref 10-54)*.	Any time of year, ideally when vegetation not in leaf (November to February)	50m is an appropriate Survey Area acknowledging that the majority of habitats of importance to Badger, such as woodland and hedgerows, will be retained.

10.32 No specific surveys are proposed for Polecat, Hedgehog and Brown Hare, but mitigation and enhancement delivered as part of the Scheme should look to avoid disturbance to these species, retain habitats and ensure that connectivity is maintained throughout the Scheme and into the wider area. All species are likely to benefit from a reduction in intensively managed agricultural land.

10.33 A habitat conditions assessment will also be undertaken on land within the Scheme boundary in order to undertake a Biodiversity Net Gain (BNG) assessment. The baseline information gathered from this, and other surveys, will be used to develop an appropriate strategy in line with the policies identified.

Potential Effects and Mitigation

Construction

10.34 There is the potential for the following impacts associated with construction activity on important ecological features which may result in significant effects:

- Habitat loss or gain – direct impacts associated with changes in land use resulting from the Scheme, for example temporary works associated with site clearance, and permanent land-take (mainly arable land) associated with the installation of the Scheme;
- Fragmentation of populations or habitats – indirect impacts due to the Scheme dividing a habitat, group of related habitats, site or ecological network, or the creation of partial or complete barriers to the movement of species, with a consequent impairment of ecological function;
- Disturbance – indirect impacts resulting from a change in normal conditions (e.g., light, noise, vibration and human activity) that result in individuals or populations of species changing behaviour or range;
- Invasive species – direct impact from spread of invasive species either from or onto the land within the Scheme Boundary;
- Habitat degradation – direct or indirect impacts resulting in the reduction in the condition of a habitat and its suitability for some or all of the species it supports, for example changes in chemical water quality, increased sedimentation and dust deposition, or changes in surface flow or groundwater; and,
- Species mortality – direct impacts on species populations associated with mortalities due to construction activities, for example site clearance.

Operation

10.35 The operation of the Scheme may result in significant effects on important ecological features and these effects may include:

- Changes to foraging and commuting habitats – direct impacts due to land use change from agriculture (arable crops/cattle grazing) to grassland (potentially cut or grazed).

10.36 The following potential effects are **scoped out** of further assessment:

- Attraction of aquatic invertebrates to the solar panels – although there is limited evidence suggesting, in certain conditions, the attraction of some

species of aquatic invertebrates to solar panels, there are no designated sites with aquatic invertebrate species or assemblages as qualifying features within the study area and this potential impact pathway is **scoped out** of further assessment. Notwithstanding this, appropriate aquatic surveys will be undertaken to assess potential impacts to watercourses.

- Attraction of birds to solar panels – there is no evidence from operational solar schemes in the UK that the solar panels attract congregations of birds, which may lead to displacement of populations and increase the risk of mortality (through collision with solar panels and infrastructure). In addition, the Scheme is not located near areas, such as wetlands, which support large congregations of birds, nor is the Scheme located on a migratory flyway or on a flightpath between areas supporting congregations of birds. As such this potential impact pathway is **scoped out** of further assessment.

Decommissioning

10.37 Impacts on biodiversity features during decommissioning of the Scheme are likely to be the same as construction.

10.38 On the basis of the above, a biodiversity assessment of the construction, operational and decommissioning phases has been **scoped in**.

Assessment Methodology

10.39 The approach used for the ecological impact assessment (EcIA) will be undertaken in accordance with best practice guidance as published in the Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines (Ref 10-55) and summarised below.

10.40 The principal steps involved in the EcIA can be summarised as follows:

- Ecological features that are both present and might be affected by the Scheme 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 evaluated, placing their relative biodiversity and nature conservation value into geographic context. This is then used to define the relevant ecological features that need to be considered further within the assessment process;
- The changes or perturbations predicted to result as a consequence of the Scheme (i.e. the potential impacts), and which could potentially affect relevant ecological features are identified and their nature described. Established good-practice, legislative requirements or other incorporated design measures to minimise or avoid impacts are also described and are taken into account;
- The likely effects (beneficial or adverse) 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). If necessary, measures to

compensate for effects on features of nature conservation importance are also included;

- Any residual effects of the Scheme are reported; and
- Scope for ecological enhancement is considered.

Ecological importance

10.41 To support focussed ecological impact assessment, 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 Scheme are of value. A hierarchical geographical approach will be used to assign nature conservation resource importance (or value) based upon those within the CIEEM 'Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Coastal and Marine' (Ref 10-56) (hereafter referred to as the CIEEM guidelines) and professional judgement.

10.42 The frames of reference used for the assessment, based on Section 4.7 in the CIEEM guidelines will be:

- Very High (International): Statutorily designated sites, such as Ramsar Sites, SACs (including candidate SACs), SPAs, normally within the geographic area of Europe. Species occurring in numbers approaching that of international importance (i.e., >1% of a biogeographic population). Qualifying species connected to an SAC (such as bats);
- High (National (Great Britain) and Regional (East Midlands)): 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. Statutorily designated site, such as a SSSI or NNR. Species occurring in numbers approaching that of national importance (i.e., >1% of the UK population). Priority habitats included on Annex I of the Habitats Directive or S41 of the NERC Act 2006)). Regional importance when it is of greater geographical importance than within the county of Lincolnshire or Nottinghamshire but does not reach the threshold to be of National importance;
- Medium (County (Lincolnshire and Nottinghamshire) and District (Bassetlaw and West Lindsey)): Non-statutorily designated sites, such as LWSs. Species occurring in numbers approaching that of county or district importance (i.e., >1% of the county or district (if known) population;
- Low (Local): Species of conservation interest, e.g.: UK Biodiversity Action Plan (UKBAP) / Local Biodiversity Action Plan (LBAP) species that contribute to the local community. Areas of habitat that do not meet criteria for selection as LWS in Lincolnshire or Nottinghamshire. Areas of habitat or species that are considered to enrich local area; and
- Negligible (Site): Species that are common and widespread and are not legally protected or included within local planning policy. Areas of habitat that are widespread and of no local value (such as a fence-line or hard-standing).

10.43 Species populations are valued on the basis of their size, recognised status (such as through published lists of species of conservation concern and designation of Biodiversity Action Plan (BAP)) status, and legal protection. While it is important to consider the status of the species in terms of any legal protection, it is also important to consider other factors such as its distribution, rarity, population

trends and the size of the population which would be affected. For example, whilst the Great Crested Newt is protected under European law, and therefore conservation of the species is of significance at an international level, this does not mean that every population of great crested newt is internationally important. It is important to consider the particular population in its context. Assessing the value of features also requires consideration of both existing and future predicted baseline conditions (likely changes such as trends in the population size or distribution of species, likely changes to the extent of habitats and the effects of other schemes or land use changes). The assessments of value rely on the professional opinion and judgment of experienced ecologists.

10.44 Plant communities will be assessed both in terms of their intrinsic value, and as habitat for protected species whose habitat is also specifically protected, and for species of nature conservation concern which are particularly associated with them.

10.45 Due regard will also be paid to the legal protection afforded to species during the development of mitigation and compensation measures to be implemented as part of the Scheme. For European protected species, there is a requirement that the Scheme should not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

10.46 It is not necessary in the assessment to address all habitats and species with potential to occur in the study area and instead the focus should be on those that are 'relevant' i.e., ecological features considered important and potentially affected by the proposed Scheme. In its guidance, CIEEM 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 will be considered. National 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.

Magnitude of impact

10.47 In line with Section 1.21 in the CIEEM guidelines (Ref 10-56), the terminology used within the EcIA will draw a clear distinction between the terms 'impact' and 'effect'. For the purposes of this EcIA these terms are defined as follows:

- **Impact** – actions resulting in changes to an ecological feature. For example, construction activities of a development removing a hedgerow; and
- **Effect** – outcome resulting from impact acting upon the conservation status or structure and function of an ecological feature. For example, the effects on a population of bats as a result of the loss of a bat roost.

10.48 The magnitude of impact will be based on professional judgement. When describing potential impacts (and where relevant the resultant effects), consideration will be given to the following characteristics likely to influence this (sections 5.11 to 5.18 in the CIEEM guidelines):

- **Positive / Negative** – i.e., is the change likely to be in accordance with nature conservation objectives and policy:

- **Positive** – a change that improves the quality of the environment, or halts or slows an existing decline in quality e.g., increasing the extent of a habitat of conservation value; or
- **Negative** – a change that reduces the quality of the environment, e.g., destruction of habitat.
- **Extent** – the spatial or geographical area or distance over which the impact/effect may occur under a suitably representative range of conditions;
- **Magnitude** – the 'size', 'amount' or 'intensity' and 'volume' of an impact – this is described on a quantitative basis where possible;
- **Duration** – the time over which an impact is expected to last prior to recovery or replacement of the resource or feature. Consideration will be given to how this duration relates to relevant ecological characteristics such as a species' lifecycle. However, it is not always appropriate to report the duration of impacts in these terms. The duration of an effect may be longer than the duration of an activity or impact;
- **Timing and frequency** – i.e., consideration of the point at which the impact occurs in relation to critical life-stages or seasons; and
- **Reversibility** – i.e., is the impact temporary or permanent. A temporary impact is one from which recovery is possible or for which effective mitigation is both possible and enforceable. A permanent effect is one from which recovery is either not possible or cannot be achieved within a reasonable timescale (in the context of the feature being assessed).

10.49 Cumulative effects will be assessed and are those occurring from several sources (also known as interrelationships) and/or the combined effects of other developments in the area.

Significance of effect

10.50 There are a number of approaches for determining the significance of effects on ecological features. Whilst the CIEEM guidelines recommend the avoidance of the use of the matrix approach for categorisation (major, moderate and minor), in order to provide consistency of terminology, the CIEEM assessment will be translated into the classification of effects scale, as outlined in Table 10-3.

Table 10-3: Relating CIEEM assessment terms to those used in other EIA chapters

Effect classification terminology used in other EIA chapters	Equivalent CIEEM assessment
Major beneficial (positive)	1) Beneficial effect on structure / function or conservation status at a regional, national or international level; and 2) The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Moderate beneficial (positive)	1) Beneficial effect on structure/ function or conservation status at a county level; and 2) The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.

Effect classification terminology used in other EIA chapters	Equivalent CIEEM assessment
Minor beneficial (positive)	1) Beneficial effect on structure / function or conservation status at a local level; and 2) The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Negligible beneficial / adverse	No effect on structure / function or conservation status
Minor adverse (negative)	1) Adverse effect on structure / function or conservation status at a local level; and 2) The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Moderate adverse (negative)	1) Adverse effect on structure / function or conservation status at a county level; and 2) The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
Major adverse (negative)	1) Adverse effect on structure / function or conservation status at a regional, national or international level; and 2) The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.

10.51 Sections 5.24 to 5.28 in the CIEEM guidelines (Ref 10-56) states that effects should be determined 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)".

10.52 Using this information and judgment, it is determined whether the effects will be significant or not on the integrity (of site/ecosystems) or conservation status (of habitats/species) of each ecological feature and the impact significance is determined at the appropriate geographical scale.

- Not Significant – no effect on structure and function, or conservation status; and
- Significant – structure and function, or conservation status is affected.

Assumptions, Limitations and Uncertainties

10.53 The following assumptions and limitations have been noted during the scoping:

- Baseline ecological surveys commenced in 2022 and will continue through 2023 to determine the baseline ecological conditions. The surveys may highlight new important ecological features with potential to be significantly affected which have not been identified (or considered not to be significant) at this stage of the assessment.
- A precautionary approach has been taken at this stage which assumes that all habitats within the footprint of the solar PV modules and associated solar and battery storage infrastructure may be affected during construction and/or operation.

11. Flood Risk, Drainage and Surface Water

Introduction

11.1 This chapter relates to the potential effects of the Scheme on the water environment, which includes surface water bodies (e.g. rivers, streams, ditches, and canals), and groundwater bodies. Impacts considered cover water quality, water resources, physical changes to hydromorphology and the function of water environment systems, flood risk and drainage. Isolated ponds as receptors are included within *Chapter 10: Ecology* of this EIA Scoping Report.

11.2 Where designated ecological sites are sensitive to changes in hydrology or water quality (i.e. they are 'water dependent') an assessment of the risks to them is considered in this water environment scoping assessment. However, potential impacts from contaminated land on any controlled water (surface or groundwater) is not considered in this chapter. For this, please refer to *Chapter 17: Other Environmental Topics* of this EIA Scoping Report.

11.3 This scoping assessment also considers the scope for mitigation, and how it is proposed to assess the significance of these potential effects.

Study Area

11.4 A study area of approximately 1km from the Scheme Boundary has been considered in order to identify surface water bodies and groundwater bodies (aquifers and or groundwater dependant receptors) that could reasonably be affected by the Scheme. However, the baseline assessment has also considered a wider study area of up to a 3km downstream of the Scheme Boundary along watercourses as water quality and flood risks impacts may propagate downstream, and thus it is important to consider all attributes of the water body that reside within the zone of influence.

Relevant Legislation, Planning Policy and Guidelines

11.5 A summary of the legislation, planning policy and guidance relevant to the assessment of impacts of the Scheme on the water environment is presented in this section.

Legislation

11.6 The main legislation relevant to the Scheme include the following (please note that details of European Directives are not included, just the national legislation that transposes them):

- Environment Act 2021 (Ref 11-1);
- Water Act 2014 (Ref 11-2);
- Floods and Water Management Act 2010 (Ref 11-3);
- Land Drainage Act 1991 (as amended) (Ref 11-4);

- Water Resources Act 1991 (as amended) (Ref 11-5);
- Salmon and Freshwater Fisheries Act 1975 (as amended) (Ref 11-6);
- Water Environment (WFD) (England and Wales) Regulations 2017 (Ref 11-7);
- Environmental Damage (Prevention and Remediation) Regulations 2015 (Ref 11-8);
- Environmental Permitting (England and Wales) Regulations 2016 (Ref 11-9);
- Building Regulations 2010 (Ref 11-10);
- Groundwater (England and Wales) Regulations 2009 (Ref 11-11);
- Flood Risk Regulations 2009 (Ref 11-12);
- Eels (England and Wales) Regulation 2009 (Ref 11-13); and
- Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 11-14).

National Planning Policy

11.7 The following planning policies have been taken into account as part of identifying the assessment methodology, receptor selection, importance and sensitivity, potential significant environmental effects, and scope for mitigation either embedded in the design or additional:

- NPS EN-1 and draft NPS EN-1 (Ref 11-15, Ref 11-16) with particular reference to section 5.15 Water Quality and Resources. Paragraph 5.15.5 and paragraph 5.15.6. The Infrastructure Planning Commission (IPC) needs to satisfy itself that a proposal has regard to the River Basin Management Plans and meets the requirement of the WFD (including Article 4.7 [of the Directive as transposed in England]). Also, particular reference to Section 5.7 Flood Risk, paragraphs 5.7.8 to 5.7.24. Additionally, paragraph 4.8.6 states that applicants for new energy infrastructure must take into account the potential impacts of climate change, including the most up to date UK climate change projections, and adopt appropriate mitigation or adaption measures for the lifetime of the proposed infrastructure. Paragraphs 5.15.4 – 7 outline the decision making process with regard to water pollution, and more weight is attributed to any impacts that would have an adverse effect on the achievement of environmental objectives under the WFD. Within paragraphs 5.15.8-10 it is stated that the possible requirement for mitigation measures over and above those included within the application should be considered by the examining authority;
- NPS EN-3 and draft NPS EN-3 (Ref 11-17, Ref 11-18) – although the current NPS does not cover solar developments, this document highlights the importance of considering potential impacts on water quality, water resources and flood risk, taking into account climate change. The draft NPS EN-3, paragraph 2.50.7 specifically mentions the potential need for a flood risk assessment that will need to consider the impacts of drainage;
- NPS EN-5 (Ref 11-19), with particular reference to Section 2.4: Climate Change Adaptation; and NPPF with particular reference to paragraphs 8 (a and b), 20(b), 149, 155-165 in relation to flood risk and paragraphs 8(c), 20(d), 149, and 170 I regarding water quality; and

- NPPF (Ref 11-20). Whilst the NPPF does not contain specific policies for national significant infrastructure projects, national policy statements form part of the overall framework of national planning policy. Within the NPPF, particular reference is given to paragraphs 8 (a and b), 20(b), 149, 155-165 in relation to flood risk and paragraphs 8(c), 20(d), 149, and 174 I regarding water quality.

11.8 Revised Draft NPS were released by the UK Government for consultation in September 2021.

11.9 Certain relevant sections of text in NPS EN-1 have been revised in the draft that has been published. This includes some of the text in section 15.5 (water quality and resources) which is section 15.6 in the revised draft. For instance, paragraph 5.16.3 states that where possible, applicants are encouraged to manage surface water during construction by treating surface water runoff from exposed topsoil prior to discharging. Similarly, there are some changes in the flood risk section (section 5.7 in the current policy at 5.8 in the revised draft), to include additional text on the 'minimum requirements' for flood risk assessments.

11.10 Notably, the revised draft NPS for Renewable Energy (NPS EN-3 (Ref 11-18) includes a specific section on solar developments. With regard to the Water Environment, the following is provided for (see paragraph 2.50.7):

- A Flood Risk Assessment (FRA) may accompany an applicant's assessment, and this will need to consider the impact of drainage;
- Where access tracks are needed, permeable tracks should be used, and localised Sustainable Drainage Systems (SuDS) should be used to control runoff;
- Given the temporary nature of solar farms, sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses; and
- Culverting existing watercourses/drainage ditches should be avoided. When this is unavoidable, it should be demonstrated that no reasonable alternatives exist and where necessary it will only be for the construction period.

11.11 In addition, the same draft NPS also provides, in terms of decision-making, that water management is a critical component of site design for ground mount solar plants.

11.12 Consideration will also be given to UK Government's 25 Year Environment Plan (Ref 11-21), the UK Government's Future Water Strategy (2011) (Ref 11-22), Non-statutory technical standards for Sustainable Drainage Systems (SuDS) (Ref 11-23), Building Regulations 2010 Approved Document H: Drainage and Waste Disposal (Ref 11-24), BRE Digest 365: Soakaway Design and Sewers for Adoption (7th Edition, 2012) (Ref 11-25), where relevant.

11.13 At a regional level, water management is coordinated through 10 River Basin Management Plans (RBMPs). Each RBMP is prepared by the Environment Agency for six year cycles and set out how organisations, stakeholders and communities will work together to improve the water environment. The most recent plans were published in 2015 (the second cycle) and will remain in place until after 2021 when cycle 3 plans would be published. However, these have

been delayed and the Environment Agency earlier this year carried out a public consultation on them. The water bodies within the study area fall under the Humber and Anglian RBMP (Ref 11-26 and Ref 11-27).

National Planning Practice Guidance

11.14 The National Planning Policy Guidance (NPPG) (Ref 11-28) provides guidance for local planning authorities on assessing the significance of water environment effects of proposed developments. The guidance highlights that adequate water and wastewater infrastructure is needed to support sustainable development.

11.15 The NPPF (Ref 11-20) and the Flood Risk and Coastal Change NPPG (Ref 11-29) recommends that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and should develop policies to manage flood risk from all sources taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs). Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to public and property and manage any residual risk, taking account of the impacts of climate change.

Local Planning Policy

11.16 The following policies are relevant to the Scheme:

- Policy LP14 of the adopted Central Lincolnshire Local Plan (2017) sets out policy considerations with respect to managing water resources and flood risk (Ref 11-30).
- Policy S21 of the Central Lincolnshire Submission Local Plan (2022) sets out emerging policy in relation to dealing with flood risk and water resources (Ref 11-31).
- Joint Lincolnshire Flood Risk and Water Management Strategy 2019-2050 (Ref 11-32).
- Scunthorpe & Gainsborough Water Management Board IDB Flood Risk management Policy, 2019 (Ref 11-33).
- Upper Witham IDB Flood Risk Management Policy, 2018 (Ref 11-34).
- Trent Valley IDB Advice Note AN02: Culverts and bridges and AN06: Surface Water, 2021 (Ref 11-35).

11.17 Policy DM12 of the Adopted Bassetlaw Core Strategy and Development Management Policies (2017) (Ref 11-36) set out the local planning policy considerations with respect to flood risk, sewerage and drainage. Policy ST52 of the emerging Bassetlaw District Submission Local Plan (2022) relates to flood risk and drainage.

11.18 With regard to water quality and water resources, the policies from the above documents generally require consideration of potential impacts of pollution from development on the water environment by assessing the risk to water features and water bodies and protected areas under the WFD (Ref 11-7), water protection and safeguard zones, source protection zones (SPZ) around potable groundwater abstractions, and water dependent ecological sites (i.e. where conservation status depends on sites hydrology or water quality). The policies

also encourage mitigation of pollution on the water environment through careful design to facilitate good pollution control practice.

11.19 Finally, the following SFRAs are available for the development sites and will be reviewed in full as part of the EIA:

- Central Lincolnshire Level 1 Strategic Flood Risk Assessment (Ref 11-37);
- West Lyndsey District Council Strategic Flood Risk Assessment (SFRA), July 2009 (Ref 11-38);
- Preliminary Flood Risk Assessment (PFRA) in 2011 and second cycle 2017 (Ref 11-39); and
- Nottinghamshire County Council (March 2019) Nottinghamshire Level 1 Minerals Strategy Flood Risk Assessment SFRA (Ref 11-40).

11.20 A SFRA is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future, taking account of the impacts of climate change, and to assess the impact that land use changes and development in the area will have on flood risk.

11.21 Trent Valley IDB Advice Note AN02: Culverts and Bridges, states the byelaws with regard to culverting of IDB maintained watercourses.

Baseline Conditions

11.22 Baseline information has been reviewed in the context of the Scheme in order to identify the potential for significant effects based on a source-pathway-receptor model and where relevant, consideration has been given to the scope for mitigation.

Topography, Land Use, Climate and Geology

Principal Site

11.23 The topography of the area is relatively flat, with existing ground levels in the region of 20-25m Above Ordnance Datum (AOD) according to online Ordnance Survey (OS) and Bing mapping (Ref 11-41 and Ref 11-42). There are many minor watercourses and drainage ditches in the Principal Site, which is currently used mainly for agriculture, with a mosaic of agricultural fields, and the village of Harpswell and Glentworth on the eastern boundary.

11.24 Based on the Meteorological Office website (Ref 11-43) the nearest weather station is located in Scampton (SK 95080 79300), approximately 11km southeast from the Scheme Boundary. Using data from this weather station for the period 1991-2020, it is estimated that the study area experiences approximately 619mm of rainfall per year, with it raining more than 1 mm on approximately 118 days per year, which are both low in the UK context. This is relevant to the whole study area.

11.25 The bedrock and superficial geology for the area has been identified using the BGS online mapping (Ref 11-44). These are in shown in Figure 11-1 and Figure 11-2 respectively. Glacial Till is the predominant superficial deposits within the study area. Other superficial deposits found within the study area include Glacio-fluvial deposits, River Terrace Deposits and Alluvium, which are deposited along the floodplains of the rivers and watercourses.

11.26 The bedrock geology beneath the study area comprises of the Scunthorpe and Charmouth Mudstone Formations, which predominantly underlain the western and central parts of the study area. The Marlstone Rock Formation consisting of interbedded layers of ferruginous Limestone and Sandstone, Grantham Formation consisting of Sandstone, Siltstone and Mudstone and the Lincolnshire Limestone Formation are the bedrock geology underneath the eastern flanks and wider eastern parts of the study area.

11.27 The western part of the Principal Site is located on Scunthorpe Mudstone Formation, with a north-south geological boundary part way through the Principal Site. To the east is the Charmouth Mudstone Formation. Overlying the bedrock geology much of the area is overlain with glacial till, with some small pockets of glaciofluvial deposits.

Figure 11-1 Bedrock Geology

Revision: 0 Drawn: BF Checked: DH Approved: ST Date: 2022-09-21

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River Trent

Saundby Beck

River Trent

Lower Trent Erewash - Secondary Combined

GAINSBOROUGH

Witham Lias

Alternative Cable Route Corridor Search Area

Preferred Cable Route Corridor Search Area

River Till

Grimsby Ancholme Louth Limestone Unit

River Till

River Trent

Fossdyke Navigation

North Beck

Witham Limestone Unit A

Catchwater Drain

N

1:60,000 @ A3

0 500 1,000 1,500 2,000 2,500 m

AECOM

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CLIENT

Tillbridge Solar Limited

CONSULTANT

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LEGEND

- Principal Site
- Cable Route Corridor Options
- 1km Buffer
- Main River
- Ordinary Watercourse

Water Framework Directive Ground Waterbody Status

- Good
- Poor Overall Condition

Source Protection Zone

- Zone I - Inner Protection Zone
- Zone II - Outer Protection Zone
- Zone III - Total Catchment

Bedrock Geology

- GREAT OOLITE GROUP - SANDSTONE, LIMESTONE AND ARGILLACEOUS ROCKS
- INFERIOR OOLITE GROUP - LIMESTONE, SANDSTONE, SILTSTONE AND MUDSTONE
- LIAS GROUP - MUDSTONE, SILTSTONE, LIMESTONE AND SANDSTONE
- TRIASSIC ROCKS (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE

NOTES

ISSUE PURPOSE

FOR INFORMATION

PROJECT NUMBER

60677969

FIGURE TITLE

Bedrock Geology

FIGURE NUMBER

Figure 11-1

Figure 11-2 Superficial Geology

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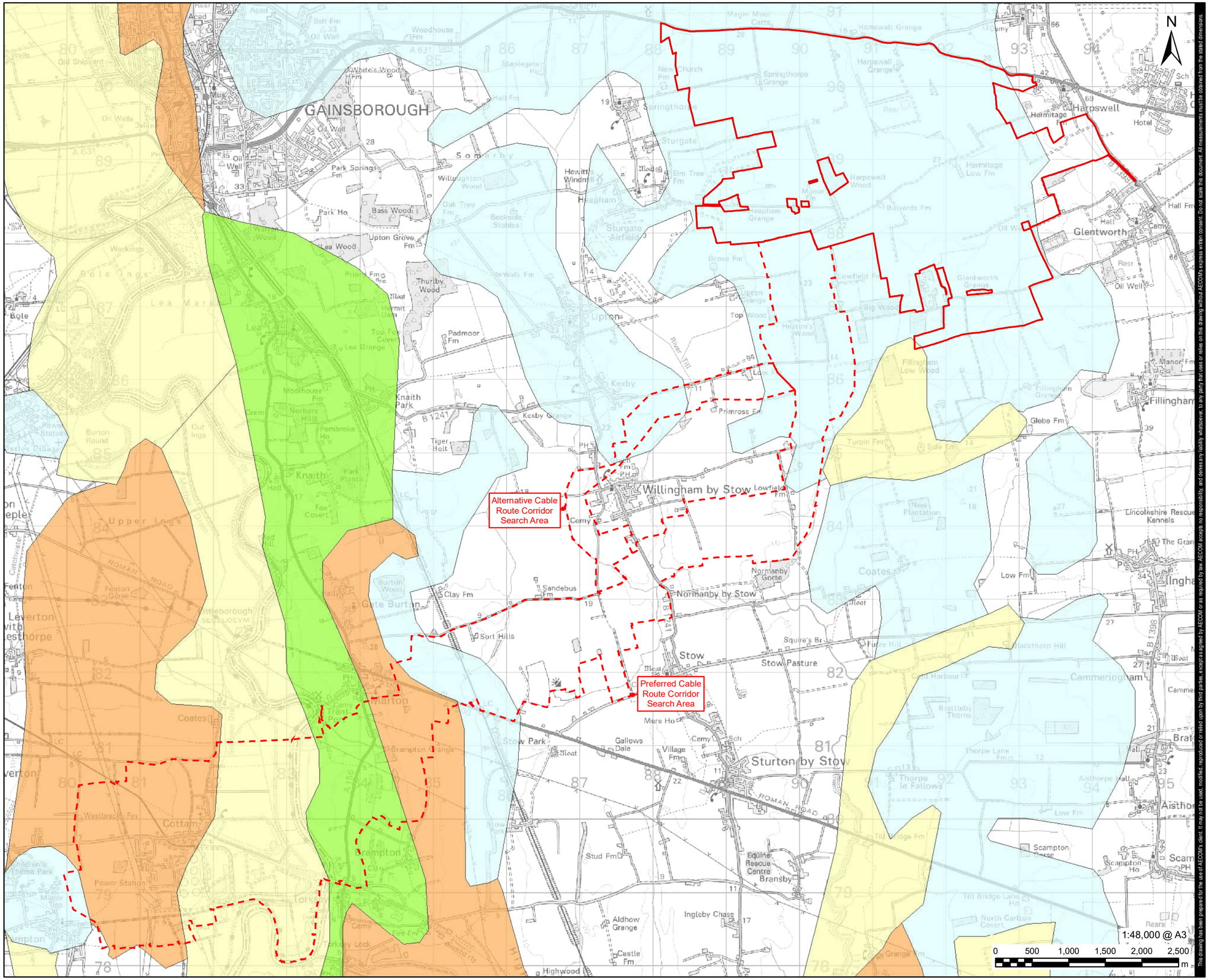

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LEGEND

- Principal Site
- Cable Route Corridor Options

Superficial Geology

- ALV-CLSS
- BSA-SAND
- RTDU-SAGR
- TILL-DMTN

NOTES

ISSUE PURPOSE

For Information

PROJECT NUMBER

60677969

FIGURE TITLE

Supeficial Geology

FIGURE NUMBER

Figure 11-2

Cable Route Corridor Search Area

11.28 The climate and land use for the Cable Route Corridor Search Area are the same as for the Principal Site.

11.29 The topography of the area is fairly flat, and of decreasing elevation from the Principal Site (20-25m AOD) towards crossing the River Trent and the village of Cottam (less than 10m AOD). There are floodplains associated with the River Trent and River Till and their tributaries.

11.30 From the Heapham area south-eastwards, the bedrock geology changes from Scunthorpe Mudstone, through to the Mercia Mudstone Group. This is overlain by discontinuous Glacial Till deposits in the northeast area, through an area with no superficial deposits overlying the Scunthorpe Mudstone in the area of Willingham by Stow to Gate Burton. Within the floodplain of the River Trent, the superficial deposits change to alluvial sediments, with Holme Pierrepoint Sand and Gravel member, and alluvial sediments.

Flood risk from all sources

11.31 The flood risk from all sources for the Scheme is summarised in Table 11-1 and Table 11-2 below. Fluvial flood risk and surface water flood risk is illustrated on Figure 11-3. The Environment Agency online interactive maps (Ref 11-45, Ref 11-46 and Ref 11-47) have been used to obtain information on sources of flooding, together with information on the geology of the area (Ref 11-44).

Table 11-1: Cable Route Corridor Search Area – Flood Risk from all sources

Flood Risk Source	Pre-Scheme Flood Risk	Comments
Tidal / Fluvial	High	The Cable Route Corridor Search Area passes through several small areas of fluvial Flood Zone 3 associated with tributaries of the River Till, and west of the village of Marton the route is contained within Flood Zone 3 associated with the River Trent with some Flood Zone 3 associated with the Skellingthorpe Main Drain.
Surface Water	Low to High	There are isolated areas at low, medium and high risk of flooding. However, these areas are likely associated with areas of low topography where surface water is gathering in low points and draining towards smaller ordinary watercourses and/or local land drains
Groundwater	Low	Limited groundwater is present within the Glacial Till due to the nature of the formation, which resists groundwater percolation and flows. Therefore, given the groundwater condition in the Glacial Till beneath this area, the risk of groundwater flooding is considered to be low. Groundwater is likely to be present in the alluvium and river terrace deposits and at shallow depth. The risk of groundwater flooding in this area is considered high, such as in the southern and central part of the cable route which fall in areas underlain by the alluvium and river terrace deposits.
Sewers	Low	The Cable Route Corridor Search Area is located in predominantly rural areas, however where a discrete area of proposed development is located adjacent to a highway/settlement there is potential for flooding from

Flood Risk Source	Pre-Scheme Flood Risk	Comments
		sewer sources. No recorded specific sewer flooding within Scheme boundary.
Artificial Sources	Low (Residual)	For the Cable Route Corridor Search Area, there are areas at risk of flooding from reservoir failure in the area of the River Trent floodplain – but only when there is also flooding from rivers. No other artificial sources are noted within the Cable Route Corridor Search Area.

Table 11-2: Principal Site – Flood Risk from all sources

Flood Risk Source	Pre-Scheme Flood Risk	Comments
Tidal / Fluvial	Low	Most of the Principal Site is contained within Flood Zone 1. There are 4 discrete areas of Flood Zone 3 within the boundary extents of the Principal Site. These are in the north near Harpswell Grange (watercourse flowing to the north within 'Eau from Source to Northorpe Beck Water Body' catchment), west and southwest of Glentworth ('Fillingham Beck Water Body' catchment), and east of Heapham. All the areas at risk of fluvial flood risk are in area classed as "Less Vulnerable" within Annex 3 of the NPPF; Land and Buildings used for Agriculture.
Surface Water	Low to High	There are isolated areas at low, medium and high risk of flooding however these areas are likely associated with areas of low topography where surface water is gathering in low points and draining towards smaller ordinary watercourses and/or local land drains.
Groundwater	Low	As stated in Table 11-1 above, the Glacial Till which resist groundwater flow or rise/percolation is also the predominant superficial geology beneath the Principal Site. Therefore, the risk of groundwater flooding is considered to be low. But the risk of groundwater flooding is considered high in the small pocket areas where the Alluvium and River Terrace Deposits are present due to the likely shallow groundwater condition in these units.
Sewers	Low	The Principal Site is located in predominantly rural areas, however where a plot is located adjacent to a highway/settlement there is potential for flooding from sewer sources.
Reservoirs	Low (Residual)	There are areas at risk of flooding from reservoir failure in the area of Glentworth and to the southeast, within the Fillingham Beck Water body catchment – but only when there is also flooding from rivers. Three in-line, assumed to be, irrigation basins are located off Northlands Road in the southeast corner of the Principal Site. Risk to the Principal Site is considered to be low as the adjacent ordinary watercourse would convey flows downstream, with PV panels not located in the floodplain of the watercourse. No other risk form artificial sources have been identified within the Principal Site.

Figure 11-3 Fluvial and Surface Water Flood Risk

Revision: 0 Drawn: BF Checked: DH Approved: ST Date: 2022-09-21

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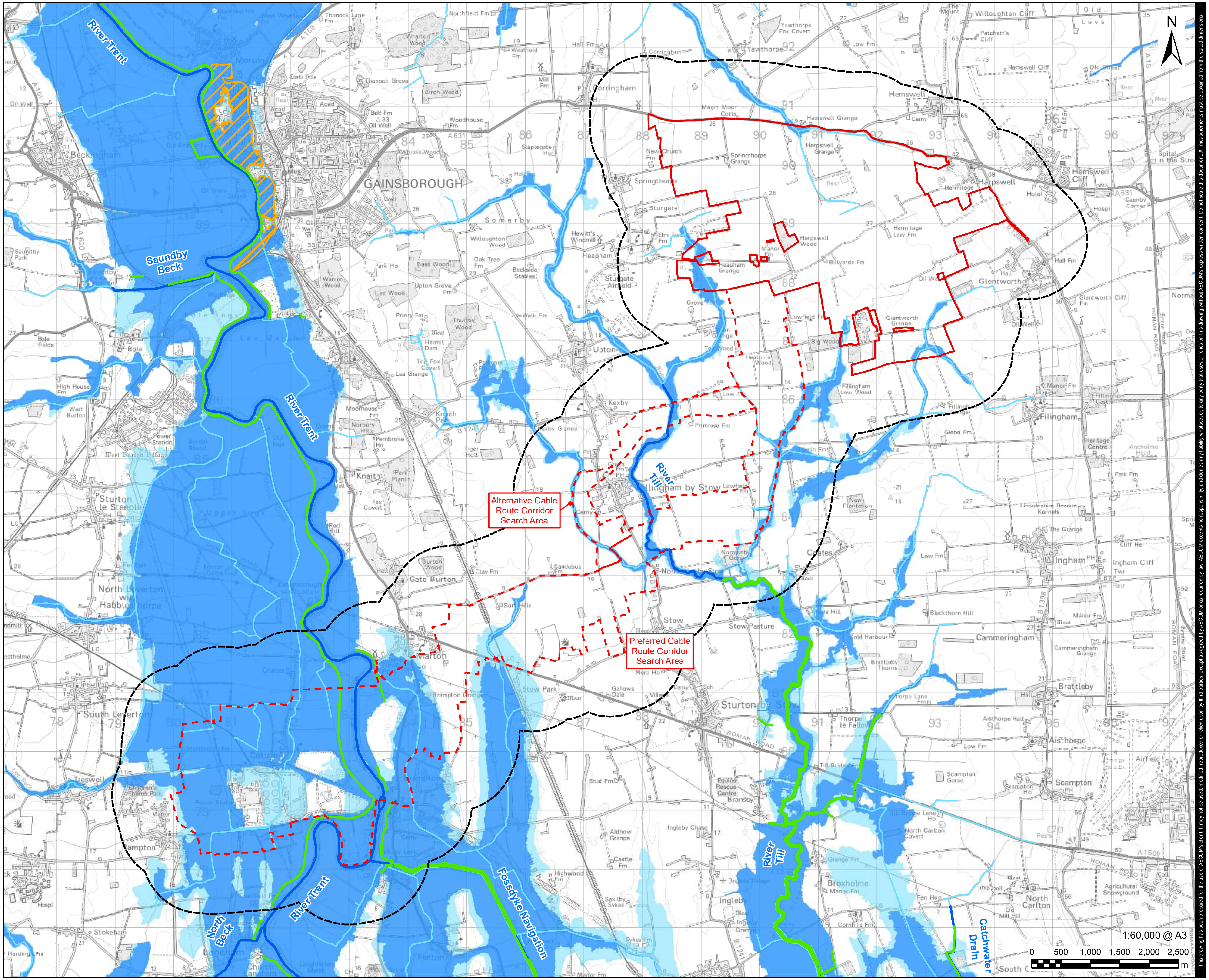

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LEGEND

- Principal Site
- Cable Route Corridor Options
- 1km Buffer
- Main River
- Ordinary Watercourse
- Flood Defence
- Area Benefiting from Flood Defence
- Flood Zone 2
- Flood Zone 3

NOTES

ISSUE PURPOSE

FOR INFORMATION

PROJECT NUMBER

60677969

FIGURE TITLE

Fluvial and Surface Water Flood Risk

FIGURE NUMBER

Figure 11-3

11.32 Main Rivers are defined according to criteria set under the Water Resources Act 1991 (Ref 11-5) as usually larger rivers and streams. There are for Main Rivers within the study area, for which the Environment Agency is the regulating authority. These are the River Till and the River Trent. Other watercourses are Ordinary Watercourses and the LLFA is the regulating authority for these. For the area west of the River Trent this is Nottinghamshire County Council, and for the area east of the River Trent this is Lincolnshire County Council.

11.33 The study area is located within three areas regulated by IDBs. These are:

- The Scunthorpe & Gainsborough Water Management Board, this includes an area in the north of the Principal Site associated with the 'Eau from Source to Northorpe Beck Water Body' catchment;
- Upper Witham IDB, Till (Witham) Water Body' catchment; and
- Trent Valley IDB, associated with the River Trent and its tributaries.

11.34 Main Rivers and Ordinary Watercourses are shown on Figure 11-4.

Figure 11-4 Surface Waterbodies and their Attributes

Revision: 0 Drawn: BF Checked: DH Approved: ST Date: 2022-09-21

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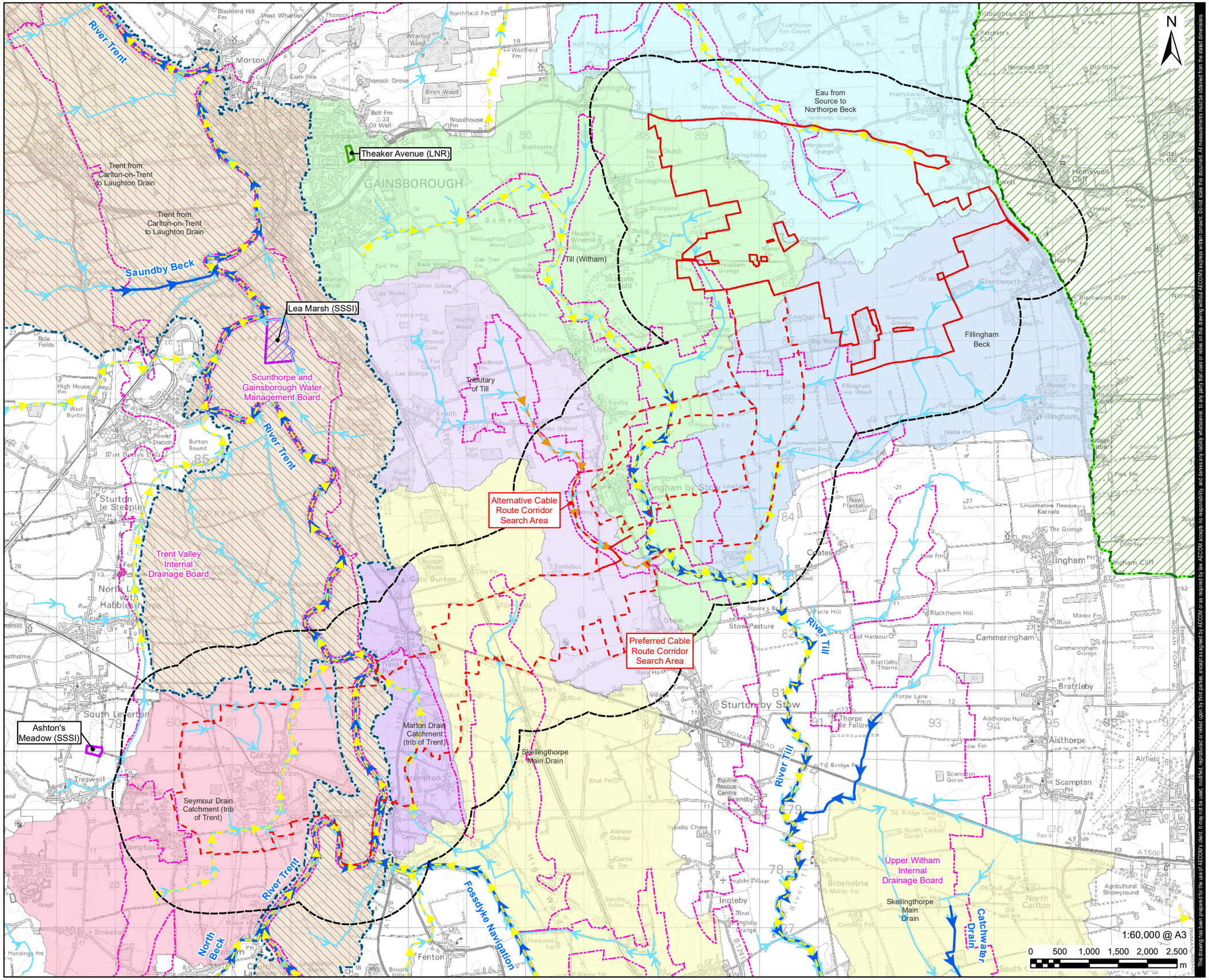

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LEGEND

- Principal Site
- Cable Route Corridor Options
- 1km Buffer
- Main River
- Ordinary Watercourse
- Internal Drainage District
- Drinking Water Safeguard Zone for Surface Water
- Drinking Water Protected Area

WFD Surface Waterbody
- Moderate Ecological Status
- Poor Ecological Status

WFD Surface Waterbodies
- Eau from Source to Northorpe Beck
- Fillingham Beck
- Marton Drain Catchment (trib of Trent)
- Seymour Drain Catchment (trib of Trent)
- Skellingthorpe Main Drain
- Till (Witham)
- Trent from Carlton-on-Trent to Laughton Drain
- Tributary of Till

Statutory Sites
- LNR
- SSSI

NOTES

ISSUE PURPOSE

FOR INFORMATION

PROJECT NUMBER

60677969

FIGURE TITLE

Surface Waterbodies and their Attributes

FIGURE NUMBER

Figure 11-4

Surface water bodies

11.35 The Scheme sits across eight WFD surface waterbodies which fall equally into two WFD River Basin Districts (RBDs), the Anglian and the Humber; two WFD Management Catchments (Lower Trent and Erewash and Witham); and two operational Catchments (Trent and Tributaries and Upper Witham) (Ref 11-45) as shown in Table 11-3.

Table 11-3: WFD RBD, Management and Operational Catchments, and Water bodies

RBD	Management Catchment	Operational Catchment	Water body
Anglian	Witham	Upper Witham	Fillingham Beck – GB105030062490
			Skellingthorpe Main Drain – GB105030062390
			Till (Witham) – GB105030062500
			Tributary of Till – GB105030062480
Humber	Trent Lower and Erewash	Trent and tributaries	Eau from Source to Northorpe Beck – GB104028057970
			Marton Drain Catchment (trib of Trent) – GB104028057840
			Seymour Drain Catchment (trib of Trent) – GB104028058340
			Trent from Carlton-on-Trent to Laughton Drain – GB104028058480

11.36 These catchments and named WFD surface water bodies are also shown within Appendix C. The WFD status for these watercourses is summarised in Table 11-4 and Table 11-5 below with data from Defra's Water Quality Archive (Ref 11-47).

11.37 The Fillingham Beck – GB105030062490 water body drains a fairly small catchment covering around 24 km^2, discharging to the River Till at SK 89876 82891. The water body has an overall Moderate Ecological Potential under the WFD and is designated as a heavily modified water body. The water body comprises a network of small, straightened Ordinary Watercourses that are probably artificial drainage ditches, or natural watercourses that have been grossly over-deepened and modified to facilitate land drainage and agriculture. As such, no flow gauging data is available. The water body is failing to reach Good Ecological Potential due to its Bad status for biological quality elements (invertebrates) and failing to meet Good Chemical Status due to priority hazard substances.

11.38 The Skellingthorpe Main Drain – GB105030062390 is a larger water body, draining a catchment of around 98 km^2, discharging to the River Trent at SK 83747 78073. The water body has an overall ecological Potential of Moderate and is designated as heavily modified due to its complex arrangement of severely degraded navigable water ways interspersed with a number of sluices, weirs and a network of straight filed ditches. The water body is failing to meet Good Ecological Potential due to failing dissolved oxygen, moderate biological quality

elements and failing to meet Good Chemical Status due to priority hazardous substances (namely, Mercury and its compounds and polybrominated diphenyl ethers).

11.39 The Till (Witham) – GB105030062500 is a small WFD water body that drains a catchment area of 35 km^2 and ultimately discharges to the Fossdyke Navigation at SK 91751 74850. The water body is currently at Moderate Ecological Potential under the WFD as it is designated as a heavily modified water body. The water body is also failing to meet Good Chemical Status due to priority hazardous substances (namely, Mercury and its compounds and polybrominated diphenyl ethers).

11.40 The Tributary of Till – GB105030062480 drains a small catchment area of 17 km^2 and, as the name reveals, discharges to the River Till at SK 88329 83387. The primary watercourse in the water body is Padmoor Drain, which, is an extensively modified and degraded watercourse. Despite this, the water body is not designated as Heavily Modified under the WFD, although it is currently at Poor Ecological Status due to poor classifications for biological quality elements and is failing to meet Good Chemical Status due to priority hazardous substances (namely, Mercury and its compounds and polybrominated diphenyl ethers).

11.41 The Eau from Source to Northorpe Beck – GB104028057970 is a small water body that covers a 17 km^2 catchment area, ultimately discharging to the River Trent at SE 83703 03277. The surface water network within the water body is comprised of agricultural ditches that drain to the Yawthorpe Beck, a tributary of the River Eau that ultimately discharges to the River Trent at SE 83703 03277. The water body is not designated as heavily modified, and is at Moderate Ecological Status due to moderate statuses for biological and physico-chemical quality elements and is failing to meet Good Chemical Status due to priority hazardous substances (namely, Mercury and its compounds and polybrominated diphenyl ethers).

11.42 The Marton Drain Catchment (tributary of Trent) – GB104028057840 is a small WFD water body that lies immediately adjacent to the River Trent and drains a catchment area of just 5 km^2. The water body is designated as heavily modified and is at Moderate Ecological Potential. This is due to moderate status in physico-chemical quality elements and failing to meet Good Chemical Status due to priority hazardous substances (namely, Mercury and its compounds and polybrominated diphenyl ethers).

11.43 The Seymour Drain Catchment (tributary of Trent) – GB104028058340 drains a catchment area of 19 km^2 discharging to the River Trent at SK 81383 85720. The Seymour Drain and its network of straightened agricultural ditch tributaries are representative of degraded watercourse system in a largely agricultural catchment. As such the water body is designated as heavily modified and is at Moderate Ecological Potential. This is due to moderate classifications for biological and physico-chemical quality elements, including poor status for dissolved oxygen and phosphate, as well as failing to meet Good Chemical Status due to priority hazardous substances (namely, Mercury and its compounds and polybrominated diphenyl ethers).

11.44 There are no National River Flow archive (Ref 11-46) gauging stations on any of the above watercourses.

11.45 The Trent from Carlton-on-Trent to Laughton Drain – GB104028058480 is a sizable water body that drains a catchment area of 155 km^2. The River Trent is a very large river that supports significant industry and has historically been an important route for navigation. As such, the water body is designated artificial under the WFD and is at Moderate Ecological Potential. The nearest gauging station on the River Trent is located over 21 km southeast and upstream of the Scheme at North Muskam (Station 28022 Trent at North Muskam Ref 11-46). The annual mean flow is 90.431 m3/sec, with a flow that is exceeded 95% of the time (Q95) of 28.9 m3/sec. Whilst this gauging station is located a long way upstream, it demonstrates the size and scale of the River Trent in this area. In the area of the Scheme, both the mean flow and the Q95 will be considerably larger.

Table 11-4: Anglian RBMP WFD Cycle 2 surface water status 2019

Management Catchment	Anglian			
Operational Catchment	Witham			
Water bodies	Fillingham Beck	Skellingthorpe Main Drain	Till (Witham)	Tributary of Till
Water Body ID	GB105030062490	GB105030062390	GB105030062500	GB105030062480
Overall Water body status 2019 (overall Water Body Objective)	Moderate by 2015	Moderate by 2015 (Draft Cycle 3: Good by 2017)	Moderate by 2015 (Draft Cycle 3: Good by 2017)	Moderate by 2027 (Draft Cycle 3: Good by 2017)
Artificial or Heavily Modified Water Body?	Heavily modified	Heavily modified	Heavily modified	No
Overall Ecological Status	Moderate	Moderate	Moderate	Poor
Biological quality elements	Bad	Moderate	Good	Poor
Physico-chemical	Moderate	Moderate	Moderate	High
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good
Specific Pollutants	N/A	N/A	N/A	N/A
Chemical	Fail	Fail	Fail	Fail
Priority Hazardous Substance	N/A	N/A	N/A	N/A

Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment

Table 11-5: Humber RBMP WFD Cycle 2 surface water status 2019

Management Catchment	**Humber**			
Operational Catchment	Trent and Tributaries			
Water bodies	Eau from Source to Northorpe Beck	Marton Drain Catchment (trib of Trent)	Seymour Drain Catchment (trib of Trent)	Trent from Carlton-on-Trent to Laughton Drain
Water Body ID	GB104028057970	GB104028057840	GB104028058340	GB104028058480
Overall Water body status 2019 (overall Water Body Objective)	Good by 2027	Good by 2027	Good by 2027	Good by 2027
Artificial or Heavily Modified Water Body?	No	Heavily modified	Heavily modified	Artificial
Overall Ecological Status	Moderate	Moderate	Moderate	Moderate
Biological quality elements	Moderate	Good	Moderate	Bad
Physico-chemical	Moderate	Moderate	Moderate	Moderate
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good
Specific Pollutants				
Chemical	Fail	Fail	Fail	Fail
Priority Hazardous Substance	Good	Fail	Fail	Fail
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Good

11.46 At the PEIR stage, the Applicant will request from the Environment Agency details of proposed mitigation measures for WFD water bodies within the study area that are not at good or their target status/potential.

Hydromorphology

11.47 It is difficult to assess the specific hydromorphological condition of the receptor surface water bodies without field survey, which will not be undertaken until the

PEIR stage. However, the general character may be determined from desk study and professional judgement. Since all identified WFD water bodies are screened in for further assessment, walkover surveys will take place as part of subsequent stages of the planning processes to establish baseline conditions of WFD hydromorphological, biological and chemical quality elements. For expediency, the hydromorphological condition of the screened-in water bodies is grouped by WFD operational catchment, since they are broadly representative of the smaller water body units that comprise them.

Upper Witham

11.48 The Upper Witham catchment has a maximum elevation of around 157m AOD and drains broadly south to north, before turning sharply east towards its confluence with The Haven, near Boston, Lincolnshire. However, the Scheme is located in the northern portion of the catchment which is drained by the River Till and tributaries. This watercourse flows broadly north to south. The catchment is heavily influenced by a significant proportion of arable farmland and improved grassland that, in combination, comprises more than 80% of its area. This strong agricultural influence has resulted in an extremely modified surface water drainage network, with straightened and probably grossly over-deepened channels forming the typical plan-form of watercourses. A complex system of artificial drains and navigable waterways further exacerbate the low-functionality of the catchments hydrological network.

11.49 Historical mapping (Ref 11-48) and analysis of topographic LiDAR (Ref 11-49) data reveal very little channel change over long-term and more recent timeframes respectively. This is because modifications to watercourses and excavation of land drains for agriculture took place many centuries before the emergence of formal mapping. However, given the topographic character of the catchment, and its generally low-lying elevation, its pre-modified state probably resembled a system of extensive wetland and bog habitats with strong lateral connectivity to the Witham and its tributaries, and vertical connectivity with underlying groundwater.

Trent and Tributaries

11.50 The Trent and Tributaries water body is a very sizeable catchment with a maximum elevation of around 90m AOD and drains broadly south to north, eventually joining the River Humber east of Goole, East Riding of Yorkshire. The Scheme occupies a small portion of the catchment, most of which is comprised of the proposed Cable Route Corridor. Similarly, the catchment is heavily dominated by agricultural land which influences the character and planform of the surface water network therein. Moreover, the River Trent is designated as ‘Artificial’ under the WFD due to extensive modification required to maintain it as a navigable waterway.

11.51 As with the neighbouring Upper Witham catchment, historical mapping reveals very little channel change due to modifications pre-dating formal OS mapping in the 19th Century. The Trent has a well-developed by extremely dysfunctional and poorly connected floodplain that once occupied a complex network of riparian wetlands and floodplain bog. This has been lost due to extensive land drainage, giving rise to the straightened and probably over-deepened surface water arrangement that comprises its contemporary drainage network.

Water Quality

11.52 There is water quality data for the following watercourse catchments within the Environment Agency's Water Quality Archive website (Ref 11-47). These are summarised in the Appendix D.

- Fillingham Beck – GB105030062490 (Anglian RBD). Summarised in Table D1;
- Till (Witham) – GB105030062500 (Anglian RBD) Summarised in Table D2 and D3;
- Tributary of Till – GB105030062480 (Anglian RBD). Summarised in Table D4;
- Marton Drain Catchment (tributary of Trent) – GB104028057840 (Humber RBD). Summarised in Table D5;
- Seymour Drain Catchment (tributary of Trent) – GB104028058340 (Humber RBD). Summarised in Table D6; and
- Trent from Carlton-on-Trent to Laughton Drain – GB104028058480 (Humber RBD). Summarised in Table D7.
- The WFD standards are also provided for comparison in Table D8.

11.53 There is no water quality archive data for the Eau from Source to Northorpe Beck – GB104028057970 (Humber RBD). The WFD standards are also provided for comparison in Table d8.

11.54 The water quality tables show that the water in the study area is slightly alkaline in nature with an average pH of between 7.74 to 8.154 pH units but falls within the WFD high classification based on the latest 20 samples included within the tables. The 10th percentile dissolved oxygen saturation of over 70% saturation is within the high WFD classification (with over 70% being High) for all of the data points with the exception of the Tributary of Till at Kexby Lane (Table D4). This has a 10th percentile dissolved oxygen saturation of 61.46 %, which is over 60% and classed as good.

11.55 There has been no monitoring of biochemical oxygen demand (BOD) in the last few years data at this monitoring location on the Eau from Source to Northorpe Beck. The 90th percentile ammonia levels (ammoniacal nitrogen as N) range from 0.07 to 0.442 mg/l which suggests good to high quality. There is likely to be sewage and agricultural runoff affecting these watercourses.

11.56 Nitrate and orthophosphate values are somewhat elevated for all monitoring sites and indicate probable pressure from the surrounding agricultural land uses through use of fertilisers and animal wastes which may runoff to the watercourses.

Water Resources

11.57 Within the study area, there is a Drinking Water Protected Area for surface water, which contains land to the east and west of the River Trent in the west of the study area (Water body GB104028058480 Trent from Carlton-on-Trent to Laughton Drain within the Lower Trent an Erewash Management Catchment). Drinking Water Protected Areas (Surface Water) are where raw water is abstracted from rivers and reservoirs and additional measures are required to

protect the raw water supply to reduce the need for additional purification treatment (Ref 11-49) This drinking water protected area is currently designated as 'currently not at risk'.

11.58 Within the study area, to the northeast of the B1398 a large area of the study area is contained within a drinking water safeguard zone for surface water (designation SWSGZ1000 Humber River Ancholme). Drinking Water Safeguard Zones are established around public water supplies where additional pollution control measures are needed. Here water supplies are at risk from several pesticides) (Ref 11-49). There are no Drinking Water Safeguard Zones for groundwater in the study area.

11.59 The whole of the study area is contained within Nitrate Vulnerable Zones (NVZ). NVZs are areas designated as being at risk from agricultural nitrate pollution (Ref 11-49). The designations are made in accordance with the Nitrate Pollution Prevention Regulations 2015. To the west of the River Trent the Scheme is contained within NVZ343, Seymour Drain catchment (tributary of River Trent), east of the River Trent is contained within several NVZs: NVZ347 R Trent from Carlton on Trent to Laughton Drain, NVZ375 Lower Witham, NVZ334 River Eau from Kirton Lindsey Tributary to River Trent).

11.60 There are no Source Protection Zones (SPZ) within the footprint of the Scheme, but there is a SPZ located to the east of the B1398 east of Harpswell. Zone 2 and Zone 3 are located east of the B1398 within the study area of the Scheme. The closest distance from the Principal Site to Zone 2 SPZ is approximately 100m.

11.61 Information on pollution incidents, licences and unlicensed water abstractions, and water activity permits (i.e. discharges) will be obtained from the Environment Agency and presented in the PEIR and ES.

Aquatic ecology and nature conservation sites

11.62 Statutory sites that are designated for nature conservation were identified through a review of the MAGIC website (Ref 11-49) within the study area. There are no international or national designated sites within the study area, or within what is considered to be the hydraulic zone of influence from the Scheme. There are 24 non-statutory designated sites for nature conservation within a 2km study area (more information on these is stated in *Chapter 10: Ecology* of this EIA Scoping Report). Much of these are for verges/ grasslands and woodlands, designated on botanical and woodland interest. Several sites are noted to contain wetland plants, or waterlogged soils etc that may be water dependent. These are listed below together with an initial assessment of whether they could be hydrologically impacted by the Scheme and thus, whether they are scoped in or out of the water environment impact assessment:

- White's Wood LWS: Located on the east of Gainsborough, south of the A631. This is located within the Till (Witham) Upper Water body, and is upstream of the Principal Site and Cable Route Corridor Search Area and thus is not hydrologically connected. As such it is **scoped out** of further assessment;
- Birch Wood LWS: located in agricultural land to the north of the A631 1km east of Gainsborough, and over 1km northwest of the Principal Site. This is deciduous woodland on seasonally waterlogged soils. This is located to the

north and outside of the Anglian River Basin District (RBD), and is therefore in a different hydrological catchment and **scoped out** of further assessment;

- Wharton Wood LWS: this is a site comprising woodland on seasonally water-logged soils. It is located to the north of Birch Wood LWS, and is therefore in a different RBD catchment and this will not be affected hydrologically and so is **scoped out** of further assessment;
- Coates Wetland LWS: a group of pools with rough grazing land near the River Trent located adjacent to the Cable Route Corridor Search Area and **scoped in** to the assessment;
- Cows Pasture Lane Drains LWS: drains with notable aquatic and bankside vegetation located within the Cable Route Corridor Search Area and **scoped in** to the assessment;
- Mother Drain Upper Ings LWS: a drain notable for supporting many species of water beetle and water bug located 800m north of the Cable Route Corridor Search Area and **scoped in** to the assessment;
- Torksey Ferry Road Ditch – Cottam LWS: a drain of interest for water beetles located within the Cable Route Corridor Search Area and **scoped in** to the assessment; and
- Cottam Ponds LWS: a number of ponds supporting abundant wildlife located within the Cable Route Corridor Search Area and **scoped in** to the assessment.

Groundwater

11.63 Groundwater is likely to be present in both the superficial (particularly in the Alluvium and River Terrace Deposits, but less likely in the till due to its nature which resists groundwater occurrence and flow) and bedrock geological units beneath the entire study area with levels at varying depths and controlled by the local geology.

11.64 Groundwater level data in the superficial deposits was not reported in the many historical BGS borehole records (SK98SW35, SK97NE1, SK98SE29, SK98NE6/B, SK89SE56, SK98NW5, SK88SE11) reviewed, however, it is anticipated that shallow (i.e. <1m below ground level) may be present in the Alluvium and River Terrace Deposits. Groundwater level in the bedrock varies between 15m and 20m below ground level (0m OD) with a regional easterly/north-easterly flow directions. The detailed design, construction and operation of the Scheme will take into consideration the groundwater level condition beneath the Scheme and will be informed following the detailed ground investigation for the Scheme.

11.65 According to MAGIC Map (Ref 11-49), the superficial glacial till and glacio-fluvial deposits which covers much of the area beneath the Scheme are designated as Secondary (undifferentiated) aquifer. Pockets of designated Secondary A aquifer within the superficial deposits are also present but are associated to the alluvium and river terrace deposits. The majority of the bedrock to the western and central part of the study area comprising the Scunthorpe and Charmouth mudstone are designated as Secondary (undifferentiated) aquifers. While the bedrock running north-south along the eastern boundary to the east up to the B1398 road are designated Secondary A aquifer. To the east of the B1398 road within and outside

the study area of the Principal Site, the bedrock in this area comprising the Lincolnshire Limestone is designated a Principal aquifer.

11.66 Principal aquifers are layers of rock of drift deposits that have high permeability, meaning they usually provide a high level of water storage and transmission. They may support water supply and/or river base flow on a strategic scale. Secondary B aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers. Secondary undifferentiated aquifer (such as in the glacial till and glacio-fluvial superficial deposits) has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

11.67 The study area is underlain by three WFD groundwater water bodies:

- Witham Lias Groundwater Body (GB40502G401400);
- Grimsby Ancholme Louth Limestone Unit (GB40401G444600); and
- Lower Trent Erewash (Humber) – Secondary Combined (GB40402G990300).

11.68 The Witham Lias Groundwater Body (GB40502G401400) covers the majority of the area beneath the Scheme and is associated with the Lincolnshire Limestone which outcrops to the east of the Scheme and forms the main designated Principal bedrock aquifer in the area. Since 2013, this groundwater body has maintained an overall classification of ‘Good’, with both the Quantitative and Chemical element statuses being ‘Good’ respectively. The ‘Chemical GWDTEs test’ is also ‘Good’. It is expected that the latest overall classification which is still at its draft state will most likely be ‘Good’ as well. Groundwater in this unit is used for drinking water purposes and is considered probably ‘Not To Be At Risk’.

11.69 Grimsby Ancholme Louth Limestone Unit (GB40401G444600) is located to the east of the Scheme and trends approximately north-south along the eastern boundary of the study area. Since 2013, this groundwater body has maintained an overall classification of ‘Good’ with both the Quantitative and Chemical element statuses being good respectively. The ‘Chemical GWDTEs test’ is also ‘Good’. It is expected that the latest overall classification which is still at its draft state will most likely be ‘Good’ as well. Groundwater in this unit is used for drinking water purposes and is considered to be ‘At Risk’.

11.70 Lower Trent Erewash (Humber) – Secondary Combined (GB40402G990300) is located to the west of the Scheme and trends approximately north-south along the western boundary of the study area. The overall classification and chemical element statuses for this groundwater body has been ‘Poor’ since 2013, but both achieved ‘Good’ status respectively in 2019. However, the ‘Chemical GWDTEs test’ has been Good since 2013 to 2019. Groundwater in this unit is used for drinking water purposes and is considered probably ‘Not To Be At Risk’.

11.71 The till is the predominant superficial deposit beneath the Scheme and most parts of the study area. Historical borehole records from the BGS online Geoindex (Ref 11-44) indicate the till is, on average, 15 m thick across the study area with limited groundwater occurrence as no groundwater was encountered

or reported during drilling due to the nature of the till which resist groundwater occurrence and flow.

11.72 There are no historical BGS borehole records in the areas where the alluvium and river terrace deposits are present beneath the Scheme. It is anticipated that shallow groundwater <1 m below ground level may be present within these deposits. However, only a small portion of the Scheme and the Cable Route Corridor Search Area traverse these deposits.

11.73 SPZ are areas defined to protect the abstraction from a protected groundwater source. There are a number of delineated SPZ 1, 2 and 3 areas located to east of the Scheme with small sections of the SPZ2 and SPZ3 catchment that fall within the eastern boundary of the study area.

11.74 According to MAGIC Map (Ref 11-49), groundwater vulnerability for the area ranges between medium to – high, with the central area predominantly being medium with some pockets area ranging between medium – high groundwater vulnerability.

11.75 There are no drinking water safeguard zones (Groundwater) in the study area. The closest is located over 20km northwest of the Scheme and is named as the Highfield Lane (Safeguard Zone ID GWSGZ0020). The pressures named for this safeguard zone are atrazine and nitrate. However, given the distance from the Scheme it will not be impacted and will not be considered any further.

Potential Effects and Mitigation

Construction and Decommissioning

11.76 A number of activities during construction and decommissioning phases are likely to generate impacts which have the potential to affect the water environment, if unmitigated.

11.77 The greatest risk of adverse impacts during construction and decommissioning are in the following six WFD catchments: Fillingham Beck, Till (Witham), Tributary of Till, Marton Drain Catchment, Seymour Drain Catchment and Trent from Carlton-on-Trent to Laughton Drain, which may be directly affected by the Scheme.

11.78 During construction the following adverse impacts may occur:

- Pollution of surface water or groundwater (and any designated ecology sites that are water dependent) due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through uncontrolled site run-off including dewatering of excavations;
- Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required;
- Temporary changes in flood risk from changes in surface water runoff (e.g. disruption of stream flows during any potential culvert construction works) and exacerbation of localised flooding, due to deposition of silt, sediment in drains, ditches; and changes; and

- Potential impacts on groundwater resources, local water supplies (licenced and unlicenced abstractions) and potentially the baseflow to watercourses from temporary dewatering of excavations or changes in hydrology.

11.79 The Scheme includes the construction of a Cable Route Corridor to connect the Principal Site to the national transmission system. This will necessitate the crossing of watercourses and drainage ditches. The construction of cable route crossings of watercourses has the potential to result in modifications to WFD water bodies. Some of these may be temporary such as to provided field access across watercourses or for an open-cut excavation of the channel for the installation of the new cables. Where these are required (and agreed with statutory bodies) a pre-works survey will be undertaken to provide baseline data for full reinstatement of the channel. Where possible, options for enhancement will also be considered.

11.80 It is assumed that the Cable Route Corridor will cross more significant waterbodies using a non-intrusive and trenchless technique (e.g. horizontal directional drilling (HDD), micro-tunnelling or boring) at a suitable depth beneath the bed level to avoid the risk of future exposure by scour of the bed (typically cables will be at least 1.5 m below the bed of a watercourse). It is also possible that watercourse crossings (or modifications to existing crossings) are required as part of works to above ground installations.

11.81 During decommissioning, potential impacts would be similar to the construction phase although it is anticipated that the cables would be left in situ beneath watercourses and there would be less excavation works required close to watercourses. There may also be some additional wastewater in pipework of any above ground installations, for example fire water storage tanks, that would need to be removed, tested, and potentially treated as waste rather than discharged to a watercourse or to ground.

Operation

11.82 During the operational phase, the following adverse impacts may occur:

- Impacts on water quality in watercourses and groundwater from run-off and the potential for accidental spillages from new permanent hardstanding and maintenance activities, assuming surface water run-off does ultimately drain to a surface watercourse rather than simply to ground;
- Potential for impact on groundwater or surface water as a result of the use of firewater in the event of a fire in the battery storage areas;
- Potential impacts on hydrology as a result of the Scheme. This may also have a subsequent effect on aquatic habitats and water-dependent nature conservation sites;
- Potential for permanent physical impacts to watercourses if crossings are required for access and depending on the design of the structure used;
- Potential impacts on the rate and volumes of surface water run-off entering local watercourses and increasing the risk of flooding;
- Potential for impact of foul drainage / water supply in the area due to the offices / maintenance facilities required as part of the Scheme;

- The current arable fields are treated with fertilizer and pesticides under current land use. During the life of the project the use of such chemicals will be greatly reduced; and
- Potential impacts on groundwater resources and local water supplies (if confirmed).

11.83 Due to the potential for impacts and effects on water receptors and resources by the Scheme, a full Water Environment Impact Assessment is **scoped in** and will be assessed further in the EIA. This will be supported by a Surface Water Drainage Strategy, a Flood Risk Assessment (FRA) and a Water Framework Directive Assessment (WFDa). The scope of these assessments and how the significance of effects will be determined is described in the following section.

Sources of Information

11.84 The water environment baseline conditions have been determined by a desk study of available information, and various other online data sources including:

- Online OS maps viewed to identify any surface water bodies within 1km of the Scheme (Ref 11-41);
- Online aerial photography (Ref 11-42);
- Part 1: Anglian river basin district river basin management plan (Ref 11-26);
- Part 1: Humber river basin district river basin management plan (Ref 11-27);
- Environment Agency Catchment Data Explorer tool (Ref 11-45);
- Met Office Website (Ref 11-43)
- BGS Borehole and Geological Maps (Ref 11-44); and
- Environment Agency Online Interactive Maps (Ref 11-50);
- Flood map for planning (rivers and sea);
- Risk of flooding from surface water;
- Risk of flooding from reservoirs; and
- Flood warning areas and risk.

11.85 Further review of existing geological plans, hydrogeological data and site investigation data will be carried out at the PEIR stage to provide a preliminary assessment of local ground and groundwater conditions. Summarised data will be recorded and provided within the FRA and will be used to inform the Surface Water Drainage Strategy. The FRA will form a technical appendix to the ES.

11.86 In addition, further information and data will be obtained from the Environment Agency and local councils and will be presented in the next stages of the assessment (i.e. the PEIR). This will include water quality, resources (pollution incidents, licenced and unlicenced (private) water abstractions and water activity permits (i.e. consented discharges), hydrogeology (e.g. groundwater levels), WFD data and flooding data.

11.87 It is also proposed to undertake general walkover and hydromorphological surveys of the site at the PEIR stage (and again at full impact assessment stage).

Assessment methodology

11.88 The following describes the proposed assessment methodology.

Water quality and resource assessment

11.89 Relevant data will be requested and obtained from the Environment Agency. A Site Walkover Survey will be undertaken during the PEIR stage of the assessment, which would be undertaken by a hydromorphologist and a water resources specialist. This will be to observe surface water bodies in the study area and to make observations about their current condition and character, the presence of existing risks and any potential pathways for construction, operation and decommissioning impacts as a result of the Scheme. Further site surveys may be required as the Scheme develops. However, no water quality sampling is proposed as it is not considered necessary to inform the determination of water body importance or inform the impact assessment, which adopts a qualitative risk based approach.

11.90 A qualitative assessment of potential effects on surface water quality from construction, operation and decommissioning of the Scheme will be undertaken. This will consider the risk to surface water bodies resulting from construction, decommissioning works or future operation activity using a source-pathway-receptor approach. Where there is a risk of pollution, mitigation measures will be described with reference to best practice guidance (e.g. Guidance on Pollution Prevention Notes and Construction Industry Research and Information Association guidance).

11.91 The potential presence of any known Private Water Supplies (PWS) will also be investigated during the impact assessment by requesting records from the environmental health departments for Nottinghamshire and Lincolnshire County Councils and associated District Councils.

11.92 As part of the groundwater assessment a groundwater risk analysis would be undertaken of each location where there be a watercourse crossing. This would compare the likely depth of excavation with available estimates of groundwater level at each site.

Hydromorphology and WFD Assessment

11.93 Due to the potential impacts upon WFD designated water bodies, a WFD Screening Assessment has been undertaken and is presented in Appendix C. The screening assessment presents the WFD surface water and groundwater bodies that would potentially be impacted by the Scheme based on the information available at the time of writing (July 2022). The report concludes that further assessment is required at subsequent stages of the planning process and upon receipt of additional information pertaining to engineering activities and construction methodologies associated with the Scheme.

11.94 It is recommended that further WFD scoping is undertaken to determine the level of risk posed by the Scheme to specific WFD biological, hydromorphological and chemical receptors. This will include a qualitative examination of the potential construction, operation and decommissioning phase impacts of the Scheme on relevant WFD hydromorphological, biological and physio-chemical parameters. It would be facilitated through review of available WFD data; targeted field work;

and consultation with the competent authority (The Environment Agency) in accordance with Advice Note 18 (Ref 11-51). The scoping assessment would be extended to incorporate elements of the impact assessment (qualitatively) and consideration of mitigation measures. The Environment Agency will be consulted on the outcome of the extended WFD Scoping Assessment.

11.95 Depending on the outcomes of the scoping assessment, more detailed investigations may be required, which will be determined in consultation with the Environment Agency, and, if potential residual impacts are identified, a detailed WFD Impact assessment would be undertaken.

Surface water drainage strategy

11.96 The design of drainage systems aims to ensure that there will be no significant increases in flood risk downstream, during storms up to and including the 1 in 100 (1%) annual probability design flood, with an allowance for climate change.

11.97 A Surface Water Drainage Strategy will be undertaken to ensure the risk of surface water flooding is not increased as a result of the Scheme, and any increased land take for foundations and any access roads.

11.98 Careful consideration of the SuDS features, in-keeping with local planning policy and through liaison with the LLFA, the three IDBs and Environment Agency, will be undertaken to ensure that the Surface Water Drainage Strategy adequately attenuates and treats runoff from the Scheme, whilst minimising flood risk to the site and surrounding areas.

11.99 In accordance with planning policy and general good practice, mitigation will be provided by restricting surface water discharge rates and providing on-site attenuation.

11.100 A water quality risk assessment of all above ground installations will be undertaken using the Simple Index Approach described in the SuDS Manual (2nd edition) (Ref 11-23). This will inform what, if any treatment measures are required to manage the risk from diffuse urban runoff to watercourses or ground.

Flood Risk Assessment

11.101 A FRA will be prepared for the Scheme, to review the current and future flood risk to the study area from all sources (including surface water, groundwater, tidal and fluvial sources), in-keeping primarily with the NPS and also in accordance with NPPF guidance, to inform the Scheme design and set out any proposed mitigation requirements that are to be addressed within the Surface Water Drainage Strategy.

11.102 The NPPF classifies solar farms as Essential Infrastructure (Annex 3). This classification is acceptable within Flood Zone 1 and should not require an Exception Test. Cable routes are not generally considered in long term flood risk terms, other than temporary works during installation, as they cables are buried with no above ground installation required to impact flood risk in the long term. The FRA will assess flood risk during construction; mitigation and construction methods will also be captured in the Framework CEMP and Framework DEMP. However, the approach to the Sequential and Exception Tests for the Cable Route Corridor will be clarified with the Environment Agency and the LLFA as

required, with due consideration for the NPPF and NPS (including Draft NPS) policies.

11.103 Where development is to take place within areas at risk of flooding, there may be a requirement for fluvial modelling and the construction of flood compensation or mitigation measures to ensure no detrimental effect to flooding potential within or from the affected watercourse in the catchment once the Scheme is operational. This will involve discussions with the Environment Agency and the Lead Local Flood Authority / IDBs. The conclusions of this will be referred to within the flood risk, drainage and surface water assessment presented in the ES. The FRA will be a technical appendix to the ES.

11.104 However, above ground installations and solar PV panels in the Principal Site will be located away from areas at risk of fluvial flooding where possible and mitigated within areas at risk of surface water flooding and form any other identified source of flood risk.

11.105 Any impacts identified through the FRA, during either construction or operation phases, will be evaluated for the impact assessment presented in the ES and an effect significance value attributed to each impact in accordance with the methodology outline in this chapter. The impact assessment only considers the potential impact of the proposed Scheme on flood risk, not the suitability of the Scheme in the context of flood risk acting on the site and it. The FRA will consider the flood risk to the Scheme.

Assessment of effect significance

11.106 The impact assessment will be based on a source-pathway-receptor model. For an impact on the water environment to exist the following is required:

- An impact source (such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water body);
- A receptor that is sensitive to that impact (i.e. water bodies and the services they support); and
- A pathway by which the two are linked.

11.107 The significance of effects will be determined using the principles of the guidance and criteria set out in the Design Manual for Roads and Bridges (DMRB) LA 113 Road Drainage and the Water Environment (Ref 11-52) and LA 104 (Ref 11-53) adapted for this assessment to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project and it provides a robust and well tested method for predicting the significance of effects. The criteria that will be used to determine receptors' importance is presented in Table 11-6.

11.108 In accordance with the stages of the methodology, there are three stages to the assessment of effects on the water environment, which area as follows:

- A level of importance (low to very high) is assigned to the water resource receptor based on a combination of attributes (such as the size of the watercourses, WFD designation, water supply and other uses, biodiversity, and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding;

- The magnitude of potential and residual impact (classed as negligible, minor, moderate or major adverse / beneficial) is determined based on the criteria listed in Table 11-7 and the assessor's professional judgment. Embedded or standard mitigation measures are taken into account in the initial assessment, but any other mitigation is not considered until the assessment of residual effects; and
- A comparison of the importance of the resource and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in Table 11-8. The significance of each identified effect (both potential and residual) is classed as very large, large, moderate, slight or neutral and either beneficial or adverse significance.

11.109 The magnitude of impact will be determined based on the criteria in Table 11-7 taking into account the likelihood of the effect occurring. The likelihood of an effect occurring is based on a scale of certain, likely or unlikely. Likelihood has been considered in the case of the assessment of potential impacts to water bodies only, as likelihood is inherently included within the flood risk assessment

Table 11-6: Criteria to Determine Receptor Importance (Adapted from LA 113 Ref 11-52)

Importance	General criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	EC Designated Salmonid / Cyprinid fishery; Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0m3 /s; site protected / designated under EC or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site. Critical social or economic uses (e.g. public water supply and navigation).	Source Protection Zone (SPZ) I; Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation; Groundwater locally supports GWDTE; Water abstraction: >1,000m3 /day	Unmodified, near to or pristine conditions, with well developed and diverse geomorphic forms and processes characteristic of river and lake type.	Essential Infrastructure or highly vulnerable development
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0m3 /s; Major Cyprinid Fishery; Species protected under EC or UK habitat legislation. Critical social or economic uses (e.g. water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction.	Principal Aquifer providing locally important source rover supporting ecosystem; SPZ II; Groundwater supports GWDTE; Water abstraction: 500-1,000m3 /day.	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.	More vulnerable development
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small /	Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ III; Water	Shows signs of previous alteration and/or minor flow / water level regulation but still retains some natural features, or may be recovering towards conditions indicative of the higher category.	Less vulnerable development.

	environmental value or is of regional importance.	limited population of protected species. Limited social or economic uses.	abstraction: 50- 499m3 /day.		
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated in its own right. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.	Generally Unproductive strata. Water abstraction:	Substantially modified by past land use, previous engineering works or flow / water level regulation. Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category.	Water compatible development
Negligible	The receptor is resistant to change and is of little environmental value	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Environmental Permitting (England and Wales) Regulations 2016 (Ref 11-9) and the Water Resources Act 1991 (as amended) (Ref 11-5) and future WFD targets also need to be considered. Note 2: Based on the water body 'Reach Conservation Status' presently being adopted for a major infrastructure project (and developed originally by Atkins) and developed from EA conservation status guidance (Environment Agency, 1998a; 1998b (Ref 11-54 and Ref 11-55) as LA113 (Ref 11-52) does not provide any criteria for morphology.

Table 11-7: Magnitude of Impact Criteria (Adapted from LA 113) (Ref 11-52)

Magnitude of Impact	Description	Examples
High Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute	Loss of a fishery; decrease in surface water ecological or chemical WFD status or groundwater qualitative or quantitative WFD status. Change in flood risk to receptor from low or medium to high.
Medium Adverse	Results in impact on integrity of attribute, or loss of part of attribute.	Partial loss of a fishery; measurable decrease in surface water ecological or chemical quality, or flow; reversible change in the yield or quality of an aquifer; such that existing users are affected, but not changing any WFD status. Change in flood risk to receptor from low to medium.
Low Adverse	Results in some measurable change in attribute's quality or vulnerability.	Measurable decrease in surface water ecological or chemical quality, or flow; decrease in yield or quality of aquifer; not affecting existing users or changing any WFD status. Change in flood risk to receptor from no risk to low risk
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity.	Negligible change discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity.
Low Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.	Measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD status. Change in flood risk to receptor from low risk to no risk.
Medium Beneficial	Results in moderate improvement of attribute quality.	Measurable increase in surface water quality or in the yield or quality of aquifer benefiting existing users but not changing any WFD status. Change in flood risk to receptor from medium to low.
High Beneficial	Results in a major improvement of attribute quality	The removal of an existing polluting discharge, or removing the likelihood of polluting discharges occurring which are currently impacting water body WFD classifications. Improvement in water body WFD classification. Creation of flood storage with decrease in peak flood level of over 100 mm.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction	

11.110 After embedded mitigation measures, and additional mitigation measures are taken into account, residual effects are those effects which are still predicted to potentially take place.

11.111 The importance of the receptor (Table 11-6) and the magnitude of impact (Table 11-7) are determined independently from each other and are then used to determine the overall significance of effects (Table 11-8). Options for mitigation will be considered and secured where possible to avoid, minimise, and reduce adverse impacts, particularly where significant effects may have otherwise occurred. The residual effects of the Scheme with identified mitigation in place will then be reported. Effects of moderate or greater are considered significant in EIA terms.

Table 11-8: Significance of effect matrix (From LA104) (Ref 11-53

		Magnitude of Impact (change)				
		High	**Medium**	**Low**	**Very Low**	**No change**
Environmental Importance (I.e., value/sensitivity)	**Very High**	Major	Major	Major	Minor	Neutral
	High	Major	Major	Moderate	Minor	Neutral
	Medium	Major	Moderate	Minor	Negligible	Neutral
	Low	Moderate	Minor	Negligible	Negligible	Neutral
	Very Low	Minor	Negligible	Negligible	Negligible	Neutral

Assumptions, limitations and uncertainties

11.112 At this stage, the Cable Route Corridor, and associated construction methodologies and mitigation, have not yet been determined and thus the proposed scope of assessment is based on best practice and professional judgement. This is of particular importance when considering impacts associated with watercourse crossings, and the quality of surface runoff, impacts to hydromorphology and channel hydraulics.

11.113 Receptors included in the assessment will include existing infrastructure assets, residential buildings, commercial buildings and agricultural land, and property potentially affected by the Scheme. The impact assessment will not consider flood risk impacts on the Scheme itself, as these are not appropriate. However, this will be considered by the FRA.

11.114 At this stage it is proposed that solar PV panels and other permanent development (except at crossing locations as may be required) will be offset from watercourses by a minimum of 10m measured from the centre line of narrow watercourse channels (i.e. typically 2-5m wide) and from the bank edge of watercourses with a wider channel with (as bank top is a variable feature). The purpose of this buffer reduces the risk of any pollutants entering the watercourse directly or direct physical impacts, whilst also providing space for mitigation measures (e.g. fabric silt fences) should they be required as identified at the

PEIR and ES stages. This buffer will be agreed with relevant stakeholders as the project is developed.

11.115 The locations of PWS and licenced abstractions have not yet been obtained, so these are not included as receptors at this time. Water activity permits (i.e. permitted discharges) are also not yet known and have not been considered in the baseline. Data will be requested from the Local Planning Authority and the Environment Agency and will be reported in the PEIR.

11.116 Requirements for hydraulic modelling of watercourses will be discussed with the Environment Agency / LLFAs / IDBs. Any modelling required will be undertaken as part of the ES to inform the FRA and Surface Water Drainage Strategy.

11.117 Visual surveys of accessible water/drainage features will be undertaken to inform the impact assessment, WFD assessment, FRA, and Surface Water Drainage Strategy. However, it may not be possible to survey all significant locations (such as crossing locations) or structures due to access constraints. Where this is the case, and adopting a precautionary approach, the Applicant will attempt to survey close to the area of interest and use data from that as a proxy. In addition, some watercourses may be small, ephemeral and flow only intermittently, and these may not be identified in the field.

11.118 Other than the site walkover surveys, the assessments and strategies proposed (e.g. FRA and Surface Water Drainage Strategy) will be based on desktop surveys and best available site layout proposals. Where available, topographical data will be used to support the FRA and Surface Water Drainage Strategy. In the absence of topographical data, LiDAR data will be used to inform the FRA and the Surface Water Drainage Strategy.

11.119 Temporary works will not be assessed unless they are of a potentially significant scale and have the potential to adversely affect flood risk or impact the quality or form of water bodies. The temporary works where such risks are considered significant (for example, excavations for the cable routes), will be identified and assessed within the FRA, extended Screening and Scoping WFD Assessment and impact assessment.

11.120 As part of the EIA, the risk from surface water drainage to surface or groundwater bodies will be assessed according to the Simple Index Approach presented in the C753 The SuDS Manual (Ref 11-23). Given the very low risk the need for treatment measures is expected to be minimal. As there is unlikely to be any limitations in terms of space it is not anticipated that there will be any issues providing adequate treatment of urban diffuse pollutants, should the Simple Index Approach assessment identify a need.

11.121 At this point in time, although it is anticipated that staff will be based on site during operation, it has not been confirmed whether welfare facilities will be provided and how any waste water would be appropriately managed. If required, options may include connecting to the nearest available public sewer or a self-contained independent non-mains domestic storage and / or treatment system.

12. Human Health

Introduction

12.1 This chapter sets out the scope and methodology for the human health assessment of the Scheme.

12.2 Due to the multi-disciplinary nature of human health the assessment of the Scheme's impacts on health will draw on technical assessments carried out by related EIA chapters, including *Chapter 7: Air Quality*; *Chapter 8: Climate Change*; *Chapter 11: Flood Risk, Drainage and Surface Water*; *Chapter 13: Landscape and Visual Amenity*; *Chapter 14: Noise and Vibration; Chapter 15: Socio-economics and Land Use*; and *Chapter 16: Transport and Access.*

Study Area

12.3 The study area for the health assessment will vary by the type of impact being assessed:

- The human health profile baseline study area will comprise a local ward area comprising the five wards in which the Scheme is located, within which there is a high likelihood that effects arising from the construction and operation of the Scheme could be experienced: Hemswell, Lea, Scampton, Stow and Torksey wards in West Lindsey district, and Rampton ward in Bassetlaw district. Where data is not available at the ward level, district level data will be provided for West Lindsey and Bassetlaw districts.
- The study areas for assessing the health impacts of the Scheme will be influenced by the geographic extent of the relevant technical assessments, as listed at 12.2. The assessment will refer to the study areas identified by the relevant EIA chapters.

Relevant Legislation, Policy, and Guidelines

12.4 Legislation, planning policy and guidance relating to Health and pertinent to the Scheme comprises:

Legislation

- Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 12-1); with particular regard to the requirement for the EIA for infrastructure projects to consider impacts on population and human health.
- The Health and Care Act (2022) (Ref 12-2) proposes health reforms in England, removes existing competition rules and formalises Integrated Care Systems (ICS). Each ICS has been established with four strategic purposes:
- Improve population health and healthcare;
- Tackle unequal outcomes and access;
- Enhance productivity and value for money; and
- Help the NHS to support broader social and economic development.

National Planning Policy

- Overarching National Policy Statement (NPS) for Energy (EN1) (Ref 12-3), with particular regard to Paragraphs 4.3.1 – 4.3.5 which detail requirements for NSIP applications to consider relevant health impacts;
- Draft New NPS EN-1 (Ref 12-4), with particular regard to Paragraphs 4.3.1 – 4.3.5 which details draft updated requirements for NSIP applications to consider relevant health impacts;
- National Planning Policy Framework (NPPF) (Ref 12-5), with particular regard to: Chapter 8 'Promoting healthy and safe communities'; Chapter 12 'Achieving well-designed places'; and, Chapter 15 'Conserving and enhancing the natural environment.

National Planning Practice Guidance

- National Planning Practice Guidance (NPPG) (Ref 12-6), with particular regard to Paragraphs 53-001-20190722 to 53-012-20190722 which set out how the design and use of the built and natural environment are major determinants of health and wellbeing, and how in turn positive planning can contribute to healthier communities;

Local Planning Policy

- Adopted Central Lincolnshire Local Plan (2017) (Ref 12-7) with particular reference to: Policy LP9: Health and Wellbeing, Policy LP13: Accessibility and Transport, Policy LP15: Community Facilities, Policy LP18: Climate Change and Low Carbon Living, Policy LP19: Renewable Energy Proposals, and Policy LP21: Green Infrastructure Network;
- Emerging Central Lincolnshire Submission Local Plan (2022) (Ref 12-8) with particular reference to: S5: Development in the Countryside, S14: Renewable Energy, S15: Protecting Renewable Energy Infrastructure, S47: Accessibility and Transport, S48: Walking and Cycling Infrastructure, S50: Community Facilities, Policy S51: Creation of New Open Spaces, Sports and Leisure Facilities and S54: Health and Wellbeing;
- Adopted Bassetlaw Core Strategy (2011) (Ref 12-9) with particular reference to: Policy DM3: General Development in the Countryside, Policy DM9: Green Infrastructure; Biodiversity and Geodiversity; Landscape; Open Space & Sports Facilities, and Policy DM10: Renewable and Low Carbon Energy;
- Emerging Bassetlaw Submission Local Plan (Addendum) (2022) (Ref 12-10) with particular reference to: Policy ST44: Promoting Healthy, Active Lifestyles; Policy ST46: Delivering Quality, Accessible Open Space; Policy 48: Protecting Amenity; Policy ST50: Reducing Carbon Emissions, Climate Change Mitigation and Adaptation; Policy ST51: Renewable Energy Generation; Policy ST52: Flood Risk and Drainage; Policy ST55: Promoting Sustainable Transport and Active Travel; and, Policy ST58: Provision and Delivery of Infrastructure.
- Corringham Neighbourhood Plan (Adopted January 2022) (Ref 12-11);
- Glentworth Neighbourhood Plan (Adopted January 2019) (Ref 12-12);
- Draft Hemswell and Harpswell Neighbourhood Plan (2022) (Ref 12-13);

- Sturton by Stow Neighbourhood Plan (Adopted July 2022) (Ref 12-14);
- Rampton and Woodbeck Neighbourhood Plan (Adopted May 2021) (Ref 12-15); and
- Treswell and Cottam Neighbourhood Plan (Adopted February 2019) (Ref 12-16).

Other Relevant Guidance

- Joint Health and Wellbeing Strategy for Lincolnshire (2018) (Ref 12-17);
- Nottinghamshire Joint Health and Wellbeing Strategy 2022-2026 (2022) (Ref 12-18);
- Central Lincolnshire HIA for Planning Applications: Guidance Note and Checklist (2017) (Ref 12-19);
- Design Manual for Roads and Bridges (DMRB) Document LA112 (Ref 12-20) which sets out guidance for assessing health impacts of highways projects;
- NHS Healthy Urban Development Unit (HUDU) (Ref 12-21) Rapid Health Impact Assessment (HIA) Tool which sets out guidance for assessing the health impacts of new developments;
- Public Health England (PHE) guidance "Spatial Planning for Health: An evidence resource for designing healthier places' (Ref 12-22);
- PHE Strategy 2020 to 2025 (Ref 12-23);
- The Marmot Review: Fair Society Healthy Lives (2010) (Ref 12-24);
- Health Equity in England 10 Years On (2020) (Ref 12-25);
- Build Back Fairer – the Covid-19 Marmot Review (2020) (Ref 12-26); and
- NHS Long Term Plan (2019) (Ref 12-27).

Baseline Conditions

12.5 This section sets out a high-level summary of community health baseline indicators across the defined local ward and district study areas detailed above.

12.6 This overview of community health indicators is based on the following public data sources:

- Office for National Statistics (ONS). Mid-year sub-national population estimate data (2020) (Ref 12-28);
- ONS 2011 Census Data (Ref 12-29). The 2011 Census is currently the most current complete dataset available, however, 2021 Census dataset will be used in preference should the required data be released at the time of carrying out the impact assessment;
- PHE Local Health Data (Ref 12-30); and
- Claimant Count Data (Ref 12-31).

Community Health Baseline Overview

12.7 Table 12-1 sets out a summary of key health indicators across the local ward and district study areas, compared to regional (East Midlands) and national (England) averages.

Table 12-1: Community Health Profile

	Local Wards	*West Lindsey*	*Bassetlaw*	*East Midlands*	*England*
Population (2020)	15,381	96,186	118,280	4,865,583	56,550,138
Population aged under 16 (%) (2019)	15.1%	17.1%	18.0%	18.5%	19.2%
Population aged over 65 (%) (2019)	27.0%	25.2%	22.3%	19.6%	18.5%
Unemployment rate	4.4%	5.6%	5.8%	6.0%	6.3%
Unemployment (% working age population claiming out of work benefits)	2.1%	3.2%	3.1%	3.4%	3.9%
General Health – bad or very bad (%)	5.2%	5.4%	6.7%	5.6%	5.5%
Long term health problem or disability (%)	20.6%	19.9%	21.8%	18.6%	17.6%
Life Expectancy at Birth (males) (2018-2020)	n/a	79.5	78.9	79.2	79.4
Life Expectancy at Birth (females) (2018-2020)	n/a	83.2	82.0	82.7	83.1
Inequality in Life Expectancy at Birth (males 2018-2020)	n/a	8.0	6.7	9.2	9.7
Inequality in Life Expectancy at Birth (females 2018-2020)	n/a	8.9	5.8	7.6	7.9
Obese children (Year 6) (%)	n/a	16.0%	23.7%	20.8%	21.0%

	Local Wards	West Lindsey	Bassetlaw	East Midlands	England
Under 75 mortality rate (all causes) (2018-2020)	n/a	309.1	359.6	342.9	336.5

Future Baseline

12.8 ONS population projections are available at Local Planning Authority level and above. Population projections for 2027 (the projected year the Scheme will be operational) and 2042 (15 years following the operational assessment year) have been considered.

12.9 The population of West Lindsey is projected to grow to 98,905 by 2027 and 102,710 by 2042 (2.8% and 6.8% growth from 2020); and the population of Bassetlaw is projected to grow to 124,055 by 2027 and 132,209 by 2042 (4.9% and 11.8% growth from 2020). This compares to 5.0% growth to 2027 and 12.4% to 2042 across the East Midlands, and 3.5% growth to 2027 and 8.8% to 2042 across England as a whole.

12.10 Due to the broad range of individual and environmental determinants that can influence physical and mental health outcomes, the future community health baseline is highly uncertain. Given this inherent uncertainty it is assumed the future community health baseline in 2027 once the Scheme is operational, and 15 years following the operational assessment year in 2042, would be in line with current local baseline conditions.

Potential Effects and Mitigation

12.11 The health assessment will consider the construction, operation and decommissioning phases of the Scheme.

Potential Construction Impacts

12.12 The following effects could generate health impacts during the construction phase of the Scheme:

- Potential temporary quality of life and safety impacts from construction works impacting on local residents, visitors and workers (arising from impacts of construction on air quality, noise, light pollution, landscape amenity and traffic and transport);
- Potential temporary or permanent accessibility impacts on PRoW and recreational routes and open space, impacting local residents, visitor and worker accessibility to active travel routes;
- Potential temporary or permanent accessibility impacts on PRoW and recreational routes and open space, impacting local residents, visitor and worker accessibility to green space;
- Potential temporary or permanent accessibility impacts on PRoW and recreational routes impacting local resident access to local community services and social infrastructure;

- Potential temporary or permanent impacts on community cohesion arising from impacts to accessibility and community engagement work impacting local residents;
- Potential impacts on climate change arising from the construction works;
- Potential impacts arising from increased access to construction related employment and training;
- Potential temporary project-wide in-combination and cumulative effects during the construction phase.

Potential Operational Impacts

12.13 The following health impacts could arise from the operational phase of the Scheme:

- Potential permanent accessibility impacts on PRoW and recreational routes and open space, impacting local residents, visitor and worker accessibility to active travel routes;
- Potential permanent accessibility impacts on PRoW and recreational routes and open space, impacting local residents, visitor and worker accessibility to green space;
- Potential permanent accessibility impacts on PRoW and recreational routes impacting local resident access to local community services and social infrastructure;
- Potential impacts arising from increased access to operational phase employment and training;
- Potential permanent impacts on community cohesion arising from permanent accessibility impacts;
- Potential permanent quality of life impacts on residents and visitors arising from landscape amenity effects;
- Potential permanent impacts on climate change arising from the operational phase;
- Potential permanent project-wide in-combination and cumulative effects.

Potential Decommissioning Impacts

12.14 The potential health impacts associated with the decommissioning phase would be in line with the potential construction phase impacts outlined above.

Summary of Effects

12.15 The potential construction, operational and decommissioning impacts outlined above will be **scoped in** for further assessment in the EIA.

Source of Information

12.16 The sources of data used for the health assessment will be primarily desk-based. Where relevant, stakeholder engagement will inform the baseline and assessment of effects.

Assessment Methodology

12.17 There is no consolidated methodology or practice for the assessment of effects on human health. Best practice principles are provided in the NHS England's Healthy Urban Development Unit's Rapid Health Impact Assessment (HIA) Toolkit 2019 and this toolkit will form the basis of the approach to assessing the impacts on health arising from the Scheme. Reference will also be made to Central Lincolnshire's 'HIA for Planning Applications' Guidance Note and Checklist.

12.18 Based on the above, a qualitative assessment of human health effects will consider the potential consequences for health and wellbeing from the construction, operation and decommissioning phases of the Scheme, drawing on best practice approaches and professional judgement.

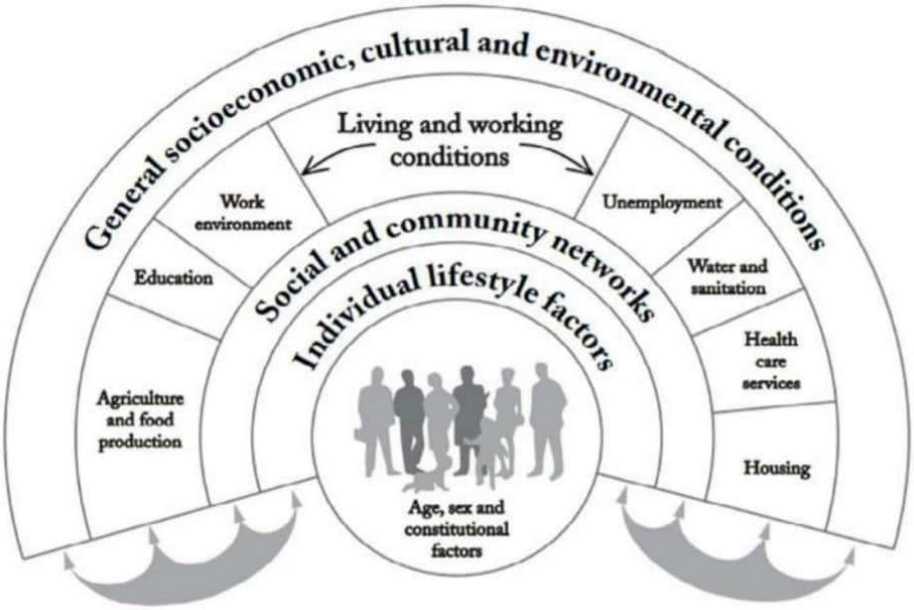
Scope of Assessment

12.19 The World Health Organisation (WHO) Europe defines health as 'a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity' (Ref 12-32). Public health therefore encompasses general wellbeing, not just the absence of illness.

12.20 The health and wellbeing of individuals is determined by a broad range of individual constitutional and behavioural factors, as well as broader environmental, social and economic factors. Some factors are direct and obvious, others are indirect.

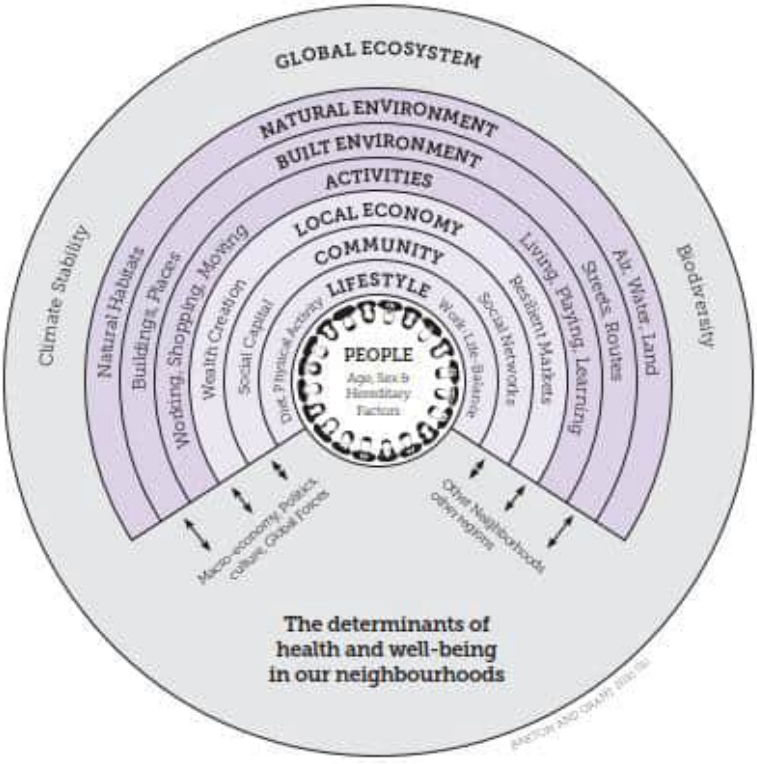
12.21 Dahlgreen and Whitehead's model of the main determinants of health (Ref 12-33) illustrates the breadth of possible influences on health, as show in Plate 12-1. At the centre of the illustration are factors that are largely fixed – including individual age, sex, constitutional and genetic factors. Outside of this are factors generally described as the wider or broader determinants of health. The model emphasises interactions between the layers. Moving outwards from the centre, individual lifestyle choices are embedded in social norms and community networks, and in living and working conditions, which in turn are shaped by and related to the wider socioeconomic and cultural environment.

Plate 12-1: Determinants of Health (Source: Dahlgreen and Whitehead, 1993)



12.22 This model has been developed to show elements of the built environment and communities that are the most significant determinants of health, as shown in Plate 12-2.

Plate 12-2: Determinants of Health in Neighbourhoods (Ref 12-34)



12.23 Within a population there can also be health inequalities, defined by the WHO as "differences in health status or in the distribution of health determinants between different population groups. For example, differences in mobility between elderly people and younger populations or differences in mortality rates between people from different social classes".

Determining the Baseline

12.24 Relevant policy will be reviewed at the local, regional and national levels to identify the key issues of relevance to the Scheme.

12.25 A baseline assessment will be undertaken using a range of sources to provide a description of the health conditions within the health study areas set out above. This will be done using established statistical sources, and in consultation with stakeholders including Lincolnshire Clinical Commissioning Group (CCG) and Nottingham and Nottinghamshire CCG, where relevant.

Assessment of Potential Effects

12.26 As set out above the factors contributing to individual health and wellbeing are broad, and the health of existing and new residents, workers and visitors will be largely determined by individual age and constitutional factors and lifestyle factors unrelated to the Scheme.

12.27 Taking account of these factors, the health assessment will use relevant guidance set out in the framework for assessment set out by the *NHS HUDU Planning for Health Rapid HIA Tool* to consider how the Scheme could influence health – including how it could influence health inequalities, during the construction and operational phases.

12.28 The HUDU assessment tool identifies eleven broad determinants that are likely to be influenced by specific development proposals and can be influenced through design and management measures, against which the likely impacts of new developments can be assessed. Of these, the following eight broad determinants are relevant to the potential health impacts arising from the Scheme:

- Access to health and social care services and other social infrastructure;
- Access to open space and nature;
- Air quality, noise and neighbourhood amenity;
- Accessibility and active travel;
- Access to work and training;
- Social cohesion and inclusive design;
- Minimising the use of resources;
- Climate change.

12.29 Due to the diverse nature of health determinants and outcomes which are assessed, and the difficulty of quantifying these with respect to health outcomes, NHS HUDU guidance does not provide a methodology for assessing the significance. In line with this, the assessment of likely health impacts of the Scheme will be described qualitatively, based on professional judgement and best practice guidance, and effects will be assessed as ‘positive’, ‘negative’, ‘neutral’ or ‘uncertain’, using the criteria set out in Table 12-2.

12.30 Where an impact is identified, actions will be proposed to mitigate any negative impact on health, or to realise opportunities to create health benefits. It should be noted that in many cases, mitigation will be embedded within the Scheme

design, and the implementation of this will be an underlying assumption of the assessment.

Table 12-2: Health Assessment Impact Categories

Impact Category	Description
Positive	A beneficial impact is identified
Neutral	No discernible health impact is identified
Negative	An adverse impact is identified
Uncertain	Where uncertainty exists as to the overall impact

12.31 The assessment will draw on the findings of related technical assessments, as listed at paragraph 12.2. The geographical extent of health effects will be determined by the assessments set out in those related chapters.

Assumptions, Limitations and Uncertainties

12.32 The Human Health assessment is based on professional judgement and considers both the adverse and beneficial impacts that the Scheme will have on surrounding receptors. It provides an indication of human health effects on people and the local community.

13. Landscape and Visual Amenity

Introduction

13.1 This chapter sets out the approach to the assessment of the Scheme's impacts for the two related sub-topics of landscape and visual amenity. These two components of a landscape and visual impact assessment (LVIA) are defined in the Guidelines for Landscape and Visual Impact Assessment, Third Edition, 2013 (GLVIA3) (Ref 13-1) as:

- Landscape Effects: effects on the landscape as a resource in its own right; and
- Visual Effects: effects on specific views and on the general visual amenity experienced by people.

13.2 The purpose of the chapter will be to identify sensitive landscape and visual receptors in the vicinity of the Scheme that will need to be scoped into the LVIA. The chapter also outlines the potential landscape and visual impacts (including cumulative); likely significant effects; and key mitigation principles that could be incorporated into the design of the scheme. It also sets out the proposed approach that will be taken within the LVIA.

13.3 The LVIA will be undertaken in accordance with the GLVIA3 and with reference to other environmental topics, including Ecology, Cultural Heritage, Arboriculture and Glint and Glare Assessments. This chapter should be read in conjunction with *Chapter 9: Cultural Heritage* of this EIA Scoping Report, which details matters relating to cultural heritage assets. This designation is referenced in this chapter as there are potential overlaps between the LVIA and cultural heritage assessment in relation to the wider landscape setting of the Registered Park and Garden.

Study Area

13.4 The LVIA study area has been informed by a desk-based review of the landform and landcover within and around the Scheme, followed by an initial site visit. Subsequently, preliminary computer-generated Zones of Theoretical Visibility (ZTV) (Figures 13-1, 13-2 and 13-3) have been produced. These have been verified during further site visits.

13.5 The preliminary ZTVs for the Principal Site indicate areas of potential visibility of the proposed solar PV panels and therefore help to identify the scope of receptors likely to be affected, as well as assisting in the identification of important viewpoints to form the basis of the assessment. They are based on a maximum height of panels of 3.5m across the Principal Site. The preliminary ZTVs do not include other associated infrastructure that may be necessary, the scale and location of which is unknown at the time of writing, so an overly worst case has been assumed at this stage. This will include sub-stations up to 12m in height. The visibility of these will be modelled by ZTVs once final locations have been confirmed.

13.6 The preliminary ZTVs for the Principal Site reflect the strong presence of the north-south oriented Lincoln Cliff or Edge, which almost completely prevents views east of the B1398 Middle Street that runs along the crest of the feature. To

the west, theoretical visibility for the Principal Site encompasses an area up to around 5km over bare ground (Figure 13-1). However, when the screening effect of existing features including woodland and buildings is considered, the principal zones of visibility for the Principal Site will be generally confined to locations within 2km (Figure 13-2). The exception is along Middle Street, above Glentworth and Harspwell, where longer-range views are likely to be available.

13.7 No ZTVs have been produced for the Cable Route Corridor Search Area at this stage, due to the absence of a defined route at the time of writing alongside the more limited nature of work envisaged, which would only be relevant to construction as permanent works will be below-ground. A high-level baseline review and site survey of the Cable Route Corridor Search Area have been undertaken. Should the Cable Route Corridor subsequently require works such as woodland removal, a ZTV may be produced to inform the assessment process.

13.8 The extent of the LVIA study area will be reviewed throughout the iterative design process and by fieldwork in winter when deciduous vegetation is not in leaf. Modifications may arise to ensure all works (including temporary areas required for construction and permanent infrastructure) are included. The maximum parameters of these, in terms of height and location, will be determined as the Scheme design develops, taking into account environmental and technical factors. A reasonable worst case will be assessed and presented in the ES.

Figure 13-1 Zone of Theoretical Visibility – Bare Earth

Revision: 0 Drawn: NK Checked: LL Approved: DW Date: 2022-09-22

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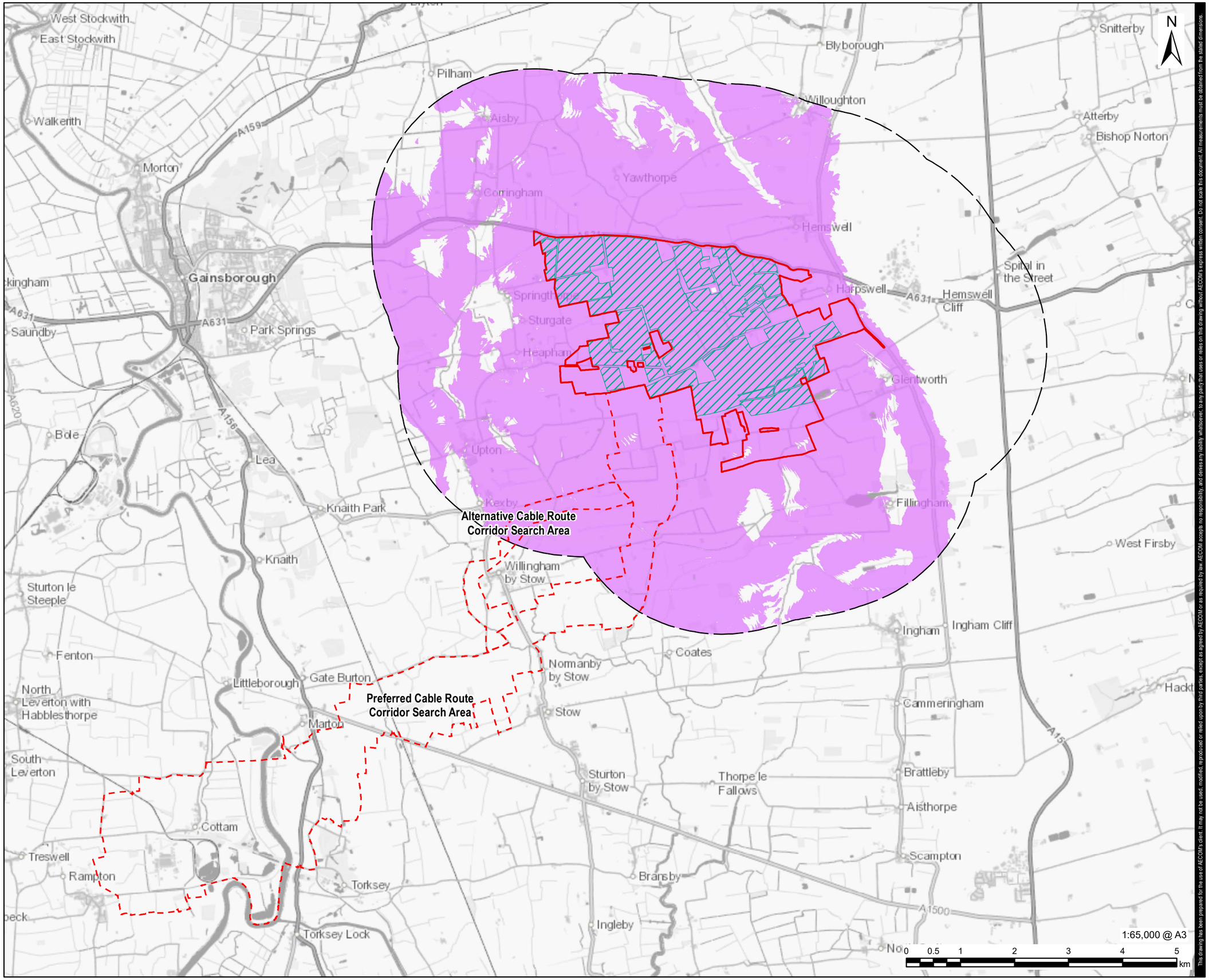

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LEGEND

- Principal Site
- Cable Route Corridor Options
- Indicative Developable Area
- Principle Site 3km Buffer

Zone Of Theoretical Visibility

- No Theoretical Visibility
- Theoretical Visibility

NOTES

1) Zone of Theoretical Visibility (ZTV) has been generated using Environment Agency Digital Terrain Model (DTM), with a 2m resolution.
2) ZTV is based upon indicative developable areas of solar panels, with an anticipated height of 3m above existing ground levels, and an observer height of 1.5m. The precise location of panels will be subject to change, and the scheme will also include elements of greater height, such as substations, that will be modelled separately once locations are confirmed.
3) ZTV calculated using ArcGIS 10.8.1 Viewshed tool.

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PROJECT NUMBER

60677969

FIGURE TITLE

Zone of Theoretical Visibility - Bare Earth

FIGURE NUMBER

Figure 13.1

Figure 13-2 Zone of Theoretical Visibility with Barriers

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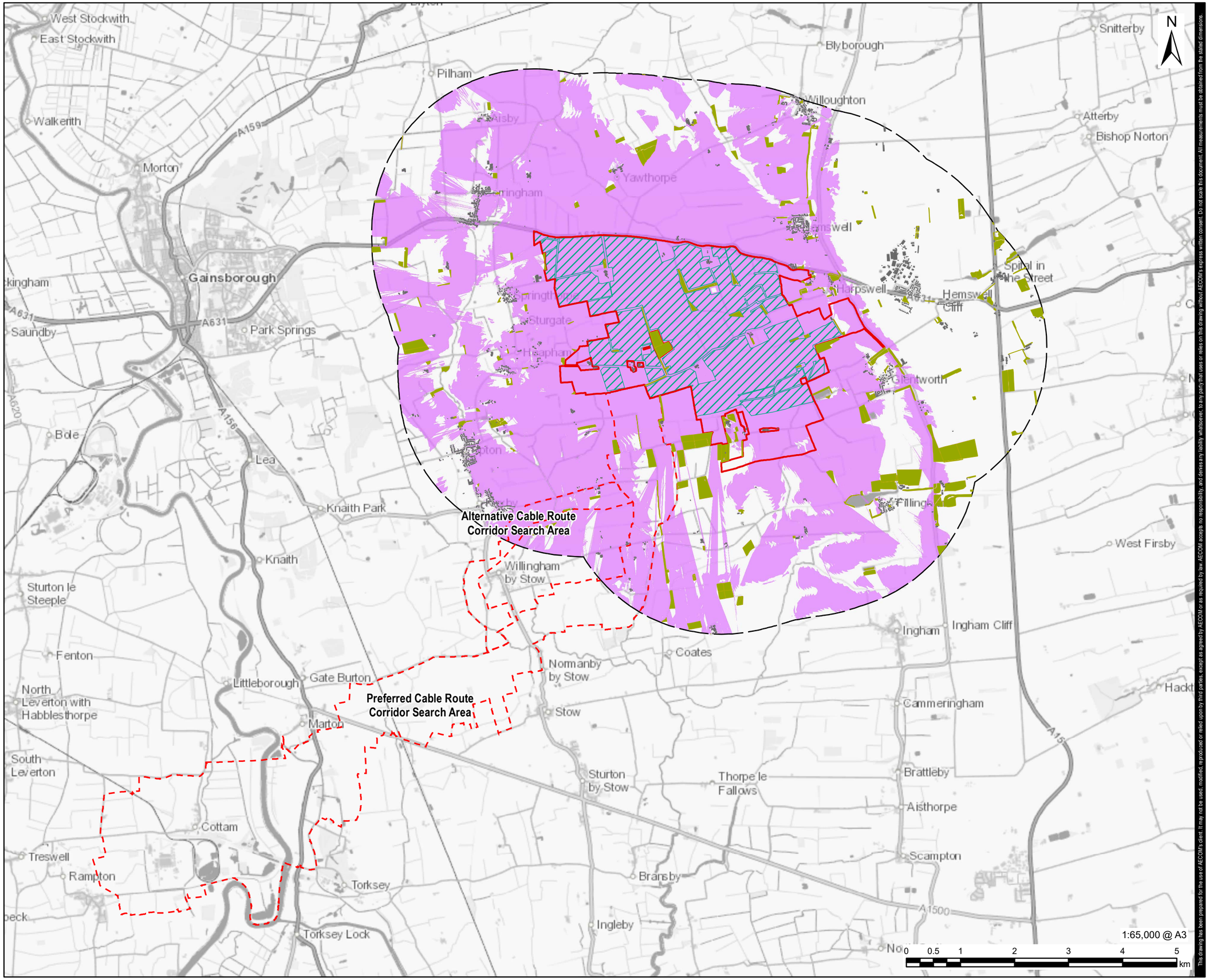

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LEGEND
- Principal Site
- Cable Route Corridor Options
- Principle Site 3km Buffer
- Indicative Developable Area
- Buildings
- Woodland

Zone of Theoretical Visibility
- No Theoretical Visibility
- Theoretical Visibility

NOTES

Contains Ordnance Survey Data © Crown Copyright and database right 2022.
1) Zone of Theoretical Visibility (ZTV) has been generated using Environment Agency Digital Terrain Model (DTM), with a 2m resolution, which takes into account the effects of trees and buidings. Woodland from the Forestry Commission National Forestry Inventory (2021) and OS Open Data, with an assumed height of 8m and Buildings from OS Open Data with an assumed height of 11m have been incorporated into the DTM, to mask any 'false' visibility from the top of trees and buildings.
2) ZTV is based upon indicative developable areas of solar panels, with an anticipated height of 3m above existing ground levels, and an observer height of 1.5m. The precise location of panels will be subject to change, and the scheme will also include elements of greater height, such as substations, that will be modelled separately once locations are confirmed
3) ZTV calculated using ArcGIS 10.8.1 Viewshed tool.

ISSUE PURPOSE
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PROJECT NUMBER
60677969

FIGURE TITLE
Zone of Theoretical Visibility with Barriers

FIGURE NUMBER
Figure 13.2

Relevant Legislation, Planning Policy Context and Guidelines

13.9 Legislation, planning policy and guidance relating to landscape and visual matter and pertinent to the Scheme comprises:

National Planning Policy

- NPS EN-1 (Ref 13-2) – paragraphs 4.1.3-4.1.4, 4.2.1, 4.2.3-4.2.4, 4.2.8-4.2.10 in relation to assessment principles and paragraphs 4.5.1-4.5.3 in relation to good design, 5.1.2 in relation to ES requirements and section 5.9 in relation to landscape and visual assessment. Consideration will also be given to Draft NPS EN-1 Section 5.10 with respect to landscape and visual considerations when assessment new energy developments.
- NPS EN-3 (Ref 13-3) paragraphs 2.4.2 with respect to renewable energy infrastructure demonstrating good design in respect of landscape and visual amenity. Draft NPS EN-3 will also be considered and the policy considerations applied to the design of the Scheme. The draft NPS EN-3 introduces policies specific to solar photovoltaics with Section 2.51 setting out specific policy requirements with respect to the consideration of landscape, visual and residential amenity.
- NPS EN-5 (Ref 13-4) paragraph 2.2.5 in relation to location and landscape considerations and paragraph 2.8.4 in relation to landscape and visual assessment. Consideration will also be given in relation to Draft NPS EN-5 Section 2.11 with respect to landscape and visual considerations when considering schemes for new electrical network infrastructure.
- NPPF (Ref 13-5) in particular paragraph 127 in relation to achieving well designed places, paragraph 153 in relation to compliance with development plan policies, paragraph 170 in relation to conservation and enhancing the natural environment and paragraph 180 in relation to siting development that is appropriate for its location taking account of effects and mitigation.

National Planning Practice Guidance

- Planning Practice Guidance, Natural Environment (Landscape) (Ref 13-6); and
- Planning Practice Guidance, Renewable and Low Carbon Energy (Ref 13-7), with particular reference to glint and glare.

Local Planning Policy

- Adopted Central Lincolnshire Local Plan (April 2017) (Ref 13-8), with particular reference to Policy LP17 Landscape, Townscape and Views (which makes reference to Areas of Great Landscape Value (AGLV)); Policy LP19: Renewable Energy Proposals; Policy LP20: Green Infrastructure Network; Policy LP21 Biodiversity and Geodiversity; Policy LP25: The Historic environment; and Policy LP26 Design and Amenity.
- Emerging Central Lincolnshire Submission Local Plan (2022) (Ref 13-9) with specific reference to Policy S5 (Development in the Countryside), Policy S14 (Renewable Energy), Policy S34: Non-designated Employment Proposals in

the Countryside, Policy S53 (Design and Amenity), Policy S57 (The Historic Environment), Policy S59 (Green and Blue Infrastructure Network) and Policy S62 (Area of Outstanding Natural Beauty and Areas of Great Landscape Value),

- Adopted Bassetlaw Core Strategy (2011) (Ref 13-10) with particular reference to Policy DM3: General Development in the Countryside, Policy DM9: Green Infrastructure; Biodiversity and Geodiversity; Landscape; Open Space & Sports Facilities.
- Emerging Bassetlaw Submission Local Plan (2022) (Ref 13-11) with specific reference to Policy ST11 (Rural Economic Growth and Economic growth outside Employment Areas), Policy ST35 (Design Quality), Policy ST37 (Landscape Character), Policy ST39 (Green and Blue Infrastructure), Policy ST40 (Biodiversity and Geodiversity), Policy 41 (Trees, woodlands and hedgerows), Policy ST42 (The Historic Environment), Policy ST50 (Reducing Carbon Emissions, Climate Change Mitigation and Adaptation) and Policy ST51 (Renewable Energy Generation)
- Glentworth Neighbourhood 2019 (Ref 13-12), including Neighbourhood Character Profile.
- Corringham Neighbourhood Plan (2022) (Ref 13-13).
- Hemswell and Harpswell Neighbourhood Plan (Ref 13-14) (not made, undergoing examination), including Hemswell and Harpswell Character Assessment 2018.
- Sturton by Stow and Stow Neighbourhood Plan 2022, including Plan Profile 2019 (Ref 13-15).
- Ingham Neighbourhood Profile (draft) 2020 (Ref 13-16) (to support emerging Neighbourhood Plan).
- Treswell and Cottam Neighbourhood Plan (2019) (Ref 13-17).

13.10 These policies identify the requirement for good design and the need for mitigation to assist in integrating development into its landscape context. They also require the assessment of effects to consider local strategies, policies and character assessment.

Other Relevant Guidance

- The Green Infrastructure Study for Central Lincolnshire 2011 (Ref 13-18) and 2019 Ecological Network and Opportunities Mapping (Ref 13-19) provides an evidence base which may be used to inform proposed landscape and ecological mitigation and enhancement.

Baseline Conditions

13.11 This section provides a review of the key local guidance documents and identifies those landscape and visual receptors which merit detailed consideration in the LVIA. In accordance paragraph 3.19 of GLVIA3, it also identifies those which are 'scoped out' from further assessment as effects '*have been judged unlikely to occur or so insignificant that it is not essential to consider them further*'.

Landscape context

13.12 The Principal Site and the majority of the Cable Route Corridor Search Area is located within Lincolnshire, within the West Lindsey District. To the west, the River Trent forms the boundary with Nottinghamshire, which contains the western termination of the Cable Route Corridor and is within the Bassetlaw District.

Principal Site

13.13 The Principal Site is located on farmland between the settlements of Springthorpe in the west; Harpswell in the northeast; and Glentworth to the east. It also includes an isolated narrow strip along the west side of Middle Street (B1398), to the east of the Principal Site, intended for mitigation.

13.14 The land within the Principal Site is generally flat and low-lying but dominated in the east by the scarp slope of Lincoln Cliff. The Cliff is a notable topographic feature in the county, extending north-south from around Scunthorpe to Grantham. Although relatively modest in elevation (rising to around 67m AOD above Glentworth), the Cliff contrasts with the low-lying farmlands in the west that comprise much of the Principal Site, making it a prominent local feature. Expansive views are available from the crest (scarp) of the Cliff, extending as far as the Peak District, over 60km to the west. Also visible are the landmark cooling towers of coal-fired power stations of the Trent Valley: West Burton to the north, and Cottam (now decommissioned) in the south.

13.15 Away from the Cliff, the land dips imperceptibly from a watershed along Common Lane to low points of around 20m: in the north on the A631 near Hemswell Grange; and to the south on Kexby Lane. A slight watershed runs also north-south through the centre of the Principal Site, falling very gently west towards Springthorpe from a high point of 27m AOD near Harpswell Wood.

13.16 Ditches or small watercourses form the boundaries to some fields, particularly in lower-lying areas, although the visibility of these features is limited. These generally drain south or west, towards the River Till that rises near Corringham and flows towards Lincoln where it is named the Foss Dyke. Tributaries to the west of Harpswell flow north, into the River Eau.

13.17 The Principal Site largely comprises fields that are medium to large scale and rectilinear. Some smaller scale fields and paddocks are located closer to the edges of settlements, as relics of older enclosures. Fields are generally bound by hedges, occasionally with trees but often cut low and sometimes absent. Hedgerows closer to the edges of villages and along some roads or tracks are often wider and taller, with more numerous trees.

13.18 Woodland is relatively sparse, comprising isolated blocks of deciduous woodland such as Big Wood or Harspwell Wood, or belts of deciduous or mixed woodland along field boundaries.

13.19 The A617 forms the northern boundary: a relatively busy national speed limit, single-carriageway route that links Gainsborough and Market Rasen. Roads through the Principal Site itself are noticeably limited, being restricted to unclassified, single-track roads. The two longest run east-west: Common Lane, that links Heapham and Harpswell; and Kexby Road, which forms part of a route from Upton to Glentworth. Others are School Lane, east of Springthorpe; and Northlands Road, west of Glentworth.

13.20 Farm tracks, particularly older, more established features such as Bratt Field Middle and South Road (east of Springthorpe) run generally east to west, following the dominant historic field pattern and reflecting former drovers' roads. Hedgerows along roads are varied, with taller examples along Kexby Lane west of Glentworth, and very open sections along Common Lane, west of Harpwell. Some routes have wide, grassed verges which are protected at certain locations through the county Roadside Nature Reserve scheme.

13.21 The are no settlements within the Principal Site, with built form being limited to isolated farmsteads and houses, the former usually with associated outbuildings such as portal barns. Older properties are red brick with pantile roofs. Most have small garden areas, sometimes bounded by hedges and trees. There are also a very small number of isolated barns not associated with residences.

13.22 Part of the former Sturgate Airfield is within the southwest of the Principal Site: a former World War II RAF base that has partly been returned to agriculture, with remnant sections of runway used for storing of materials.

13.23 Oil wells west and south of Glentworth oil well are incongruous but low-key features, with 'nodding donkeys' set behind screening bunds and palisade fencing. Oil is removed by tankers.

13.24 PRoW are notably limited within the Principal Site: the only route being on the southern periphery, a bridleway extending south from Kexby Road near Glentworth Grange, towards Willingham Road (Gltw/85/1).

13.25 Overall, the combination of low-lying farmland with limited woodland cover, sparse built form and low or absent hedgerows creates a very expansive character, with open and long-range views, albeit truncated by the distinctive landform of Lincoln Cliff to the east.

13.26 The area surrounding the Principal Site is broadly similar to that described above, but with the inclusion of a number of settlements. To the east are the villages of Harpswell and Glentworth, 'springline' villages located on the lower scarp slope of Lincoln Cliff. The former is scattered and open in character, dominated by the Grade I listed 11th century Church of St. Chad; the latter is more enclosed, with narrow lanes around the Grade II* listed Church of St. Michael, and the Grade II* listed Glentworth Hall in open grounds to the north.

13.27 West of the Principal Site are the villages of Springthorpe and Heapham and the hamlet of Sturgate, including the Grade I listed Church of All Saints set within fields. Around these settlements, fields are notably smaller and bounded by dense, tall hedges that restrict views and contrast with the more open landscape to the west.

13.28 Immediately outside the Principal Site boundary, to east of Sturgate, a recently adopted byway and a 'temporary voluntary permissive bridleway' create a small circular walking and riding route linking Green Lane and Bratt Field Middle Road.

13.29 The majority of Sturgate Airfield is located outside the Principal Site, with the truncated runway housing the Lincoln Aero Club within a private aerodrome. A small waste processing site is located within the former airfield, with the surrounding area having a generally functional appearance.

13.30 The isolated strip of the Principal Site along Middle Street is intended for screen planting, subject to detailed design. It runs for around 1km along the west side of the road, between a point above Harspwell and the junction with Coachroad Hill.

Cable Route Corridor

13.31 The character of much of the Cable Route Corridor Search Area is broadly similar to that described for the Principal Site and surrounding area, comprising low-lying or very gently undulating arable farmland with occasional woodland blocks and scattered farmsteads or isolated properties. Field boundaries are slightly more sinuous further to the southwest, with marginally more pronounced topography around Marton, where there is a gentle scarp slope facing west across the River Trent. PRoW are again largely absent. The A156 runs north-south between Gainsborough and Newark, with the A1500 branching east towards Lincoln, along the alignment of a Roman Road that led to a historic crossing point of the Trent at Littleborough. Stow village includes the Grade I listed Minster, of Saxon and Norman origin of substantial proportions relative the size of the settlement.

13.32 The River Trent is a prominent landscape feature, representing the boundary of Nottinghamshire and Lincolnshire. The absence of any road crossing along the 15km stretch between Gainsborough and Dunham Bridge to the south creates a barrier to east-west communication, although the Grade II* railway viaduct at Torksey (an early example using of a structure using box girders) now carries a walking and cycling route. The bridge affords views towards Torksey and the Grade I listed medieval castle.

13.33 West of the River Trent, the Cable Route Corridor Search Area is dominated by the cooling towers of the decommissioned coal-fired Cottam power station, one of three constructed along the Trent during the 1960s and now scheduled for demolition. A small, more recent gas turbine plant operates on the site, with high voltage electricity pylons terminating at a large sub-station to the south. The wider area includes former coal storage areas and ash tips, set within low-lying farmland with medium to small-scale rectilinear fields. The village of Cottam lies immediately north of the power station, but largely screened by mature trees and screen planting around the latter.

Landscape Character

National

13.34 Much of the study area lies within a single National Character Area (NCA), as defined by Natural England: NCA 48: Trent and Belvoir Vale (Ref 13-20). The NCA covers an area of largely low-lying agricultural land that extends from Gainsborough in the north to Nottingham in the south, dominated by the strong feature of the River Trent. The regularly shaped fields reflect 18th and 19th century enclosure, punctuated by red brick and pantile villages and farmsteads. Rural tranquility is a noted feature, but residential and infrastructure pressures exist from the main settlements and major roads that cross the area.

13.35 To the eastern edge of the study area is NCA 45, Northern Lincolnshire Edge with Coversands (Ref 13-21), covering the ridge (Lincoln Cliff) of Jurassic limestone that includes the steeper western scarp slope. The extensive long views to the west are highlighted.

Local

13.36 At the local level and within Lincolnshire, the Principal Site and the majority of the Cable Route Corridor are covered by the West Lindsey Landscape Character Assessment (1999) (Ref 13-22). Four Broad Landscape Character Types are subdivided into 14 Landscape Character Types (LCT), which are broad tracts of land that display a unity of character. Three LCT are within the study area and are briefly described below:

- **LCT 2 Trent Valley**, which extends along the eastern side of the study area and includes the land around Marton in the Cable Route Corridor. Key characteristics include low lying, undulating landform; significant blocks of deciduous woodland and good hedgerows with hedgerow trees; the River Trent with adjacent washlands enclosed by steep flood embankments; historic parkland landscapes such as deer parks and the landmark Torksey Castle; main roads; and views of the power stations along the river.
- **LCT 3 The Till Vale** encompasses much of the Principal Site and the Cable Route Corridor, extending in a north-south band across the District. Key characteristics include large, flat open fields; low hawthorn hedges with some trees; small blocks of mixed woodland and shelterbelts; extensive network of rivers, dikes and ditches but with little visual presence; small, nucleated settlements on high ground with a sequence of views to landmark churches; ancient enclosure roads; and long views west to the power stations and east to the Cliff.
- **LCT 4 The Cliff** covers the very eastern edge of the Principal Site, running north-south along the prominent landscape feature. Key characteristics include the straight, limestone-capped scarp slope; a diverse pattern of mixed pasture and arable land with good hedgerow boundaries; spring-line villages at the foot of the scarp with historic character and many trees; historic halls and associated landscapes; and ponds and lakes along the spring-line.

13.37 Within Nottinghamshire, the eastern end of the Cable Route Corridor Search Area is covered by the Bassetlaw Landscape Character Assessment dated 2009, which forms part of a county-wide Nottinghamshire Landscape Character Assessment (Ref 13-23). The NCAs described above are subdivided into a series of Regional Character Areas (RCA), of which the Cable Route Corridor is within the Trent Washlands RCA. Bassetlaw is then subdivided into Landscape Policy Zones (LPZ), of which the following are within the Cable Route Corridor:

- Trent Washlands Policy Zone (TW PZ) 21 Cottam, Rampton and Church Laneham Village Farmlands, which covers the area to the west of Cottam power station and is typified by flat, large-scale arable fields with smaller scale pastoral fields around villages; long distance views dominated by power stations and pylons; and nucleated villages.
- TW PZ 22 Cottam River Meadowlands, to the north of Cottam, which is a flat landscape of arable and pasture fields; long-distance views dominated by the power station; mature trees confined to the riverside and wetland areas; scrub and aquatic vegetation close to the river; and limited settlement.
- TW PZ 48 Littleborough Village Meadowlands, a narrow area along the western side of the River Trent, characterised by flat improved and

unimproved pasture; willows and scrubby riparian vegetation along watercourses; hedgerows and a grassy flood bank.

Relevant Designations

Landscape Designations

13.38 The study area, Principal Site and Cable Route Corridor Search Area are not covered by any national landscape designations, e.g. National Parks or Areas of Outstanding Natural Beauty (AONB).

13.39 The Central Lincolnshire Plan includes areas designated as AGLV, referenced in Policy LP17. Within the study area, these include the scarp slope of Lincoln Edge and an area extending south from Gainsborough to Marton.

Heritage Designations

13.40 Heritage designations are considered in *Chapter 9: Cultural Heritage* of this EIA Scoping Report. However, the presence of such designations can inform landscape and visual value and sensitivity. Within the study area, these include:

- The Grade II Registered Park and Garden at Fillingham Castle: a mid- to late-18th century park and woodland surrounding the 18th century Gothic style castle.
- Conservation Areas in the villages of Glentworth, Hemswell, Springthorpe and Fillingham.
- Listed buildings, including Grade I churches in Harpswell, Springthorpe, Heapham and Marton; and Torksey Castle.
- Scheduled Monuments, including the post-medieval house and gardens at Harpswell Hall.

Visual Receptors

13.41 A range of visual receptors or receptor groups can be expected to be affected by the Scheme, including:

- Residents of settlements;
- Residents of more isolated properties within the open countryside;
- Residents of scattered residential properties along Middle Street, on the top of the Lincoln Cliff scarp;
- Visitors and/or residents at tourism facilities, such as holiday parks;
- Users of PRoW and byways both within the boundary of the Principal Site and Cable Route Corridor, as well as those that may have views towards both;
- Users of temporary or permissive paths, such as the route currently in place to the east of Sturgate;
- People travelling through the landscape by car, bicycle, bus or train, including several unclassified rural roads that run through the Principal Site. The absence of PRoW would suggest that such routes may be more typically used for informal recreation such as walking and cycling; and

- People may also experience views from workplaces, educational establishments and from vehicles travelling on main roads such as the A631 and A156; and the Gainsborough to Lincoln railway.

Important Viewpoints and Representative Viewpoints

13.42 There are no specific viewpoints identified on OS mapping within the immediate study area. However, views associated with Lincoln Cliff are frequently cited in baseline descriptions for landscape character assessments. These include long-range views west from along Middle Street toward the Trent valley; and shorter-range views of the scarp slope from the adjacent farmland and spring line villages.

13.43 Neighbourhood Plans, including made plans for Sturton by Stow and Stow and Glentworth; and plans undergoing examination for Hemswell and Harspwell; describe 'key views' and are accompanied by supporting evidence such as character assessments. These will be considered as part of the selection of representative viewpoints and potential visualisation locations.

13.44 For the Principal Site, the potential for important views has been appraised and an initial selection of 15 potential viewpoints are proposed to cover a representative range of viewing distances, elevations and orientations, with different viewing experiences of the Scheme.

13.45 These may be subject to further iteration and amendment, following changes in the arrangement of the Principal Site. The viewpoints will be used as 'samples' on which to base judgements and will help establish how visible the proposals will be from specific locations and help to gauge the anticipated effects upon visual amenity.

13.46 The initial locations for these are listed below in Table 13-1 and shown on Figure 13-3. Together with other key views, they will assist in making judgements on effects on visual amenity.

Table 13-1: Draft Representative Viewpoints

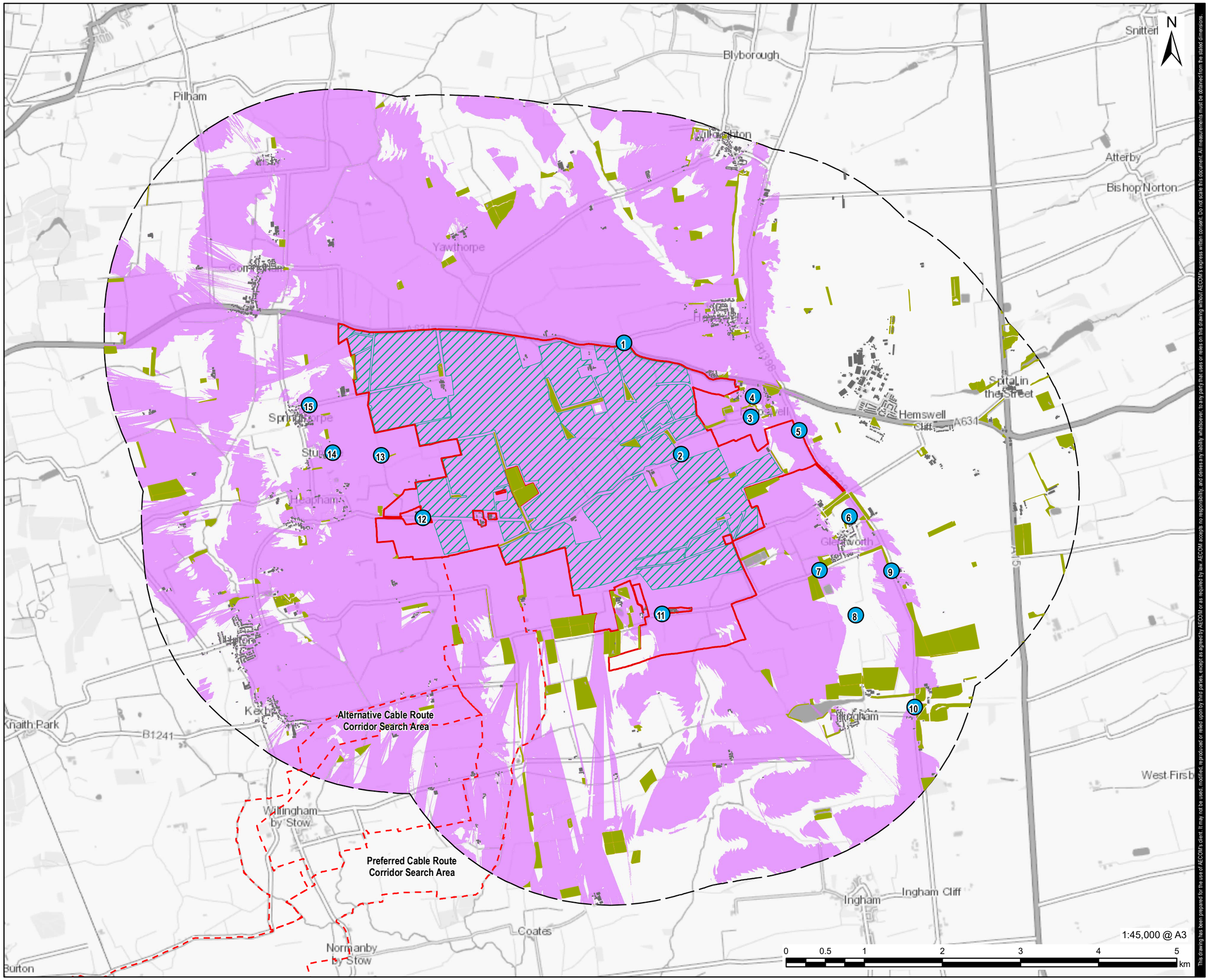
Ref	Description	Grid Reference
1	Hemswell Lane, A631	SK 91773 90613
2	Common Lane, near Billyards Farm, Harpswell	SK 92502 89186
3	Common Lane, west edge of Harpswell	SK 93397 89663
4	Green space, site of Harspwell Hall	SK 93424 89926
5	Middle Street, above Harpswell	SK 94014 89493
6	Hillside Road, Glentworth	SK 94659 88393
7	Kexby Road, west of Glentworth	SK 94276 87702
8	PRoW between Glentworth and Fillingham	SK 94738 87128
9	Middle Street, Glentworth Cliff Farm	SK 95196 87696
10	Middle Street, Fillingham	SK 95492 85951
11	Kexby Road, junction with bridlleway to Willingham Road	SK 92258 87142

Ref	Description	Grid Reference
12	Common Lane, east of Heapham	SK 89196 88374
13	Kirton Gate Lane, adopted byway	SK 88664 89173
14	Brattfield Road, Sturgate	SK 88043 89206
15	Common Lane, Springthorpe	SK 87741 89815

Figure 13-3 Draft LVIA Viewpoints (Subject to Agreement)

Revision: 0 Drawn: LL Checked: ST Approved: DW Date: 2022-09-22

Filename: \\na.aecomnet.com\fs\EMEA\London-UKLON06\Legacy\UKLON06PFPSW001\UKLON06PFPSW001-V1\DPE\Library\GIS_DATA\Projects\Greta III\Layout\Tillbridge Solar\Landscape\220727_TillbridgeSolar_ZTV_BarriersWithViewpoints.mxd



AECOM

PROJECT

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LEGEND

- Principal Site
- Cable Route Corridor Options
- Indicative Developable Area
- Principle Site 3km Buffer
- Buildings
- Woodland
- Draft LVIA Viewpoints (Subject to Agreement)

Zone of Theoretical Visibility

- No Theoretical Visibility
- Theoretical Visibility

NOTES

Contains Ordnance Survey Data © Crown Copyright and database right 2022.
1) Zone of Theoretical Visibility (ZTV) has been generated using Environment Agency Digital Terrain Model (DTM), with a 2m resolution, which takes into account the effects of trees and buidings. Woodland from the Forestry Commission National Forestry Inventory (2021) and OS Open Data, with an assumed height of 8m and Buildings from OS Open Data with an assumed height of 11m have been incorporated into the DTM, to mask any 'false' visibility from the top of trees and buildings.
2) ZTV is based upon indicative developable areas of solar panels, with an anticipated height of 3m above existing ground levels, and an observer height of 1.5m. The precise location of panels will be subject to change, and the scheme will also include elements of greater height, such as substations, that will be modelled separately once locations are confirmed
3) ZTV calculated using ArcGIS 10.8.1 Viewshed tool.

ISSUE PURPOSE

EIA Scoping Report

PROJECT NUMBER

60677969

FIGURE TITLE

Draft LVIA Viewpoints (Subject to Agreement)

FIGURE NUMBER

Figure 13.3

13.47 It is expected that further discussions will take place with the Local Planning Authority in order to refine and/or amend these viewpoints, prior to the selection of those to be progressed as visualisations to illustrate the effects of the Scheme in year 1 and in year 15 of operation.

13.48 For the Cable Route Corridor, no specific viewpoint locations have been selected at this stage. However, it is anticipated that viewpoints are likely to be required that reflect the following:

- Along rural, unclassified roads east of Upton, Kexby and Willingham by Stow;
- Around Willingham by Stow, with reference to views to or from key buildings such as the Church of St. Helen;
- Northeast of Stow, including along Wooden Lane (a PRoW) and with reference to views to or from key buildings in the village, such as the Grade I listed Minster;
- Around Marton and Trent Port, at the proposed crossing point of the River Trent; and
- Around Cottam, including views from Torksey viaduct and Castle.

Potential Effects and Mitigation

13.49 The Scheme has the potential to result in temporary significant adverse landscape effects during the construction phase, due to alterations to surface landform and vegetation, the presence of construction machinery and associated reductions in tranquillity. These aspects of the construction phase also have the potential to result in significant adverse visual effects, due to changes to the composition of views, in comparison to views of a rural landscape and general farming activity.

13.50 The Scheme has the potential to result in significant adverse landscape effects during operation (assessed at year 1 and year 15) due to the change in land use resulting from the presence and massing of the solar PV panels and associated structures, although the Scheme is reversible. The proposed structures also have the potential to result in significant adverse visual effects due to the changes in the composition of views, in comparison to the baseline views of a rural landscape and general farming activity.

13.51 As with the construction phase, the decommissioning phase has the potential to result in significant adverse landscape and visual effects, due to the presence of machinery and general activity to remove the panels and associated structures.

13.52 Cumulative landscape and visual effects may also arise. These may include cumulative visual effects, such as intervisibility with other solar schemes, both in combination or sequentially; or cumulative landscape effects, due to greater extent of solar infrastructure within a defined landscape character area.

13.53 The effects on landscape and visual receptors will be mitigated as far as possible to avoid, prevent, reduce, or offset effects through the integrated design and mitigation strategy for the Scheme. This will comprise primary and secondary measures. Primary measures are those developed through the iterative design process that will become integrated or embedded into the project design along with standard construction and operational management practices for avoiding

and reducing environmental effects. Secondary measures are those, as noted in GLVI3, that are "*designed to address any residual adverse effects remaining after primary measures and standard construction practices have been incorporated into the scheme*".

13.54 The primary mitigation measures integrated into the design of the Scheme will consider the following principles:

Principal Site

- Offset the Principal Site from the nearest settlement fringes to protect key views to/from settlements including Springthorpe, Harpswell and Glentworth.
- Offset the Principal Site from isolated rural properties, particularly where there are key views from particular elevations or garden areas.
- Avoid and/or screen areas around the byway and temporary voluntary bridleway to the east of Sturgate, where open views are available towards the Cliff and the circular walking route provides amenity to residents.
- Offset the Principal Site from the rising ground of Lincoln Cliff, including the AGLV areas; and areas that feature in views from sensitive receptors such as villages or provide a landscape context to heritage assets such as Conservation Areas, churches or Scheduled Monuments.
- Provide a combination of internal site planting and development setbacks from boundaries adjacent to sections of roads between rural settlements, particularly where there the Scheme is located on both sides and where rural roads are used for recreation in the absence of PRoW. Such planting can improve landscape and visual amenity; enhance biodiversity and create better and more connected green infrastructure.
- Consider the potential for creation of new permissive paths and PRoW, in an area where these are notably absent.
- Consider how landscape planting to the east of the Principal Site, along and to the base of Lincoln Cliff, can help screen, soften and buffer the Scheme; reduce impacts on residential properties along Middle Street; but also reflect the wider landscape character.
- Create an offset between the Cottam Solar Project to limit cumulative effects, including properties along Kexby Road.

Cable Route Corridor

- Route the corridor to avoid sensitive landscape features such as native hedgerows, hedgerow trees and woodland, in an area where these features are relatively limited.
- Use trenchless construction methods to limit adverse impacts on sensitive features, where avoidance is not possible.
- Avoid PRoW, again in an area where the density of such features is low and disruption may have a greater impact on amenity.
- Consider the potential impact of the corridor on key views to and from settlements and landmarks such as churches.

- Consider the impacts on the crossing of the River Trent, including landscape elements such as riparian vegetation; and views to or from Torksey viaduct and Torskey Castle.

13.55 Some residual landscape and visual effects during operation may remain significant despite mitigation. For example, the Principal Site could have reversible long-term effects on the rural character of the landscape and/or reversible long-term effects on views experienced by some sensitive receptors, where views are open and experienced frequently in a sequence of views and where the Scheme is in proximity.

13.56 Climate change and biosecurity are also major factors likely to bring about future change in the landscape. The need for climate change mitigation and adaption is now well established at policy level. These issues for appropriate mitigation will be considered in line with the Landscape Institute policy document 'Landscape architecture and the challenge of climate change', (Ref 13-24). The planting design will take account of the risks of biosecurity issues, such as the increased prevalence of pests and diseases, through a wider mix of species including some non-natives.

13.57 Further consideration will be given to identify opportunities for landscape enhancement beyond mitigation proposals to appraise what proposals will deliver the greatest balance and benefit in terms of ecosystem services, landscape character and landscape setting of important features noted above.

13.58 Based on desktop analysis and observations on site, landscape and visual matters during construction, operation and decommissioning will be **scoped in** for further assessment in the EIA.

Sources of Information

13.59 A desk based analysis was undertaken, alongside production of ZTVs and site visits from publicly accessible locations during June and July 2022.

13.60 A number of residential properties close to the Principal Site were visited with the Land Agent during July 2022. The objective was to introduce the Scheme and assist in the understanding of residential amenity, including the orientation, character and value attributed to particular views.

13.61 Further site surveys will be undertaken during the preparation of the PEIR and ES. These will include surveys on private land within the Principal Site and Cable Route Corridor, to understand potential effects on the landscape resource and refine mitigation and enhancement proposals.

Assessment Methodology

13.62 The methodology for the LVIA has been developed with reference to the following principal sources of guidance and information:

- GLVIA3; and
- Visual representation of development proposals (Landscape Institute, 2019) (Ref 13-25);

13.63 These publications together form a standard reference for undertaking LVIA for major renewable energy schemes in the UK. The guidance is not prescriptive

and therefore a tailored approach has been developed, which recognises the importance of professional judgement.

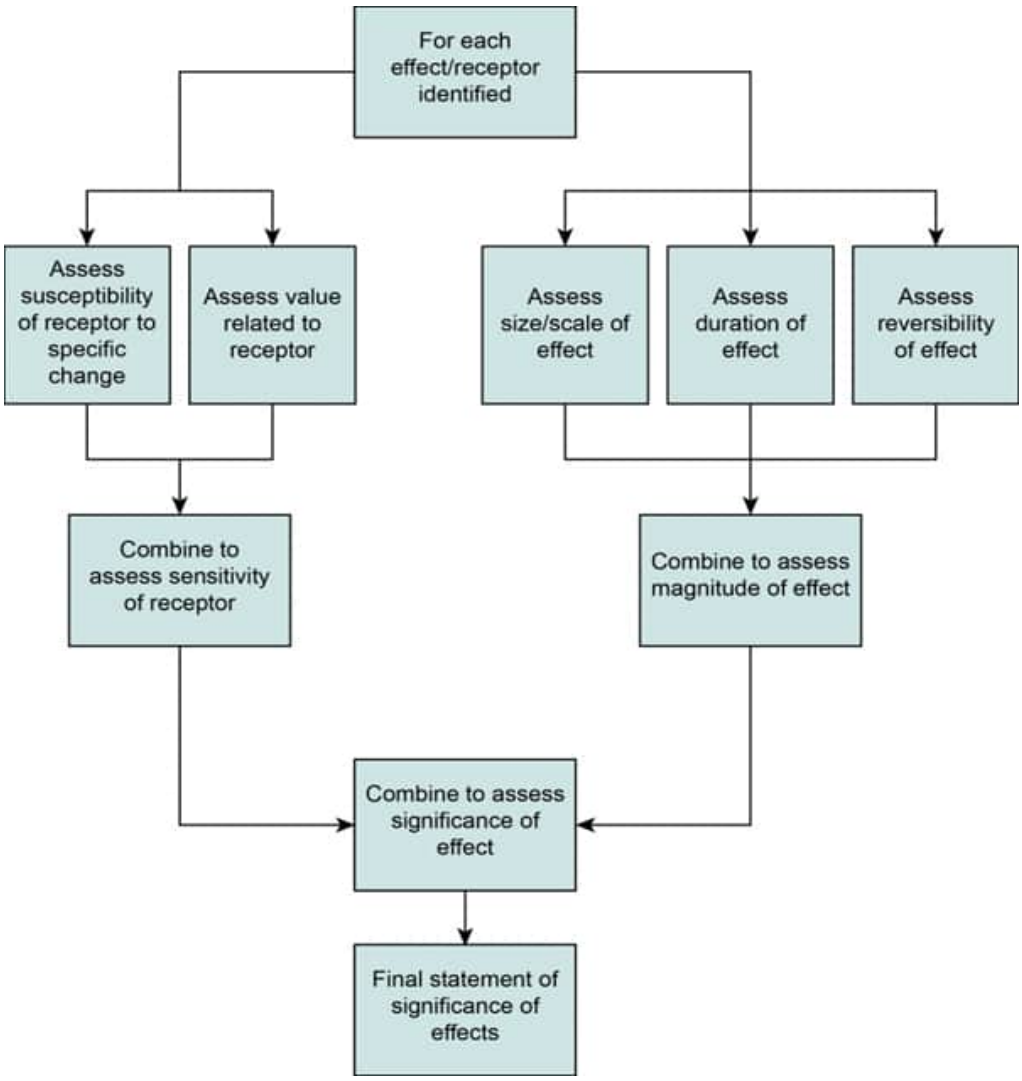
13.64 The LVIA will also be informed by aerial photography, maps and local publications.

13.65 GLVIA3 states that "Landscape and Visual Impact Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and people's views and visual amenity" (para 1.1).

13.66 In addition, sections 2.20-2.22 of GLVIA 3 indicate that the two components (assessment of landscape effects, and assessment of visual effects) are "*related but very different considerations*".

13.67 The LVIA methodology will reflect the process set out in Figure 3.5 of GLVIA3 as shown below in Plate 13-1.

Plate 13-1: GLVIA3, Assessing the significance of effects



13.68 In accordance with the GLVIA3 process, the LVIA will include the following key stages:

- A baseline review of published landscape assessments, studies, relevant supporting evidence base documents, aerial photography, mapping and

fieldwork to identify the landscape and visual baseline and the landscape and visual receptors.

- Following the identification of the landscape and visual receptors, these shall be presented to the Local Planning Authorities to seek agreement, along with the extent of the LVIA study area;
- An assessment of the sensitivity (nature of the receptor) of landscape and visual receptors, via an assessment of their value and susceptibility to change (as set out below);
- An assessment of the magnitude of impact (nature of effect) of the Scheme during the construction, year 1 year 15 and decommissioning phases. The magnitude of impact will be assessed in relation to the size, scale, duration and reversibility of the effect; and
- An assessment of the significance of the effect to the landscape and visual receptors for the above phases of the Scheme.

13.69 The assessment of the Scheme will be undertaken for the:

- Peak construction activity and in winter;
- Year 1 of operation, which will assume the Scheme is fully built out and the season is winter;
- Year 15 of the operation, which will assume the proposed planting has established and the season is summer; and
- Decommissioning, which will assume winter conditions.

Assessment of landscape sensitivity

13.70 The nature of a landscape receptor's sensitivity can be assessed by combining judgements about its value and its susceptibility to change arising from the specific development proposal (GLVIA3, page 38).

Landscape value

13.71 The assessment of the value of each of the Landscape Character Areas, which form the basis of this assessment, will be informed by the information set out in the baseline, including any relevant landscape designations, and the value of elements or characteristics of notable aesthetic, perceptual or experiential quality.

13.72 Value will be assessed at the baseline stage and consideration will be given to the criteria set out in GLVIA3 Box 5.1 (page 84) and with reference to Table 13-2.

Table 13-2: Landscape Value Criteria

Classification	*Description*
National	Recognised or iconic views within nationally/internationally designated landscapes, such as National Parks, AONB and/or national/international landmarks with views recognised in planning policy and/or management plans
Regional	Landscape with elements of regional importance designated regional leisure routes or highlighted in regional strategies.

Local	Landscape with elements which are protected or valued through local or neighbourhood planning policies, such as protected open space or groups of listed buildings, or buildings of townscape merit.
Community	Landscape with relatively common elements that are likely to be valued by the community which lives and works in the area
Limited	Landscape with weak or discordant elements and characteristics that detract from the quality of the area.

Landscape Susceptibility

13.73 GLVIA3 paragraph 5.40 defines landscape susceptibility as:

"the ability of the landscape receptor (whether it be overall character or condition of a particular landscape type or area, or an individual element and/or features, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline situation" (paragraph 5.40).

13.74 GLVIA3, paragraph 5.43 it states that judgements about susceptibility of landscape receptors to change should be recorded on a verbal scale and this will be applied as set out in Table 13-3.

Table 13-3: Susceptibility to Change of Landscape Receptors

Classification	*Susceptibility to change*
High	The receptor has a low capacity to accommodate a proposed development without effects upon its overall integrity. The landscape is likely to have a strong pattern/texture or is a simple but distinctive landscape and/or with high value features and essentially intact. Undue consequences are likely to arise from the Scheme.
Medium	The receptor has some capacity to accommodate a proposed development without effects upon its overall integrity. The pattern of the landscape is mostly intact and/or with a degree of complexity and with features mostly in reasonable condition. Undue consequences may arise from the Scheme.
Low	The receptor is robust; it can accommodate a proposed development without effects upon its overall integrity. The landscape is likely to be simple, monotonous and/or partially degraded with common/indistinct features and minimal variation in landscape pattern. Undue consequences are unlikely to arise from the Scheme.

Landscape Sensitivity

13.75 The assessment of landscape value and landscape susceptibility will be combined and are considered together to define the sensitivity or nature of the receptor (see Table 13-4).

Table 13-4: Landscape Sensitivity

Sensitivity	*Description*
High	Landscape of national or regional value with distinctive elements and characteristics, highly susceptible to small changes of the type of development proposed without undue consequences for the maintenance of the baseline situation. Typically, these would be:

	• Of high quality with distinctive elements and features making a positive contribution to character and sense of place. • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale. • Areas of special recognised value through use, perception or historic and cultural associations. • Likely to contain features and elements that are rare and could not be replaced.
Medium	Landscape of local or community value, with mostly common elements and characteristics, which by nature of their character would be able to partly accommodate change of the type proposed without undue consequences for the maintenance of the baseline situation. Typically, these would be: • Comprised of mostly commonplace elements and features creating generally unremarkable character but may include some rarer elements and with some sense of place. • Locally designated, or value may be expressed through non-statutory local publications. • Containing some features of value through use, perception or historic and cultural associations. • Likely to contain some features and elements that could not be replaced.
Low	Landscape of community or limited value and relatively inconsequential elements and characteristics, the nature of which is potentially tolerant of substantial change of the type proposed. Typically, these would be: • Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place. • Not designated. • Containing few, if any, features of value through use, perception or historic and cultural associations. • Likely to contain few, if any, features and elements that could not be replaced.
Very Low	Landscape of very low or limited value that is damaged, degraded or a substantially modified landscape pattern, with few or no natural or original features remaining, such that it is tolerant of change.

Assessment of visual sensitivity

13.76 Visual effects result from changes in the composition of views and or changes to the overall visual amenity. GLVIA3 notes that the visual sensitivity of receptors is dependent upon:

"the susceptibility to change in views and visual amenity and also the value attached to particular views" (paragraph 6.31).

13.77 Visual sensitivity includes a combination of parameters, such as the activity/occupation/pastime of the receptors at particular locations; the extent to which their attention or interest may be focused on the views and the visual amenity they experience. It will comprise the location, relative focus and orientation of particular views, the quality or importance of the existing view and its attractiveness / or scenic quality; the principal or secondary interest in that particular view; the static or sequential nature of views; the ability of the view to accommodate the type of development and the frequency and duration of the view.

Visual Value

13.78 GLVIA3 stresses the importance of considering the value attached to views, for example in relation to heritage assets, or through planning designations. It provides a list of indicators of the value of views in paragraph 6.37, including:

- Appearance in guidebooks our tourist maps;
- Provision of facilities, such as parking places, sign boards and interpretive materials; and
- References in literature or art.

13.79 The assessment of the value of views is also informed by the location of the viewing place and the quality or designation of the existing elements in the view, as shown in Table 13-5 below.

Table 13-5: Visual Value Criteria

Classification	*Value of View*
National	Recognised or iconic views within nationally/internationally designated landscapes, such as National Parks, AONB and/or national/international landmarks with views recognised in planning policy and/or management plans
Regional	Views or viewing places identified in the regional landscape frameworks or strategies
Local	Views across high quality landscape which might include features of interest, such as landmarks, which may be identified in the Local Plan
Community	Views of relatively common landscape elements, likely to be valued by the communities which experience the view; views identified in Neighbourhood Plans
Limited	Views across poor quality landscape with a high degree of detracting or common elements

Visual Susceptibility

13.80 GLVIA3 notes that visual receptors "most susceptible to change" include residents "especially using rooms normally occupied in waking or daylight hours" (para 6.36) and visitors engaged in outdoor recreation "whose attention or interest is likely to be focused on the landscape and on particular views" (para 6.33).

13.81 However, in paragraph 6.35, GLVIA3 notes that the divisions between categories are not always clear cut and “in reality there will be a gradation in the susceptibility to change”, (paragraph 6.35).

13.82 For the purposes of this assessment therefore, susceptibility of visual receptors to change will be defined as presented in Table 13-6.

Table 13-6: Susceptibility to change of views

Susceptibility	Susceptibility to Change
High	Typical receptors include: Residents at home. People engaged in outdoor recreation, whose attention/interest is likely to be focused on the landscape or particular views, including strategic/ popular PRoW. Visitors to heritage assets or other attractions, where views of the surroundings are a significant contributor to the experience. Communities where views contribute to the landscape setting enjoyed by residents. Travellers on identified scenic routes which people take to experience or enjoy the view. For whom: The development type would be of high incongruity in the context of the view. Susceptibility would be reduced for development of lesser incongruity.
Medium	Typical receptors include: Travellers on road, rail, or other transport routes who anticipate some enjoyment of landscape as part of the journey but where the attention is not primarily focused on the landscape. Users of local, and less used PRoW or where the attention is not focused on the landscape. Schools and other institutional buildings and their outdoor areas, play areas. For whom: The development type would be of medium incongruity in the context of the view. Susceptibility would be reduced for development of lesser incongruity.
Low	Typical receptors include: Travellers on road, rail or other transport routes not focused on the landscape/particular views e.g., on motorways and “A” road or commuter routes. People engaged in outdoor sport/recreation which does not involve/depend upon appreciation of views of the landscape. For whom: the development type would be of low incongruity in the context of the view. Susceptibility would be reduced for development of lesser incongruity.
Very Low	People at their place of work whose attention may be focused on their work/activity and not their surroundings. For whom: the development type would be of very low incongruity in the context of the view.

13.83 For the LVIA, GLVIA 3 will be followed for establishing the visual sensitivity of the receptors. It will use the following criteria for sensitivity of visual receptors (see Table 13-7).

Table 13-7: Sensitivity of visual receptors

Classification	*Sensitivity of visual receptors*
High	Activity resulting in a particular interest or appreciation of the view (e.g. residents with principal private views, or people engaged in outdoor recreation whose attention is focused on the landscape and where people might visit purely to experience the view, such as promoted viewpoints) and/or a view of national value (e.g. within/towards a designated landscape).
Medium	Activity resulting in a general interest or appreciation of the view (e.g. residents or people engaged in outdoor recreation that does not focus on an appreciation of the landscape, outdoor workers, people in schools or other institutional buildings and hotels and people passing through the landscape on defined scenic routes) and/or a view of local or community value (e.g. suburban residential areas, or agricultural land or urban areas).
Low	Activity where interest or appreciation of the view is secondary to the activity or the period of exposure to the view is limited (e.g. people at work, motorists travelling through the area or people engaged in outdoor recreation that does not focus on an appreciation of the landscape) and/or a view of limited value (e.g. featureless agricultural landscape, poor quality urban fringe).
Very Low	Activity where interest or appreciation of the view is inconsequential (e.g. people at work with limited views out) and/or very low value of existing view (e.g. industrial areas or derelict land).

Assessing magnitude (nature) of landscape and visual effects

13.84 GLVIA 3 notes the use of different terms for ‘impact’ and ‘effect’ within LVIA. For the purpose of this assessment and in line with GLVIA3 (paragraph 1.15), the term ‘impact’ is defined as the action being taken and the ‘effect’ is defined as the change resulting from that action.

13.85 GLVIA 3 notes that magnitude of change is informed by combining considerations relating to the “*scale, extent and duration”* of effect (para 3.28). This includes the geographical extent of influence, the spatial extent of the effect, the level of integration of new features with existing elements, its duration and degree to which the effect is reversible.

13.86 Effects can be direct, where they involve a physical change to a defined element or characteristic of the landscape, or indirect, where effects are secondary and perceived on the wider pattern of elements or on visual amenity, away from a proposed site.

Magnitude of landscape effect

13.87 Criteria for defining the level of magnitude are identified below in Table 13-8.

Table 13-8: Magnitude of Landscape Effect

Magnitude	*Typical Criteria Descriptors*
High	Total loss or large-scale damage to key characteristics or distinctive features, and/or the addition of new features or components that will substantially alter the character, setting or perceptual qualities of the area.
Medium	Partial loss or damage to key characteristics or distinctive features, and/or the addition of new features and whilst notable or obvious, the change would not fundamentally alter the balance of the key characteristics or perceptual qualities.
Low	Limited loss or damage to key characteristics or alteration of common features, and/or the addition of new features such that post development the change would be discernible or appreciable, but the underlying pattern of characteristics or perceptual qualities would remain similar to the baseline condition.
Very Low	Very limited loss, damage or alteration to key characteristics, features or perceptual qualities. The change would not influence the wider character and would be barely discernible or appreciable, approximating to a “no change” situation

Magnitude of visual effect

13.88 The magnitude of visual impact results from changes in the composition of views and or changes to the overall visual amenity. It includes combinations of the degree of change, the extent over which the changes will be visible, the period of exposure to the view and reversibility or permanence of the change and is classified as follows (see Table 13-9).

Table 13-9: Magnitude of Visual Effect

Sensitivity	*Description*
High	Extensive change to the composition of the existing view (e.g. widespread loss of characteristic features or the widespread addition of new features within the view) and/or high degree of exposure to view (e.g. close, direct or open views). Where the Scheme, or a part of it, would become the dominant feature or focal point of the view.
Medium	Partial change to the composition of the existing view (e.g. loss of some characteristic features or the addition of new features within the view) and/or medium degree of exposure to view (e.g. middle-distance or partially screened views) where the Scheme, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Low	Subtle change to existing view (e.g. limited loss of characteristic features or the addition of new features within the view) and/or low degree of exposure to view (e.g. long-distance, substantially screened or glimpsed views) where the Scheme, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.

Very Low	Barely perceptible change to the existing view and/or very brief exposure to view, where only a very small part of the Scheme would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.

Significance of Effect

13.89 Landscape and visual effects will be classified by considering the relationship between the sensitivity of the receptor and the magnitude of impact using a matrix as shown in Table 13-10. However, should professional judgement consider that the effect is different to that in the matrix, or if it should fall between two categories, then a reasoned justification will be presented in the ES chapter.

13.90 Following the classification of an effect, clear statements will be made within the LVIA as to whether that effect is significant or not significant. Effects predicted to be minor or negligible are considered to be 'non-significant', although they may be a matter for local concern. Effects assessed as moderate may be significant with reasoned justification. Substantial or major effects are considered to be 'significant' and require weighing in the planning balance against other benefits of the proposed development. Effects are adverse unless stated otherwise.

Table 13-10: Classification of Effects Matrix

Sensitivity of Receptor	Magnitude of Potential change/impact				
	High	**Medium**	**Low**	**Very Low**	**None**
High	Major	Major	Moderate	Minor	Neutral
Medium	Substantial	Moderate	Minor	Negligible	Neutral
Low	Moderate	Minor	Negligible	Negligible	Neutral
Very Low	Minor	Negligible	Negligible	Neutral	Neutral

Relationship to the Glint and Glare Assessment

13.91 Glint and glare are defined as follows:

- Glint (specular reflection) may be produced as a direct reflection of the sun from the development; and
- Glare (diffuse reflection) is a continuous source of brightness in scattered lightwaves. Glare is significantly less intense than glint. (Source: based on 'The Development of Large Scale (>50kW) Solar PV Arrays in Cornwall', Cornwall Council, March 2012) (Ref 13-26).

13.92 Section 2.52 of draft NPS EN-3 (Ref 13-27) sets out emerging government policy with respect to the consideration of glint and glare in relation to solar photovoltaic generation impacts. This sets out policy advice on how to assess glint and glare and mitigation measures, should they be required. Paragraph 2.52.2 sets out specific advice in relation to the assessment of the potential impacts of 'tracking' panels and general considerations to be adopted at the assessment stage stating that:

"…these may cause differential diurnal and/or seasonal impacts. The potential for solar PV panels, frames and supports to have a combined

reflective quality should be assessed. This assessment needs to consider the likely reflective capacity of all the materials used in the construction of the solar PV farm."

13.93 In setting out policy on mitigation, paragraph 2.52.3 states that in some cases, the Secretary of State may require, solar panels to be of a non-glare/non-reflective type and the front face of the panels to comprise of (or be covered) with a non-reflective coating for the lifetime of the permission.

13.94 The emerging NPS EN-3 acknowledges that whilst solar PV panels are designed to absorb irradiation, that the Secretary of State will assess the potential impact of glint and glare on nearby homes and motorists. Paragraph 2.52.5 goes on to state that there is no evidence that glint or glare impacts upon aviation navigation and as such, no weight will be given to claims of aviation interference in considering proposed development.

13.95 NPPG also sets out specific planning considerations with respect to solar farms. This acknowledges that large-scale solar farms can have a negative impact on the landscape, but that visual impact if well-planned and well-screened can be addressed subject to the implementation of sensitive landscape design. This includes consideration of potential glint and glare and its effect on landscape

13.96 A general consideration of the potential for glint and glare from the Scheme to cause significant effects to landscape and visual receptors will be provided as part of the landscape and visual assessment. It is proposed that a separate glint and glare assessment will be included as a technical appendix to the ES (see *Chapter 17: Other Environmental Topics*).

Relationship to Residential Visual Amenity

13.97 The LVIA will assess the potential visual effects to different types of visual receptor, including residential receptors, i.e. private views.

13.98 With reference to the Landscape Institute's Technical Guidance Note 2/19: 'Residential Visual Amenity Assessment' (Ref 13-28), the Residential Visual Amenity Threshold is considered as to whether:

"the effect of the development on Residential Visual Amenity of such nature and / or magnitude that it potentially affects 'living conditions' or Residential Amenity."

13.99 The guidance is based upon a 'four' stage approach. Stages 1 to 3 accord with the above LVIA methodology whereby—in line with GLVIA3— visual receptors are identified, along with the magnitude of impact and the significance of effect.

13.100 The fourth step is a more detailed examination of residential properties, where appropriate, when the highest 'significance of effect' levels are identified via Stages 1 to 3. Although, as stated by the guidance, there are no 'hard and fast rules' as to making a judgement on the Residential Visual Amenity Threshold (RVAT).

13.101 Therefore, if at year 15 of operation, i.e. post the establishment of the proposed mitigation, there are residential receptors predicted to experience significant adverse effects, a Residential Visual Amenity Threshold shall be undertaken, with the methodology stated in the ES.

Assumptions, Limitations and Uncertainties

13.102 Access to viewpoints may be restricted to publicly accessible areas and private land where access had been agreed. Where access is limited, site work will be undertaken from the nearest publicly accessible location and noted within the assessment. The consequential evaluation for impacts on some private and/or inaccessible viewpoints will be made, therefore, based upon the professional judgement of suitably qualified and experienced specialists. However, these will be informed by the site visits to residential properties noted above.

13.103 Where appropriate, visual receptors will be grouped together as ‘clusters’ within the same receptor group at points where they are likely to experience the same level of effect.

13.104 The number of business receptors has been assumed as one per receptor group where businesses are situated in proximity to one another and will experience the same visual effects. This is because it might not be possible to gain a clear understanding of the number of separate businesses in some areas.

13.105 Impacts on views from existing PRoW and other temporary/permissive routes will be assessed.

13.106 Cumulative landscape and visual effects will be undertaken with reference to information on other relevant proposals that is in the public domain at the time of report preparation. These may include sequential views along pre-defined routes, such as specific roads, PRoW or long-distance trails.

13.107 Impacts on future visual receptors, including those subject to planning permission, will be assessed as part of the future baseline where developments are known and will be completed before the Scheme is under construction, or otherwise they will be treated as part of the cumulative effects assessment.

13.108 Only visual receptors within the ZTV that will experience a potentially significant adverse or beneficial effect will be assessed. Whilst there are likely to be a number of other receptors that will experience views of parts of the Scheme, these will not be recorded in detail where the significance of effect will be neutral at all timescales.

13.109 Existing vegetation outside the Scheme Boundary will screen or filter views from some locations and will be taken into account within the assessment of visual effects. Changes to this vegetation will potentially affect the visual effects caused by the Scheme but the management and retention of such vegetation is outside the control of this Scheme.

14. Noise and Vibration

Introduction

14.1 This chapter sets out the approach to the assessment of the Scheme's impacts on noise and vibration. The purpose of the assessment will be to identify and characterise any relevant sensitive receptors, to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.

14.2 Note that the scope of this section considers noise and vibration effects on human receptors and excludes assessment of noise and vibration on heritage or ecological receptors. Effects on local heritage or ecological receptors due to the introduction of the Scheme, where applicable, will be considered in *Chapter 9: Cultural Heritage* and Chapter 10: Ecology of this EIA Scoping Report respectively.

Study Area

14.3 The study area for construction and operational noise effects will include receptors within 500m of the Principal Site and within 300m of the Cable Route Corridor. These distances have been selected based on previous experience that operational noise sources associated with solar operations are likely to be negligible distances greater than 500m and that construction noise predictions (based on guidance in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise' (Ref 14-1)) are generally reliable up 300m. Operational noise effects from the Cable Route Corridor are anticipated to be minimal, therefore the 300m study area is considered to allow for a robust assessment.

14.4 The study area for construction vibration effects will include receptors within 50 m of the Principal Site and Cable Route Corridor. This distance has been selected based on guidance in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration (Ref 14-2).

Relevant Legislation, Policy and Guidelines

14.5 Legislation, planning policy and guidance relating to noise and vibration and pertinent to the Scheme comprises:

Legislation

14.6 The Control of Pollution Act 1974 (Ref 14-3) (CoPA) requires that Best Practicable Means (BPM) (as defined in Section 72 of CoPA) are adopted to control construction noise on any given site as far as reasonably practicable. Sections 60 and 61 of the CoPA provide the main legislation regarding enabling works and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued with instructions to cease work until specific conditions to reduce noise have been adopted.

14.7 Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been

agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

14.8 Whilst construction noise and vibration are factors which can be considered during the planning process, Local Planning Authorities have alternative powers under Sections 60 and 6 of CoPA to regulate these issues if complaints arise.

14.9 The Environmental Protection Act 1990 (Ref 14-4) prescribes 'noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance' as a statutory nuisance.

14.10 Local Planning Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either the abatement of the nuisance; or works to abate the nuisance to be carried out; or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. A right of appeal to the Magistrates Court exists within 21 days of the service of a noise abatement notice.

14.11 No statutory noise limits exist for determining a nuisance, therefore the Local Planning Authority can take account of various guidance documents and existing case law when investigating complaints. Lower noise level limits are generally applied when considering the acceptability of a planning permission than those which would be used when considering whether an existing noise source amounts to a statutory nuisance. Demonstrating the use of best practicable means to minimise noise levels is an accepted defence against a noise abatement notice.

14.12 When considering an application, the extent to which the development under consideration has the potential to cause a statutory nuisance should be evaluated and this outcome avoided if possible.

National Planning Policy

14.13 The Overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 14-5) sets out national policy for energy and will be an 'important and relevant consideration' in the Secretary of State's ('SoS') determination of consent in respect of the Scheme. Reference will be made to Section 5.11 and Paragraphs 5.11.4 to 5.11.7, in relation to the assessment of noise.

14.14 Draft updates to this guidance (Ref 14-6) expand upon the requirements of assessment of noise to specifically relate to impact on health and well-being. Additional considerations for underwater or subterranean noise is also included, as well as including reference to best available techniques for mitigation of noise impacts.

14.15 The NPS for Renewable Energy Infrastructure (EN-3) (Ref 14-7) does not include references to noise and vibration impacts from solar photovoltaic generation. However, Draft updates to this guidance (Ref 14-8) includes new noise requirements for these types of assessments and, if published in its current form, will become an important reference for future decisions taken by the SoS.

14.16 The NPS for Electricity Networks Infrastructure (EN-5) (Ref 14-9), taken together with NPS EN-1, provides the primary basis for decisions taken by the SoS on

applications it receives for the categories of nationally significant electricity networks infrastructure included within it. Reference will be made to Section 2.9 and Paragraphs 2.9.7 which relates to noise from sub-station equipment.

14.17 Draft updates to this guidance (Ref 14-10) include additional references to selection of quietest cost-effective equipment, and the inclusion of planned maintenance arrangements in noise assessments.

14.18 NPPF (Ref 14-11) sets out the Government's planning policies for England and describes how these are expected to be applied. Policies relating to noise comprise:

Paragraph 174, stating that:

– *"planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans…"*

Paragraph 180, stating that:

– *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a. *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

b. *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason [….]"*

14.19 With regards to 'adverse effects' and 'significant adverse effects', the NPPF refers to the Noise Policy Statement for England (NPSE)

14.20 Noise Policy Statement for England (NPSE) (2010) (Ref 14-12) sets out the long-term vision of the government's noise policy. The 'Explanatory Note' within the NPSE provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the following concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

National Planning Practice Guidance (2021)

14.21 Planning Practice Guidance: Noise (PPG) (Ref 14-13) provides guidelines that are designed to assist with the implementation of the noise requirements set out in the NPPF. The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date.

14.22 The PPG states that local planning authorities should take account of the acoustic environment and in doing so consider:

- "whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved."

14.23 Factors to be considered in determining whether noise is a concern are identified by PPG. This includes the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise, and cumulative effects.

14.24 Regarding mitigating noise effects on residential development, the PPG highlights that effects may be partially off-set if residents have access to a relatively quiet façade as part of their dwelling or a relatively quiet amenity space (private, shared or public).

Local Planning Policy

14.25 Central Lincolnshire Local Plan Adopted April 2017 (Ref 14-14) sets out objective k) to reduce pollution, which includes noise. Additionally, Policy LP26 outlines that all developments should demonstrate how noise and vibration issues have been considered in relation to both construction and life of the development.

14.26 The emerging Central Lincolnshire Submission Plan (2022) (Ref 14-15) comprises policies relating to noise and vibration. This includes Policy S53 (Design and Amenity) which states that all development must demonstrate good design, which includes demonstrating that proposals do not result in adverse noise and vibration taking into account surrounding uses.

14.27 The adopted Bassetlaw Core Strategy and Development Management Policies (2011) (Ref 14-16) comprises Policy DM10 that relates to renewable and low carbon energy. This states that the Council will be supportive of proposals that seek to utilise renewable energy subject to demonstrating compliance with a number of criteria. This includes demonstrating that proposals will not have an unacceptable impact in terms of noise.

14.28 The emerging Bassetlaw Submission Local Plan (2022) (Ref 14-17) comprises Policy 48 (Protecting Amenity), which states that proposals for development should be designed and constructed to avoid and minimise impacts on the amenity of existing and future users. This includes ensuring that proposals do not generate a level of noise that cannot be mitigated to an appropriate standard.

Baseline Conditions

14.29 Following a desktop review, the site is identified as rural with isolated or small clusters of dwellings in the area of the Scheme. There are few major roads in the area, with the A631 bounding the Principal Site to the north and the B1398 less

than 1km to the east of the Principal Site. The A15, which is part of the UK's Major Road Network (MRN) and is thus likely to be more highly trafficked than the B1398, is approximately 1 km further to the east, approximately 2 km from the Principal Site at its closest approach.

14.30 The roads identified above will result in some noise at receptor locations, particularly those nearer to the roads, but road traffic noise is considered unlikely to be the dominant sound source in most cases. In these cases, sound levels are likely to be driven by local sound sources such as vegetation, insects, domestic noise, agricultural noise, and birds. Light aircraft associated with Sturgate Airfield is also a potential sound source.

14.31 The nearest noise-sensitive receptors are identified in Table 14-1. These receptors have been determined by desktop study; a finalised list of noise sensitive receptors will be confirmed following receipt of the EIA Scoping Opinion and consultation with key stakeholders such as Environmental Health Officers at the local planning authorities. Receptor locations are shown in Figure 14-1.

Table 14-1: Sensitive Receptor Locations

R1	Church Farm, School Lane	488116.845,389930.009
R2	Moorlands Magin Moor, Harpswell Lane A631	489616.539,390827.309
R3	Hemswell Grange, Harpswell Lane A631	490744.881,390707.156
R4	Harpswell Hill Mobile Home Park, Harpswell Lane	492899.298,390218.657
R5	Harpswell Village	493239.645,389971.841
R6	Heapham Village	488162.844,388565.801
R7	Springthorpe Grange, School lane	489417.163,390114.429
R8	Harpswell Low Farm, Harpswell Lane A631	490489.863,390411.716
R9	Grange Cottage / Grange Bungalow / Harpswell Grange, Harpswell Lane A631	491328.548,390489.592
R10	Hermitage Low Farm House, Common Lane	492132.587,388980.516
R11	Billyards Farm, Common Lane	491152.085,388353.564
R12	Manor Farm / Low Farm Cottage / Heapham Cliff Farm, Common Lane	489993.66,388333.962
R13	Grange Farm / South View, Common Lane	489176.029,388373.884
R14	Glentworth Grange / Low Farm / Spitals Farm / Orchard House / Westlands Farm, Kexby Road	492033.861,387121.387
R15	Northlands Cottages, Northlands Road	493584.601,388291.715
R16	Glebe Farm / Low Farm / Low Farm Cottages, Glentworth Road	489242.343,386149.787
R17	Primrose Farm / Primrose Farm Cottage	488796.646,385540.523
R18	Kexby Village, Glentworth Road	487680.953,385714.573

R19	Willingham by Stow Village	487451.865,384596.619
R20	Millfield / Mill House / Charmon House / Uplands / The Cottage / The Haven / West View / The Rest, Stow Road B1231	487715.944,383805.82
R21	Tilby-Dale, Stow Road B1231	487955.134,383435.279
R22	Sort Hills, Willingham Road	485564.199,382477.363
R23	Marton Village	484046.917,381932.284
R24	Trent Port, Trent Port Road	483413.044,381534.452
R25	The Lodge, A156	483877.162,380043.132
R26	Cottam Village	481894.375,380113.439
R27	Westbrecks Farm, Westbrecks Lane	480137.737,380016.816
R28	Moor Farm	489898.757,384216.54
R29	Lowfield Farm	489870.26,384431.854
R30	Davidson's Farm / Ivy Cottage / Magin Moor Farm	489961.029,384848.76
R31	Parish Farm	490174.232,386217.69
R32	Low Field Farm	490469.76,387321.7
R33	Sandebus Farm	486437.644,383036.274
R34	1-4 Flat Tops, Normanby	488212.844,382810.576
R35	Normanby by Stow Village	488110.318,383086.933
R36	Stow Park	485534.153,381513.927
R37	Grange Farm Stables / Marton Grange	485024.829,381712.365
R38	Poplar Farm	484528.734,381540.386
R39	63-67 / 66-80, High Street, Marton	484049.176,381212.963
R40	Brampton Grange	484250.921,380991.374
R41	Bellwood Grange Farm	484492.354,379843.742
R42	Oakfield Grange	484142.402,379917.053
R43	The Castle / 6-28, Station Road	483991.59,379120.127
R44	Manor Farm, Tillbridge Lane	486141.81,381506.964
R45	Toskey Village	483634.945,379035.702
R46	Ye Old Ferry Cottage	483115.632,378007.869
R47	The Fairways, Toskey	484139.042,378863.004
R48	Rampton Village	479986.134,378602.654
R49	Danes Farm / Highfield Farm	486980.038,381489.962
R50	Manor Court, Stow	487907.14,381939.225

R51	22-29, Church Road, Stow	488037.844,382314.935
R52	Church View Farm	488353.228,382566.818
R53	Manor House, Rampton	479771.847,379103.465

Figure 14-1 Noise Receptors

Revision: 0 Drawn: LL Checked: CT Approved: ST Date: 2022-09-22

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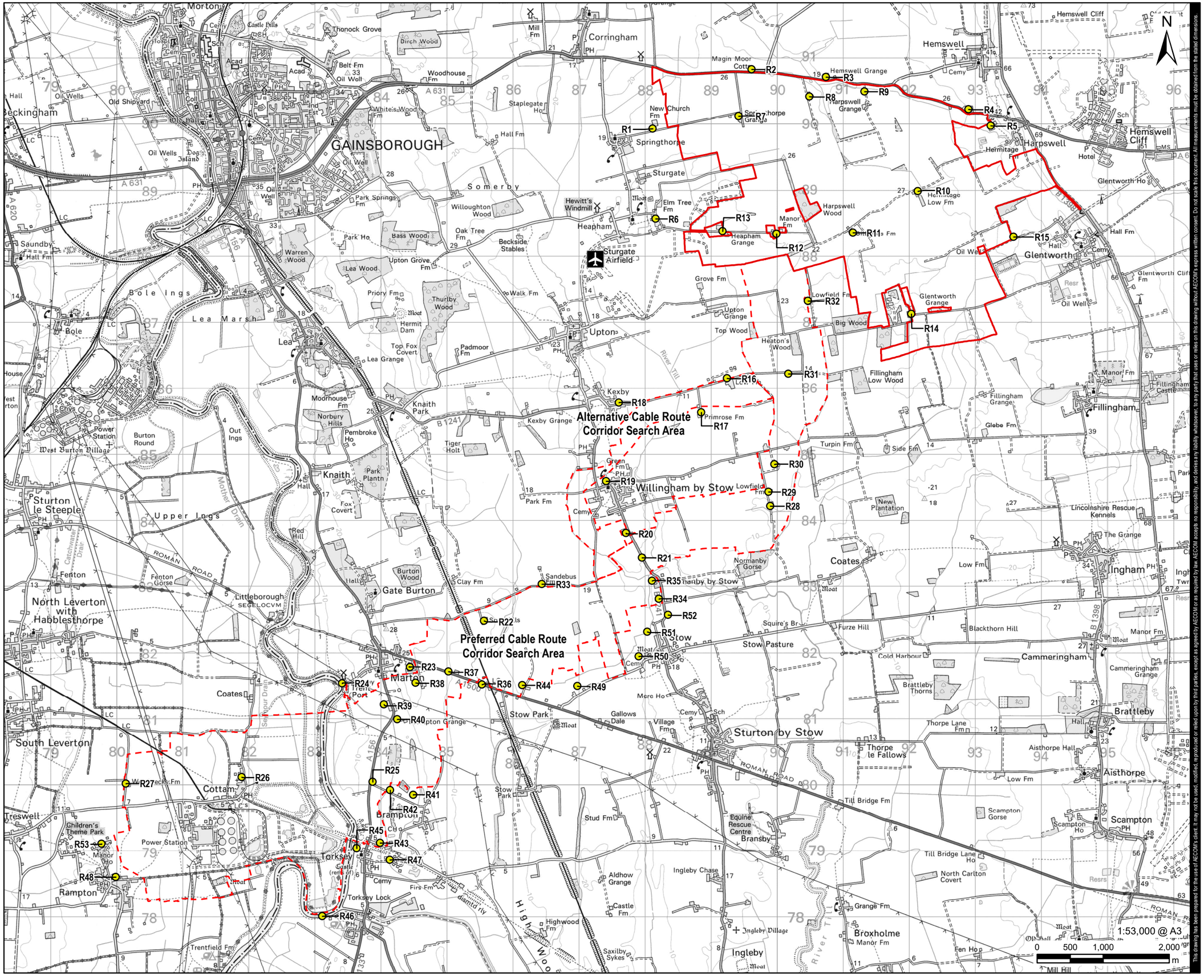

AECOM

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LEGEND

- Principal Site
- Cable Route Corridor Options
- Noise Receptor
- Sturgate Airfield

NOTES

ISSUE PURPOSE

EIA Scoping Report

PROJECT NUMBER

60677969

FIGURE TITLE

Noise Receptors

FIGURE NUMBER

Figure 14-1

Potential Effects and Mitigation

Construction and decommissioning noise and vibration (temporary effects)

14.32 The potential noise and vibration effects during the construction and decommissioning phases are likely to include works activities associated with site preparation, plant installation, sub-station construction, cable laying, and construction-related vehicle movements within the Principal Site and Cable Route Corridor, as well as along access routes. Construction works for both the Principal Site and Cable Route Corridor have the potential to occur at close proximity to sensitive receptors and cause disturbance due to vibration.

14.33 An assessment of the noise and vibration effects from construction and decommissioning works are therefore **scoped in** for further assessment.

Operational noise (reversible long-term effects)

14.34 Although items such as solar PV panels, mounting structures and cabling (both on the Principal Site and the Cable Route Corridor) will not produce any operational noise emissions, there is potential noise effects during operation from inverters, transformers, switchgears and associated battery storage plant and any associated vehicle movements. Operational noise from fixed plant is therefore **scoped in** for further assessment.

14.35 Typically, in the absence of notable new roads or changes to traffic speed or composition, an increase in traffic volume of at least 25% is generally required in order for a non-negligible change in traffic noise to potentially occur. Due to the very low level of operational traffic associated with the Scheme, it is anticipated that operational traffic will result in no perceptible changes to overall road traffic noise levels across the study area and would not be significant. Additionally, Draft NPS EN-3 (Ref 14-8) paragraph 2.54.10 states that:

"Once solar farms are in operation, traffic movements to and from the site are generally very light, in some instances as little as a few visits each month by a light commercial vehicle or car. Should there be a need to replace machine components, this may generate heavier commercial vehicle movements, but these are likely to be infrequent. Therefore, it is very unlikely that traffic or transport impacts from the operational phase of a project would prevent it from being approved by the Secretary of State."

14.36 As such, it is proposed that operational road traffic noise is **scoped out** of further assessment.

14.37 No major vibration sources are envisaged to be introduced as part of the Scheme and as such there will be no associated operational vibration effects. It is proposed that operational vibration is **scoped out** of any further assessment.

Source of Information

14.38 In order to conduct the assessment, the following information will be used:

- Sound source data for proposed construction and operational equipment;
- Proposed plans and layouts for the site;

- Proposed construction schedule and layouts;
- Baseline noise survey data;
- Construction traffic data;
- Topographical information (i.e. ground and building heights); and
- The outputs of acoustic modelling procedures.

Assessment Methodology

Construction & Decommissioning Noise and Vibration

14.39 Baseline noise monitoring will be carried out to establish the existing noise environment around the Scheme Boundary and representative of surrounding noise-sensitive receptors.

14.40 The monitoring procedures will follow guidance from BS 7445-1:2003 'Description and environment of environmental noise – Part 1: Guide to quantities and procedures' (Ref 14-18) and BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (Ref 14-19). A combination of long-term unattended and short-term attended measurements will be used. A weather station will also be installed for the duration of the noise surveys so any periods of adverse weather conditions could be identified and excluded from noise data.

14.41 Noise and vibration levels associated with construction and decommissioning works will be assessed (at chosen sensitive receptors, intended to be agreed with the Environmental Health Officers at the local planning authorities) using the data and procedures given in BS 5228:2009+A1:2014 Part 1: Noise and Part 2: Vibration (Ref 14-1, Ref 14-2).

14.42 BS 5228 contains a methodology for the assessment of the significance of effect of construction noise in relation to the ambient noise levels, known as the "ABC method". The criteria for significance provided in BS 5228-1 are reproduced in Table 14-2.

Table 14-2: Construction Noise Threshold of Potentially Significant Effect at Dwellings

Assessment Category	Threshold Value (dB) $L_{Aeq,T}$		
	Category A [a]	Category B [b]	Category C [c]
Night-time (23:00 – 07:00)	45	50	55
Evenings and Weekends [d]	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A potentially significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values) then a potentially significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3: Applies to residential receptors only.			
Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values. Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values. 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.			

14.43 For the appropriate period (night, evening/weekend, day), the ambient noise level is determined and rounded to the nearest 5 dB. The appropriate Threshold Value is then identified. The construction noise level is compared with this Threshold Value. If the noise level from the works exceeds the Threshold Value, then there is the potential for a significant effect to occur. However, in line with best practice, this indicator of a potential significant effect is then further considered using professional judgement and accounting for a range of other factors, including:

- The duration of the impact. Based on the guidance in BS 5228, construction noise levels above the Threshold Value for less than 10-days (or 10-evenings/weekends or nights) in any 15 consecutive days, or 40-days or less (or 40 evenings/weekends or nights) in any 6-month consecutive period would not normally be considered significant;
- The timing of the impact, night-time impacts being more likely to be considered significant than daytime impacts; and
- The location of the impact at the receptor, for example, a receptor may contain areas which are more or less sensitive than others, e.g. in a residential property, the kitchens and bathrooms would be considered less sensitive than the bedrooms.

14.44 With reference to the NPSE, the LOAEL is identified by the existing ambient sound level, while the SOAEL is identified as the Threshold Values as set out in Table 14-2. The magnitude of the construction noise impact is based on the level above the Threshold Value at the façade of a sensitive receptor. The criteria

shown in Table 14-3 can be used to assess the impact of construction noise levels.

Table 14-3: Impact criteria for construction noise

Construction Noise Level (Façade) (dB)	Magnitude of Impact / Descriptor
< LOAEL	Very Low / Negligible
≥ LOAEL and < SOAEL	Low / Minor
≥ SOAEL and < SOAEL+5 dB	Medium / Moderate
≥ SOAEL+5 dB	High / Major

Operational Noise

14.45 The impact of the proposed operational plant will be primarily assessed following guidance from BS 4142:2014 (Ref 14-19), based on information on the operating conditions and the levels of noise generated by the plant, as provided by the client. If a schedule of plant is not available, suitable criteria for operational noise limits will be provided based on baseline noise measurements.

14.46 BS 4142 is applicable to the assessment of operational sound on residential receptors. Where a group of residential and sensitive non-residential receptors are identified, such as a village with a place of worship, they will be assessed collectively alongside residential receptors for the purpose of the assessment as a worst-case.

14.47 Isolated noise-sensitive non-residential receptors will be evaluated on a case-by-case basis using acceptable design criteria from BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’ (Ref 14-20) and through informed assumptions regarding the acoustic performance of the building façades.

14.48 The basis of the BS 4142 assessment method is a comparison between the background sound level in the vicinity of residential locations and the rating level of the sound source under consideration. The relevant parameters in this instance are as follows:

- Background sound level – defined in the Standard as the ‘A’ weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels;
- Specific sound level – the equivalent continuous ‘A’ weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T;
- Residual sound level – the equivalent continuous ‘A’ weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
- Rating level – the specific sound level plus any adjustment made for the characteristic features of the noise such as tonality, impulsivity and intermittency.

14.49 When comparing the background sound level and the rating level, the standard states that:

"*a. Typically, the greater the difference, the greater the magnitude of impact.*

b. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.

c. A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.

d. The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context."

14.50 Importantly, as indicated above, BS 4142 requires that the rating level of the sound source under assessment be considered in the context of the environment when defining the overall significance of the impact. The standard suggests that in assessing the context, all pertinent factors should be taken into consideration, including the following:

- "The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor, such as whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions."

14.51 With reference to NPSE, and given initial considerations of context, the LOAEL is defined in this assessment as where there rating level is equal to the background sound level, and the SOAEL as where the rating level is 10 dB greater than the background sound level, subject to further contextual considerations. The criteria at this stage are anticipated to be as set out in Table 14-4.

Table 14-4: Impact criteria for operational sound

Operational Sound Level (dB)	Magnitude of Impact / Descriptor
< LOAEL	Very Low / Negligible
≥ LOAEL and < LOAEL+5	Low / Minor
≥ LOAEL+5 dB and <SOAEL	Medium / Moderate
≥ SOAEL dB	High / Major

Assumptions, Limitations and Uncertainties

14.52 Predictions of sound levels have an associated degree of uncertainty. Modelling and measurement processes will be carried out in such a way to reduce such uncertainty; however, it is unavoidable that some degree of prediction uncertainty remains.

14.53 Construction works noise levels will be predicted following guidance from BS 5228-1:2009+A1:2014 (Ref 14-2) which provides a realistic estimate of sound

propagation from construction plant and also provides representative noise levels for typical items of plant that are used in such developments.

14.54 Construction phase vibration will be assessed based on historic vibration measurement data from relevant guidance documents including BS 5228 2:2009+A1:2014 (Ref 14-2) and TRL Report 429 (Ref 14-21). No predictions of ground-borne vibration propagation are proposed.

14.55 Predictions of operational plant and activities sound pressure levels will be undertaken following guidance in ISO 9613 ‘Attenuation of sound during propagation outdoors’ (Ref 14-22), which are based on an assumption of moderate downwind propagation, and hence could be considered as a worst-case calculation. However, the standard also indicates an estimated accuracy of ±3 dB(A) in predicted levels.

14.56 Any measurement of existing ambient or background sound levels will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort will be made to ensure that measurements are undertaken in such a way as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods. However, a small degree of uncertainty will remain in the values taken from such a measurement survey.

15. Socio-economics and Land Use

Introduction

15.1 This chapter sets out the approach to the assessment of the Scheme's impacts on socio-economics and land use. The purpose of the assessment will be to identify and characterise any relevant socio-economic and land use receptors, to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.

Study Area

15.2 The study area for socio-economics and land use varies depending on the likely spatial extent of the effect under consideration.

15.3 Impacts on the economy and employment will be considered within West Lindsey District and Bassetlaw District, which are the Local Planning Authorities that the Scheme falls within, and the wider East Midlands region.

15.4 Impacts on users of recreational routes and PRoW will consider impacts on routes and PRoW likely to be affected by alterations in their use. This will include all routes located within 500m of the Scheme Boundary.

15.5 The study area for local communities that could be affected by community severance will consider communities that may potentially be directly and indirectly affected by the Scheme. These will include communities directly connected by recreational routes and PRoW. The communities that could be impacted are within 1km of the Scheme Boundary.

15.6 The study area for residential properties, agricultural land (including best and most versatile (BMV) agricultural land), local businesses (including, but not limited to agricultural businesses and visitor accommodation), visitor attractions relevant for tourism, community facilities, open space and development land will consider receptors that could be directly or indirectly affected by the Scheme. The receptors that could be impacted are within 500m of the Scheme Boundary.

Relevant Legislation, Policy and Guidelines

15.7 Legislation, planning policy and guidance relating to socio-economics and land use and pertinent to the Scheme comprises:

Legislation

15.8 There is no legislation of relevance to the assessment of socio-economic and land use effects.

National Planning Policy

- Overarching NPS for Energy (EN1) (Ref 15-1), with particular regard to Paragraphs 5.10.5 - 5.10.9 which detail requirements for NSIP applications to consider relevant land use impacts; and Paragraphs 5.12.2 – 5.12.5 which detail requirements for NSIP applications to consider relevant socio-economic impacts;

- Draft NPS EN-1 (Ref 15-2), with particular regard to Paragraphs 5.11.5 - 5.11.9 which detail requirements for NSIP applications to consider relevant land use impacts; and Paragraphs 5.13.2 - 5.13.6 which detail draft updated requirements for NSIP applications to consider relevant socio-economic impacts;
- There is no relevant policy contained within NPS for Renewable Energy Infrastructure EN-3 (Ref 15-3);
- Draft New NPS EN-3 (Ref 15-4) includes paragraph 2.49.11, which references the potential socio-economic benefits of retaining site infrastructure after the operational life of the solar farm;
- NPPF (Ref 15-5), with particular regard to: Paragraph 8 which outlines the role of the planning system in helping to support economic growth; Paragraph 100 which states planning decisions should protect and enhance PRoW; and, Paragraph 174b, in relation to impacts on best and most versatile agricultural land.

National Planning Practice Guidance

- NPPG (Ref 15-6), with particular regard to guidance on economic development, jobs and employment, open space, sports and recreation facilities, PRoW and local green space.

Local Planning Policy

- Adopted Central Lincolnshire Local Plan (2017) (Ref 15-7) with particular reference to: Policy LP5: Delivering Prosperity and Jobs; Policy LP7: A Sustainable Visitor Economy; Policy LP12: Infrastructure to Support Growth; Policy LP15: Community Facilities; and Policy LP19: Renewable Energy Proposals; Policy LP20: Green Infrastructure Network; Policy LP23: Local Green Space and other Important Open Space; and, Policy LP55: Development in the Countryside;
- Emerging Central Lincolnshire Submission Local Plan (2022) (Ref 15-8) with particular reference to: Policy S5: Development in the Countryside; Policy S14: Renewable Energy; Policy S42: Sustainable Urban Tourism; Policy S48: Walking and Cycling Infrastructure; Policy S50: Community Facilities; Policy S59: Green and Blue Infrastructure Network; Policy S65: Important Open Space; and, Policy S67: Best and Most Versatile Agricultural Land;
- Adopted Bassetlaw Core Strategy (2011) (Ref 15-9) with particular reference to: Policy DM1 Economic Development in the Countryside; Policy DM7 Securing Economic Development; Policy DM9 Green Infrastructure; Biodiveristy and Geodiversity, Open space and Sports facilities; Policy DM10 Renewable and Low Carbon Energy; Policy DM11 Developer Contributions and Infrastructure Provision;
- Emerging Bassetlaw Submission Local Plan (2022) (Ref 15-10) with particular reference to: Policy ST11: Rural Economic Growth and Growth Outside Employment Areas; Policy ST39: Green and Blue Infrastructure; Policy ST40a: Recreational Disturbance Avoidance and Mitigation Strategy (RAMS); Policy ST45: Protection and Enhancement of Community Facilities; Policy ST47: Promoting Sport and Recreation; Policy 48: Protecting Amenity; and, Policy ST58 Provision and Delivery of Infrastructure;

- Corringham Neighbourhood Plan (Adopted January 2022) (Ref 15-11);
- Glentworth Neighbourhood Plan (Adopted January 2019) (Ref 15-12);
- Draft Hemswell and Harpswell Neighbourhood Plan (2022) (Ref 15-13);
- Sturton by Stow Neighbourhood Plan (Adopted July 2022) (Ref 15-14);
- Rampton and Woodbeck Neighbourhood Plan (Adopted May 2021) (Ref 15-15); and
- Tresswell and Cottam Neighbourhood Plan (2019) (Ref 15-16).

Other Relevant Guidance

- Protecting, Progressing, Prospering: Greater Lincolnshire Local Enterprise Partnership (LEP) Plan for Growth (2021) (Ref 15-17);
- D2N2 LEP Recovery and Growth Strategy (2021) (Ref 15-18);
- West Lindsey Sustainability, Climate Change and Environment Strategy (2021) (Ref 15-19) with particular reference to the chapters titled 'Land Use and Green Space', 'Power' and 'Carbon Management Plan'; and
- West Lindsey Visitor Economy Strategy (2022) (Ref 15-20).

Baseline Conditions

15.9 This section sets out a high-level summary of socio-economic and land use baseline indicators across the defined study areas detailed above.

15.10 The high-level overview of key socio-economic indicators, including the summary employment and labour market baseline is based on the following public sources:

- Office of National Statistics (ONS), (2021), Mid-Year Population Estimates 2020 (Ref 15-21);
- ONS, (2021), Claimant count by sex and age (May 2022) (Ref 15-22);
- ONS, (2020), Annual Population Survey (January 2021 to December 2021) (Ref 15-23); and
- Ministry of Housing, Community and Local Government (MHCLG), (2020), English Indices of Deprivation (2019) (Ref 15-24).

15.11 The baseline for recreational routes and PRoW is based on:

- Lincolnshire PRoW map (electronic version) (Ref 15-25);
- Nottinghamshire PRoW Non-Definitive map (Ref 15-26)

15.12 The baseline for residential properties, agricultural land, local businesses, visitor attractions relevant for tourism, community facilities, open space and development land is based on AECOM desk research with reference to:

- Central Lincolnshire Local Plan Adopted and Proposed Policies Map (Ref 15-27); and
- Bassetlaw Local Plan Adopted and Proposed Policies Map (Ref 15-28)
- Planning applications portals for West Lindsey and Bassetlaw.

Overview

15.13 The Scheme is located within West Lindsey District Council and Bassetlaw District Council administrative areas. West Lindsey had a population of 96,186 and Bassetlaw had a population of 118,300 in 2020.

15.14 The Scheme Boundary comprises predominantly agricultural land. A number of settlements lie outside of but close to the Scheme Boundary (within 1km). These include: Hemswell approximately 300m to the north; Harpswell approximately 300m to the east; Hemswell Cliff approximately 400m to the east; Glentworth approximately 800m to the east; Coates approximately 600m to the east; Stow approximately 200m to the south; Brampton approximately 500m to the east; Torksey approximately 100m to the east; Laneham approximately 700m to the south; Rampton adjacent to the west; Cottam within the Scheme Boundary; South Leverton approximately 800m to the east; Marton adjacent to the north; Willingham by Stow adjacent to the north, south and west; Kexby less than 100m to the west; Upton approximately 700m to the north; Heapham approximately 500m to the west; and Springthorpe approximately 700m to the west.

15.15 West Lindsey is ranked 146th most deprived out of England's 317 Local Planning Authority areas. In West Lindsey, 8% of Lower Layer Super Output Areas (LSOAs) are within the 10% most deprived LSOAs in England. Bassetlaw is the 108th most deprived of England's 317 Local Planning Authority areas, with 7% of its LSOAs within the 10% most deprived LSOAs in England.

Employment and Labour Market

15.16 In 2020, the economic activity rate in West Lindsey (72.5%) was below average rates across the East Midlands (79.5%) and England (78.7%). The economic activity rate in Bassetlaw (78.8%) was also lower than the East Midlands average, and slightly higher than the average across England.

15.17 In 2020, the unemployment rate for working-age (16- to 64-year-olds) was 4.9% in West Lindsey and 5.2% in Bassetlaw, which is higher than the average rates across the East Midlands (4.5%) and England (4.6%). The claimant count (as a proportion of residents aged 16-64 years), recorded in May 2022, was 3.2% in West Lindsey and 3.1% in Bassetlaw, lower than the rates across the East Midlands (3.4%) and England (3.9%).

15.18 In 2021, the proportions of working-age residents with a degree-level qualification or higher is lower in West Lindsey (25.6%) and Bassetlaw (20.1%), compared to the averages across the East Midlands (28.6%) and England (36.8%). The proportion of residents holding no formal qualifications is higher in West Lindsey (9.3%) and lower in Bassetlaw (4.9%) than averages across the East Midlands (7.5%) and England (6.4%).

15.19 Gross Value Added (GVA) per head is slightly lower in West Lindsey (£15,558) and Bassetlaw (£18,703) than the averages across the East Midlands (£21,228) and England (£27,165). The percentage of total employment within the mining, quarrying and utilities broad industrial group (which includes employment from the generation of energy) is similar in both West Lindsey (1.5%) and Bassetlaw (1.6%). This is in line with the East Midlands (1.6%) and higher than England (1.1%).

Recreational Routes and PRoW

15.20 One PRoW traverse the Principal Site (GItw/85/1). A number of PRoW traverse the Cable Route Corridor Search Area and are listed in further detail in *Chapter 16: Transport and Access.* There are a large number of additional recreational routes and PRoW within 500m of the Scheme.

Residential Properties

15.21 There are a number of dispersed private properties and farm buildings within the study area for residential properties, and further residential properties within the settlements of Hemswell, Harpswell, Hemswell Cliff, Stow, Brampton, Torksey, Rampton, Cottam, Marton, Willingham by Stow, Kexby and Heapham are within the study area for residential properties.

Agricultural Land

15.22 An agricultural land classification (ALC) survey will be carried out. This will inform the baseline assessment of best and most versatile (BMV) agricultural land.

Business Premises

15.23 There are a large number of businesses within the study area, including within the settlements of Hemswell, Hemswell Cliff (including Hemswell Cliff Business Park), Harpswell, Stow, Brampton, Torksey, Rampton, Cottam, Marton, Willingham by Stow, Kexby and Heapham. In addition there are a number of isolated buildings across the study area in business use, including related to agricultural trades.

Visitor Attractions

15.24 Sundown Adventureland children's theme park is located within the study area, to the north of Rampton.

Community Facilities

15.25 There are a number of community facilities within the study area, including: Willingham GP surgery; Howson Care Home; Marton & Gate Burton Village Hall; The Marton Academy Primary School; and Torksey GP surgery.

Open Space

15.26 There are a number of designated public open spaces in the study area including in Hemswell Cliff, Willingham by Stow, Kexby, Marton, Cottam and Rampton.

Development Land

15.27 The following allocated development sites are within the study area:

- Hemswell Cliff Business Park Extension – Allocated employment site in Hemswell Cliff
- WL/HEM/C001 – Housing site allocation in Hemswell Cliff (Central Lincolnshire Draft New Local Plan)
- WL/HEM/C007 - Proposed housing site allocation in Hemswell Cliff (Central Lincolnshire Draft New Local Plan)

- WL/MAR/016 - Proposed housing site allocation in Marton (Central Lincolnshire Draft New Local Plan)
- GT002 – Proposed traveller site allocation north of Rampton (Bassetlaw Draft Local Plan).

15.28 The following proposed solar development schemes currently undergoing consultation are within the study area:

- Gate Burton Energy Park
- Cottam Solar Project
- West Burton Solar Project.

Future Baseline

15.29 The population of West Lindsey is projected to grow from 96,186 to 98,905 by 2027 and 102,710 by 2042 (2.8% and 6.8% growth); and the population of Bassetlaw is projected to grow from 118,280 in 2020 to 124,055 by 2027 and 132,209 by 2042 (4.8% and 11.8% growth). This compares to 5.0% growth 2020-2027 and 12.4% to 2020-2042 across the East Midlands, and 3.5% growth 2020-2027 and 8.8% to 2020-2042 across England as a whole.

15.30 The future baseline for residential properties, businesses, community facilities, open spaces, visitor attractions and development land over the medium-term is highly uncertain. Due to this uncertainty, for the purposes of this assessment, it is assumed the future baseline for the Scheme study area would be unchanged from the current baseline, except where new development is expected to be delivered in line with allocated and planned development sites as set out in paragraph 15.26.

Potential Effects and Mitigation

15.31 The socio-economics and land use assessment will consider the construction, operation and decommissioning phases of the Scheme. Details of each of these stages are set out in *Chapter 3: Description of the Scheme* of this EIA Scoping Report.

Potential Construction Impacts

15.32 The following socio-economic and land use impacts could arise from the construction phase of the Scheme:

- Generation of construction-related employment, training and apprenticeship opportunities, both directly at work sites and indirectly in the supply chain;
- Generation of GVA in West Lindsey and Bassetlaw;
- Potential temporary or permanent closure or diversions to PRoW and recreational (relevant routes are within 500m of the Scheme Boundary);
- Potential temporary or permanent severance of access to community facilities for residents leading to deterioration of social cohesion and affecting mental health (relevant communities are within 1km of the Scheme Boundary); and

- Potential temporary or permanent adverse land take or amenity impacts on residential properties, agricultural land (including BMV land), local businesses (including, but not limited to, agricultural businesses and visitor accommodation), visitor attractions, community facilities, open space or development land, (relevant receptors are within 500m of the Scheme Boundary).

Potential Operational Impacts

15.33 The following socio-economic and land use impacts could arise from the operational phase of the Scheme:

- Potential closure or diversions to PRoW and recreational routes (relevant routes are within 500m of the Scheme Boundary);
- Potential severance of access to community facilities for residents leading to deterioration of social cohesion (relevant communities are within 1km of the Scheme Boundary);
- Potential adverse land take or amenity impacts on residential properties, agricultural land (including BMV land), local businesses (including, but not limited to, agricultural businesses and visitor accommodation), visitor attractions, community facilities, open space or development land, (relevant receptors are within 500m of the Scheme Boundary);
- Potential creation of permanent operational phase employment, training and apprenticeship opportunities, both directly at work sites and indirectly in the supply chain in West Lindsey and Bassetlaw. Where appropriate, evaluation of job creation associated with the Scheme will include information related to the sustainability of the jobs created, including the extent to which they will help develop the skills needed for the UK's transition to Net Zero; and
- Potential generation of GVA in West Lindsey and Bassetlaw.

Potential Decommissioning Impacts

15.34 The potential socio-economic and land use impacts that could arise from the decommissioning phase of the Scheme are expected to be the same as the potential construction impacts outlined above.

Summary of effects scoped into the assessment

15.35 The potential impacts outlined above will be **scoped in** and assessed further in the EIA to understand the socio-economic and land use impacts of the Scheme.

Source of information

15.36 A desk-based baseline assessment will be undertaken using a range of sources to provide a description of the socio-economic conditions within the socio-economic and land use study areas set out above. This will be done using established statistical sources, and in consultation with stakeholders, where relevant. Relevant policy will be reviewed at the local, regional and national levels to identify the key issues of relevance to the Scheme.

15.37 An Agricultural Land Classification (ALC) soil survey will be undertaken for the land parcels within the Scheme Boundary. This will be used to inform the

assessment of the impact of the potential loss of agricultural land (including BMV agricultural land) arising from the Scheme.

Assessment Methodology

15.38 The assessment methodology for the EIA is set out in *Chapter 6: Environmental Impact Assessment Methodology* of this EIA Scoping Report.

15.39 The methodology for assessing the socio-economic and land use impacts will follow standard EIA guidance, and will:

- Assess the likely scale, permanence and significance of effects on socio-economic and land use receptors;
- Assess the potential cumulative impacts of the Scheme in interaction with other planned projects within the surrounding area.

Assessment of Potential Effects (including significance criteria)

15.40 The assessment of potential socio-economic impacts will use policy thresholds and expert judgment to assess the scale and nature of the impacts of the Project against baseline conditions. For socio-economics and land use there is no accepted definition of what constitutes a significant (or not significant) socio-economic effect. It is however recognised that effects are categorised based upon the relationship between the scale (or magnitude) of effect and the sensitivity (or value) of the affected resource or receptor.

15.41 As such, the socio-economics and land use effects will be assessed on the basis of:

- *Consideration of sensitivity to impact*: specific values in terms of sensitivity are not attributed to socio-economic and land use receptors due to their diverse nature and scale, however the assessment will be undertaken with regard to the qualitative (rather than quantitative) 'sensitivity' of each receptor and, in particular, their ability to respond to change based on recent rates of change and turnover (if appropriate); and
- *Scale of impact*: this entails consideration of the size of the impact on socio-economic and land use receptors in the context of the area in which effects will be experienced.

15.42 The assessment will aim to be objective and quantify effects as far as possible. However, in some cases, effects can only be evaluated on a qualitative basis. Effects will be assessed as follows:

- *Beneficial classifications of effect*: indicate an advantageous or beneficial effect on an area, which may be minor, moderate, or major in effect;
- *Negligible classifications of effect*: indicate imperceptible effects on an area;
- *Adverse classifications of effect*: indicate a disadvantageous or adverse effect on an area, which may be minor, moderate or major in effect; and
- *No effect classifications*: indicate that there are no effects on an area.

15.43 Where an effect is assessed to be beneficial or adverse, the scale of the effect will be assigned using the below criteria:

- *Minor*: a small number of receptors are beneficially or adversely affected. The effect will make a small measurable positive or negative difference on receptors;
- *Moderate*: a noticeable number of receptors are beneficially or adversely affected. The effect will make a measurable positive or negative difference on receptors; and
- *Major*: all or a large number of receptors are beneficially or adversely affected. The effect will make a measurable positive or negative difference on receptors.

15.44 Effects which are found to be moderate or major will be considered 'significant' and those which are minor or negligible will be considered 'not significant'.

15.45 Duration of impact will also be considered, with more weight given to long-term or permanent changes than to temporary ones. Temporary impacts are considered to be those associated with the construction works. Long-term impacts are generally those associated with the completed and operational development.

15.46 Consideration of employment and GVA effects will reflect the temporary and permanent impact on the local economy and labour market in West Lindsey and Bassetlaw and the wider East Midlands region. Homes and Communities guidance on "Additionality" will be applied to assess direct, indirect and induced impacts.

15.47 The likely effects on land-use that could result from the construction, operation and decommissioning of the Scheme will also be considered. of the Scheme will also be considered.

15.48 The assessment of effects on agricultural land-use will consider the impacts that could result from the construction, operation and decommissioning phases of the Scheme, arising from the change to the dominant land-use within the Scheme boundary, from its current use for arable cultivation, to that of energy generation using solar PV.

15.49 There are no defined thresholds for assessing the effects of non-agricultural development on agricultural assets. The NPPF states that "*planning policies and decisions should contribute to and enhance the natural and local environment by… 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*".

Assumptions, Limitations and Uncertainties

15.50 Assessing the potential impacts of any commercial agreements for land between the Applicant and landowners is beyond the scope of the socio-economic and land use assessment.

16. Transport and Access

Introduction

16.1 This chapter sets out the approach to the assessment of the Scheme's impacts on transport and access. The purpose of the assessment will be to identify and characterise any relevant transport and access infrastructure, to consider the nature and scale of potential impacts arising from the Scheme, and to assess the significance of any likely effects.

16.2 A Transport Scoping Note including the access strategy will also be prepared in due course, which will set out the proposed scope specific to the future Transport Assessment (TA) that will accompany the DCO application. Both Lincolnshire County Council (LCC) and Nottinghamshire County Council (NCC), the latter having an interest given the location of the proposed Cable Route Corridor, will be consulted on the Transport Scoping Note to determine, and seek agreement on, the scope and approach of the TA. National Highways will also be consulted, although the Scheme is located approximately 20km from the M180 and A46, which are the closest points on the Strategic Road Network.

Study Area

16.3 The study area includes extents of the highway network shown in Figure 16-1 and the PRoW network shown in Figure 16-2, which, based on professional judgement and experience of other Solar Farm DCO submissions, are considered to be potentially at risk from possible direct and indirect impacts arising from the Scheme.

16.4 The areas surrounding the Principal Site comprise several small rural villages, including Harpswell and Glentworth approximately 500m and 1km to the east of the Scheme boundary respectively, and Springthorpe and Heapham approximately 500m and 1.5km to the west of the Scheme boundary respectively. The villages of Upton, Kexby and Willingham by Stow are located circa 2km to the west of the expected Cable Route Corridor. The Principal Site accesses are located circa 13km to the north of Lincoln. The Cable Route Corridor is expected to run from the existing Cottam Power Station in a north-east direction crossing the River Trent, A156 and A1500.

16.5 The A631 (High Street/Harpswell Lane) and B1398 (Middle Street) runs along the northern and eastern boundaries of the Principal Site respectively and the A15 (Ermine Street) also runs parallel to the eastern boundary of the Principal Site. Several minor roads cross the Principal Site, including Springthorpe Road/Hill Road, Common Lane, Kexby Road and Willingham Road.

16.6 Due to the nature of the Scheme, consideration will be given to a number of locations within the surrounding highway network which could potentially be impacted, with key links/ locations identified below.

- A631/B1398 Roundabout
- A631
- B1398 (Middle Street)
- A1500 (Till Bridge Lane)

- B1241 (Willingham Road)
- A15
- A156
- Common Lane
- Kexby Road
- Willingham Road
- Cottam Road
- Cottam Road/Outgang Lane

16.7 The Cable Route Corridor is expected to run in a southwest direction from the Principal Site to the point of connection at Cottam sub-station. Starting from the Principal Site, the expected Cable Route Corridor route would cross Cow Lane, Glentworth Road and Fillingham Lane which are all narrow rural single lane roads. From east to west it crosses the B1241 (Normandy Road), the A1500 (Stow Park Road) and the A156 (High Street), which are single carriageway roads with a single lane in each direction, as well as the railway line running between Gainsborough and Lincoln. Within Nottinghamshire, the Cable Route Corridor is expected to cross agricultural lands, a railway track to the northwest of Cottam Power Station, the River Trent and Town Road/Headstead Bank, Cottam Road/Outgang Lane, before reaching existing Cottam Power Station.

16.8 Additional information regarding the study area is provided later in the sources of information section which identifies the traffic survey locations used to determine the baseline traffic flows. Also, the proposed study area for the Personal Injury Collision (PIC) data for the Principal Site is identified later in the sources of information section.

16.9 The extent of the study area for assessment in terms of highway impact will be subject to discussion, and agreement will be sought, with LCC and NCC as Highway Authorities for the Local Road Network (LRN).

Figure 16-1 Study Area

Revision: 0 Drawn: LL Checked: CC Approved: ST Date: 2022-09-22

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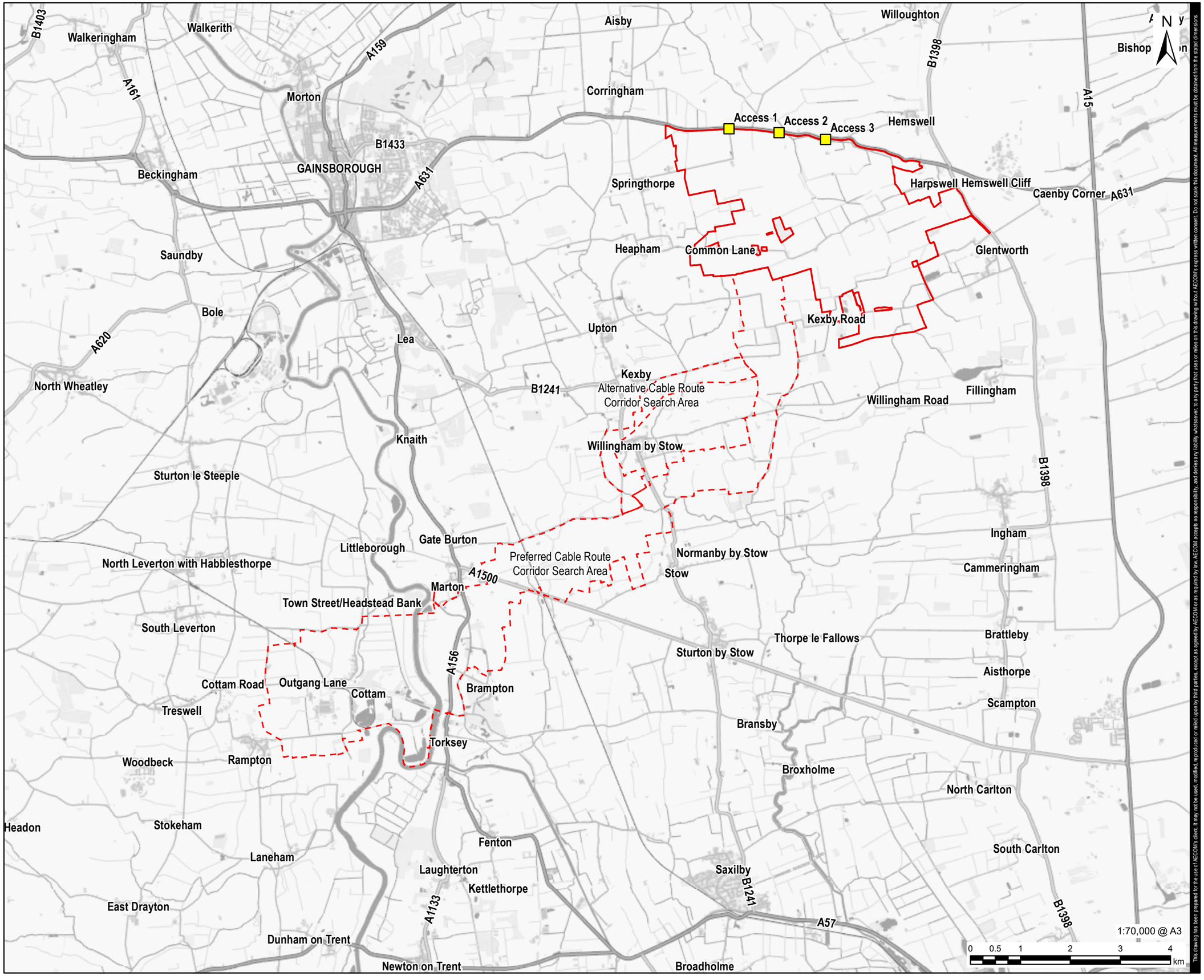

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LEGEND
- Principal Site
- Cable Route Corridor Options
- Potential Site Accesses for the Principal Site

NOTES

ISSUE PURPOSE
EIA Scoping Report

PROJECT NUMBER
60677969

FIGURE TITLE
Study Area

FIGURE NUMBER
Figure 16.1

Figure 16-2 PRoWs located within or cross the Red Line Boundary

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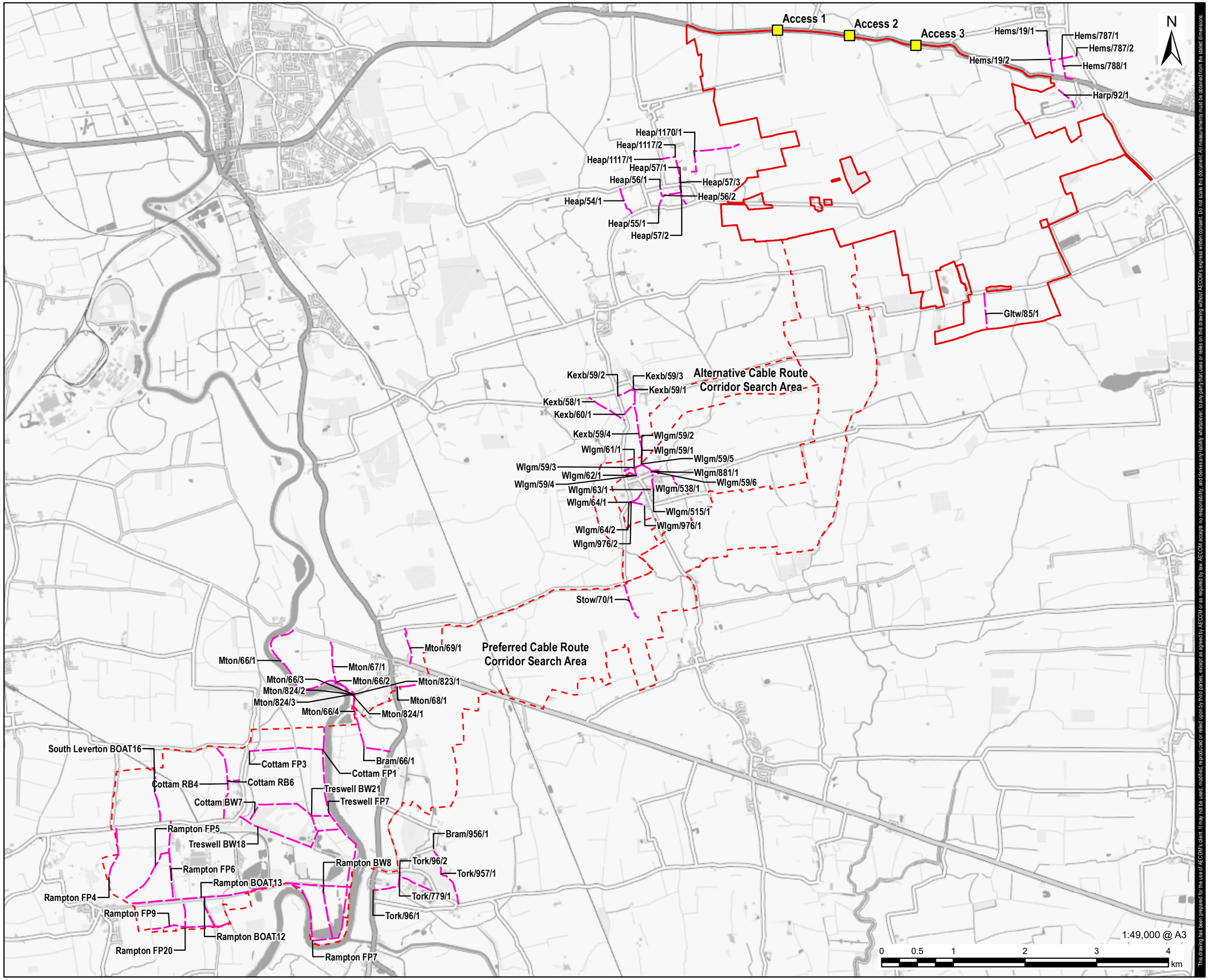

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- Cable Route Corridor Options
- Potential Site Accesses for the Principal Site
- Public Rights of Way

NOTES

ISSUE PURPOSE
EIA Scoping Report

PROJECT NUMBER
60677969

FIGURE TITLE
PRoWs located within or cross the Red Line Boundary

FIGURE NUMBER
Figure 16.2

Relevant Legislation, Planning Policy and Guidelines

16.10 Planning policy and guidance relating to transport and access and pertinent to the Scheme comprises that identified below.

National Planning Policy

16.11 Reference will be made to NPS EN-1 with particular reference to section 5.13 with respect to traffic and transport considerations in relation to energy proposals.

16.12 The Draft Overarching NPS for Energy (EN-1) (Ref 16-1) will also be considered with this once designated providing the basis for decisions regarding nationally significant energy infrastructure. Section 5.14 outlines the planning policy for traffic and transport, including guidance on undertaking relevant parts of the EIA.

16.13 The Draft NPS for Renewable Energy Infrastructure (EN-3) (Ref 16-2) sets out the policies relating to electricity generation from renewable sources of energy, to be considered in conjunction with NPS EN-1. Section 2.54 reviews solar photovoltaic generation impacts during construction including traffic and transport, noise and vibration.

16.14 The Draft NPS for Electricity Networks Infrastructure (EN-5) (Ref 16-3) sets out the policies relating to electricity networks infrastructure, to be considered in conjunction with draft NPS EN-1. Section 2.11.12 refers to the design of access roads and making it an integral part of the site layout and design as to fit in with the surroundings. Section 2.11.12 also states that developers should *minimise any adverse effects on existing land use and rights of way.*

16.15 The Government's NPPF (Ref 16-4) was originally published in March 2012 and most recently revised in July 2021, outlining the Government's planning policies and how they are expected to be applied. The most relevant paragraphs in the context of transport are set out below:

- Paragraph 104 outlines that 'transport issues should be considered from the earliest of stages of plan-making and development proposals';
- Paragraph 110 outlines the key considerations when assessing sites to be allocated for development in plans or specific development applications;
- Paragraph 111 states that development should only be prevented or refused on highways grounds where there would be an unacceptable impact on highway safety, or the residual cumulative impacts of development on the road network would be severe;
- Paragraph 112 states that applications for development should give priority first to pedestrian and cycle movements and then, as far as possible, to facilitating access to high quality public transport; and
- As outlined in Paragraph 113, all developments that generate significant amounts of movement should be required to provide a Travel Plan, and the application should be supported by a Transport Statement or TA so that the likely impacts of the proposal can be assessed.

National Planning Practice Guidance

16.16 The Government's Planning Practice Guidance: Travel Plans, Transport Assessments and Statements (2014) (Ref 16-5) provides advice on when TAs and Transport Statements are required, and what they should contain. The most relevant paragraphs are summarised below:

- Paragraph 002: assessing and mitigating the negative transport impacts of development in order to promote sustainable development;
- Paragraphs 004 and 005: evaluating the potential transport impacts of a development proposal and may propose mitigation measures to promote sustainable development;
- Paragraph 006: positively contributing to encouraging sustainable travel, reducing traffic generation and detrimental impacts, reducing carbon emissions and climate impacts, creating accessible, connected and inclusive communities, improving health outcomes and quality of life, improving road safety and reducing the need for new development to increase existing road capacity of providing new roads;
- Paragraph 007 discusses early-stage consultation and, tailored to local circumstances, collaborative ongoing working between the local planning authority/ transport authority, transport operators, rail network operators, as well as Highways England (National Highways) where there may be implications for the strategic road network and other relevant bodies; and
- Paragraphs 013 to 015 discuss the potential scope and establishes what information should be included.

Local Planning Policy

16.17 A summary of the local planning documents which will be reviewed within the ES and TA is set out below.

16.18 Policy LP19 of the adopted Central Lincolnshire Local Plan (2017) (Ref 16-6) identifies the issues that will be considered when assessing proposals for renewable energy:

- Proposals for non-wind renewable energy development (renewable technology will be assessed on their merits, with the impacts, both individual and cumulative, considered against the benefits of the scheme, taking into account a number of environmental considerations. This includes taking account of safety and ensuring no adverse highway impact. Other policies of relevance within the adopted plan are Policy LP12 (Infrastructure to Support Growth) and Policy LP13 (Accessibility and Transport), The emerging Central Lincolnshire Submission Local Plan (2022) comprises policies of relevance to access and transport. In this regard, consideration will be given to Policy S45 (Strategic Infrastructure Requirements), Policy 47 (Accessibility and Transport), Policy S48 (Walking and Cycling Infrastructure) and Policy S49 (Parking Provision).
- Policy DM13 (Sustainable Transport) of the adopted Bassetlaw Core Strategy and Development Management Policies Local Plan (2011) will be considered along with relevant policies from the emerging Bassetlaw Submission Local Plan (2022) including Policy ST54 (Transport

Infrastructure) and Policy ST55 (Promoting Sustainable Transport and Active Travel.

Oher Relevant Guidance

Lincoln Transport Strategy 2020 to 2036

16.19 The new Lincoln Transport Strategy (Ref 16-7) has been developed by LCC, City of Lincoln Council, North Kesteven District Council and West Lindsey District Council. It aims to provide a clear vision for the future of transport across the Lincoln area up to 2036. The strategy includes:

- Enhancing connectivity across the network for all modes;
- Increasing the capacity of the network and supporting the reduction in traffic in the urban area; and
- Rebalance movement towards walking and cycling.

Fourth Lincolnshire Local Transport Plan 2013/14 to 2022/23

16.20 The Fourth Lincolnshire Local Transport Plan (LTP4) (Ref 16-8) builds on the strategies and policies adopted by previous Local Plans, and the transport goals set out within this document include:

- Provide a reliable, resilient transport system which supports a thriving economy and growth whilst encouraging sustainable and healthy travel;
- Improve access to key services, particularly enabling employment and training opportunities; and
- Minimise the impacts of transport on people's lives, maximise opportunities to improve the environment and help tackle carbon emissions.

16.21 In addition, Section 5.17 relates to travel planning and sustainable travel within new developments whilst Section 14.33 relates to reducing the impact of traffic.

Gainsborough Transport Strategy (October 2010)

16.22 The Gainsborough Transport Strategy (Ref 16-9) aims to understand and quantify transport problems and to develop a Transport Strategy based on short-term and long-term interventions, these include:

- Better management of movements into and through Gainsborough;
- Management of existing and future levels of congestion; and
- Addressing the impacts of existing and future movements in Gainsborough.

Nottinghamshire Local Transport Plan 2011-2026

16.23 The Nottinghamshire Local Transport Plan (LTP) (Ref 16-10) sets out Nottinghamshire's transport strategy and outlines a programme of measures to be delivered over the short, medium and long-term. The strategy covers all types of transport including public transport, walking, cycling, cars and freight.

Industry Guidance

16.24 Institute of Environmental Management and Assessment (IEMA) Guidelines for the Environmental Assessment of Road Traffic (1993) (Ref 16-11), provides guidance on examining the environmental impacts of developments in terms of traffic and transportation.

Baseline Conditions

16.25 A summary is provided below of the local networks for vehicles, public transport (bus and rail), walking and cycling, including PRoW and equestrian for both the Principal Site and Cable Route Corridor.

Highway Network

16.26 The highway network is discussed below and shown in Figure 16-1.

- The A631 is a key route that runs along the northern Principal Site boundary in an east-west direction. To the west the A631 provides a connection to the A159 and A156 which are both routes through Gainsborough to the north and south respectively. The A631 connects to the A15 to the east which runs in a north-south direction, which subsequently provides access to Lincoln to the south and the M180 to the north.
- The B1398 (Middle Street) is a local route that runs along the eastern extent of the Principal Site. A small section of the RLB fronts along the B1398 between the villages of Harpswell and Glentworth and includes an existing farm track access road into the Principal Site. The B1398 connects with A631 to the north and the A1500 (Till Bridge Lane) to the south. The B1398 provides connections to local villages including Harpswell, Glentworth and Fillingham.
- The A1500 (Till Bridge Lane) is located to the south of the Principal Site and runs in an east-west direction through Sturton by Stow and connects to the A156 to the west and the A15 in the east. The Cable Route Corridor is expected to cross the A1500 (Till Bridge Lane) between Marton and Sturton by Stow.
- The B1241 (Willingham Road) runs in a north-south direction along the western extent of the Principal Site through Normanby by Stow, Willingham by Stow, Kexby and Upton. It is known by several different names including Gainsborough Road, Stow Road, Normanby Road, Sturton Road and High Street. It connects to Kexby Lane and Fillingham Lane.
- A15 is a key route located to the east of the Principal Site running in a north to south direction. To the north the A15 provides a connection to the M180 and the A46 to the south. The A15 provides a key route to/from Lincoln to the south of the Principal Site.
- A156 is a key route located to the west of the Principal Site running in a north to south direction. The A156 provides a connection to the A631 to the north and the A57 to the south. The A156 provides a route to/from Gainsborough.
- A57 is a key route which is located to the south of the Scheme and provides a route over the River Trent from the A156 towards the Cable Route Corridor.
- Common Lane is a narrow rural road which runs in an east-west direction towards Heapham to the west and Harpswell to the east. Common Lane is located within the Principal Site boundary, providing access via the A631 in the east and the B1241 in the west.
- Kexby Road is a narrow rural road which runs in an east-west direction towards Upton to the west and Glenworth to the east. Kexby Road is located

within the Principal Site boundary, providing access via the B1398 (Middle Street).

- Willingham Road is a narrow rural road which runs in an east-west direction towards Willingham by Stow to the west and Fillingham to the east. Willingham Road is located within the Principal Site boundary.
- Cottam Road provides access to the existing Cottam Power Station, located within Nottinghamshire to the west of the River Trent and is expected to be in close proximity to the Cable Route Corridor.
- Town Street/Headstead Bank is located in Nottinghamshire to the east of the existing Cottam Power Station and runs in a north-south direction through Cottam and is expected to be in close proximity to the Cable Route Corridor.
- Cottam Road and Outgang Lane are located in Nottinghamshire to the north of the existing Cottam Power Station and runs in an east-west direction providing access to the Cottam Power Station and onto Cottam.

16.27 All of the above routes are single carriageway roads with a single lane in each direction. Speed limits on the routes vary from 30mph to 40mph, where they pass through residential areas, up to the national speed limit (60mph) outside towns/villages.

16.28 Within the study area there are a number of other local roads which run through, alongside or in close proximity to the Principal Site. These include:

- Springthorpe Road/Hill Road is a single carriageway road with one lane in each direction but no street markings. It runs north-south through Springthorpe in close proximity (500m) to the north-western border of the Principal Site and provides a link to the A631 in the north and the B1241 in the south; and
- High Street/ Willingham Road runs from the B1398 (Middle Street) through Fillingham village, the road has a single lane in each direction but no street markings and narrows to a single-track road. The road runs east-west across the south of the site, providing access via the B1398 in the east and Willingham by Stow in the west.

Non-Motorised User Networks

16.29 A summary is provided below of the local Non-Motorised Users (NMUs) facilities. This includes walking (e.g. footways and crossings), cycle, equestrian and PRoWs, for both the Principal Site and Cable Route Corridor.

Walking

16.30 Due to the location of the Principal Site in rural Lincolnshire, there is limited footway provision in the surrounding area. Footways are limited to parts of the A631 and the settlements that surround the Principal Site, as follows:

- Along the northern Principal Site boundary, a narrow footway is provided along the northern side of the A631 from Pilham Lane through Corringham where the footway widens until the junction with Springthorpe Lane (approximately 850m). A footway is provided along the south side of the A631 through Corringham, ending at the Beckett Arms bus stop. Just after the Caravan Park homes off the northern side of the A631 , a footway is provided

until the sign for Harpswell, where provision changes to the southern side of the carriageway until the junction with Common Lane (approximately 500m).

- To the west of the Principal Site boundary, the junction between the A631 and Springthorpe Road provides access to Springthorpe where approximately 450m of footway fronts onto residential properties on the eastern side of the carriageway, providing access to the Church and New Inn bus stops in Springthorpe.
- To the east of the Principal Site boundary, the junction between the A631 and Common Lane provides access to Harpswell where approximately 150m of footway is provided on the eastern side of the carriageway fronting onto residential properties and providing access to St Chad's Church.
- To the east of the Principal Site, the junction between the B1398 (Middle Street) and Hanover Hill provides access to Glentworth where approximately 650m of footway is provided along the northern side of the carriageway until it becomes a narrow single lane track after the village. The footway widens when fronting residential properties through Glentworth.
- To the east of the Principal Site along the B1398 (Middle Street), approximately 600m of narrow unkept footways varying between the eastern and western sides of the road exist between the junction with Hanover Hill providing access into Glentworth and residential buildings to the south. The footway widens on the eastern side of the carriageway when fronting the residential properties. Approximately 400m of narrow footway is also provided on the eastern side of the carriageway located north of the junction with the B1398 and Ingham Lane.
- To the east of the Principal Site boundary, the junction between the B1398 (Middle Street) and High Street provides access to Fillingham where approximately 1km of footway is provided along the northern side of the road until it becomes a narrow single lane track after the village.

Equestrian

16.31 There are various bridleways for equestrian use in the local area. The facilities are discussed further in the PRoW section below. Laughton Wood Equestrian Centre is located approximately 11km (circa 12 minutes' drive) to the Principal Site access to the north of Gainsborough and there are two Liveries located to the south of the Principal Site in the villages of Ingleby and South Carlton approximately 16km and 25km from the Principal Site access respectively.

PRoW

16.32 There are several PRoW within or crossing the Principal Site boundary and the Cable Route Corridor Search Area. These are listed below and are also displayed in Figure 16-2.

Principal Site boundary:

- PRoW Gltw/85/1 – a bridleway which runs through the southern extent of the Principal Site, running in a north-south direction for approximately 500m from Kexby Road, west of Glentworth Grange before linking within PRoW Fill/85/1 to the south.

Cable Route Corridor Search Area boundary:

- PRoW Stow/70/1 – a bridleway which runs through the western extents of the Cable Route Corridor Search Area, running in a north-south direction for

approximately 500m to the south of Marton Road and to the west of Normanby by Stow.

- PRoW Mton/68/1 - a footpath which runs through the western extents of the Cable Route Corridor Search Area, running in an east-west direction for approximately 800m between High Street and Stow Park Road to the South of Marton.
- PRoW Mton/66/4 - a footpath which runs through the western extents of the Cable Route Corridor Search Area, running in a north-south direction for approximately 550m to the east of the River Trent and linking within PRoW Bram/66/1 in the south and PRoW Mton/824/1 in the north.
- PRoW Bram/66/1 - a footpath which runs through the western extents of the Cable Route Corridor Search Area, running in a north-south direction for approximately 200m and in an east-west direction for approximately 400m to the east of the River Trent and linking within PRoW Mton/66/4 in the north.
- PRoW Cottam FP3 – a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 1km between Headstead Bank and the River Trent and linking within PRoW Cottam FP1 in the east.
- PRoW Cottam FP1 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 900m and linking within PRoW Cottam FP3 in the north and PRoW Treswell FP7 in the south.
- PRoW Treswell FP7 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 500m and linking within PRoWs Cottam BW7 and Treswell BW6 in the west, PRoW Cottam FP1 in the north and PRoW Treswell FP1 in the south.
- PRoW Cottam BW7 - a bridleway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 1.3km along the border of an ash disposal site and linking within PRoWs Treswell FP7 and BW21 in the east and PRoW Treswell BW18 in the west.
- PRoW Treswell BW6 - a bridleway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 280m and linking within PRoW Treswell FP7 in the east and PRoWs Treswell BW21 and BW18 in the west.
- PRoW Treswell BW21 - a bridleway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 250m and linking within PRoW Cottam BW7 in the north and PRoW Treswell BW18 in the south.
- PRoW Treswell BW18 - a bridleway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 1.18km along the border of an ash disposal site and linking within PRoWs Treswell BW21 and BW6 in the east and PRoW Cottam BW7 in the west.
- PRoW Treswell FP1 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-

south direction for approximately 190m and linking within PRoW Treswell FP7 in the north and PRoW Rampton FP7 in the south.

- PRoW Rampton FP7 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 800m along the River Trent and linking within PRoWs Treswell FP1 and Rampton BOAT13 in the north and PRoW Rampton BW8 in the south.
- PRoW Rampton BW8 - a bridleway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 750m and linking within PRoW Rampton FP7 in the south and PRoW Rampton BOAT13 in the north.
- PRoW Rampton BOAT13 – a byway open to all traffic which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 2.6km along the southern border of Cottam Power Station and linking within PRoWs Rampton BW8 and FP7 in the east and PRoWs Rampton BOAT12, FP20 and FP6 in the west.
- PRoW Rampton BOAT12 – a byway open to all traffic which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 400m and linking within PRoW Rampton BOAT13 in the north and PRoW Rampton FP9 in the south.
- PRoW Rampton FP9 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 1.35km and linking within PRoWs Rampton FP1 and FP10 in the west and PRoWs Rampton FP20, BOAT12 and FP7 in the east.
- PRoW Rampton FP20 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 380m and linking within PRoW Rampton FP9 in the south and PRoW Rampton BOAT13 in the north.
- PRoW Rampton FP6 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 500m and linking within PRoWs Treswell FP5 and Rampton FP5 in the north and PRoW Rampton BOAT13 in the south.
- PRoW Rampton FP5 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 800m and linking within PRoWs Treswell FP5 and Rampton FP6 in the north.
- PRoW Treswell FP5 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 400m and linking within PRoWs Rampton FP6 and FP5 in the south.
- PRoW Treswell FP3 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 470m from Cottam Road and linking within PRoW Rampton FP4 in the south.

- PRoW Rampton FP4 - a footpath which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 650m and linking within PRoW Treswell FP3 in the north.
- PRoW South Leverton BOAT16 - a byway open to all traffic which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 1.1km along Cow Pasture Lane to the north west of Cottam Power Station.
- PRoW Cottam RB4 – a restricted byway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in a north-south direction for approximately 1.1km between Cottam Road and Broad Lane and linking within PRoW Cottam RB6 in the middle.
- PRoW Cottam RB6 - a restricted byway which runs within the vicinity of the south western extent of the Cable Route Corridor Search Area, running in an east-west direction for approximately 180m and linking within PRoW Cottam RB4 in the west.

16.33 In addition, there are several PRoW (Ref 16-12) which run close to the Scheme but currently do not cross the boundary. Given the stage of the project, and potential changes to the Scheme boundary as a result of finalising the Cable Route Corridor, the PRoW in close proximity to the Scheme are listed in Appendix F which had been identified using the Lincolnshire (Ref 16-13) and Nottinghamshire (Ref 16-14) interactive maps which provide further information on the PRoW locations. The ES will provide a refined list of PRoWs that are likely to be impacted by the Scheme once the final red line boundary has been confirmed.

Cycling

16.34 There are no on or off-road dedicated/ marked cycling facilities within the immediate vicinity of the Scheme Boundary. To the west of the Scheme boundary, the National Byway (a leisure cycling route covering parts of England, Scotland and Wales) runs in a north-south direction through Gainsborough and Treswell, which is approximately 2.6km (circa 9 minutes' cycle) to the west of Cottam Power Station. The route includes some off-carriageway facilities.

16.35 The nearest National Cycle Network route (between Harby and Lincoln) is located approximately 25km to the south of the Principal Site access on the A631. There is also a narrow footway/cycle path on the eastern side of the A15 running for approximately 5.1km between RAF Scampton and Lincoln, to the south of the Scheme boundary.

16.36 The Principal Site could potentially be accessed by cyclists from Corringham, Hemswell and Springthorpe as all are located within an approximate 3km-4km cycle distance (10 minute cycle) of one of the proposed accesses along the A631.

Public Transport Networks

16.37 A summary of the local bus and rail facilities in the vicinity of the Scheme boundary is provided below. The frequency of the bus and rail services within the likely arrival and departure hours of the construction staff, and the likelihood of rail as a potential travel mode for construction workers, will be discussed

further within the transport chapter/ documents. The bus stops and railway stations discussed below are locations identified in Figure 16-3 and Figure 16-4.

Bus

16.38 Bus services 100, 103, 106, 190 and 354 serve the Scheme. Bus stops are located on the A631, B1398 (Middle Street), B1241 (Willingham Road) and Cottom Lane which are in close proximity to the Scheme. The bus stops closest to the Principal Site access points and Cottam Power Station are listed in Table 16-1 with key information regarding service frequency provided. Other bus stops along the routes which are close to the Scheme Boundary are also listed.

Table 16-1: Bus Services Operating Within the Vicinity of the Scheme

Service	Operator	Route	Bus Stop Name & Location (Closest Bus Stop to Principal Site Access)	Figure 16-3 Ref	Facilities Provided	Service Frequency	Other Stop Locations along the Bus Route
100	Stagecoach	Scunthorpe/ Gainsborough - Lincoln	Kexby Corner – B1241 Kexby Lane	19 – Northbound 20 - Southbound	Northbound: footway and shelter Southbound: flag and footway	Northbound AM: 07:59, 09:04 Northbound PM: 17:49, 18:34 Southbound AM: 06:48, 07:41, 08:53, 09:48 Southbound PM: 17:26 Approximately an hourly service between 10:00-16:00 (Monday to Saturday excluding bank holidays)	• Gainsborough Lea Road Station • Lea Green (A156 Lea Road) • Knaith Park Stags Head (B1241 Willingham Road) • Willingham by Stow Church (B1241 High Street) • Stow Church (B1241 Sturton Road) • Sturton by Stow (B1241 High Street)
103	Stagecoach	Scunthorpe to Lincoln	Post Office – A631 Hemswell	8 – Northbound	Northbound: footway, flag and layby Southbound: flag, layby and	Northbound AM: 07:39, 09:06 Northbound PM: 17:21, 18:36 Southbound AM: 07:16, 09:46	• Fillingham Castle (B1398) • Ingham (Church Hill, Ingham) • Cammeringham (B1398)

Service	Operator	Route	Bus Stop Name & Location (Closest Bus Stop to Principal Site Access)	Figure 16-3 Ref	Facilities Provided	Service Frequency	Other Stop Locations along the Bus Route
				7 - Southbound	shelter with seating	Approximately a service every 2 hours between 10:00-16:00 (Monday to Saturday excluding bank holidays)	
			St George's Hill – B1398 Glentworth	11 – Northbound	Northbound: flag and shelter with seating	Northbound AM: 09:03 Northbound PM: 17:18, 18:33 Southbound AM: 07:19, 09:49	
				12 - Southbound	Southbound: footway and flag	Approximately a service every 2 hours between 10:00-16:00 (Monday to Saturday excluding bank holidays)	
			Hanover Hill - B1398 Glentworth	13 - Northbound	Northbound: footway and flag	Northbound AM: 09:02 Northbound PM: 17:17, 18:32 Approximately a service every 2 hours between 10:00-16:00	

Service	Operator	Route	Bus Stop Name & Location (Closest Bus Stop to Principal Site Access)	Figure 16-3 Ref	Facilities Provided	Service Frequency	Other Stop Locations along the Bus Route
						(Monday to Saturday excluding bank holidays)	
106	Stagecoach	Gainsborough – Lincoln (via Springthorpe)	Beckett Arms PH - A631 Corringham	2 – Northbound 1 - Southbound	Northbound: flag, layby and shelter with seating Southbound: footway only	Northbound AM: 08:25 Southbound PM: 15:55 One daily service in each direction (Monday to Saturday excluding bank holidays)	• Stow Church (B1241 Sturton Road) • Willingham by Stow Church (B1241 High Street) • Kexby Chapel (B1241 Upton Road) • Upton Rose & Crown PH (Hight Street, Upton) • Heapham (Common Lane)
			New Inn – Hill Road, Springthorpe	15 – Northbound 16 - Southbound	Northbound: footway only Southbound: footway only	Northbound AM: 08:21 Southbound PM: 15:59 One daily service in each direction (Monday to Saturday excluding bank holidays)	
190	Gem Mini Travel	Retford - Tuxford	Cottam Lane - Treswell	18 – Northbound 17 - Southbound	Northbound: footway and flag Southbound: no facilities	The service is demand responsive through 'village link phoneabus. (Ref 16-15) At the rural stops, there is no set timetable and the bus will only serve the stop if	• Treswell Town Street • Woodbeck Chadwick Walk (Woodbeck, Retford)

Service	Operator	Route	Bus Stop Name & Location (Closest Bus Stop to Principal Site Access)	Figure 16-3 Ref	Facilities Provided	Service Frequency	Other Stop Locations along the Bus Route
						there is demand. Passengers can book the service up to a maximum of 14 days in advance of their trip and at least 2 hours before the time of travel. (Monday to Saturday excluding bank holidays)	
354	Stagecoach	Gainsborough Queen Elizabeth School – Lincoln (via Corringham)	Yawthorpe Lane End – A631 Harpswell Lane	4 – Northbound 3 - Southbound	Northbound: no facilities Southbound: no facilities The Stagecoach website (Ref 16-15) confirms that they are in operation and are served by route 354.	Northbound AM: 08:04 Southbound PM: 16:01 One daily service in each direction (Schooldays)	• Scampton Village School (B1398) • Ingham High Street • Corringham

Service	Operator	Route	Bus Stop Name & Location (Closest Bus Stop to Principal Site Access)	Figure 16-3 Ref	Facilities Provided	Service Frequency	Other Stop Locations along the Bus Route
			Harpswell Grange - A631 Harpswell Lane	6 – Northbound 5 - Southbound	Northbound: no facilities Southbound: no facilities The Stagecoach website confirms that they are in operation and are served by route 354.	Northbound AM: 08:04 Southbound PM: 16:01 One daily service in each direction (Schooldays)	
			Hill Top Lodge – B1398/ A631 Roundabout	9 – Northbound 10 - Southbound	Northbound: footway only Southbound: layby with no road markings only The Stagecoach website confirms that	Northbound AM: 08:03 Southbound PM: 16:05 One daily service in each direction (Schooldays)	

Service	Operator	Route	Bus Stop Name & Location (Closest Bus Stop to Principal Site Access)	Figure 16-3 Ref	Facilities Provided	Service Frequency	Other Stop Locations along the Bus Route
					they are in operation and are served by route 354.		
			St George's Hill – B1398 Glentworth	11 – Northbound 12 - Southbound	Northbound: flag and shelter with seating Southbound: footway and flag	Northbound AM: 07:58 Southbound PM: 16:09 One daily service in each direction (Schooldays)	
			Church Street – Kexby Road Glentworth	14 – Northbound and Southbound	Northbound and Southbound: footway only The Stagecoach website confirms that they are in operation and are served by route 354.	Northbound AM: 07:57 Southbound PM: 16:11 One daily service in each direction (Schooldays)	

Figure 16-3 Selected Bus Stops Closest to the Scheme

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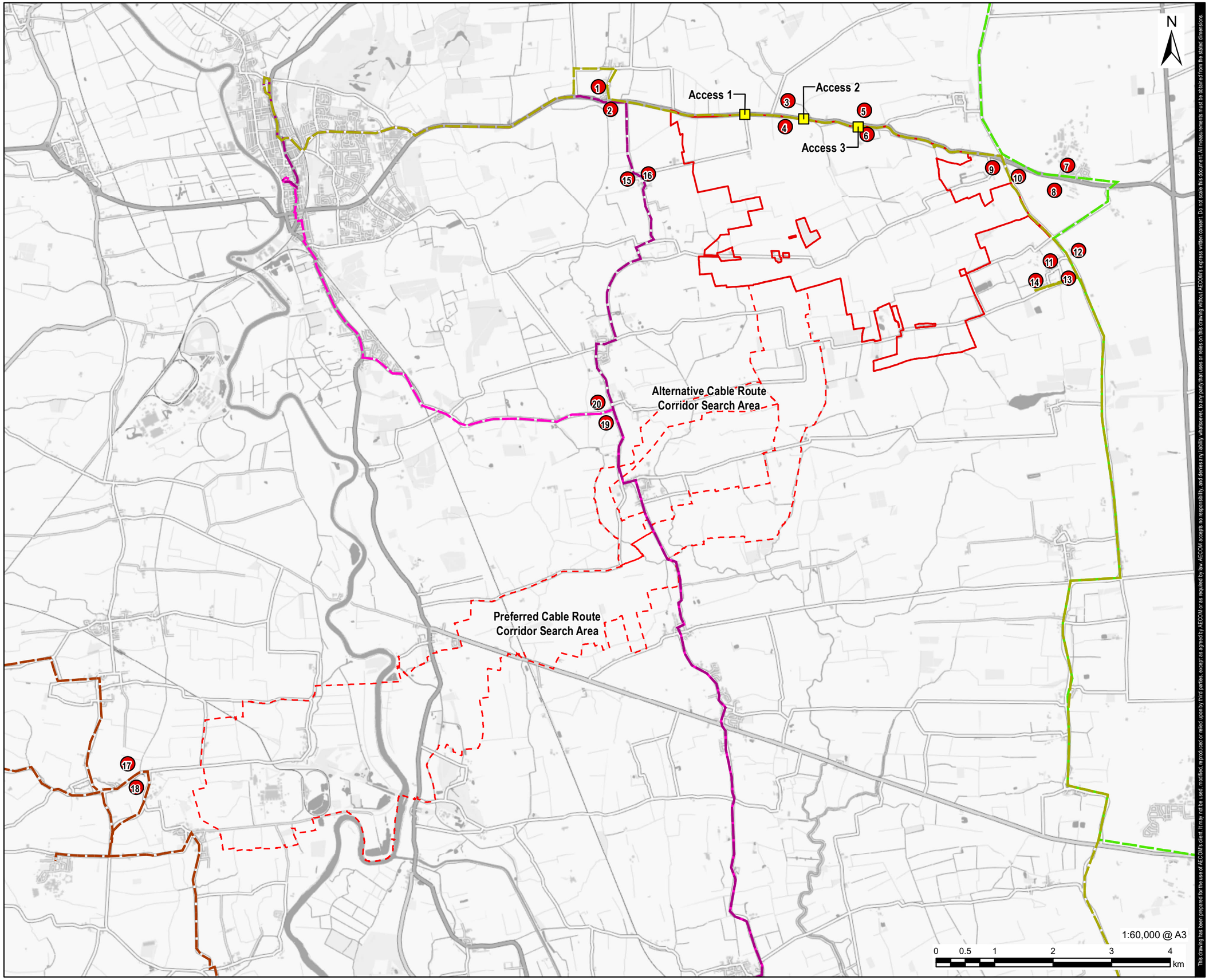

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LEGEND

- Principal Site
- Cable Route Corridor Options
- Potential Site Accesses for the Principal Site
- Selected Bus Stops Closest to the Scheme

Bus Route

- Route 354
- Route 190
- Route 106
- Route 103
- Route 100

NOTES

ISSUE PURPOSE

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PROJECT NUMBER

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FIGURE TITLE

Selected Bus Stops Closest to the Scheme

FIGURE NUMBER

Figure 16.3

Figure 16-4 Local Railway Stations

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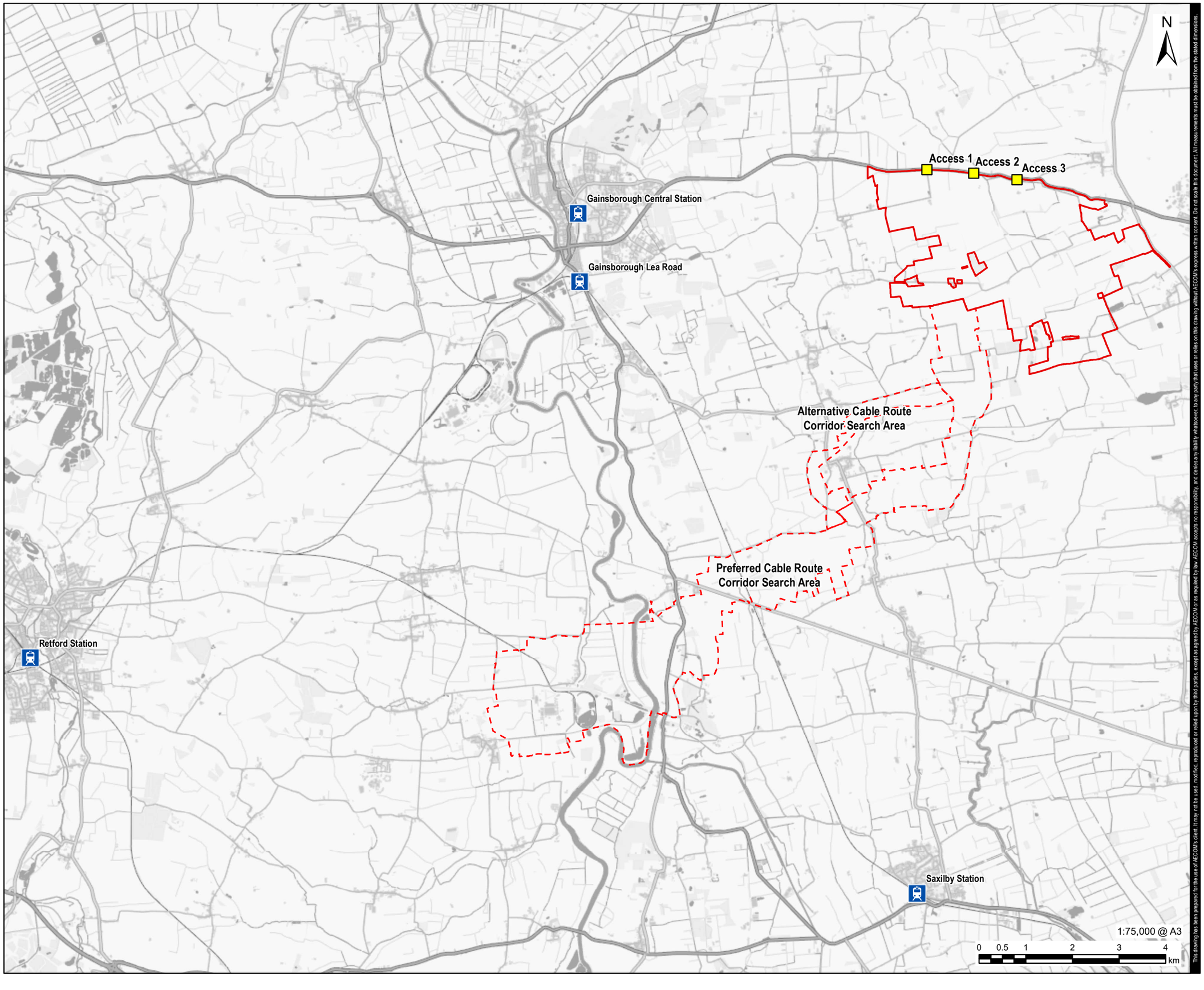

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LEGEND
- Principal Site
- Cable Route Corridor Options
- Potential Site Accesses for the Principal Site
- Local Railway Station

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FIGURE TITLE
Local Railway Stations

FIGURE NUMBER
Figure 16.4

16.39 As shown in the frequencies detailed above, there are a limited number of bus services before 07:00 and after 19:00. It is therefore considered unlikely that the bus services in the vicinity of the Scheme boundary will provide a viable option for construction staff to travel to and from the Scheme given the current assumed construction working hours of 07:00-19:00.

Rail

16.40 Gainsborough is located to the west of the Scheme boundary and has two railway stations, Gainsborough Central and Gainsborough Lea Road. Retford Station and Saxilby Station are also located in close proximity to the Scheme boundary. Railway stations could be used as locations to pick-up/drop-off construction staff via a mini-bus/shuttle service.

16.41 Figure 16-4 provides the location of each railway station in relation to the Principal Site access points and Cottam Power Station as the proposed Cable Route Corridor will originate/terminate at the Power Station. Key information regarding service frequency between 06:00-10:00 and 17:00-20:00 is also provided as this covers the expected time periods construction staff will arrive/depart the Scheme. The railway stations included in Table 16-2.

Table 16-2: Rail Services Operating Within the Vicinity of the Scheme

Train Station	Location	Operator	Route	AM and PM Arrival and Departure Times and Interpeak Frequency
Gainsborough Central Station	Approximately 8.5km (circa 10 minutes' drive) to the west of the Principal Site accesses Approximately 18km (circa 23 minutes' drive) to the north of Cottam Power Station	Northern Rail	Sheffield to Gainsborough to Lincoln/ Cleethorpes	Northbound AM: 09:16 Northbound PM: 19:01 Southbound AM: 08:52 Southbound PM: 18:50 One morning and evening service in each direction only
Gainsborough Lea Road Station	Approximately 9km (circa 10 minutes' drive) to the west of the Principal Site accesses Approximately 17km (circa 21 minutes' drive) to the north of Cottam Power Station	Northern Rail	Leeds/ Sheffield to Lincoln/ Cleethorpes	Northbound AM: 07:03, 07:43, 08:46, 09:11, 09:35 Northbound PM: 17:46, 18:01, 18:43, 19:49, 19:58 Southbound AM: 06:40, 07:32, 08:24, 09:37 Southbound PM: 17:35, 18:34, 19:11, 19:39 Approximately 2 services an hour between 10:00-16:00

Train Station	Location	Operator	Route	AM and PM Arrival and Departure Times and Interpeak Frequency
		East Midland Trains	Peterborough to Doncaster	Northbound AM: 09:07, 09:12 Northbound PM: 18:01, 19:59 Southbound AM: No service before 10:00 Southbound PM: 19:11 Approximately 3 services between 10:00-16:00
Saxilby Station	Approximately 19.5km (circa 25 minutes' drive) to the south of the Principal Site accesses Approximately 19km (circa 20 minutes' drive) to the south of Cottam Power Station It takes approximately 12-13 minutes' drive between Saxilby Station and Gainsborough Lea Road Station	Northern Rail	Leeds/ Sheffield to Lincoln/ Cleethorpes	Northbound AM: 06:52, 07:32, 08:35, 08:54, 09:24 Northbound PM: 17:34, 17:49, 18:31, 19:38, 19:46 Southbound AM: 06:52, 07:42, 07:44, 08:36, 09:49 Southbound PM: 17:46, 18:46, 19:22, 19:51 Approximately 2 services an hour between 10:00-16:00
		East Midland Trains	Peterborough to Doncaster	Northbound AM: 08:54, 09:00 Northbound PM: 17:49, 19:46, 19:53 Southbound AM: No service before 10:00 Southbound PM: 19:23 Approximately 3 services between 10:00-16:00
Retford Station (Nottinghamshire)	Approximately 27km (circa 30 minutes' drive) to the south west of the Principal Site accesses Approximately 14km (circa 18 minutes' drive) to the west of Cottam Power Station	Northern Rail	Leeds/ Sheffield to Lincoln/ Cleethorpes	Northbound AM: 06:13, 06:56, 07:17, 07:57, 09:00, 09:32, 09:51 Northbound PM: 17:59, 18:56, 19:20 Southbound AM: 06:24, 06:46, 07:17, 08:09, 08:36, 09:20 Southbound PM: 17:19, 18:19, 18:34, 19:24 Approximately 1 service an hour between 10:00-16:00

Train Station	Location	Operator	Route	AM and PM Arrival and Departure Times and Interpeak Frequency
		London North Eastern Railway	London Kings Cross to Edinburgh/ York/ Leeds	Northbound AM: 07:34, 07:57, 08:47 Northbound PM: 18:05, 19:49 Southbound AM: 06:51, 08:35 Southbound PM: 18:00, 18:42 Approximately 1 service every 2 hours between 10:00-16:00
		Hull Trains	London Kings Cross to Hull/ Beverley	Northbound AM: 08:52, 08:53 Northbound PM: 17:12, 19:12 Southbound AM: 07:41, 09:39 Southbound PM: 18:18, 19:42 Approximately 1 service every 2 hours between 10:00-16:00

16.42 In terms of potentially utilising the railway for deliveries during the construction phase, whilst the existing Cottam Power Station is served by a rail station, it is understood that this section of track is no longer in use.

Potential Effects and Mitigation

Construction

16.43 The nature of the Scheme is such that the greatest impact is likely to occur during the construction and decommissioning phases and this will be the focus of the assessment of transport effects presented in the ES.

16.44 The main considerations and potential effects due to the Scheme during the construction and decommissioning phases are:

- Increase in HGV movements;
- Abnormal loads;
- Travel to and from site by construction employees;
- Increase in delay to vehicles, pedestrians, cyclists and equestrians due to increase in HGV movements; and
- Change in route connections and amenity for pedestrians, cyclists and equestrians due to the Scheme.

16.45 At this stage, it is considered likely that only a small proportion of trips will either originate from or pass through local villages such as Glentworth and Springthorpe, during the construction, operation, or the decommissioning phases. Whilst some employees originating from larger settlements nearby (e.g. Gainsborough and Lincoln) may travel by public transport or bicycle (the distance is too far to walk) these modes are not expected to constitute a significant proportion of trips to the site. Consideration will also be given to those users of local facilities for Non-Motorised Users (NMUs) (e.g. walking, cycling and horse-riding) which could be impacted by the Scheme.

16.46 The main point of vehicular access for the Principal Site during the construction, operation and decommissioning of the Scheme is anticipated to be via the A631 which runs west to east along the Principal Site northern boundary. At this stage access is expected to be taken from three points along the A631:

- Site Access 1 via the existing A631/School Lane T-Junction;
- Site Access 2 via the existing A631/farm access T-Junction, circa 1km to the east of the A631/School Lane T-Junction; and
- Site Access 3 via the existing A631/Grange Farm T-Junction circa 950m to the east of the A631/farm access T-junction and circa 5.5km to the west of the A631/A15 Roundabout.

16.47 It is currently unknown the proportion split of HGVs, LGVs and construction staff which are to use each of the three site accesses.

16.48 Currently, no further site accesses are expected to the Principal Site. However, further to the above, a new site access is expected to be constructed on the northern side of Cottam Road (in the vicinity of the existing power station access) to provide construction vehicle access to the Cable Route Corridor works in this area. The Cable Route site accesses will be determined once the Cable Corridor is further defined.

16.49 Further detail on proposed accesses to the Scheme will be included within the ES and the TA, which will be submitted with the DCO submission.

16.50 At this stage it is anticipated that, as a worst-case during the peak construction period, there could be up to 64-66 HGV deliveries per day and on average 47-49 HGV deliveries per day. In addition, there will be vehicle movements associated with construction worker arrivals and departures. Construction worker numbers are anticipated to peak at 1,125 staff per day and on average 500 staff per day; traffic forecasts associated with the above will be provided in the ES and TA. Potential impacts during the construction and decommissioning phases are typically considered as short term. The TA and Access Strategy will consider the impact of any other committed developments and/ or highways improvement schemes in the vicinity which may be considered to have a cumulative impact during the construction of the Scheme.

16.51 The need for mitigation measures will be considered in the ES and TA, however, potential mitigation measures which could be implemented during the construction and decommissioning phases which will be set out in the Construction Transport Management Plan, include:

- Restriction of HGV movements to certain routes, days of the week and times of the day;

- Upgrading of routes, where considered necessary, to cater for the additional or larger vehicles;
- Positioning of suitably qualified marshal at the site access points, to allow all vehicle arrivals and departures to be safely controlled during the construction period;
- Providing road signs and/ or markings to increase awareness of the site access points during the construction phase and undertaking vegetation clearance in the vicinity of the site access points to improve visibility;
- Encouraging local construction staff to car share, to reduce single occupancy car trips, by promoting the benefits of car sharing such as reduced fuel costs and by providing dedicated parking spaces nearer to the compound for those car sharing;
- Implementing a mini-bus/ shuttle-bus service to transfer non-local staff to/ from local worker accommodation, or potentially bus stops or railway stations, to reduce vehicle trips on the surrounding highway network;
- Implementing a Delivery Management System to control the bookings of HGV deliveries from the start of the construction period i.e. to regulate the arrival times of HGVs via timed delivery slots, as well as to monitor compliance with agreed HGV routing;
- Maintaining access to PRoWs during the construction phase where possible, or potentially providing temporary diversion routes if appropriate.

Operation

16.52 During the operational phase, the Scheme will be manned by a nominal number of people across the site with 10-12 permanent staff, predominantly undertaking maintenance tasks. Staff vehicles and those used for maintenance will primarily be four wheeled drive vehicles and vans, with heavy good vehicles rarely accessing the site during this phase. Notwithstanding the above, some solar panels may need to be replaced during the operational life of the Scheme. The level of vehicle trips associated with component replacement (e.g. batteries and panels) is not expected to be significant. Therefore, due to the low level of trips likely to be generated within the network peak hours, it is proposed that operational phase transport effects are **scoped out** of the EIA.

Decommissioning

16.53 For the purposes of the EIA, the decommissioning assessment year is assumed to be 2067 (40 years after opening). The decommissioning period is expected to be similar in duration and nature to the construction phase, albeit with fewer vehicle trips over a slightly shorter duration. In addition, this scenario is considered to be too far into the future to be able to accurately predict future baseline traffic flows or road / junction layouts. Therefore, the likely impacts of the decommissioning phase, including any required mitigation, are expected to be the same as (and not greater than) the construction phase. It is therefore not proposed to carry out a separate standalone assessment for the decommissioning phase given the above.

Source of Information

Overview

16.54 To inform the Transport and Access assessment of the Scheme, information from a number of sources will be collected. The sources which will be used are set out below:

- Various traffic count and speed survey data (see below);
- Traffic growth to be identified using National Road Traffic Forecast (NRTF) growth factors, with National Transport Model (NTM) adjustments applied within the Trip Ends Model Program (TEMPRO) utilising National Trip Ends Model (NTEM) dataset v7.2;
- Local travel and network information from various sources including LCC, NCC and local rail and bus operators which has been utilised within the baseline conditions section above;
- Personal Injury Collision (PIC) data from LCC and NCC (see below);
- OS mapping and topographical survey (where available) to provide geographical representation of the areas in the vicinity of the Scheme;
- Highway boundary information from LCC and NCC;
- Population data within a 30km radius, circa a 45-minutes' drive of the Principal Site to be identified from the Office for National Statistics (ONS), (2021), Mid-Year Population Estimates 2020 (Ref 16-16) at Middle Layer Super Output Area (MSOA) level to identify the likely locations of residence of the construction staff to identify a population-based gravity model; and
- Route planning software such as Google Maps to assess the most direct and functional route to the Principal Site accesses.

Traffic Survey Data

16.55 Peak hour traffic flows will be identified from various traffic surveys, Automatic Traffic Counts (ATCs) and Manual Classified Counts (MCCs) which have been carried out between 10th and 19th July 2022, which avoids school holidays. Agreement will be sought with the County Highway Authorities over the extent of the traffic data and, if necessary, the need for any further traffic surveys. The locations of the traffic surveys undertaken in July 2022 are shown in Figure 16-5.

16.56 A summary of the locations of the traffic surveys is as follows:

- A1: A621 (East of School Lane)
- A2: A631 (East of minor access south)
- A3: A631 (West of minor access south)
- A4: A631 (West of B1398)
- A5: B1398 Middle Street (North of A631)
- A6: A631 (East of B1398)
- A7: B1398 Middle Street (South of A631)
- A8: Hanover Hill (Glentworth)

- A9: A631 (West of A15)
- A10: A15 (North)
- A11: A631 (East of A15)
- A12: Kexby Lane
- A13: Common Lane
- A14: School Lane
- A15: Common Lane
- A16: Cow Lane
- A17: Glentworth Road
- A18: Fillingham Lane
- A19: High Street (Willingham by Stow)
- A20: Gainsborough Road (Willingham by Stow)
- A21: Marton Road (Willingham by Stow)
- A22: B1241 (North of Normanby by Stow)
- A23: B1241 (Sturton by Stow)
- A24: A1500 Tillbridge Road (East of Saxilby Road)
- A25: Saxilby Road
- A26: A1500 Stow Park Road (east of A156)
- A27: A156 (south of Willingham Road)
- A28: A156 (south of A1500)
- A29: Kexby Lane B1241
- A30: Cottam Road (east of Cow Pasture Lane) (located in Nottinghamshire)
- A31: Town Street/Headstead Bank (south of Broads Lane) (located in Nottinghamshire)
- M1: A631/B1398 roundabout
- M2: A15/A631 roundabout
- M3: A1500 Marton Road/Tillbridge Road/B12241 High Street/Saxilby Road junction (Sturton by Stow)
- M4: Gainsborough Road/Marton Road/High Street T-junction (Willingham by Stow)
- M5: A156/Stow Park Road A1500/Littleborough Lane staggered junction (Marton)
- M6: Cottam Road/Power Station Access (located in Nottinghamshire)

Figure 16-5 Traffic Survey Locations

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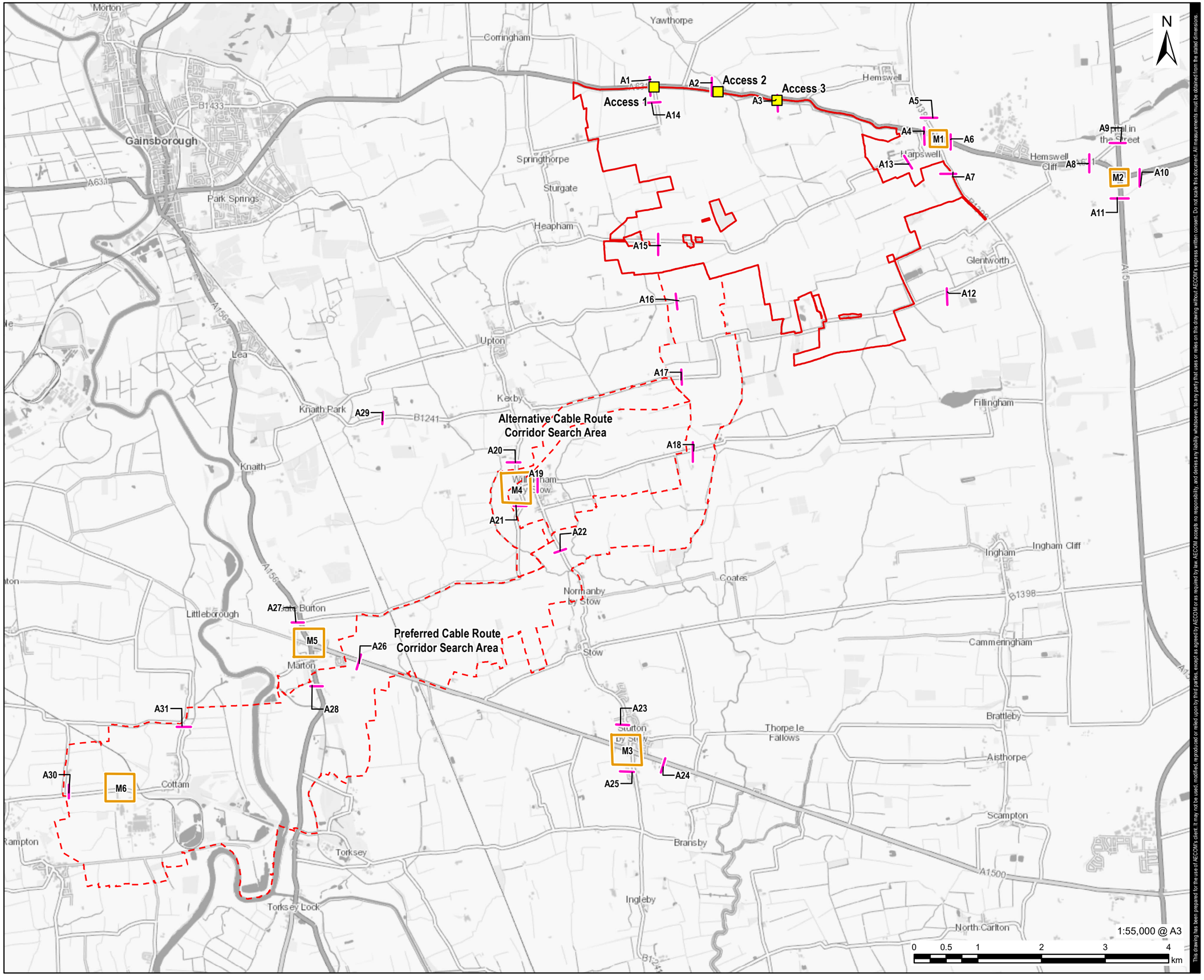

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LEGEND
- Principal Site
- Cable Route Corridor Options
- Potential Site Accesses for the Principal Site
- Manual Classified Count
- Automatic Traffic Count

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PROJECT NUMBER
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FIGURE TITLE
Traffic Survey Locations

FIGURE NUMBER
Figure 16.5

PIC Data

16.57 PIC data will be analysed within the transport and access chapter/ documents. An indicative study area is identified in Figure 16-6 which includes parts of the highway network situated within Lincolnshire around the Principal Site boundary. The PIC study area includes the main vehicle routes that are expected to be utilised to/ from the Principal Site.

16.58 Further analysis of parts of the highway network situated within Nottinghamshire and Lincolnshire may be required when the Cable Route Corridor is confirmed. The study area includes parts of the highway network which provide access to/ from Corringham and Harpswell to the north, Upton and Kexby to the west, Willingham by Stow and Fillingham to the south and Glentworth to the east.

16.59 A request will be made to each Local Highways Authority (LHA) to obtain available data for the most recent five-year period once the study area for each Local Planning Authority has been agreed.

Figure 16-6 PIC Study Area for the Main Site

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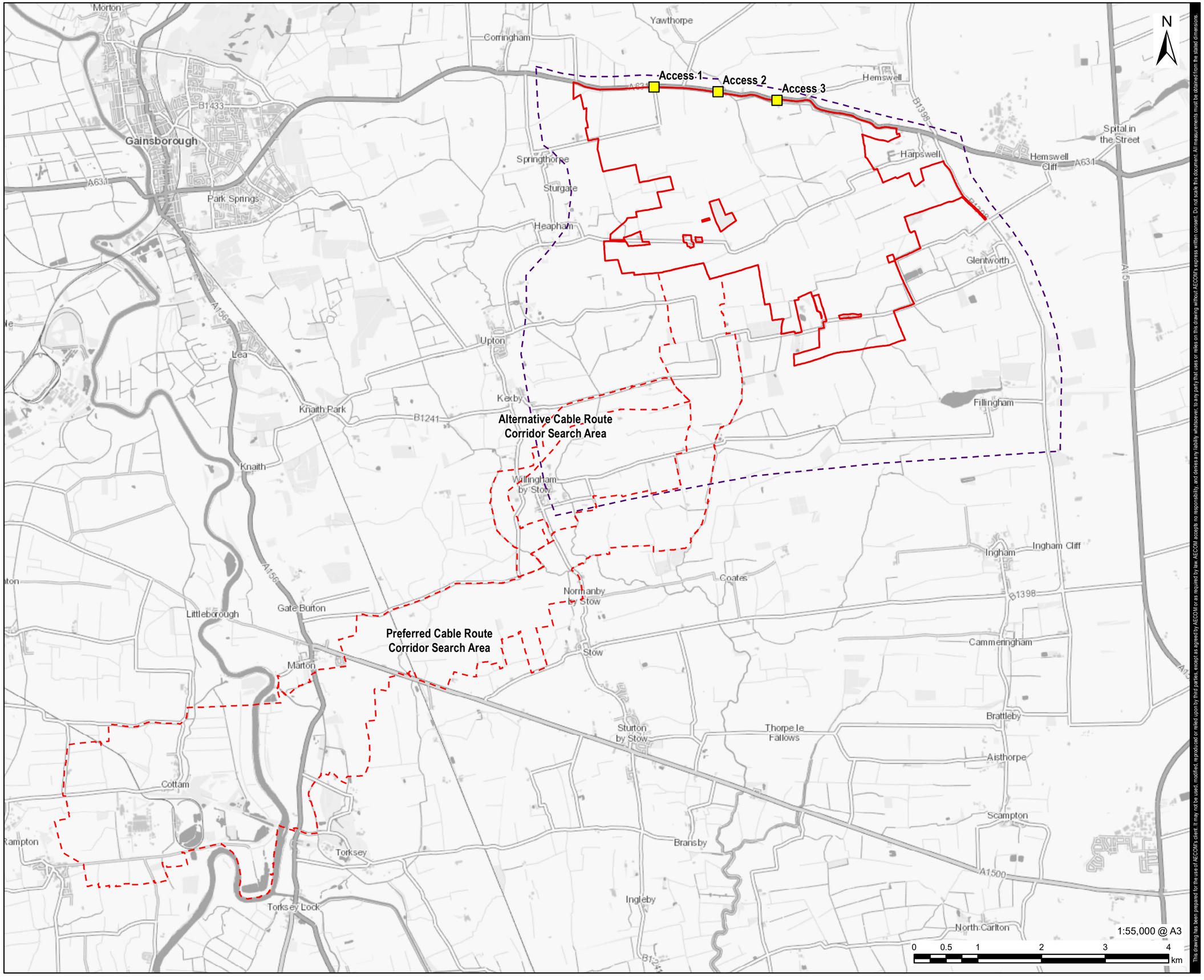

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LEGEND
- Principal Site
- Cable Route Corridor Options
- Potential Site Accesses for the Principal Site
- PIC Study Area for the Main Site

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FIGURE TITLE
PIC Study Area for the Main Site

FIGURE NUMBER
Figure 16.6

Assessment Methodology

Overview

16.60 In order to ensure the EIA is robust in considering the likely significant effects of the Scheme, appropriate assessment scenarios and years have been identified and are discussed below. The scenarios considered appropriate for assessment are:

- Baseline (2022) – AM peak (06:00-07:00), PM peak (19:00-20:00) and Daily; and
- Peak Construction Year (2026) With and Without Development – AM peak (06:00-07:00), PM peak (19:00-20:00) and Daily.

16.61 The construction working hours will be confirmed prior to undertaking the PEIR.

16.62 The peak construction year for the purpose of the EIA is anticipated to be 2026; this assumes commencement of construction in 2025, with completion in 2027. This assumes that the Scheme is built out rapidly, which is a worst case from a traffic generation point of view because it compresses the trip numbers into a shorter duration. This would therefore also be the worst-case in terms of effects on drivers, pedestrians and cyclists.

16.63 For the purposes of the EIA, the decommissioning assessment year is considered to be 2067 (40 years from opening). This year will not be considered in the TA in terms of the highway impact assessment or any junction assessments as it is considered too far into the future to be able to accurately predict traffic flows or junction forms. The operational phase will not be considered due to the minimal number of full-time staff.

16.64 A weekday assessment (Monday to Friday) will be carried out to provide a worst-case assessment of the peak construction phase based on the above, as it is not proposed to carry out a Saturday assessment given that both baseline traffic flows and construction traffic flows would be lower than weekday traffic flows i.e. the network will have more capacity to accommodate construction traffic at this time.

16.65 The TA Scoping Report will be formally presented to LCC and NCC as statutory consultees in order to seek to agree the scope of the TA. It is possible that some junction capacity analysis will be required, and this will be discussed and agreed with LCC and NCC where necessary.

16.66 The proposed study area for assessing potential effects on vehicle travellers is represented by the highway network discussed in the study area section and also in the traffic survey data section within this chapter.

16.67 The proposed assessment methodology for the transport and access chapter of the PEIR and ES is set out below.

16.68 In accordance with the IEMA guidance (Ref 16-11) for assessing the environmental impacts of road traffic, the following criteria has been considered in this assessment:

- Severance;
- Driver delay;

- Pedestrian delay;
- Pedestrian and cyclist amenity;
- Fear and Intimidation;
- Accidents and safety; and
- Hazardous loads.

16.69 The IEMA guidelines set out two rules in identifying potential links for analysis:

- **Rule 1**: include highway links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%); and
- **Rule 2**: include any other specifically sensitive areas (e.g. accident black spots, conservation areas, hospitals, links with high pedestrian flows etc) where traffic flows increase by 10% or more.

16.70 Based on this, links will be assessed where traffic flows are expected to increase by 30% or more during the peak hours of the peak construction phase (2026). However, links have not been assessed where there is expected to be a less than 30% increase in traffic flows as a result of the Scheme, unless any specifically sensitive areas are identified as set out in Rule 2 above.

16.71 The significance of effect has been determined through consideration of two elements; the sensitivity of the receptor and the magnitude of impact.

Sensitivity of Receptors

16.72 If required the impacts of Driver Delay will be assessed at junction level. The sensitivity of these receptors is expressed in terms of Ratio of Flow to Capacity (RFC) or Degree of Saturation (DoS). The construction working hours are currently assumed to be 07:00-19:00, and therefore the development peak hours of 06:00-07:00 and 19:00-20:00 are proposed to be assessed with reference to the baseline traffic flows on the surrounding highway network at these times. The thresholds for sensitivity of junctions are proposed below:

- **Low Sensitivity:** RFC / DoS below 90%;
- **Medium Sensitivity:** RFC / DoS between 90% and 95%; and
- **High Sensitivity:** RFC / DoS above 95%.

16.73 As mentioned above, the assessment of Driver Delay will not be carried out for any parts of the network where detailed junction capacity analysis will not be required as part of the TA.

16.74 In terms of Severance, Pedestrian Delay, Pedestrian / Cycle Amenity and Fear and Intimidation, the road links within easy walking/ cycling distance of the Principal Site will be used as receptors, as well as any road links which are expected to provide a main vehicular route to/ from the Principal Site accesses and contain pedestrian/ cycle facilities. A review of any internal routes and road links within easy walking/ cycling distance of the Cable Route Corridor will also be carried out as part of the ES Chapter once these are confirmed, i.e. given that the exact location of the Cable Route Corridor may not be defined at PEIR stage.

16.75 For the construction impacts, the sensitivity of pedestrian routes and cycle routes are based on a qualitative assessment of the 2022 baseline scenario, taking into consideration the importance and attractiveness of the routes and the

destinations served. The thresholds have been defined based on professional judgement and experience of other Solar Farm DCO submissions and are as follows:

- **Very Low Sensitivity:** Rural road with no pedestrian/cycle facilities provided;
- **Low Sensitivity:** Strategic vehicular route in a rural setting with pedestrian/cycle facilities;
- **Medium Sensitivity**: Main vehicular route with pedestrian/ cycle facilities provided in built up area; and
- **High Sensitivity**: Lightly trafficked route provided in town/village centre setting e.g. including residential streets.

16.76 Using the methodology outlined above, the highway and Non-Motorised User (NMU) sensitivity for the links being assessed will be presented in the PEIR and ES.

Magnitude of Impact

16.77 The overall effect will be determined by measuring the magnitude of the impact following mitigation measures (where applicable) against criteria including: the type and sensitivity of the receptor; and the type of impact. Effects are defined as beneficial or adverse, with effects further defined using the following classifications:

- **Very Low** – very little change approximating to a no change situation;
- **Low –** slight, very short, or highly localised impact of no significant consequence;
- **Medium –** limited impact (by extent, duration or magnitude) which may be considered significant; and
- **High –** considerable impact (by extent, duration or magnitude) of more than local significance, or in breach of recognised acceptability, legislation, policy or standards.

16.78 It should be emphasised that irrespective of the proportional increase in traffic flows, an increase of fewer than 30 additional vehicle trips per hour during each of the development peak hours is to be categorised as a very low magnitude of impact. This threshold has been determined based on professional judgement and previous experience including DCOs and solar farm projects, as it is considered that an increase of less than one vehicle every two minutes would not result in any significant effects. It is also considered likely that this could lead to over representation of significance of effects when presented against a lower traffic flow baseline outside of the network peak hours, as the construction staff are expected to arrive and depart outside of the network peak hours.

16.79 The IEMA guidelines (Ref 16-11) state that the magnitude of each impact should be determined as the predicted deviation from the baseline conditions. This will be completed for the construction phases, on the assumption that the decommissioning phase will be no worse than the construction phase and the operational phase would have minimal impact.

16.80 IEMA (Ref 16-11) sets out a number of criteria by which the magnitude of impact can be measured. These are outlined below. Where specific thresholds for measuring impacts are unavailable, impacts will be measured qualitatively.

16.81 **Severance** is defined in the IEMA guidelines (Ref 16-11) as the *"perceived division that can occur with a community when it becomes separated by a major traffic artery".* The term is used to describe a complex series of factors that separate people from places and other people. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities. IEMA guidelines suggest that 30%, 60% and 90% increases in traffic flows will result in low, medium and high changes in severance, respectively.

16.82 **Driver Delay** is proposed to be determined through the analysis of junction capacity assessments carried out as part of the TA, where required. Further details including in relation to the Cable Route Corridor will be provided as part of the ES. Delay is measured in terms of change in delay per vehicle (in seconds) from the baseline situation. This criterion is considered to be applicable to all modes of transport using the public highway, namely cars, motorcycles, pedal cycles and buses. For any parts of the network where junction capacity assessments are not required as part of the TA, given that no adverse impacts are envisaged for these parts of the network in terms of additional delay to road users, the impact is to be considered to be negligible and therefore not to be considered further.

16.83 **Pedestrian Delay** is considered to be affected by the changes in volume, composition or speed of traffic, in terms of their respective impacts on the ability of pedestrians to cross roads. In general, increases in traffic levels and/ or traffic speeds are likely to lead to greater increases in pedestrian delay. IEMA guidelines (Ref 16.1) suggest that a 30%, 60% and 90% increase in traffic flows will result in a minor, moderate and major change in pedestrian delay, as outlined in the IEMA guidance.

16.84 **Pedestrian and Cycle Amenity** is broadly defined as "the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width / separation from traffic". The guidance suggests that a tentative threshold for judging the significance of impact on pedestrian and cycle amenity would be where the traffic flow is halved or doubled. To be consistent with the pedestrian delay and the severance assessment, the 30%, 60% and 90% increase in traffic flows is proposed to be applied which will result in a low, medium and high change, with change less than 30% categorised as very low.

16.85 **Fear and Intimidation** is "dependent on the volume of traffic, its HGV composition, and its proximity to people or the lack of protection caused by such factors as narrow pavement widths". To provide consistency with pedestrian delay, pedestrian and cycle amenity criteria, it is proposed that a 30%, 60% and 90% increase in HGV flows would result in a low, medium and major change respectively, with change less than 30% categorised as very low, which is line with the other criteria thresholds. The assessment also qualitatively considers the changes of other relevant factors such as speed, proportion of vulnerable road users, footway widths, lighting and security measures (e.g. CCTV).

16.86 At this stage an assessment of **Accidents and Safety** will be carried out by examination of PIC data for the most recent five-year period available. The PEIR will include a review of the PIC data for the highway network in the vicinity of the Principal Site and the north-eastern part of the Cable Route Corridor (within Lincolnshire). The ES will include a full review of PIC data including the likely impacted section of highway network in the vicinity of the south-western part of the Cable Route Corridor (within Nottinghamshire). This analysis will be included in the TA and undertaken to highlight if there are any existing safety issues on the local road network which may be exacerbated by the Scheme. The outcome of the assessment will be presented in the ES. To provide consistency with pedestrian delay, pedestrian and cycle amenity and fear and intimidation criteria's, it is proposed that a 30%, 60% and 90% increase in traffic flows would result in a low, medium and major change respectively, with change less than 30% categorised as very low, which is line with the other criteria thresholds.

16.87 With regard to **Hazardous and Dangerous Loads**, the IEMA guidance (Ref 16-11) indicates that "the Statement should include a risk or catastrophe analysis to illustrate the potential for an accident to happen and the likely effect of such an event". Analysis of the road network within the study area indicates that there are no particular features, such as a significant vertical drop immediately beyond the carriageway, which would suggest that the transfer of materials poses a particular risk beyond that which would be expected on the general highway network. In addition, there are not expected to be any Hazardous and Dangerous Loads associated with the Scheme. Nonetheless, the Framework Construction Transport Management Plan (FCTMP) and the ES will include details of measures that will be employed to ensure the safe vehicular transport of components to and from the Scheme.

16.88 In view of the above, it is concluded that the impacts of Hazardous and Dangerous Loads do not warrant further consideration in the preparation of the ES and will not then be assessed further beyond an estimation of the likely number and composition of loads required and the measures which will be implemented to safely transport components to and from the Principal Site or Cable Route Corridor.

Determining Significance of Effects

16.89 In order to determine the effect on specific receptors, both the sensitivity of receptors and the magnitude of impact, as outlined above, are considered. Table 16-3 identifies the matrix that will be used to determine the effect category. On the basis of the above, further assessment of hazardous and dangerous loads are **scoped out**.

16.90 Potential effects are therefore concluded to be major, moderate, minor or negligible. Following the classification of an effect, a clear statement is then made as to whether that effect would be "significant" or "not significant". As a general rule, major and moderate effects are considered to be significant, whilst minor and negligible effects are considered not to be significant. However, professional judgment will also be applied where necessary, including taking account of whether the effect is permanent or temporary and whether the classified sensitivity / magnitude meets the qualitative definition, both in terms of over or under-statement. This is particularly important on links where there is a low baseline level of traffic, as small increases in traffic would result in a high percentage impact, meaning significance could be over-stated.

Table 16-3: Matrix for Determining Effect Category

Importance of the Resource/Sensitivity of Receptor	Magnitude of Potential Change/Impact			
	High	**Medium**	**Low**	**Very Low**
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

Assumptions, Limitations and Uncertainties

16.91 At this stage the full extent of the study area cannot be confirmed as the Cable Route Corridor Search Area (within the Scheme Boundary) has not been finalised, the working hours of the construction staff are unknown and as detailed discussions have not yet taken place with the respective Highway Authorities (LCC and NCC). The area proposed as part of this Scoping Report is determined by the Applicants understanding of the road network and where the likely impacts will be; however, it is anticipated that this will be formally agreed with LCC and NCC. Any additional assessment scope requested will be assessed as part of both the TA and the ES.

16.92 Given the distance of the Scheme from the strategic motorway and trunk road network, the expected relatively low traffic attraction of the Scheme, and the fact there are multiple routes between the Scheme and the strategic road network over which traffic could disperse, it is not considered that discussions with National Highways will be required, however this will need to be confirmed.

16.93 It is expected that the FCTMP will include a chapter on construction worker travel patterns and measures to encourage travel by alternative modes to single occupancy vehicle. A standalone Travel Plan is therefore not expected to be required, as this document typically applies to the operational phase of a development, with a chapter to be included as part of the FCTMP. As set out above, due to the low level of trips likely to be generated within the network peak hours, it is proposed to exclude operational phase transport effects and a standalone Travel Plan from the EIA.

17. Other Environmental Topics

17.1 The aim of EIA scoping is to focus the EIA on those environmental aspects that may be significantly affected by the Scheme. The following section provides a summary of other environmental topics that have been considered during the preparation of this EIA Scoping Report. In some cases, although environmental topics may be proposed to be scoped out of EIA, additional supporting information may be prepared as part of the DCO application. Where this is the case, this is stated below.

Glint and Glare

17.2 Glint and glare in this context is the effect of reflected sunlight causing harm or discomfort to a sensitive receptor. A glint can be defined as the momentary receipt of a bright light and a glare can be defined as the receipt of a bright light over an extended or continuous period of time (Ref 17-1).

17.3 Glint and glare assessments are sometimes required to accompany planning applications for solar developments, depending on the determining authority's judgement of their need. There are no guidelines setting out a particular methodological approach, but the receptors of interest are specified in the NPPF (Ref 17-2) as well as guidance issued by the DCLG (Ref 17-3) which states:

> *"Particular factors a local planning authority will need to consider include… the effect on landscape of glint and glare and on neighbouring uses and aircraft safety."*

17.4 As described in *Chapter 13: Landscape and Visual Amenity*, the effect of glint and glare on landscape will be considered in the EIA and presented within the LVIA chapter of the ES.

17.5 Aviation receptors identified in the wider area include RAF Scampton approximately 7km south-east of the Scheme and Sturgate Airfield approximately 1km south of Scheme. Other potential receptors include motorists using the A631 and A15 and ground based receptors including neighbouring residential properties, recreational receptors including users of PRoWs.

17.6 Construction and decommissioning activities will be undertaken in accordance with a Framework CEMP and Framework DEMP. This will include information on how reflective surfaces are to be treated during construction and decommissioning phases with a view toward their final placement across the Principal Site. It is expected that avoidance of the effects of glint and glare will be considered as part of construction and decommissioning planning. Based on the nature of the activities, the distances to receptors and the use of a CEMP, construction and decommissioning effects are proposed to be **scoped out** of the assessment.

17.7 Operational effects are considered to be fixed and will last for the duration of the Scheme. The interaction of solar PV panels with sensitive locations, such as vehicular junctions or pedestrian crossings on roads, is primarily influenced by their siting, as solar PV panels require orientation toward the sun path. As the design develops, consideration will be given to the potential for solar reflections to impact on sensitive receptors. This will include undertaking calculations to determine whether the solar PV panels will be visible from sensitive locations

and if a solar reflection could occur, whether it is likely to be a significant nuisance or hazard. If it is likely to be a nuisance or hazard, mitigation will be proposed. As appropriate, the results and recommendations of any glint and glare calculations will be incorporated into the Scheme design and a glint and glare assessment presented as a technical appendix to the ES. It is therefore proposed to be **scoped out** of the assessment.

Ground Conditions

17.8 The Environment Agency's Land Contamination Risk Management (LCRM) Guidance (Ref 17-4) identifies that the first step (known as Stage 1, Tier 1) in evaluating land contamination risks is a Preliminary Risk Assessment (PRA). The objective of the PRA is to identify and evaluate potential land quality risks and development constraints associated with the Scheme and to construct an initial conceptual site model that can be used to inform future decision making and the design of future ground investigation and or mitigation, should it be required.

17.9 A Phase 1 PRA report has been prepared to cover the Principal Site and is included in Appendix E.

17.10 The Phase 1 PRA includes the following:

- Details of land within the Site and surrounding area including development history, geology, hydrogeology, hydrology, soil and groundwater quality and environmental setting;
- A review of the environmental data report provided by Landmark Information Group;
- Details of land designated for Mineral Safeguarding;
- Details of any available site investigation reports for land within the Site;
- Details from a site walkover documenting:
    - The existing layout, current operations and condition of land within the Site, the property boundaries and immediately surrounding land;
    - The visual inspection of any potential indicators of any land contamination, for e.g.: spillages, disturbed ground; and
    - The visual inspection of any geohazards or ground conditions constraints.
- A conceptual site model (CSM) and an evaluation of potential contamination linkages; and
- Conclusions and recommendations based on the findings.

17.11 Based upon the Phase 1 PRA, a number of environmental design and management measures have been recommended as standard best practice to minimise impacts to both human health and controlled waters during the construction and decommissioning phase of the Scheme, including those listed in Table 17-1 below. These will be incorporated into the Framework CEMP.

17.12 Potential environmental impacts that will be avoided, prevented, reduced or offset through the implementation of these mitigation measures include:

- Human exposure through direct contact / inhalation / dermal uptake of contaminants;
- Creation of preferential pathways and mobilisation of contamination;
- Contamination of natural soils, driving of contamination into an aquifer during piling, contamination of groundwater with concrete, paste or grout;
- Pollution and degradation of water quality of any underlying aquifer;
- Infiltration and / or runoff into the local drainage / sewerage network - pollution of drainage and sewerage network and any adjacent surface water features;
- Run-off and infiltration of contaminants from material stockpiles;
- Contamination of drainage and sewerage network and/or groundwater; and
- Spread of nuisance dusts and soils to the wider environment and local roads.

17.13 Table 17-1 lists the standard or tertiary mitigation measures which will be included in the Framework CEMP and Framework DEMP. These mitigation measures, defined by IEMA are considered to be standard measures that form part of the general environmental management of the Scheme.

Table 17-1: Construction Standard or Tertiary Environmental Mitigation Measures

Potential Impact	Mitigation / Enhancement Measure
Potential for risks to human health associated with waste generation, land contamination, airborne contamination and groundwater contamination.	Ground investigation works (if required) will be undertaken prior to commencing construction. Results would be reviewed by the appointed contractor, including any additional investigation or mitigation measures beyond the impact avoidance measures stated here.
The discovery of ground contamination during groundworks. Levelling of the Principal Site including the possible introduction of new fill materials.	Best practice avoidance and mitigation measures proposed include: • All workers would be required to wear Personal Protective Equipment (PPE) such as dust masks as applicable; • Containment measures would be implemented, including drip trays, bunding or double-skinned tanks of fuels and oils; all chemicals would be stored in accordance with their COSHH guidelines, whilst spill kits would be provided in areas of fuel/oil storage; • All plant and machinery would be kept away from surface water bodies wherever possible, checked regularly and, where necessary, the use of drip trays would be employed. Refuelling and delivery areas would be located away from surface water drains; • An emergency spillage action plan will be produced, which staff would have read and understood, and provisions made to contain any leak/spill;

Potential Impact	Mitigation / Enhancement Measure
	• Should any potentially contaminated ground, including isolated 'hotspots' of contamination and/or potential deposits of asbestos containing materials (ACM), be encountered, the contractor would be required to investigate the areas and assess the need for containment or disposal of the material. The contractor would also be required to assess whether any additional health and safety measures are required; • To further minimise the risks of contaminants being transferred and contaminating other soils or water, construction workers would be briefed as to the possibility of the presence of such materials; • In the event that contamination is identified, appropriate remediation measures would be taken to protect construction workers, future site users, water resources, structures and services; • The contractor would be required to place arisings and temporary stockpiles away from watercourses and drainage systems, whilst surface water would be directed away from stockpiles to prevent erosion; • The risk to surface water and groundwater from run-off from any contaminated stockpiles during construction works would be reduced by implementing suitable measures to minimise rainwater infiltration and/or capture runoff and leachates, through use of bunding and/or temporary drainage systems. These mitigation measures would be designed in line with current good practice, follow appropriate guidelines and all relevant licences/permits; • The contractor would ensure that all material is suitable for its proposed use and would not result in an increase in contamination-related risks on identified receptors, including any landscaped areas and underlying groundwater; • Any waters removed from excavations by dewatering would be discharged appropriately, subject to the relevant permits being obtained from the Environment Agency; • The contractor will implement a dust suppression/management system in order to control the potential risk from airborne contamination migrating off-site to adjacent sites; and • Piling design and construction works will be completed following the preparation of a piling risk assessment.

17.14 Any effects on ground conditions are therefore considered not significant. As the Scheme design progresses, there will be ground investigation (GI) that will

incorporate chemical testing of soil samples. The PRA will be refined based on the results of the GI and any further Scheme design.

17.15 Taking the above into account, a separate ground conditions chapter is proposed to be **scoped out** of the ES.

Major Accidents and Disasters

17.16 The EIA Regulations (Ref 17-5) have introduced a requirement to consider major accidents or disasters. It is considered likely that the original changes to the EIA Directive to consider major accidents or disasters were made in order to bring certain other statutory requirements, mainly other EU Directives, within the overall 'wrapper' of EIA and the ES. The Directive and domestic Regulations cite two specific directives as examples of risk assessments to be brought within EIA, these are Directive 2012/18/EU of the European Parliament and of the European Council (which deals with major accident hazard registered sites) (Ref 17-6) and Council Directive 2009/71/Euratom (which deals with nuclear sites) (Ref 17-7). Neither of these Directives is relevant to the Scheme.

17.17 'Accidents' are considered to be an occurrence resulting from uncontrolled developments in the course of construction and operation of a development (e.g. major emission, fire or explosion). 'Disasters' are considered to be naturally occurring extreme weather events or ground related hazard events (e.g. subsidence, landslide, earthquake).

17.18 In the absence of established guidance on this topic, the following methodology has been adopted. In general, major accidents or disasters, as they relate to the Scheme, fall into three categories:

- Events that could not realistically occur, due to the nature of the Scheme or its location;
- Events that could realistically occur, but for which the Scheme, and associated receptors, are no more vulnerable than any other development; and
- Events that could occur, and to which the Scheme is particularly vulnerable, or which the Scheme has a particular capacity to exacerbate.

17.19 An exercise was undertaken to identify all possible major accidents or disasters that could be relevant to the Scheme. This list was drawn from a number of sources, including the UK Government's Risk Register of Civil Emergencies (Ref 17-8). Major accidents or disasters with little relevance in the UK were not included. The long list of major accidents or disasters is presented in Appendix G. This long list was screened to identify the third group of major accidents or disasters listed above, to form a shortlist of events to be taken forward for further consideration.

17.20 Although the majority of the major accidents or disasters on the long list are already considered under other legislative or design requirements, this is not considered to be sufficient reason to automatically eliminate the major accident or disaster from any further consideration. This is consistent with the approach for other topics, for example that the need to comply with nature conservation legislation does not mean that ecology and nature conservation do not need to be considered in EIA. However, where it is concluded that the need for

compliance is so fundamental, and the risk of any receptors being affected differently so remote, major accidents or disasters on the long list are not included on the shortlist.

17.21 Likewise, it is considered reasonable and proportionate to exclude certain receptor groups from the outset. Construction workers, as a receptor, can be excluded from the assessment, because existing legal protection is considered to be sufficient to minimise any risk from major accidents or disasters to a reasonable level. Legislation in force to ensure the protection of workers in the workplace includes:

- Health and Safety at Work etc. Act 1974 (Ref 17-9);
- The Management of Health and Safety at Work Regulations 1999 (Ref 17-10);
- The Workplace (Health, Safety and Welfare) Regulations 1992 (Ref 17-11); and
- Construction (Design and Management) (CDM) 2015 Regulations (Ref 17-12).

17.22 Table 17-2 presents a short list of major accidents or disasters that are considered to need further consideration. Where the major accidents and disasters identified are not already being considered within the scope of existing technical assessments, they will continue to be reviewed with the design team to ensure the risks are understood and addressed through design as necessary. However, it is considered highly likely that all of these major accident or disaster types will be able to be removed from the scope of the assessment prior to publication of the ES, as the design will ensure there is no real risk or serious possibility of the event interacting with the Scheme.

Table 17-2: Major Accidents or Disasters Shortlisted for Further Consideration

Major accident or disaster	Potential receptor	Comments
Floods	Property and people in areas of increased flood risk.	Both the vulnerability of the Scheme to flooding, and its potential to exacerbate flooding, will be covered in the Flood Risk Assessment, and also reported in ES, both in terms of the risk to the Scheme and increased risk caused by the Scheme.
Fire	Local residents, habitats and species.	There may be some potential for fire as a result of the battery storage element of the Scheme. However, the battery energy storage system will include cooling systems, which are designed to regulate temperatures to within safe conditions to minimise the risk of fire. An outline battery fire safety management plan will be prepared as part of the DCO application.
Road accidents	Aquatic environment Road users	The risk posed by spillage from hazardous loads as a result of a road traffic accident during construction or decommissioning will be considered in the Flood Risk, Drainage and Water Resources chapter of the ES.

Major accident or disaster	Potential receptor	Comments
		The potential for glint and glare to affect road users will be considered within a technical appendix to the ES if any risks are identified. Mitigation will be considered and, where necessary, incorporated into the Scheme design.
Rail accidents	Rail users	The Cable Route Corridor crosses the railway line connecting Gainsborough to Saxilby and Lincoln. The 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.
Aircraft disasters	Pilots and aircraft	The potential for glint and glare to affect aircraft will be considered within a technical appendix to the ES if any risks are identified. Mitigation will be considered and, where necessary, incorporated into the Scheme design.
Flood Defence Failure	Employees	This will be covered in the Flood Risk Assessment and will also be reported in ES, both in terms of the risk to the Scheme and increased risk caused by the Scheme.
Utilities failure (gas, electricity, water, sewage, oil, communications)	Employees and local residents	The Scheme has the potential to affect existing utility infrastructure below ground. To identify any existing infrastructure constraints, both consultation and a desk based study will be undertaken.
Mining / Extractive Industry	Employees	There is the potential for current or past quarrying activity in the vicinity to lead to unstable ground conditions. However, the risk will be considered as part of the geotechnical design, ensuring that the risk is designed out.
Plant disease	Habitats and species	New planting may be susceptible to biosecurity issues, such as the increased prevalence of pests and diseases, due to climate change. The planting design will take account of biosecurity risks through a wider mix of species including some non-natives.

17.23 Where further design mitigation is unable to remove the potential interaction between a major accident or disaster and a particular topic, the relevant ES chapter will identify the potential consequence for receptors covered by the topic, and give a qualitative evaluation of the potential for the significance of the reported effect to be increased as result of a major accident or disaster.

17.24 The potential receptors of effects resulting from major accidents or disasters will be reported in the relevant topic chapter, and as such major accidents or disasters is proposed to be **scoped out** of the assessment.

Telecommunications, Television Reception and Utilities

17.25 Solar farms have the potential to affect existing utility infrastructure below ground but are not at a height to affect above ground telecommunications. To identify any existing infrastructure constraints, both consultation and a desk based study will be undertaken. Consultation with relevant telecommunication and utilities providers is a routine part of development and consultees will include water, gas and electricity utilities providers and telecommunications providers as appropriate. Information obtained from consultation will be used to inform the Scheme design and appropriate protective provisions will be included in the DCO to ensure the protection of apparatus wherever any existing infrastructure has the potential to be affected by the Scheme.

17.26 Taking the above into account, relevant measures will be captured in the Scheme design, therefore a separate utilities chapter is proposed to be **scoped out** of the assessment.

Waste

17.27 The types of wastes generated during construction are likely to comprise:

- General waste from site offices and welfare facilities;
- Small quantities of waste from the maintenance of construction vehicles;
- Packaging waste from incoming materials; and
- Other waste from construction of fencing, access roads and other supporting infrastructure.

17.28 The PV modules, racks, inverters and other supporting equipment will be manufactured off-site to the specified sizes, and wastage during installation is expected to be minimal.

17.29 Large-scale earthworks are not expected, and therefore there is not expected to be either a surplus or shortfall of fill material requiring either export or import.

17.30 A Site Waste Management Plan (SWMP) will be prepared as part of the Construction Environmental Management Plan (CEMP), which will set out:

- The waste streams that will be generated;
- How the waste hierarchy will be applied to these wastes;
- Good practice measures for managing waste; and
- Roles and responsibilities for waste management.

17.31 All management of waste will be in accordance with the relevant regulations and waste will be transported by licensed waste hauliers to waste management sites which hold the necessary regulatory authorisation and/or permits for those wastes consigned to them.

17.32 For the operational Scheme, there will be relatively little waste produced from the operation of the Scheme since solar PV panels do not generate any waste as part of the energy production process. There is relatively little waste associated with office/administrative activities.

17.33 During decommissioning, site infrastructure will be removed and recycled or disposed of in accordance with good practice and market conditions at that time.

17.34 Taking the above into account, a separate waste chapter is proposed to be **scoped out** of the assessment.

18. Proposed Scope of the EIA

18.1 A summary of the proposed scope of the EIA is given in Table 18-1. This summarises the conclusions of this EIA Scoping Report in terms of the environmental topics that are considered likely to give rise to significant environmental effects.

Table 18-1: Summary of the proposed scope of the EIA

Topic	Scoping summary
Air Quality	A qualitative construction phase dust assessment and a quantitative construction phase local air quality assessment have been scoped in. This will also cover the decommissioning phase. An assessment of air quality impacts during operation of the Scheme has been scoped out.
Climate Change	A lifecycle GHG impact assessment and a climate change resilience assessment have been scoped in. An in-combination climate change impact assessment has been scoped out.
Cultural Heritage	An assessment of the effects of the Scheme on buried archaeology and built heritage during construction, operation and decommissioning has been scoped in.
Ecology	An assessment of the effects of the Scheme on ecology for both construction, operation and decommissioning has been scoped in. A Biodiversity Net Gain Assessment will be undertaken using the Defra Metric 3.1 (of the most up to date metric) to identify opportunities for contributing to ecological enhancement.
Flood Risk, Drainage and Surface Water	An assessment of the effects of the Scheme on the water environment has been scoped in. This will be supported by a Surface Water Drainage Strategy, a Flood Risk Assessment and a Water Framework Directive Assessment.
Human Health	An assessment of the effects of the Scheme on human health during construction, operation and decommissioning has been scoped in.
Landscape and Visual Amenity	An assessment of the landscape and visual effects of the Scheme during both construction, operation and decommissioning has been scoped in.
Noise and Vibration	An assessment of the noise and vibration effects from construction and decommissioning are scoped in. An assessment of operational noise from fixed plant has been scoped in. An assessment of operational road traffic noise and operational vibration has been scoped out.
Socio-economics and Land Use	An assessment of the effects of the Scheme on socio-economics and land use during construction, operation and decommissioning has been scoped in.

Topic	Scoping summary
Transport and Access	An assessment of the effects of the Scheme on traffic and transport during construction and decommissioning has been scoped in. An assessment of the effects of the Scheme on traffic and transport during operation has been scoped out.

18.2 Other environmental topics are proposed to be scoped out of the EIA, however, where appropriate further information will be provided as part of the wider DCO application. For example, a glint and glare assessment and an outline battery fire safety management plan will be prepared.

19. Proposed Structure of the Environmental Statement

Environmental Statement

19.1 The ES will comprise of the following set of documents

Environmental Statement Volume I: Main Document

19.2 This will contain the full text of the EIA with the proposed chapter headings as follows

- Chapter 1: Introduction
- Chapter 2: Scheme Location
- Chapter 3: Scheme Description
- Chapter 4: Alternatives and Design Evolution
- Chapter 5: EIA Methodology
- Chapter 6: Air Quality
- Chapter 7: Climate Change
- Chapter 8: Cultural Heritage
- Chapter 9: Ecology
- Chapter 10: Flood Risk, Drainage and Surface Water
- Chapter 11: Human Health
- Chapter 12: Landscape and Visual Amenity
- Chapter 13: Noise and Vibration
- Chapter 14: Socio-economics and Land Use
- Chapter 15: Transport and Access
- Chapter 16: Cumulative Effects
- Chapter 17: Summary of Significant Environmental Effects

Environmental Statement Volume II: Technical Appendices

19.3 This will provide supplementary details of the environmental studies conducted during the EIA including relevant data tables, figures and photographs.

Environmental Statement Volume III: Figures

19.4 This will include drawings and diagrams to be read alongside the environmental studies in ES Volume I.

Environmental Statement Non-Technical Summary

19.5 The Non-Technical Summary (NTS) document will provide a concise summary of the ES, which will include information regarding the proposed development,

alternative designs that were considered, likely environmental effects and mitigation measures.

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21. Glossary

Acronym	Description
AOD	Above Ordnance Datum
ALC	Agricultural Land Classification
AQAL	Air Quality Assessment Level
AQS	Air Quality Strategy
AC	Alternate Current
AGLV	Area of Great Landscape Value
AONB	Areas of Outstanding Natural Beauty
ATC	Automatic Traffic Counts
BCT	Bat Conservation Trust
BESS	Battery Energy Storage System
BAP	Biodiversity Action Plan
BNG	Biodiversity Net Gain
BGS	British Geological Survey
BS	British Standards
BRE	Building Research Establishment
CO2	Carbon dioxide
CLJSPC	Central Lincolnshire Joint Strategic Planning Committee
CIfA	Chartered Institute for Archaeologists
CIEEM	Chartered Institute of Ecology and Environmental Management
CCR	Climate Change Resilience
CCTV	Closed Circuit Television
CDM	Construction (Design and Management) Regulations
CEMP	Construction Environment Management Plan
COPA	Control of Pollution Act
DoS	Degree of Saturation
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DCO	Development Consent Order
DPD	Development Plan Documents
DC	Direct Current
EcIA	Ecological Impact Assessment
EA	Environment Agency
eDNA	Environmental DNA
EIA	Environmental Impact Assessment
EPUK	Environmental Protection UK

ES	Environmental Statement
EC	European Commission
EU	European Union
FRA	Flood Risk Assessment
FCEMP	Framework Construction Environment Management Plan
FCTMP	Framework Construction Transport Management Plan
GRP	Glass reinforced plastic
GHG	Greenhouse Gas
GVA	Gross Value Added
GLVIA3	Guidelines for Landscape and Visual Impact Assessment Third Edition
HSI	Habitat Suitability Index
HRA	Habitats Regulations Assessment
HVAC	Heating, ventilation and cooling
HGV	Heavy Goods Vehicle
HV	High Voltage
HERs	Historic Environment Records
HLC	Historic Landscape Characterisation
HDD	Horizontal Directional Drilling
HFCs	Hydrofluorocarbons
ICCI	In-combination climate change
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
IHBC	Institute of Historic Building Conservation
IDB	Internal Drainage Boards
ISO	International Organization for Standardization
IAS	Invasive Alien Species
ICE	Inventory of Carbon and Energy
JNCC	Joint Nature Conservation Committee
km	Kilometre
LVIA	Landscape and Visual Impact Assessment
LCA	Landscape Character Area
LCT	Landscape Character Type
LLFA	Lead Local Flood Authorities
LiDAR	Light detection and ranging
LGV	Light Goods Vehicle
LSE	Likely Significant Effects
LCC	Lincolnshire County Council
LBAP	Local Biodiversity Action Plan
LEP	Local Enterprise Partnership

LHA	Local Highways Authority
LNR	Local Nature Reserves
LRN	Local Road Network
LTP	Local Transport Plan
LWS	Local Wildlife Site
LV	Low Voltage
LSOA	Lower Layer Super Output Areas
LOAEL	Lowest Observable Adverse Effect Level
MRN	Major Road Network
MCC	Manual Classified Counts
MV	Medium Voltage
MWp	Megawatt Peak
MW	Megawatts
CH4	Methane
m	Metre
µg	Microgram
MSOA	Middle Layer Super Output Area
MHCLG	Ministry of Housing, Community and Local Government
MAGIC	Multi-Agency Geographic Information for the Countryside
NCA	National Character Area
NHLE	National Heritage List for England
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NRTF	National Road Traffic Forecast
NTM	National Transport Model
NTEM	National Trip Ends Model
NSIP	Nationally Significant Infrastructure Project
NERC	Natural Environment and Rural Communities Act
NVZ	Nitrate Vulnerable Zone
NO2	Nitrogen dioxide
NOx	Nitrogen oxides
NF3	Nitrogen trifluoride
N2O	Nitrous oxide
NOEL	No Observed Effect Level
NPSE	Noise Policy Statement for England
NMU	Non-Motorised Users
NCC	Nottinghamshire County Council
OEP	Office for Environmental Protection
ONS	Office of National Statistics

OS	Ordnance Survey
PM10	Particulate Matter with a diameter of 10 micrometres or less
PM2.5	Particulate Matter with a diameter of 2.5 micrometres or less
PFCs	Perfluorocarbons
PIC	Personal Injury Collision
PV	Photovoltaic
PINS	Planning Inspectorate
PPG	Planning Policy Guidance
PEA	Preliminary Ecological Appraisal
PEI	Preliminary Environmental Information
PFRA	Preliminary Flood Risk Assessment
PRA	Preliminary Risk Assessment
PWS	Private Water Supplies
PRoW	Public Rights of Way
RFC	Ratio of Flow to Capacity
RCA	Regional Character Areas
RBMP	River Basement Management Plan
RBD	River Basin District
RAF	Royal Air Force
SoS	Secretary of State
SOAEL	Significant Observed Adverse Effect Level
SSSI	Site of Special Scientific Interest
SPZ	Source Protection Zone
SAC	Special Area of Conservation
SPA	Special Protection Area
SFRA	Strategic Flood Risk Assessment
SF6	Sulphur hexafluoride
SuDS	Sustainable Drainage Systems
TA	Transport Assessment
TEMRIO	Trip Ends Model Program
UKBAP	UK Biodiversity Action Plan
UKCP18	UK Climate Projections 2018
WTNs	Waste Transfer Notes
WFD	Water Framework Directive
WFD-UKTAG	Water Framework Directive - United Kingdom Technical Advisory Group
WLDC	West Lindsey District Council
WCA	Wildlife and Countryside Act
ZOI	Zone of Interest
ZTV	Zone of Theoretical Visibility

Appendix A – Transboundary Screening Matrix

Regulation 32 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the consideration of any likely significant effects on the environment of another European Economic Association (EEA) State.

Guidance upon the consideration of transboundary effects is provided in the Planning Inspectorate's Advice Note 12: Transboundary Impacts and Process[1].

The following screening matrix provides the consideration of transboundary effects for the Scheme, taking guidance from Advice Note 12 (Annex).

Table A1: Screening Matric for Possible Substantial Effects on the Environment of Another EEA State

Criteria and Relevant Considerations	Commentary with Regard to Scheme
Characteristics of the development **· Size of the development** **· Use of natural resources** **· Production of waste** **· Pollution and nuisance** **· Risk of accidents** **· Use of technologies**	The resources required for the construction of the Scheme are likely to be obtained from the global market but it is envisaged that materials would be obtained locally wherever possible. No waste, nuisances or accidents are likely to extend beyond the border of the UK. No novel technologies are proposed that have potential for transboundary effects.
Location of development (including existing use) and Geographical area **· What is the existing use?** **· What is the distance to another EEA state? (Name EEA state)?** **· What is the extent of the area of a likely impact under the jurisdiction of another EEA state?**	The Scheme's closest EEA boundary is France, located approximately 320km to the south-east. No impacts are likely to extend beyond the jurisdiction of the UK, with the exception of potential greenhouse gas emissions. The latter is expected to be minimal given the nature of the Scheme, which will not emit GHG emissions during its operation (except for any emissions associated with maintenance vehicles and repair works).
Environmental importance **· Are particular environmental values (e.g. protected areas – name them) likely to be affected?** **· Capacity of the natural environment.** **· Wetlands, coastal zones, mountain and forest areas, nature reserves and parks, Natura 2000 sites, areas where environmental quality standards already exceeded, densely populated areas, landscapes of historical, cultural or archaeological significance.**	There are a number of European statutory designated nature conservation sites within 10km of the Scheme. The potential for significant effects relating to these designated sites will be accounted for in the EIA. However, it is not anticipated that there is potential for transboundary effects (and therefore any effects on important environmental receptors beyond the UK).
Potential impacts and carrier **· By what means could impacts be spread (i.e. what pathways)?**	The only potential transboundary environmental impact which is considered likely is from greenhouse gas (GHG) emissions. These emissions would be spread by atmospheric processes and are anticipated to be minimal given the nature of the Scheme. The Scheme is expected to offset GHG emissions

[1] https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-twelve-transboundary-impacts-and-process/

Criteria and Relevant Considerations	Commentary with Regard to Scheme
	through the generation of clean electricity, that otherwise would have been generated from a typical fuel mix comprising technologies such as gas fired power stations for example.
Extent **· What is the likely extent of the impact (geographical area and size of the affected population)?** **Magnitude** **· What will the likely magnitude of the change in relevant variables relative to the status quo, taking into account the sensitivity of the variable?** **Probability** **· What is the degree of probability of the impact?** **· Is the impact likely to occur as a consequence of normal conditions or exceptional situations, such as accidents?** **Duration** **· Is the impact likely to be temporary, short-term or long-term?** **· Is the impact likely to relate to the construction, operation or decommissioning phase of the activity?** **Frequency** **· What is likely to be the temporal pattern of the impact?** **Reversibility** **· Is the impact likely to be reversible or irreversible?**	The only potential transboundary environmental impact which is considered likely is from greenhouse gas emissions, which are known to contribute to changes on climate on a global scale. The impact of GHG emissions is considered irreversible within human lifetimes, however as above, the emissions are expected to be minimal during construction and decommissioning (in the order of 1 to 3 years) and is expected to lead to a beneficial contribution to UK GHG emissions during operation (assumed to be 40 years). The temporal pattern of GHG emissions is likely to be relatively constant during the construction and decommissioning phases. It is proposed to calculate the likely greenhouse gas emissions as part of the EIA. Greenhouse gas impacts will be put into context in terms of their impact on the UK's 5 year carbon budgets which set legally binding targets for greenhouse gas emissions. The greenhouse gas emissions offset through the production of cleaner electricity during the operational phase will be accounted for within the greenhouse gas emissions calculations. In any event, the receptor for GHG emissions is the global atmosphere rather than individual countries, and it is not currently possible to determine if GHG emissions would change atmospheric processes or affect a particular country or state. There is therefore no potential for significant effects on the environment of any EEA State or group of EEA States resulting from GHG emissions from the Scheme. The assessment will present the GHG emissions and compare them with the UK national emissions inventory; transboundary effects from GHG emissions will not be considered further in the EIA.
Cumulative impacts **· Are other major developments close by?**	Proposed developments within 10km of the Scheme will be taken into consideration in the Environmental Impact Assessment (EIA), with particular consideration given to other proposed solar developments. However, it is not anticipated that there is potential for significant cumulative transboundary effects.

Appendix B – Preliminary Ecological Appraisal

Tillbridge Solar

Preliminary Ecological Appraisal

Tillbridge Solar Ltd

September 2022

Delivering a better world

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1. Introduction

1.1 Background

1.1.1 AECOM Ltd was instructed by Tillbridge Solar Ltd to undertake a Preliminary Ecological Appraisal (PEA) for the proposed Tillbridge Solar scheme (the 'Scheme').

1.1.2 This PEA was commissioned to identify whether there are known or potential ecological receptors (nature conservation designations, protected and notable habitats and species and scheduled invasive non-native species (INNS)) that may constrain or influence the design and implementation of the Scheme. The approach applied when undertaking this PEA accords with the Guidelines for Preliminary Ecological Appraisal published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2017) (Ref 7-1). The PEA addresses relevant wildlife legislation and planning policy as summarised in Section 2 of this report and is consistent with the requirements of British Standard 42020:2013 Biodiversity - Code of Practice for Planning and Development (Ref 7-2).

1.1.3 In order to deliver the PEA, a desk study and an extended Phase 1 Habitat Survey were undertaken by appropriately experienced ecologists, to identify ecological features relevant to the Scheme, with reference to the red line boundary (the 'Site') as shown on Figure 1 (Appendix A) and occurring within the wider potential zone of influence. The potential zone of influence was also defined with reference to the red line boundary (the 'Site') as shown on Figure 1 (Appendix A) and with consideration of the type of development. Additional details on the methods used are provided in Section 3.

1.1.4 The purpose of the PEA was to:

- identify and categorise habitats present within the Site and any areas immediately outside of the Site where there may be potential for direct or indirect effects (the "zone of influence");
- carry out an appraisal of the potential of the habitats recorded to support protected or notable species of fauna and flora; and
- provide advice on any potential ecological constraints and opportunities in the zone of influence that should be addressed to inform and support the DCO application for the Scheme, including the identification (where relevant) of any requirements for follow-up habitat and species surveys and/ or requirements for ecological mitigation.

1.1.5 The purpose of this report is to provide a preliminary high-level appraisal of the ecological risks and opportunities associated with the Scheme. The report identifies the scope of further work (where necessary) that would be required to support a DCO application and to inform an Ecological Impact Assessment (EcIA). Preliminary high-level recommendations are made on potential options for the avoidance, mitigation or compensation of the potential impacts of the Scheme (where known) on the identified ecological receptors and of potential enhancements to the biodiversity to achieve an overall gain.

1.2 The Scheme

1.2.1 The Scheme (see Figure 1) will comprise the installation of solar photovoltaic (PV) generating panels and on-site energy storage facilities (on the Principal Site) within Lincolnshire and associated infrastructure for connection to the national grid at Cottam substation in Nottinghamshire. The Scheme would allow for the generation of) electrical generation capacity in excess of 50 MW and, as such, qualifies as a Nationally Significant Infrastructure Project (NSIP) and would require a Development Consent Order (DCO).

1.3 Site Description

1.3.1 The Principal Site is located approximately 5km to the east of Gainsborough, Lincolnshire, within the administrative district of West Lindsey. The proposed grid connection tracks south of the Principal Site, to the east of Willingham by Stow before tracking west towards the River Trent and to the south of Gate Burton. The grid connection crosses into Nottinghamshire (within the administrative district of Bassetlaw) before connecting to the Cottam substation.

1.3.2 The location of the Scheme is presented in Figure 1 (Appendix A).

1.3.3 The Principal Site is dominated by arable fields. There are numerous mature trees and hedges within the Principal Site, with woodlands and small wooded copses. The Principal Site is surrounded by mainly arable and improved grassland livestock fields.

2. Legislation and Policy Context

2.1 Legislative Context

2.1.1 The following wildlife legislation was considered when undertaking this PEA:

- Wildlife and Countryside Act (WCA) 1981 (as amended) (Ref 7-3);
- Countryside and Rights of Way (CRoW) Act 2000 (Ref 7-4);
- Natural Environment and Rural Communities (NERC) Act 2006 (Ref 7-5);
- The Conservation of Habitats & Species Regulations 2017 (as amended) (the Habitats Regulations) (Ref 7-6) and The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Ref 7-7);
- The Environment Act 2021 (Ref 7-8);
- The Protection of Badgers Act 1992 (Ref 7-9);
- The Hedgerow Regulations 1997 (Ref 7-10);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017(Ref 7-11); and
- Invasive Alien Species (Enforcement and Permitting) Order 2019 (Ref 7-12).

2.1.2 Compliance with the above legislation may require the attainment of relevant protected species licences prior to the implementation of the Scheme.

2.1.3 Further information on the requirements of the above legislation is provided in Appendix B.

2.2 National and Local Planning Policy

National Planning Policy Statements

2.2.1 The following National Policy Statements (NPSs) are relevant and were 'designated' in 2011. These NPSs are, as of September 2022 (with no further updates to this text), in the process of being updated and therefore, relevant sections of the draft NPSs are also included below, where relevant.

2.2.2 Overarching National Policy Statement for Energy (EN-1) (2011) (Ref 7-14), with particular reference to paragraphs 4.2.2 and 4.2.3, which provide national policy on what an Environmental Statement for a 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 DCO; 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 The Draft Overarching National Policy Statement for Energy (EN-1) (Ref 7-15) (2021) includes guidance for biodiversity net gains in paragraphs 4.5.1 to 4.5.3 and generic impacts on biodiversity in Part 5.4 and that guidance has also been considered.

2.2.3 The Draft National Policy Statement for Renewable Energy EN-3 (2021) (Ref 7-16) now includes sections 2.47 to 2.54 (inclusive) which set out policy requirements specific to solar generation and these have been considered within this report.

2.2.4 Part 2.7 of the National Policy Statement for Electricity Networks Infrastructure (EN-5) (2011) (Ref 7-17) sets out generic impacts concerning biodiversity, although these are more relevant to considerations for birds and overhead lines. However, paragraph 2.8.9 of EN-5 (2011) details biodiversity considerations when choosing an underground electricity line. This includes the environmental consequences, as underground cables can disturb sensitive habitats.

National Planning Policy Framework

2.2.5 The National Planning Policy Framework (NPPF) (Ref 7-13) states the commitment of the UK Government to minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity.

2.2.6 It specifies the obligations that 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. Protected or notable habitats and species can be a material consideration in planning decisions and may therefore make some sites unsuitable for certain types of development, or if development is permitted, mitigation measures may be required to avoid or minimise impacts on certain habitats and species, or where impact is unavoidable, compensation may be required.

2.2.7 The NPPF is clear that pursuing sustainable development includes moving from no net loss of biodiversity to achieving 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. The latest revision of the NPPF came into being in July 2021. Section 15 of the NPPF relates specifically to 'Conserving and Enhancing the Natural Environment'. Relevant paragraphs from Section 15 are included in Appendix B.

Local and Regional Plans

2.2.8 Local Planning policies that are relevant to the biodiversity for the Scheme are:

- Central Lincolnshire Local Plan 2012-2036 (Ref 7-19), adopted 24 April 2017, specifically Policies LP19: Renewable Energy Proposals, LP20: Green Infrastructure Network and Policy LP21: Biodiversity and Geodiversity.

- Bassetlaw District Council Core Strategy and Development Management Policies DPD (Ref 7-20), adopted 22 December 2011, specifically Policy DM9: Green Infrastructure, Biodiversity & Geodiversity, Landscape; Open Space & Sports Facilities.

Central Lincolnshire Local Plan 2012-2036

2.2.9 Policy LP19: Renewable Energy Proposals states that: "*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:

- *Ecology and diversity*

Proposals will be supported where the benefit of the development outweighs the harm caused and it is demonstrated that any harm will be mitigated as far as is reasonably possible."

2.2.10 Policy LP20: Green Infrastructure Network states that: "The Central Lincolnshire Authorities will aim to maintain and improve the green infrastructure network in Central Lincolnshire by enhancing, creating and managing multifunctional green space within and around settlements that are well connected to each other and the wider countryside.

Development proposals which are consistent with and help deliver the opportunities, priorities and initiatives identified in the latest Central Lincolnshire Green Infrastructure Study and Biodiversity Opportunity Mapping Study, will be supported. Proposals that cause loss or harm to this network will not be permitted unless the need for and benefits of the development demonstrably outweigh any adverse impacts. Where adverse impacts on green infrastructure are unavoidable, development will only be permitted if suitable mitigation measures for the network are provided.

Development proposals should ensure that existing and new green infrastructure is considered and integrated into the scheme design from the outset. Where new green infrastructure is proposed, the design should maximise the delivery of ecosystem services and support healthy and active lifestyles.

Development proposals must protect the linear features of the green infrastructure network that provide connectivity between green infrastructure assets, including public rights of way, bridleways, cycleways and waterways, and take opportunities to improve such features.

Development will be expected to make contributions proportionate to their scale towards the establishment, enhancement and on-going management of green infrastructure by contributing to the development of the strategic green infrastructure network within Central Lincolnshire, in line with guidance set out in LP12".

2.2.11 Policy LP21: Biodiversity and Geodiversity states that: *"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 to their scale, through site layout, design of new buildings and proposals for existing buildings.

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".

Bassetlaw District Council Core Strategy & Development Management Policies DPD:

2.2.12 Policy DM9 states: "*Development proposals will be expected to support the Council's strategic approach to the delivery, protection and enhancement of multi-functional Green Infrastructure, to be achieved through the establishment of a network of green corridors and assets (please refer to the Council's Green Infrastructure work for a full list of Green Corridors and Nodes within, and running beyond, the District) at local, sub-regional and regional levels. Particular support will be given to proposals that will further the development of: The Idle Valley Project; The Trent Vale Partnership; Sherwood Forest Regional Park.*

Development proposals will be expected to demonstrate, in line with the Council's Green Infrastructure work, that: i. they protect and enhance green infrastructure assets affected by the development and take opportunities to improve linkages between green corridors; ii. where they overlap with or will affect existing green infrastructure nodes or corridors, such assets are protected and enhanced to improve public access and use; iii. where opportunities exist, development proposals provide improvements to the green infrastructure network that benefit biodiversity through the incorporation of retained habitats and by the creation of new areas of habitat; and iv. they provide robust delivery mechanisms for, and means of ensuring the long-term management of, green infrastructure.

Development that will result in the loss of existing green infrastructure may be supported where replacement provision is made that is considered to be of equal or greater value than that which will be lost. Where new development may have an adverse impact on green infrastructure, alternative scheme designs that minimise impact must be presented to the Council for consideration before the use of mitigation measures (e.g. off-site or through financial contributions for improvements elsewhere) is considered.

Development proposals will be expected to take opportunities to restore or enhance habitats and species' populations and to demonstrate that they will not adversely affect or result in the loss of features of recognised importance, including: i. Protected trees and hedgerows; ii. Ancient woodlands; iii. Sites of Special Scientific Interest (SSSI); iv. Regionally Important Geodiversity Sites; Local Wildlife Sites (Sites of Importance for Nature Conservation (SINC)); vi. Local and UK Biodiversity Action Plan Habitats (including Open Mosaic Habitats on Previously Developed Land); and vii. Protected Species.

Development that will result in the loss of such features may be supported where replacement provision is made that is considered to be of equal or greater value than that which will be lost and which is likely to result in a net gain in biodiversity. Where new development may have an adverse impact on such features, alternative scheme designs that minimise impact must be presented to the Council for consideration before the use of mitigation measures is considered. Where sufficient mitigation measures cannot be delivered, compensation measures must be provided as a last resort.

New development proposals in and adjoining the countryside will be expected to be designed so as to be sensitive to their landscape setting. They will be expected to enhance the distinctive qualities of the landscape character policy zone in which they would be situated, as identified in the Bassetlaw Landscape Character Assessment. Proposals will be expected to respond to the local recommendations made in the Assessment by conserving, restoring, reinforcing or creating landscape forms and features accordingly."

2.3 Other Guidance

2.3.1 Additional guidance has been reviewed for its relevance to the Scheme and is summarised below.

The 25 Year Environment Plan

2.3.2 In early 2018, the Government published its 25 Year environment plan (Ref 7-21) which seeks to embed environmental net gain within the planning system in England. The plan promotes a natural capital approach that recognises the

wider value of the environment and its contribution, such as food, clean water and air, wildlife, energy, wood, recreation and protection from hazards. The plan seeks to embed a net environmental gain principle for development to deliver environmental improvements locally and nationally.

Natural England and Department for Environment, Food and Rural Affairs (Defra) Standing Advice (protected species)

2.3.3 Standing advice from Natural England and Defra (Ref 7-22) 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.

2.3.4 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 Post-2010 Biodiversity Framework

2.3.5 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. From this list, action plans for priority habitats and species of conservation concern were published and have subsequently been succeeded by the UK Post-2010 Biodiversity Framework (July 2012) (Ref 7-23). 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.

2.3.6 The UK Post-2010 Biodiversity Framework is relevant in the context of Section 40 of the NERC Act 2006 (Ref 7-5), 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.

2.4 Local Biodiversity Action Plan

2.4.1 The Scheme is located within the counties of Lincolnshire and Nottinghamshire. The Lincolnshire Biodiversity Action Plan (3rd edition) (Ref 7-24) and Nottinghamshire Biodiversity Action Plan (Ref 7-25) provide the local nature conservation strategy for identifying threats to species within each of the counties and set out the action plans necessary to conserve them. These action plans provide context to inform identification of threatened or uncommon species within the district and, or county. The plans also identify priorities for conservation and enhancement but confers no particular legislative or policy protection to the species identified, however in some cases this is provided through related legislation and local planning policy.

2.4.2 The Lincolnshire Biodiversity Action Plan sets out action plans for 26 habitat types and 231 species and the Nottinghamshire Biodiversity Action Plan sets out action plans for 19 habitat types and 19 species. A list of the habitats and species action plans for Lincolnshire and Nottinghamshire can be found in Appendix C.

3. Methods

3.1 Desk Study

3.1.1 A desk study was carried out to identify nature conservation designations and protected or notable habitats and species potentially relevant to the Scheme.

3.1.2 A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the Scheme on different ecological receptors; and, an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study identified any international nature conservation designations within 10km of the Scheme Boundary (as well as any Special Areas of Conservation (SACs) within 30km where bats are noted as the, or one of the, qualifying features; other statutory nature conservations designations within 2km of the Scheme Boundary; and local non-statutory nature conservation designations and protected or notable habitats and species within 2km of the Scheme Boundary.

3.1.3 The desk study was carried out using the data sources detailed in Table 3-1. Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA; Schedules 2 and 4 of the Habitats Regulations; species and habitats of principal importance for nature conservation in England listed under Section 41 (S41) of the NERC Act; and other species that are Nationally Rare, Nationally Scarce or listed in national or local Red Data Lists and Biodiversity Action Plans.

3.1.4 Only records up to ten years old were considered within the assessment, as any records older than ten years are unlikely to be still representative of species presence in the local area.

Table 3-1 Desk study data sources

Data Source	Accessed	Data Obtained
Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref 7-26)	July 2022	International statutory designations within 10km of the Scheme Boundary. Other statutory designations within 2km of the Scheme Boundary. Ancient woodlands and notable habitats within 2km of the Scheme Boundary.
Ordnance Survey 1:2500 Pathfinder maps and aerial photography	July 2022	Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints.
Lincolnshire Environmental Records Centre	July 2022	Sites designated for their nature conservation value, such as County Wildlife Sites (CWS), Local Nature Reserves (LNRs) and Local Wildlife Sites (LWS) within 2km of the Scheme Boundary. Protected and notable species within 2km of the Scheme Boundary (records for the last ten years only).
Nottinghamshire Biological and Geological Records Centre	March 2022	Sites designated for their nature conservation value, such as CWSs, LNRs and LWSs within 2km of the Scheme Boundary. Protected and notable species within 2km of the Scheme Boundary (records for the last ten years only).

3.2 Field Survey

Phase 1 Habitat Survey

3.2.1 The Phase 1 Habitat survey was undertaken in accordance with the standard survey method, developed by the Joint Nature Conservation Committee (JNCC) (Ref 7-23). Phase 1 Habitat survey is a standard method of environmental audit. It involves categorising different habitat types and habitat features within a survey area. The information gained from the survey can be used to determine the likely ecological value of a site, and to direct any more specific survey work which may need to be carried out prior to the submission of a DCO application. The standard Phase 1 Habitat survey method can be 'extended' to record target notes on protected, notable and invasive species.

Appraisal of the Potential Suitability of Habitats for Protected and Notable Species

3.2.2 An appraisal was made of the potential suitability of the habitats present to support protected and notable species of plants or animals (as defined by legislation and planning policy in Section 2 of this report). Field signs, habitat features with potential to support protected species and any sightings or auditory evidence were recorded when encountered, but no detailed surveys were carried out for any particular species.

3.2.3 In addition, attention was given to identifying INNS that are listed under Schedule 9 of the Wildlife and Countryside Act 1981 (Ref 7-3) and those "widespread species" listed in the Invasive Alien species (Enforcement and Permitting) Order 2019 (Ref 7-12). Locations of plants or stands of any such INNS, if found, were recorded.

3.3 Desk Study and Field Survey Limitations

3.3.1 The aim of a desk study is to help characterise the baseline context of a scheme and provide valuable background information that would not be captured by a single site survey alone. Information obtained during the course of a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular habitat or species does not necessarily mean that the habitats or species do not occur in the study area. Likewise, the presence of records for particular habitats and species does not automatically mean that these still occur within the area of interest or are relevant in the context of the Scheme.

3.3.2 Where habitat boundaries coincide with physical boundaries recorded on OS maps, the resolution is as determined by the scale of mapping. Elsewhere, habitat mapping is as estimated in the field and/or recorded by hand-held Samsung tablets using Collector software. Where areas of habitat are given they are approximate and should be verified by measurement on-site where required for design or construction. While indicative locations of trees are recorded, this does not replace requirements for detailed specialist arboriculture survey to British Standard 5837:2012 Trees in Relation to Design, Demolition and Construction.

3.3.3 There were no other limitations to the desk study or habitat survey.

4. Results

4.1 Nature Conservation Designations

Statutory Designations

4.1.1 The desk study identified no international sites that are statutorily designated for their nature conservation value and within the 10km Scheme Boundary as set out in Section 3.1.

4.1.2 However, there is one SSSI that is statutorily designated for biodiversity reasons and located within 2km of the Scheme. This is Ashton's Meadow SSSI, which is a grassland area bordered by hedgerows. The SSSI is 1.3km to the west of the Cable Route Corridor Options, the location of which is presented in Figure 2 (Appendix A).

4.1.3 There are no SAC's within 30km of the Scheme that are designated for bats.

Non-statutory Designations

4.1.4 The desk study identified 14 non-statutorily sites designated for nature conservation within 2km of the Scheme (as per the method in Section 3.1 of this report). These are presented in Figure 3 (Appendix A). These sites have all been designated as LWSs for their biodiversity value at a county level and are known to have supporting value to a wide variety of protected and ecologically important species and/ or habitats. These sites are detailed in Table 4-1 and are listed in ascending order of distance from the Scheme.

Table 4-1 Non-Statutory Designated Sites within 2km of the Scheme

Non-Statutory Site Name and Designation	Description	Approximate Distance and direction from closest point of the Scheme
Upton Grange Road Verges LWS	The north and east verges are exceptionally species-rich. This rich assemblage is all the more remarkable as there is very little species-rich grassland in the immediate vicinity due to agricultural intensification. The south and west verges comprises linear herb-rich neutral grassland with adjacent species-poor hedgerows. It is considered that the invertebrate diversity on these verges is likely to be high given the floral diversity and abundance of nectar resources.	Within the Cable Route Corridor Options.
Cottam Wetlands LWS	Part of the former Cottam Power Station, this excellent wetland mosaic comprises lagoons, marshy grasslands, swamp and a representative length of the River Trent.	Within the Cable Route Corridor Options.
Cottam Ponds LWS	A number of ponds supporting abundant wildlife.	Within the Cable Route Corridor Options.
Cow Pasture Lane Drains LWS	Drains with notable aquatic and bankside vegetation including Branched Bur-reed *Sparganium erectum*, Amphibious Bistort	Within the Cable Route Corridor Options.

Non-Statutory Site Name and Designation	Description	Approximate Distance and direction from closest point of the Scheme
	Persicaria amphibia, Blunt-fruited Water-starwort *Callitriche obtusangula*and stands of Reed Sweet-grass *Glyceria maxima*. The lower reaches of the bank support Wild Angelica *Angelica sylvestris* and False Fox-sedge *Carex otrubae*.	
Torkskey Ferry Road Ditch LWS	A drain of interest for water beetles, including the near threatened water beetle *Agabus ulignosus, Cercyon convexiusculus, Cymbiodyta marginellus* and *Ilybius montanus*.	Within the Cable Route Corridor Options.
Coates Wetland LWS	The River Trent meanders around this site comprising a mosaic of habitats including wetland, developing woodland and grassland enclosed within a flood bank.	Adjacent to the Cable Route Corridor Options.
Willingham to Fillingham Road Verges LWS	This length of road, marked by sharp bends at each end, is flanked by verges 3-3.5m wide on both sides. Both verges are level, receive full sun and run alongside ditches with a species-rich hedgerow. *Nitrophiles* are occasional but never dominating. Coarser grasses are frequent but not dominating. Both verges are flailed with cuttings left in late summer by the adjacent landowner. This management maintains current biodiversity but could be improved through collection of cuttings. The site is therefore best described as being in favourable condition but under negative management.	120m to the east of the Cable Route Corridor Options.
Broad Lane Grassland, North Leverton LWS	This small neutral grassland is bordered by Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa* hedgerows and a linear broadleaved woodland, separating it from a railway line.	470m to the north of the Cable Route Corridor Options.
Mother Drain Upper Ings LWS	Mother Drain is notable for supporting 46 water beetle species and 11 water bug species, incuding the nationally near threatened *Hydrochus elongates* at it's only Nottinghamshire location and Nationally scarce *Hygrotus quinquelineatus*.	810m to the north of the Cable Route Corridor Options.
Ashton's Meadow LWS	This meadow is also a SSSI (see section 4.1.2) owned and managed by the Nottinghamshire Wildlife Trust. The sward is unimproved and species-rich with a range of characteristic grasses and forbs	1.3km to the west of the Cable Route Corridor Options.
Bushstocks, Lane Meadow LWS	This old hay meadow has a sward containing many plant species indicative of unimproved neutral grassland. Ridge and furrow running in an east-west direction influences the composition of the sward. Damper hollows support abundant Meadow Foxtail *Alopecurus pratensis* whilst the drier ridges are dominated by Common Knapweed *Centaurea nigra*.	1.5km to the west of the Cable Route Corridor Options.
Thornhill Lane Drain LWS	No description provided.	1.5km to the north of the Cable Route Corridor Options.

Non-Statutory Site Name and Designation	Description	Approximate Distance and direction from closest point of the Scheme
Littleborough Lagoons CWS	No description provided.	1.7km to the north of the Cable Route Corridor Options.
Retford Road Wood LWS	A mature deciduous woodland set in an arable landscape has a mixed canopy of Beech *Fagus sylvatica*, Sycamore *Acer pseudoplatanus* and some Large-leaved Lime *Tilia platyphyllos*.	1.8km to the west of the Cable Route Corridor Options.

4.1.5 In addition, one area of ancient or semi-natural woodland was identified within 2km of the Scheme:

- Burton Wood, 551m north of the Cable Route Corridor Options.

4.2 Habitats

4.2.1 The area surveyed encompassed all safely accessible parts of the Principal Site, and adjacent habitats to a maximum distance of 50m, where access permission had been granted in advance of survey, or this land was visible from within the Principal Site boundary or from public rights of way, or other publicly accessible areas. At the time of the Phase 1 Habitat survey access was only available to the Principal Site. As further access along the Cable Route Corridor becomes available, this report will be updated, where necessary, to reflect Phase 1 Habitat survey of these areas. In addition, a further 47.58ha of land has been added to the Principal Site since the Phase 1 Habitat survey was undertaken and will be subject to further survey. A complete Phase 1 Habitat survey will be presented in the Environmental Statement.

4.2.2 Typical and notable plant species were recorded for different habitat types and reflect the conditions at the time of survey. This was not intended to be a detailed inventory of the plant species present in the survey area, as this is not required for the purposes of Phase 1 Habitat survey.

4.2.3 The Phase 1 Habitat survey was undertaken between the 22nd and 25th March 2022, with follow up surveys on the 28th and 29th July 2022, by suitably qualified AECOM ecologists who recorded and mapped all habitat types present within the survey area, along with any associated relevant ecological receptors observed. The Phase 1 Habitat map for the Scheme is provided in Figure 4 (Appendix A).

4.2.4 The broad habitat types present within the Site are presented in Table 4-2. The approximate extent and distribution of these habitats recorded are presented on Figure 4 (Appendix A).

Table 4-2 Broad habitat types within the Site

Habitat	Area (ha) / length (km)	% of Principal Site area
A1.1.1 - Broadleaved woodland - semi-natural	5.89 ha	0.4%
A1.1.2 - Broadleaved woodland - plantation	3.06 ha	0.2%
A1.3.1 - Mixed woodland - semi-natural	2.18 ha	0.2%
A2.1 - Scrub - dense/continuous	0.17 ha	0.0%
A2.2 - Scrub - scattered	1.02 km	-
B2.2 - Neutral grassland - semi-improved	7.03 ha	0.5%
B4 - Improved grassland	17.66 ha	1.3%
B6 - Poor semi-improved grassland	21.83 ha	1.5%
C3.1 - Other tall herb and fern - ruderal	5.08 ha	0.4%
G1 - Standing water	1.53 ha	0.1%
G2 – Running water	2.47 ha	0.2%
Hardstanding	4.89 ha	0.4%
I2.2 - Spoil	0.04 ha	0.0%
J1.1 - Cultivated/disturbed land - arable	1032.07 ha	74.1%
J1.2 - Cultivated/disturbed land - amenity grassland	0.85 ha	0.1%
J3.6 - Buildings	1.45 ha	0.1%
J4 - Bare ground	4.74 ha	0.3%
J5 - Other habitat	5.47 ha	0.4%
No access	278.25 ha	20.0%
A3.1 - Broadleaved parkland/scattered trees	1.75 km	-
J2.1.1 - Intact hedge - native species-rich	1.17 km	-
J2.1.2 - Intact hedge - species-poor	27.64 km	-
J2.2.2 - Defunct hedge - species-poor	1.08 km	-
J2.3.1 - Hedge with trees - native species-rich	0.53 km	-
J2.3.2 - Hedge with trees - species-poor	2.31 km	-
J2.4 - Fence	2.15 km	-
J2.6 - Dry ditch	13.41 km	-

Arable

4.2.5 The large majority of the Principal Site is used as arable farmland.

Game bird strips/cover crops

4.2.6 These areas are located on the edge of a number of arable fields, species present included White Melilot *Melilotus albus,* Ribbed Melilot *Melilotus officinalis*, Wild Carrot *Daucus carota,* Alsike Clover *Trifolium hybridum*, Red Clover *Trifolium pratense,* Maize *Zea mays* and Scentless Mayweed *Tripleurospermum inodorum.*

Semi-improved neutral grassland

4.2.7 This habitat is present in two locations in the north-east of the Principal Site.

4.2.8 The species present included Common Knapweed *Centaurea nigra,* Birdsfoot Trefoil *Lotus corniculatus,* Oxeye Daisy *Leucanthemum vulgare,* Yarrow *Achillea millefolium,* Red Clover *Trifolium pratense,* Perennial Rye-grass *Lolium perenne,* Spear Thistle *Cirsium vulgare,* Creeping Thistle *Cirsium arvense,* False Oat Grass *Arrhenatherum elatius,* Ribwort Plantain *Plantago lanceolata,* Smooth Tare *Vicia tetrasperma,* Cocksfoot *Dactylis glomerata,* Timothy *Phleum pratense,* Red Fescue *Festuca rubra,* Smooth Meadow-Grass *Poa pratensis,* Yorkshire Fog *Holcus lanatus,* and Field Bindweed *Convolvulus arvensis.*

Poor semi-improved grassland

4.2.9 There are a number of areas of this habitat across the Principal Site including along some of the arable fields. Species present are False Oat Grass *Arrhenatherum elatius,* Creeping Thistle *Cirsium arvense,* Hog Weed *Heracleum sphondylium,* Clustered Dock *Rumex conglomeratus,* Cocksfoot *Dactylis glomerata* and Smooth Meadow Grass *Poa pratensis.*

Broad-leaved woodland

4.2.10 There are a number of areas of this habitat across the Principal Site, including a larger woodland in the north-east. species within these include Pedunculate Oak *Quercus robur*, Ash *Fraxinus excelsior* along with Hawthorn *Crataegus monogyna*, Blackthorn *Prunus spinosa*, Field Maple *Acer campestre* and Elder *Sambucus nigra*.

Broad-leaved plantation

4.2.11 There are a number of areas of semi-natural broad-leaved woodland containing Pedunculate Oak, Ash and Sycamore *Acer pseudoplatanus*.

Mixed woodland

4.2.12 There are a number of areas of semi-natural mixed woodland across the Principal Site, which contain Sycamore, Ash, Black Pine *Pinus nigra* and Scot's Pine *Pinus sylvestris*.

Hedges

4.2.13 There are many hedges across the Principal Site from species poor to species rich, the woody species recorded in the hedges included Ash, Hawthorn, Blackthorn, Dog Rose *Rosa canina agg*., Field Maple, Buckthorn *Rhamnus cathartica*, Midland Hawthorn *Crataegus laevigata*, a Willow *Salix sp*., Pedunculate Oak, Horse Chestnut *Aesculus hippocastanum*, Crab Apple

Malus sylvestris, Sweet Chestnut *Castanea sativa*, Wild Privet *Ligustrum vulgare*, Guelder Rose *Viburnum opulus*, Sycamore, Wild Cherry *Prunus avium*, Elm sp. *Ulmus sp*., Elder, Wych Elm *Ulmus glabra* and a planted Tibetan Cherry *Prunus serrula*.

Scrub

4.2.14 There are a number of small areas of scattered scrub throughout the Principal Site, species include many areas of dense Bramble *Rubus fruticosus agg*. along with Hawthorn and Blackthorn.

Tall ruderal

4.2.15 This habitat is scattered over the site and contains species including Creeping Thistle, Spear Thistle, Broad-leaved Dock *Rumex obtusifolius,* Common Ragwort *Jacobaea vulgaris* and Common Nettle *Urtica dioica.*

Standing water

4.2.16 Ponds are located throughout the Principal Site, with the majority dry at the time of survey or containing very little aquatic vegetation with the only species present being a species of Milfoil *Myriophyllum sp.*, emergent species included Common Clubrush *Schoenoplectus lacustris*.

Running water

4.2.17 There is a stream running through a ditch on the north-eastern side of the Principal Site, this contains species including Reed Sweet-grass *Glyceria maxima*, Reed Canary-grass *Phalaris arundinacea*, Common Duckweed *Lemna minor*, Common Valerian *Valeriana officinalis*, Meadowsweet *Filipendula ulmaria*, Great Willowherb, Bur-reed sp. *Sparganium sp.*, Brooklime *Veronica beccabunga*, Pink Water Speedwell *Veronica catenata* and Fool's Watercress *Helosciadium nodiflorum*.

4.3 Notable Habitats

4.3.1 Table 4-3 provides a summary of notable habitats recorded within the Principal Site, based on the results of the Phase 1 Habitat survey and with reference to guidance for the recognition of NERC Act S41 (Ref 7-5) and the relevant LBAPs, as detailed in Section 2.4 of this report. The desk study has been used to identify habitats that are likely to occur within the Cable Route Corridor and have also been evaluated in Table 4-3, although a Phase 1 habitat survey is required to confirm habitats in these areas. Further surveys may also be required to investigate the value of habitats, as detailed in Section 5 of this report.

Table 4-3 Notable habitat types within the Principal Site

Habitat	NERC Act	Lincolnshire BAP	Nottinghamshire BAP	Supporting Comments
Ancient and/or species rich hedgerows	✓	✓	✓	Hedgerows are present across the Principal Site. Impacts to hedgerows should be minimised and where possible the Scheme should be designed to avoid potential impacts. However, further investigation would be required to determine the value of individual hedgerows if impacts are likely.

Habitat	NERC Act	Lincolnshire BAP	Nottinghamshire BAP	Supporting Comments
Ancient woodland	✓	-	-	No areas of ancient woodland were recorded from the desk study, from within 2km of the Principal Site. No ancient woodland is likely to be affected by the Scheme. Although it isn't an LBAP habitat in either county, it is a priority habitat that adds to the wider local resource.
Running Water	✓	✓	✓	Further investigation will be required to determine the value of any running water habitats.
Standing Open Waters/ Ponds	✓	✓	✓	There are a number of waterbodies within 500m of the Principal Site and further investigation will be required to determine their value. Direct impacts (*i.e*. loss of ponds) and indirect impacts to species using riparian habitats such as Great Crested Newts should be avoided. All water bodies should be retained and as a minimum, suitable buffer zones (>20m) would be part of the embedded mitigation.
Arable Field Margins	✓	✓	✓	There is potential for scarce arable plants to be present within arable field margins on site and these margins may fulfil the criteria for this priority habitat type. Further investigation will be required to determine the importance of arable field margins.
Lowland Mixed Deciduous Woodland	✓	✓	✓	Broad-leaved woodland is present within the Principal Site and further investigation will be required to determine their value. However, no woodland is likely to be affected by the Scheme.

4.4 Protected and Notable Species

4.4.1 Table 4-4 provides a summary of potentially relevant species identified through a combination of desk study and field survey. The table summarises the conservation status of each species and provides comment on the likelihood of presence.

4.4.2 Where species are identified in Table 4-4 as likely or possible, they are likely to represent legislative constraints or may be material to determination of the planning application. Further surveys will or may be required to determine presence or probable absence of species (see Section 5).

Table 4-4 Protected and/ or notable species

Species (or species group)	Supporting Comments
Flora / plants	The desk study identified records of notable plants occurring within the study area, including, Bluebell *Hyacinthoides non-scripta* and *Persicaria mitis*. The field survey did not record any notable or protected plant species. however, further investigation of the

Species (or species group)	Supporting Comments
	arable field margins and other notable habitats will be required to determine their value.
Terrestrial Invertebrates	The data search returned no records of terrestrial invertebrate species. However, there are grassland margins and scrub habitats present that may support protected and notable invertebrate species.
Aquatic Invertebrates	The data search returned records of aquatic invertebrates, including Willow Emerald Damselfly *Chalcolestes viridis.* There are aquatic habitats present (*e.g.* ponds and watercourses) with potential to support notable aquatic invertebrate species and assemblages.
Amphibians	The desk study identified four amphibian species (Great Crested Newt *Triturus cristatus*, Smooth Newt *Lissotriton vulgaris*, Common Frog *Rana temporaria*, and Common Toad *Bufo bufo*) occurring within the study area. Further investigation of ponds relevant to the Scheme will be required to determine their potential suitability for Great Crested Newt and other amphibians.
Reptiles	The data search returned small numbers of records of a Grass Snake (*Natrix Helvetica*) within 2km of the Scheme and a single record of Common Lizard *Zootoca vivipara.* Reptile habitat is limited, but small pockets of habitat suitable for reptiles do exist comprising uncropped field margins, hedgerows, woodland edge habitats and ditches.
Breeding birds	The desk study identified at least 99 bird species within the study area, including specially protected species that have the potential to breeding on Site or within the ZoI, including Peregrine *Falco peregrinus*, Hobby *Falco subbuteo*, Barn Owl *Tyto alba*, Kingfisher *Alcedo atthis* and Red Kite *Milvus milvus.* Habitats present, such as trees, hedgerows and arable fields will support nesting birds during the breeding season, including those of conservation concern.
Non-breeding (wintering and passage) birds	Trees, scrub and arable fields will support birds during the non-breeding season, including those of conservation concern, such as Skylark *Alauda* arvensis, Linnet *Linaria cannabina*, Redwing *Turdus iliacus* and Fieldfare *Turdus pilaris*.
Bats	The data search returned records of at least eight bat species (Brown Long-eared *Plecotus auritus*, Common Pipistrelle *Pipistrellus pipistrellus*, Noctule *Nyctalus noctule*, Brandt's bat *Myotis brandtii,* Natterer's bat *Myotis nattereri*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Nathusius's Pipistrelle *Pipistrellus nathusii,* Daubenton's Bat *Myotis daubentonii, Pipistellus* sp and *Myotis* sp) occurring within 2km of the Scheme and within the last ten years. Details of bat roosts occurring within 2km of the Scheme included roosts for Common Pipistrelle and Brown Long-eared bat. The Site contains trees, woodlands and buildings which have the potential to support roosting bats. The habitat within the Site also provides connectivity and foraging resources for bats.
Badger *Meles meles*	The data search returned a number of records of Badger within 2km of the Scheme. Several field signs of Badger activity were recorded during the Phase 1 survey.

Species (or species group)	Supporting Comments
Otter *Lutra lutra*	The data search returned records of Otter within the study area. The watercourses and water bodies occurring on the Site have the potential to support Otter.
Water Vole *Arvicola amphibius*	The data search returned records of Water Vole within 2km of the Scheme. The watercourses and water bodies occurring on the Site and have the potential to support Water Vole.
INNS	The data search returned records of five invasive species, including Mitten Crab *Eriocheir sinensis*, American Mink *Mustela vison*, New-Zealand Pigmyweed *Crassula helmsii*, Himalayan Balsam *Impatiens glandulifera* and Japanese Knotweed *Reynoutria japonica.* No invasive non-native species were recorded within the Site during the survey. However, there is potential for invasive non-native species to be present within the Site.
Brown Hare *Lepus europaeus*	The data search returned records of Brown Hare within the study area and this species has the potential to occur across the Site.
West European Hedgehog *Erinaceus europaeus*	The data search returned records of Hedgehogs occurring within the study area. This species has the potential to occur across the Site within the grassland and scrub habitats.
Other Species	The data search also returned records of European Eel *Anguilla Anguilla*, Common Roach *Rutilus rutilus*, Ferret *Mustela putorius furo*, Stoat *Mustela erminea* and Weasel *Mustela lutreola.*

Species present on site are those for which recent direct observation or field signs confirmed presence. Species which are possibly present are those for which there is potentially suitable habitat based on the results of the Phase 1 Habitat survey, or this combined with desk study records.

Legally protected species are those listed under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended); and, Schedules 2 and 4 of The Conservation of Habitat & Species Regulations 2017 (as amended).

Species of Principal Importance as those listed under Section 41 of the NERC Act. The Secretary of State has a legal duty under Section 40 of the same Act to conserve biodiversity when determining DCO applications.

Other notable species include native species of conservation concern listed in the LBAP (except species that are also of Principal Importance), those that are Nationally Rare, Scarce or Red Data List, and non-native controlled weed species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

5. Identification of Ecological Constraints and Recommendations

5.1 Approach to the Identification of Ecological Constraints

5.1.1 Relevant ecological receptors that may represent constraints to the Scheme, or that provide opportunities to deliver ecological enhancement in accordance with planning policy, are identified in Section 4.

5.1.2 The NPSs, NPPF and local planning policy (summarised in Section 2 of this report) specify requirements for the protection of features of importance for biodiversity.

5.1.3 Compliance with planning policy requires that the Scheme considers and engages the following mitigation hierarchy where there is potential for impacts on relevant ecological receptors:

1. Avoidance - actions taken to avoid causing impacts to the environment prior to beginning development (for example, retaining and protecting key ecological resources).
2. Minimisation - measures taken to reduce the duration, intensity, extent and/or likelihood of the unavoidable environmental impacts caused by development (for example, adapting the development design to minimise impacts).
3. Restoration or rehabilitation - actions taken to repair environmental degradation or damage following unavoidable impacts caused by development.
4. Offsets - measures taken to compensate for any adverse environmental impacts caused by development which cannot be avoided, minimised and/or restored (*e.g.* including habitat creation to offset losses and/or by providing suitable habitats elsewhere (whether in the control of the Applicant or otherwise legally enforceable through DCO requirement or Section 106 agreement).

5.1.4 This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered. The rationale for the proposed mitigation and/or compensation should be provided with DCO applications, including sufficient detail to show that these measures are feasible and would be provided.

5.1.5 In pursuance of the objectives within the NPPF and Environment Act of providing net gains in biodiversity, the Scheme will integrate enhancements as part of the design. This will represent biodiversity gain over and above that achieved through mitigation and compensation. Enhancement could be achieved on and/ or off the Site.

5.1.6 The likelihood of the relevant ecological receptors constraining the Scheme has been assessed with reference to the scale described in

5.1.7 Table 5-1. The higher the importance of the ecological receptor for the conservation of biodiversity at international, national and local scales, the

more likely it is to be an important and relevant matter to be considered during determination of the DCO application for the Scheme.

Table 5-1 Scale of Constraint to Development

Likelihood	Definition
High	An actual or potential constraint that is subject to relevant legal protection and is likely to be an important and relevant matter to be considered in determining the DCO application (*e.g.* statutory nature conservation designations and European/nationally protected species). Further survey likely to be required (as detailed in this report) to support the DCO submission.
Medium	An actual or potential constraint that is covered by national or local planning policy and, depending on the level of the potential impact as a result of the Scheme, may be an important and relevant matter to be considered in determining the DCO application. Further survey may be required (as detailed in this report) to support the DCO submission.
Low	Unlikely to be a constraint to development or require further survey prior to submission of the DCO submission. Mitigation is likely to be covered under Construction Environmental Management Plan (CEMP) or precautionary working method statement (*e.g.* generic requirements for the management of nesting bird risks).

5.2 Constraints and Requirements for Further Survey: Designations

Statutory Designated Sites

5.2.1 The desk study identified one statutory site for nature conservation (Ashton's Meadow SSSI) within the study areas set out in Section 4.1. Ashton's Meadow SSSI is designated for grassland habitats and the Scheme sits outside of the SSSI Impact Risk Zone for solar development for this statutory site.

5.2.2 The Scheme will not result in any direct impacts (*i.e*. through habitat loss) to this SSSI, but there is the potential for indirect impacts (*e.g*. from pollution events or changes in air quality) during construction of the grid connection. Indirect impacts will need to be assessed fully when details of the Scheme are developed and suitable management plans will need to be prepared (such as a CEMP) to ensure best practice guidance is followed during construction, and to ensure indirect impacts do not occur.

Non-statutory Sites

5.2.3 The desk study identified 14 non-statutory sites designated for nature conservation within the study area set out in Section 3.1 of this report and presented in Table 4-1.

5.2.4 No indirect impacts (e.g. from lighting, noise or air quality) are likely to impact upon LWS identified within 2km of the Scheme, during construction or operation, with appropriate mitigation (such as dust suppression, directional lighting) formalised into the CEMP to ensure best practice guidance is followed.

5.2.5 Local Wildlife Sites within or adjacent to the Cable Route Corridor will need to be assessed fully when further details of the grid connection are established.

5.3 Constraints and Requirements: Habitats

5.3.1 Notable habitats within the Principal Site, potentially affected by the Scheme include arable field margins, hedgerows, ponds, grassland and woodland as identified in Table 4-3. Further investigation of these habitats is required to

determine their quality and extent and whether they meet the relevant criteria to qualify as suitable priority habitats. As such, further surveys (*e.g.* of hedgerows and arable flora / arable field margins) will be undertaken across the Site to help determine this and within areas where impacts cannot be avoided. These are discussed further in Table 6-1.

5.3.2 Habitats within or adjacent to the Cable Route Corridor will need to be assessed fully when further details of the grid connection are established, and access is available.

5.3.3 The Scheme will avoid, protect and retain notable habitats where practicable and offsets of at least 15m from existing boundary features (woodlands, individual trees and trees occurring within hedgerows), will need to be included in the design and a minimum of 5m from hedgerows without trees. A minimum offset of 8m from the banks of the watercourses will be required (as per Environment Agency guidelines) and at least 20m from water bodies (such as ponds) to protect aquatic habitats. Furthermore, tree Root Protection Zones will be erected around retained trees, in line with British Standard BS 5837: Trees in relation to design, demolition and construction – Recommendations (BSI, 2012).

5.3.4 A Landscape and Biodiversity Management Plan (or similar document) and Biodiversity Net Gain (BNG) Assessment is likely to be required to integrate green infrastructure and biodiversity into the Scheme to meet requirements under the Environment Act, NPSs, NPPF and Local Planning Policy.

5.4 Constraints and Requirements: Species

5.4.1 Species within or adjacent to the Cable Route Corridor will need to be assessed fully when further details of the grid connection are established, and access is available.

Flora

5.4.2 Some habitats within the Principal Site have the potential to support protected or notable flora species, such as those associated with arable field margins. Further investigation of these habitats is required to determine the presence of protected or notable plant species. As such, further Phase 2 botanical surveys will be undertaken across the Site to identify species and any areas of notable flora communities.

Terrestrial Invertebrates

5.4.3 The Principal Site comprises habitats that may support protected and notable terrestrial invertebrates or invertebrate communities, identified as being present within the wider Zone of Influence during the desk study. Based on the habitats and species recorded during the desk study, any potentially important habitats (*i.e*. woodland, hedgerows and arable field margins) are unlikely to be impacted by the Scheme (through retention of such habitats) and would be suitably buffered to avoid unnecessary damage during construction and therefore impacts to terrestrial invertebrates.

5.4.4 Whilst the majority of habitats will be retained and buffered, a scoping survey to determine the potential for protected or notable terrestrial invertebrate species or communities to be present should be undertaken by a specialist entomologist. This will determine the requirement for any further targeted

surveys to establish the presence of particular species or hotspots for terrestrial invertebrate assemblages.

Aquatic Invertebrates

5.4.5 There are some aquatic habitats present on the Principal Site (such as ponds and ditches / watercourses) that have the potential to support notable aquatic invertebrate species and assemblages. Whilst the majority of these habitats will be retained, there is potential for direct and indirect impacts to these habitats in the absence of detailed design of the Scheme.

5.4.6 Therefore, further investigation of watercourses and water bodies will be required to determine the quality of aquatic habitats associated with ponds and water courses and then the likelihood of such habitats supporting notable aquatic invertebrate species and assemblages.

Amphibians

5.4.7 The desk study identified water bodies within 500m of the Scheme (see Figure 5, Appendix A). The data search returned a number of records of Great Crested Newt and other amphibians (Common Frog, Common Toad and Smooth Newt) occurring within 2km of the Scheme.

5.4.8 Further investigation of the waterbodies that are within or close to the Site will be required where potential impacts are likely as a result of the Scheme in relation to Great Crested Newt. In the first instance, a Habitat Suitability Index (HSI) assessment will be undertaken to categorise the suitability of the waterbodies for Great Crested Newt. Following this, where water bodies are identified as being suitable to support Great Crested Newt, then further surveys (eDNA presence / absence surveys) of those water bodies will be required to determine presence or absence of Great Crested Newt. eDNA surveys can only be undertaken between mid-April and the end of June. If presence of Great Crested Newt is confirmed in water bodies through eDNA, then further surveys will be needed to determine the size of the population present and inform the assessment of the potential impacts of the Scheme on Great Crested Newt. Such surveys can only be undertaken between early April and June, however, two surveys must be undertaken on each water body between mid-April and mid-May (the peak season for Great Crested Newt).

Reptiles

5.4.9 The data search returned a small (<5) number of records of Grass Snake and a single record of Common Lizard from within 2km of the Scheme. Habitat potentially suitable to support reptiles was recorded on the Site, including streams and ditches for Grass Snake and grassland areas suitable for other reptile species (such as Common Lizard). Therefore, further surveys, following standard guidelines[1], are recommended to determine the presence or absence of reptiles. Depending on the outcomes of these surveys, mitigation may be required to avoid injuring or harming reptiles during construction.

Birds

5.4.10 Trees, scrub and arable fields occurring across the Site have the potential to support protected and notable nesting birds during the breeding season,

[1] Gent T and Gibson S (2003). Herpetofauna Workers Manual. JNCC, Peterborough.

including those of conservation concern. The Scheme will result in the direct loss of arable habitat used by notable bird species, particularly ground-nesting farmland birds such as Skylark.

5.4.11 Surveys to determine the breeding assemblages on the Principal Site commenced in April 2022.

5.4.12 Further surveys of the non-breeding bird assemblage will be required to determine the magnitude of impacts of the Scheme on the non-breeding bird assemblage and help define appropriate mitigation.

Bats

5.4.13 The data search returned bat records of at least eight species within 2km of the Scheme, including roost data for Common Pipistrelle and Brown Long-eared bat.

5.4.14 The Phase 1 habitat and protected species scoping survey identified numerous trees that have suitable features to support bat roosts as well as other woodlands close to the Principal Site with suitable roosting habitats. It is recommended that a minimum buffer of 15m is created between the Scheme and these habitats, concordant with the requirements for avoidance of woodland habitats. Further surveys (a preliminary roost assessment (PRA)) to determine the presence of potential roost features is required and if any trees or woodlands are impacted by the Scheme, then presence / absence surveys will also be required to determine whether such features support roosting bats. The findings of these surveys will inform any mitigation requirements for roosting bats. Buffer zones around roosts or potential roosts is also recommended (>15 m from the roost feature as per recommendations for offsets from woodland and trees).

Bat activity transect surveys for a low-moderate suitability site will be required to determine species and flight paths across the Site to assess potential impacts of the Scheme on foraging and commuting bats

Badger

5.4.15 The field survey recorded Badger activity within the Principal Site.

5.4.16 Owing to legislative provisions under the Protection of Badger Act 1992, further surveys (following standard guidelines[1]) are required to determine the full extent of Badger presence across the Scheme and in the wider zone of influence (up to 30m from the Scheme). The findings of these surveys will determine the potential constraints and whether mitigation and/or relevant licences are required to avoid impacts to Badgers or their setts.

Otter and Water Vole

5.4.17 The data search returned record of Otter and Water Vole from within 2km of the Scheme.

5.4.18 The watercourses and water bodies on the Site have the potential to support Water Vole and Otter. The Scheme should seek to avoid drainage ditches and any other watercourse on Site, leaving a minimum working distance of 10m

[redacted]

from the edges of watercourses (or water bodies) to avoid disturbance to Otter and Water Vole.

5.4.19 To ensure adequate baseline information on the presence, or otherwise, of Otter and Water Vole occurring on the Site, further surveys of all water bodies and watercourses within the Site for Water Vole and Otter, along with the potential for Mink *Neovison vison* will be required. The results of these surveys will identify whether mitigation is required should the Scheme result in direct loss of habitats used by Water Vole and, or, Otter or indirect impacts to these species (if present).

Non-native Invasive Species

5.4.20 The data search returned records of five non-native invasive species within 2km from the Scheme. Whilst no INNS were recorded on the Site during the survey if any INNS are found to be present during ongoing ecological surveys, biosecurity measures will need to be put in place during construction to prevent the spread of INNS into and away from the Scheme. An INNS management plan should also be produced to establish the approach to management and eradication of INNS found to be present.

Other species

5.4.21 Records of Brown Hare and Hedgehog were received during the data search alongside a record of Polecat and these species may be present throughout the Site. Polecat, Brown Hare and Hedgehog receive limited legal protection but are Species of Principal Importance on S41 of the NERC Act (Ref 7-5). As such, precautions are recommended to ensure they are not harmed during construction through a CEMP or precautionary working method statement. No further surveys are recommended for these species, as measures to protect other habitats and species, will also ensure that impacts to these species are avoided or minimised, *e.g.* retention of woodlands, hedgerows and field margins.

5.4.22 It is therefore recommended that the Scheme is planned to take account of likely mitigation requirements for these species. This will include timing of any site clearance to avoid Brown Hare during their breeding season. This is concordant with the requirements for nesting birds. As such, it is recommended that site clearance and preparatory works would be undertaken over the autumn/winter period between September and February.

6. Conclusions

6.1.1 Overall, the PEA identified notable habitats and species present within the Principal Site as detailed in Sections 4.2 and 4.3.

6.1.2 A summary appraisal of ecological constraints and the recommended further requirements can be found Table 6-1 below.

Table 6-1 Summary appraisal of features of Ecological constraints and recommended further requirements

Receptor	Scale of constraint	Further requirements	Number of survey visits required	Survey period	Driver	When is action likely to be required?		
						To inform design	Before DCO applicatio	Pre-constructi on
Designated Sites	Medium	No direct impacts (habitat loss) would occur to designated sites as all are outside of the Scheme Boundary. However, appropriate buffers will need to be included within the design to protect indirect impacts from occurring (see also Section 5.2)	N/A	N/A	Habitat Regulations (2017) WCA 1981,	✓	✓	✓
Habitat – condition assessment, River Morph surveys to inform Biodiversity Net Gain Assessment	Medium / High	A survey to determine the condition of habitats and any other assessments required (such as River Morph surveys) to inform the BNG Assessment.	Initially one survey visit	May to August	Environment Act 2021	✓	✓	✓
Habitat / Plants / Phase 2 survey / hedgerows	Medium / High	A Phase 2 botanical survey and arable plant survey to identify the presence and extent of any potential notable habitats and protected/notable plant species. The surveys will focus on potential priority habitat within the Scheme Boundary, where impacts may occur. Arable plant surveys will involve walking field boundaries and comparable areas of marginal habitat only.	Two survey visits	May to July (flora) May to September (hedgerows)	WCA 1981, LBAP, UKBAP, NERC Act 2006, Hedgerow Regulations	✓	✓	✓
Aquatic Habitats	Medium	An initial assessment of any aquatic habitats potentially directly or indirectly affected by the Scheme. This will include an assessment of the potential for aquatic habitats to support protected/notable species. Surveys of selected field ponds and watercourses	Initially one survey visit followed by targeted species surveys, where required	Any time of year, but April to May for scoping in advance of any further surveys that may be	LBAP, UKBAP, NERC Act 2006	✓	✓	✓

Receptor	Scale of constraint	Further requirements	Number of survey visits required	Survey period	Driver	When is action likely to be required?		
						To inform design	Before DCO applicatio	Pre-constructi on
		are likely to be required and will be determined following the scoping survey		required between May and October				
Terrestrial Invertebrates	Medium	A scoping survey to assess the potential of areas within the Scheme Boundary to support protected or notable invertebrate species and assemblages (Depending on the outcomes of these surveys further targeted survey may be required).	Initially one survey visit followed by targeted species surveys, where required	Any time of year, but April for scoping in advance of any further surveys that may be required between May and October	WCA 1981, NERC Act 2006	✓	✓	✓
Great Crested Newt	High	Undertake HSI assessment of all waterbodies within 500m (where accessible) for their suitability to support Great Crested Newt. Following this, surveys to determine presence or absence of Great Crested Newt within suitable waterbodies (either by eDNA or four survey visits at night). Depending on the outcomes of these surveys further surveys are required to determine the population size and evidence of breeding may be required).	One survey visit for HSI assessment and, where required, followed by presence/absence survey (eDNA or four survey visits) and then up to a total of six survey visits for population survey.	HSI - anytime of year eDNA / population surveys – April to June	Habitat Regulations (2017), WCA 1981, NERC Act 2006, UKBAP, LBAP	✓	✓	✓
Reptiles	Medium	Surveys to identify the presence or absence of reptile species across suitable habitats within the Scheme Boundary, where impacts may occur.	One survey visit to place the reptile refugia followed by seven survey visits to check for reptiles.	April to June and / or September to October.	WCA 1981, LBAP, UKBAP, NERC Act 2006	✓	✓	✓
Breeding birds	High	Surveys required to determine the breeding bird assemblage across the	Six survey visits for a territory mapping survey and to determine presence, or	March to June (breeding bird assemblage); April	Birds Directive, WCA 1981, LBAP,	✓	✓	✓

Receptor	Scale of constraint	Further requirements	Number of survey visits required	Survey period	Driver	When is action likely to be required?		
						To inform design	Before DCO applicatio	Pre-constructi on
		Scheme Boundary, including species listed on WCA Sch. 1.	absence, of species listed on Schedule 1 of the WCA.	to August (*e.g.* Barn Owls).	UKBAP, NERC Act 2006			
Non-breeding birds	Medium / High	Surveys required to determine the non- breeding (wintering) bird assemblage across the Scheme Boundary.	Six survey visits.	October to March.	Birds Directive, WCA 1981, LBAP, UKBAP, NERC Act 2006	✓	✓	✓
Bats	High	Surveys to identify potential features on trees and buildings that may support bat roosts (Depending on the findings of this survey and risk to these features, further surveys may be required to determine whether bats are present). Transect surveys and deployment of static detectors to identify important areas across the Scheme Boundary used by commuting and foraging bats and where potential impacts may occur.	One survey visit to undertake preliminary roost feature assessment across the Site. Activity surveys required between April and October, including the deployment of static detectors.	Anytime of year for PRA. May to September (if required) for roost characterisation (if required). April to October for activity surveys.	Habitat Regulations (2017), WCA 1981, LBAP, UKBAP, NERC Act 2006	✓	✓	✓
Otter	High	Undertake a presence / absence survey, including the presence of any Otter holts on watercourses and water bodies that may be affected by the Scheme.	At least two survey visits	Spring is best, but the survey can be undertaken at any time of year	WCA 1981	✓	✓	✓
Water Vole	High	Undertake a presence / absence survey on watercourses and water bodies that may be affected by the Scheme.	Two survey visits	April to June and July to September	WCA 1981	✓	✓	✓
Badger	Medium / High	Survey to record all evidence of Badger activity across the Site to	One survey visit.	Any time of year, ideally when vegetation not in	Protection of Badger Act 1992	✓	✓	✓

Receptor	Scale of constraint	Further requirements	Number of survey visits required	Survey period	Driver	When is action likely to be required?		
						To inform design	Before DCO applicatio	Pre-constructi on
		identify setts to avoid or that require mitigation.		leaf (November to February)				
INNS	Medium/High	No further investigation is required. If located a management plan should be produced to manage and eradicate where required.	Ongoing.	April to September	WCA 1981, Invasive Alien Species Order 2019	✓	✓	✓
Polecat, Hedgehog and Brown Hare	Low	No further survey required, but mitigation and enhancement delivered as part of the Scheme should look to avoid disturbance to these species, retain habitats and ensure that connectivity is maintained throughout the Scheme and into the wider area. All species are likely to benefit from a reduction in intensively managed agricultural land.	N/A	-	NERC Act 2006	✓	✓	✓

7. References

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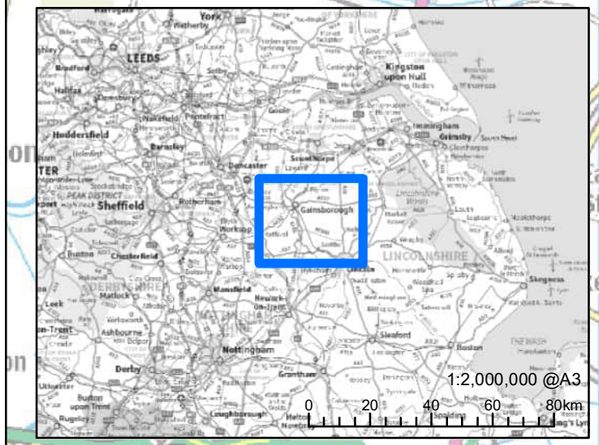
Appendix A: Figures

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21



Alternative Cable Route Corridor Search Area

Preferred Cable Route Corridor Search Area

1:100,000 @ A3
0 1 2 4 6 8 km

N

AECOM

PROJECT
Tillbridge Solar

CLIENT
Tillbridge Solar Limited

CONSULTANT
Aldgate Tower
2, Leman Street
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LEGEND
- Principal Site
- Cable Route Corridor Options

NOTES

ISSUE PURPOSE
PEA

PROJECT NUMBER
60677969

FIGURE TITLE
Site Location

FIGURE NUMBER
Figure 1

Filename: W:\Active Projects\Tillbridge (Greta) Solar Farm DCO\GIS\02_Maps\TillbridgeSolar_Figure1_SiteLocation.mxd

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Alternative Cable Route Corridor Search Area

Preferred Cable Route Corridor Search Area

Ashton's Meadow (SSSI)

N

1:120,000 @ A3

0 1 2 4 6 8 km

AECOM

PROJECT

Tillbridge Solar

CLIENT

Tillbridge Solar Limited

CONSULTANT

Aldgate Tower
2, Leman Street
London, E1 8FA
United Kingdom
T +44-0207-645-2000

LEGEND

- Principal Site
- Cable Route Corridor Options

Study Area

- 10km Study Area for International Nature Conservation Sites
- 2km Study Area for Other Statutory

Other Statutory Sites, within 2km of proposed site

- Site of Special Scientific Interest (SSSI)

NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

Sites Statutorily Designated for Nature Conservation Value

FIGURE NUMBER

Figure 2

Filename: W:\Active Projects\Tillbridge (Greta) Solar Farm DCO\GIS\02_Maps\TillbridgeSolar_Figure2_StatutorySites.mxd

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Filename: W:\Active Projects\Tillbridge (Greta) Solar Farm DCO\GIS\02_Maps\Tillbridge Solar_Figure3_NonStatutorySites.mxd

N

Upton Grange Road Verges (LWS)

Alternative Cable Route Corridor Search Area

Willingham to Fillingham Road Verges (LWS)

Mother Drain, Upper Ings (LWS)

Nottinghamshire County

Lincolnshire County

Burton Wood(AW)

Thornhill Lane Drain, Littleborough (LWS)

Littleborough Lagoons (LWS)

Coates Wetland (LWS)

Preferred Cable Route Corridor Search Area

Broad Lane Grassland, North Leverton (LWS)

Ashton's Meadow (LWS)

Cow Pasture Lane Drains (LWS)

Cottam Ponds (LWS)

Bushstocks Lane Meadow (LWS)

Torksey Ferry Road Ditch (LWS)

Cottam Wetlands (LWS)

Retford Road Wood, Rampton (LWS)

1:70,000 @ A3

0 1 2 3 4 km

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PROJECT

Tillbridge Solar

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LEGEND

- Principal Site
- Cable Route Corridor Options
- 2km Study Area for Non-Statutory Sites
- Lincolnshire Local Wildlife Site
- Nottinghamshire Local Wildlife Site
- Ancient & Semi-Natural Woodland
- Ancient Replanted Woodland
- County Boundary

NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

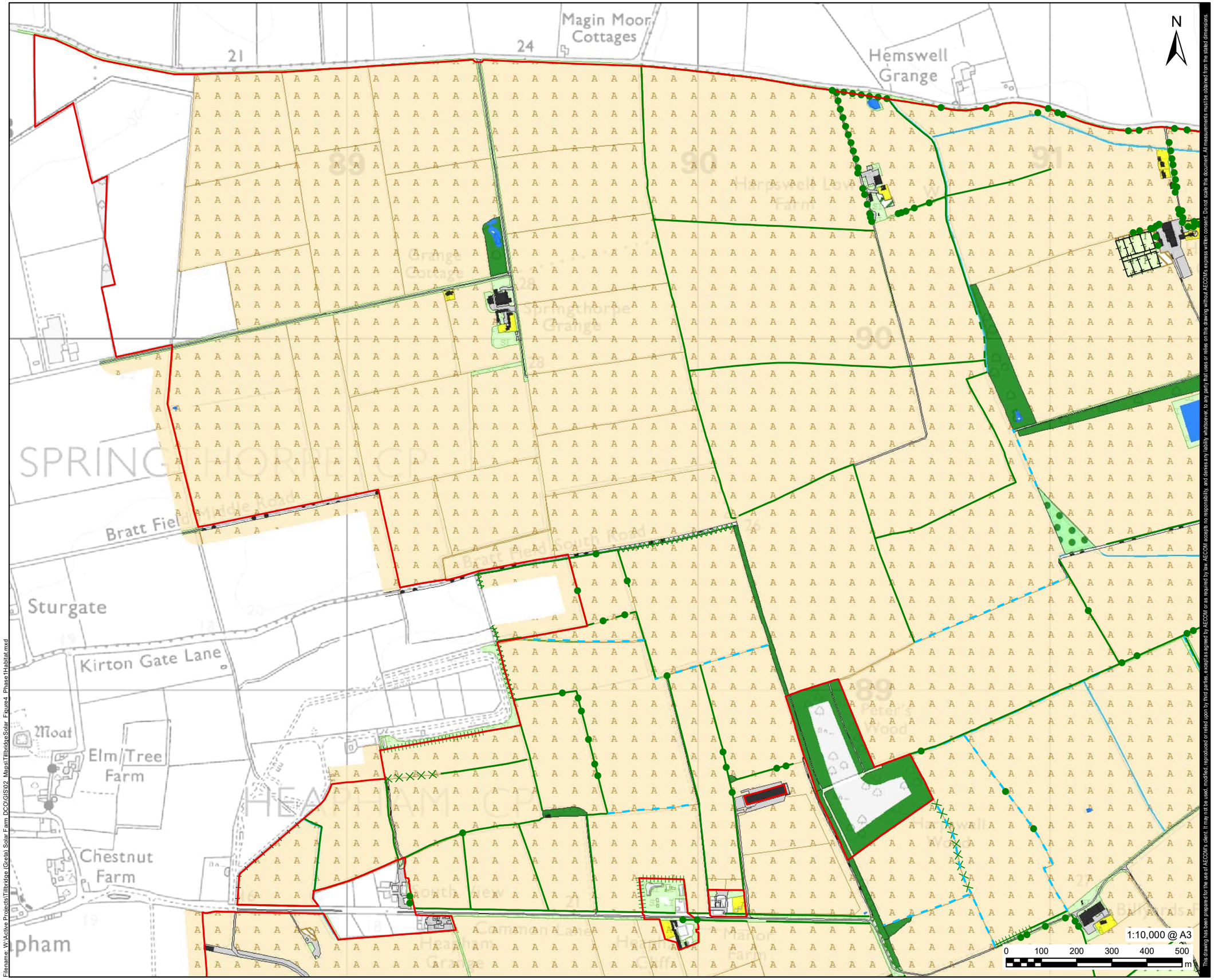
Non Statutory Sites Designated for Nature Conservation Value

FIGURE NUMBER

Figure 3

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Filename: W:\Active Projects\Tillbridge (Greta) Solar Farm DCO\GIS\02_Maps\TillbridgeSolar_Figure4_Phase1Habitat.mxd



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PROJECT

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Aldgate Tower
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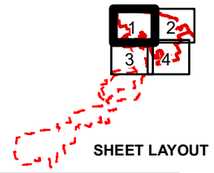
LEGEND

- Principal Site

Phase 1 Habitat

- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Mixed woodland - semi-natural
- Scrub - dense/continuous
- Improved grassland
- Poor semi-improved grassland
- Other tall herb and fern - ruderal
- Standing water
- Running water
- Hardstanding
- Cultivated/disturbed land - arable
- Cultivated/disturbed land - amenity grassland
- Buildings
- Bare ground
- Broadleaved parkland/scattered tree line
- Defunct hedge - species-poor
- Dry ditch
- Fence
- Hedge with trees - species-poor
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Scattered scrub line
- Broadleaved tree



SHEET LAYOUT

NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

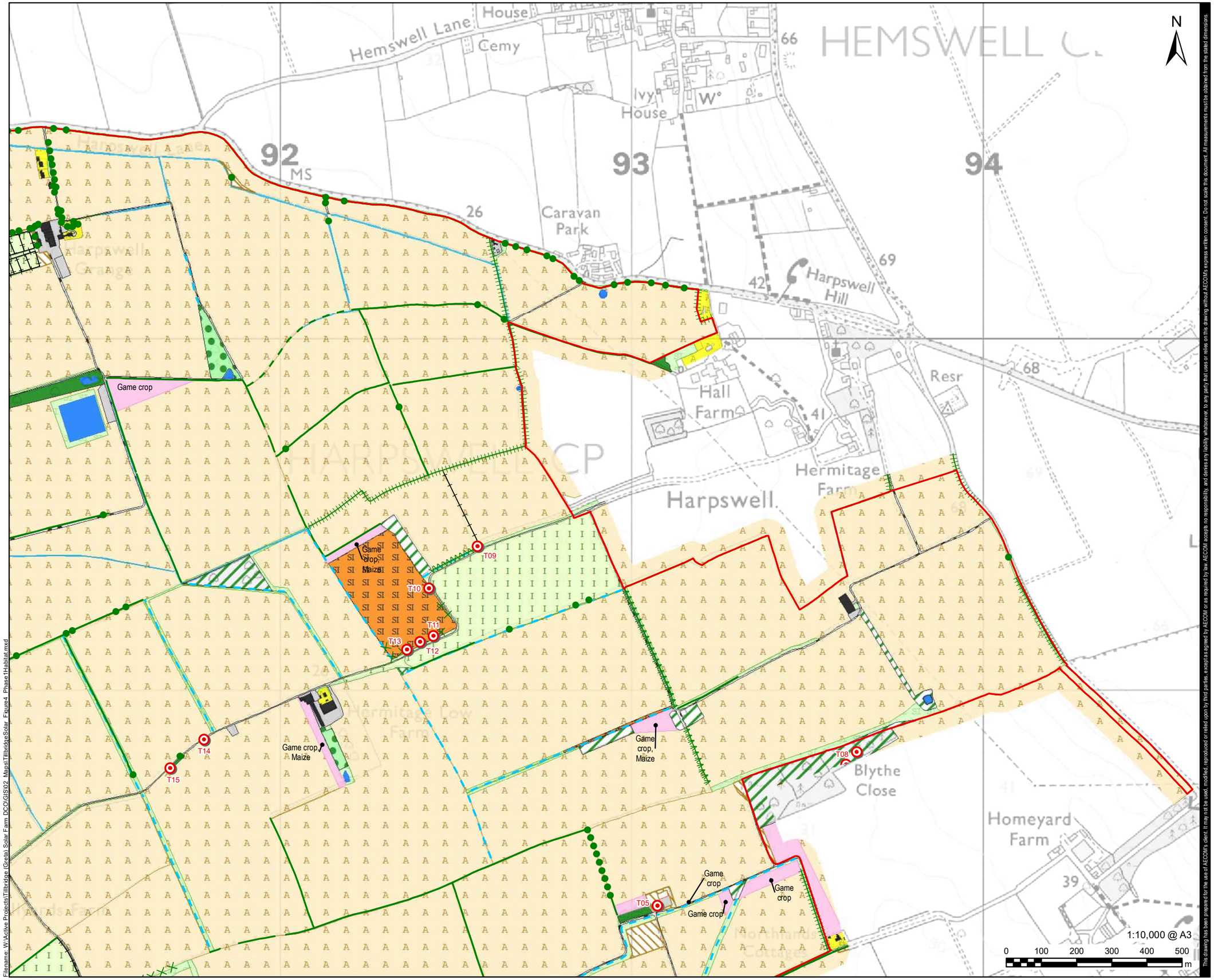
Phase 1 Habitat

FIGURE NUMBER

Figure 4.1

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Filename: W:\Active Projects\Tillbridge (Greb) Solar Farm DCO\GIS\02_Maps\TillbridgeSolar_Figure4_Phase1Habitat.mxd



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PROJECT

Tillbridge Solar

CLIENT

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CONSULTANT

Aldgate Tower
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United Kingdom
T +44-0207-645-2000

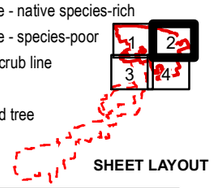
LEGEND

- Principal Site

Phase 1 Habitat

- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Mixed woodland - semi-natural
- Scrub - dense/continuous
- Neutral grassland - semi-improved
- Improved grassland
- Poor semi-improved grassland
- Other tall herb and fern - ruderal
- Standing water
- Running water
- Hardstanding
- Spoil
- Cultivated/disturbed land - arable
- Cultivated/disturbed land - amenity grassland
- Buildings
- Bare ground
- Other habitat
- Broadleaved parkland/scattered tree line
- Defunct hedge - species-poor
- Dry ditch
- Fence
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Scattered scrub line
- Scrub
- Broadleaved tree
- Target note

SHEET LAYOUT



NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

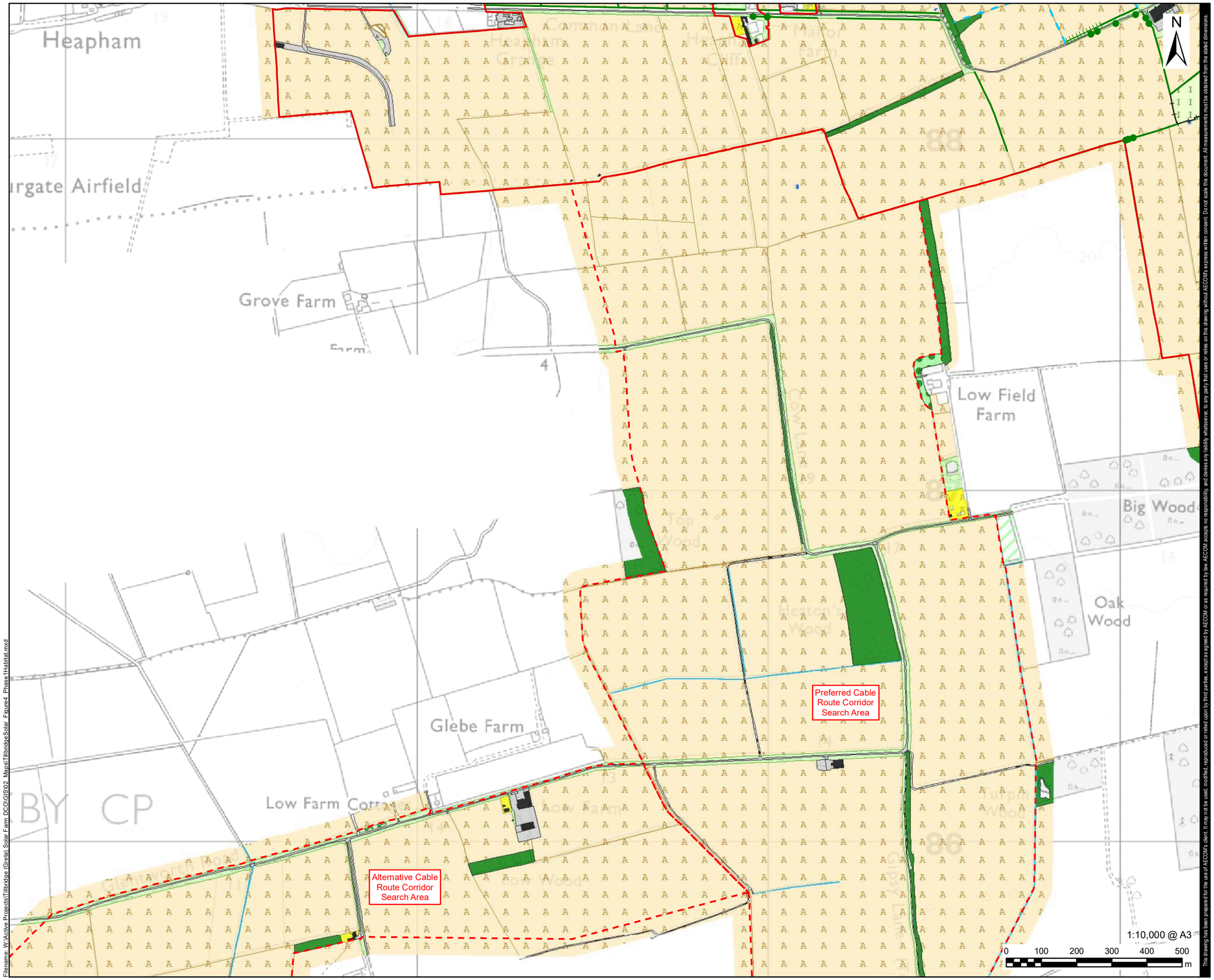
Phase 1 Habitat

FIGURE NUMBER

Figure 4.2

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Filename: W:\Active Projects\Tillbridge (Greta) Solar Farm DCO\GIS\02_Maps\Tillbridge Solar_Figure4_Phase1Habitat.mxd



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PROJECT

Tillbridge Solar

CLIENT

Tillbridge Solar Limited

CONSULTANT

Aldgate Tower
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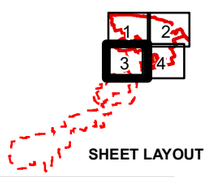
London, E1 8FA
United Kingdom
T +44-0207-645-2000

LEGEND

- Principal Site
- Cable Route Corridor Options

Phase 1 Habitat

- Broadleaved woodland - semi-natural
- Coniferous woodland - plantation
- Mixed woodland - semi-natural
- Scrub - dense/continuous
- Improved grassland
- Poor semi-improved grassland
- Other tall herb and fern - ruderal
- Standing water
- Running water
- Hardstanding
- Cultivated/disturbed land - arable
- Cultivated/disturbed land - amenity grassland
- Buildings
- Bare ground
- Dry ditch
- Fence
- Hedge with trees - species-poor
- Intact hedge - species-poor
- Broadleaved tree



SHEET LAYOUT

NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

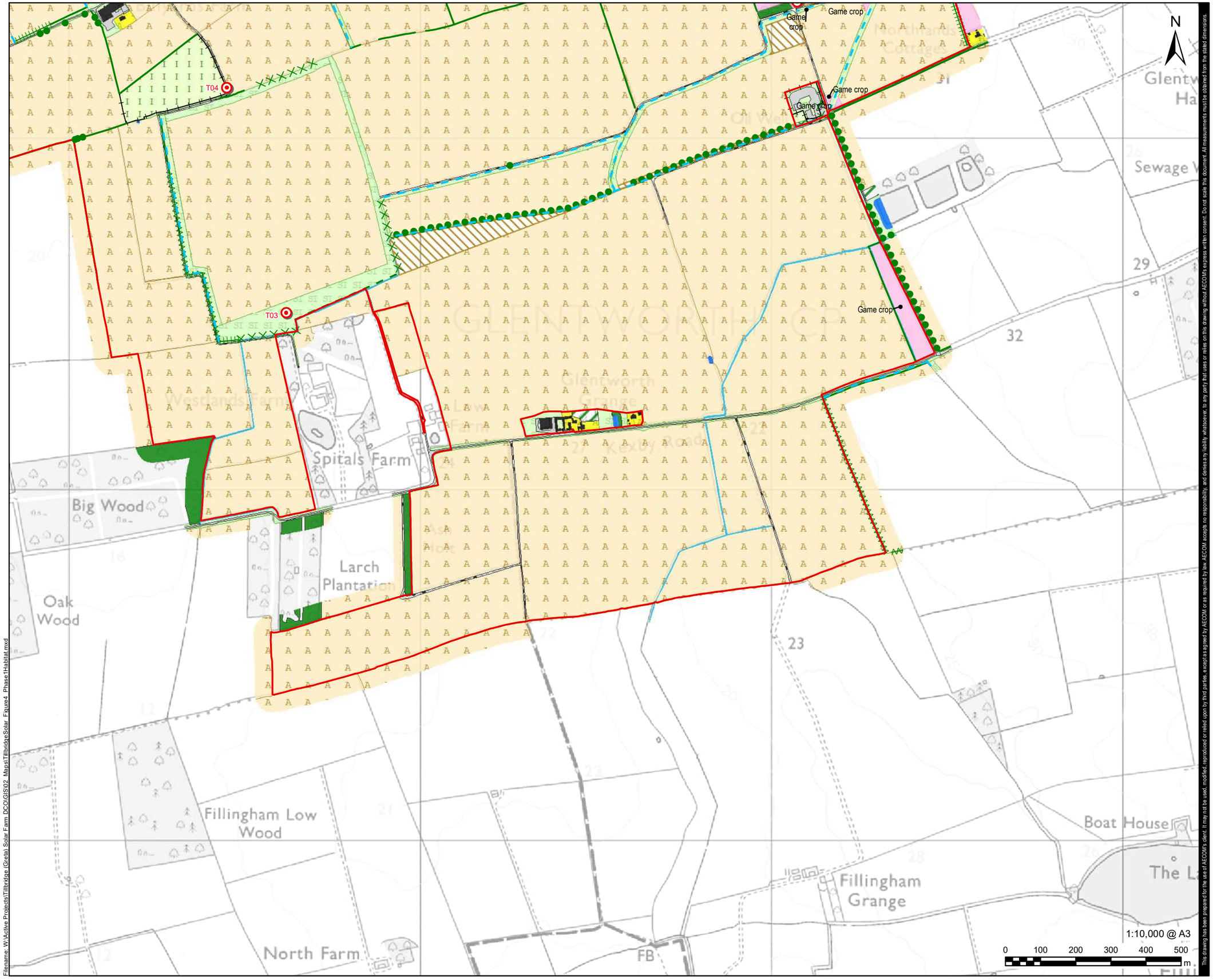
Phase 1 Habitat

FIGURE NUMBER

Figure 4.3

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Filename: W:\Active Projects\Tillbridge (Greta) Solar Farm DCO\GIS\02_Maps\TillbridgeSolar_Figure4_Phase1Habitat.mxd



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PROJECT

Tillbridge Solar

CLIENT

Tillbridge Solar Limited

CONSULTANT

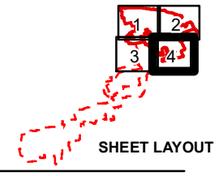
Aldgate Tower
2, Leman Street
London, E1 8FA
United Kingdom
T +44-0207-645-2000

LEGEND

- Principal Site

Phase 1 Habitat

- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Improved grassland
- Poor semi-improved grassland
- Other tall herb and fern - ruderal
- Standing water
- Running water
- Hardstanding
- Cultivated/disturbed land - arable
- Cultivated/disturbed land - amenity grassland
- Buildings
- Bare ground
- Other habitat
- Broadleaved parkland/scattered tree line
- Defunct hedge - species-poor
- Dry ditch
- Fence
- Hedge with trees - species-poor
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Scattered scrub line
- Broadleaved tree
- Target note



SHEET LAYOUT

NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

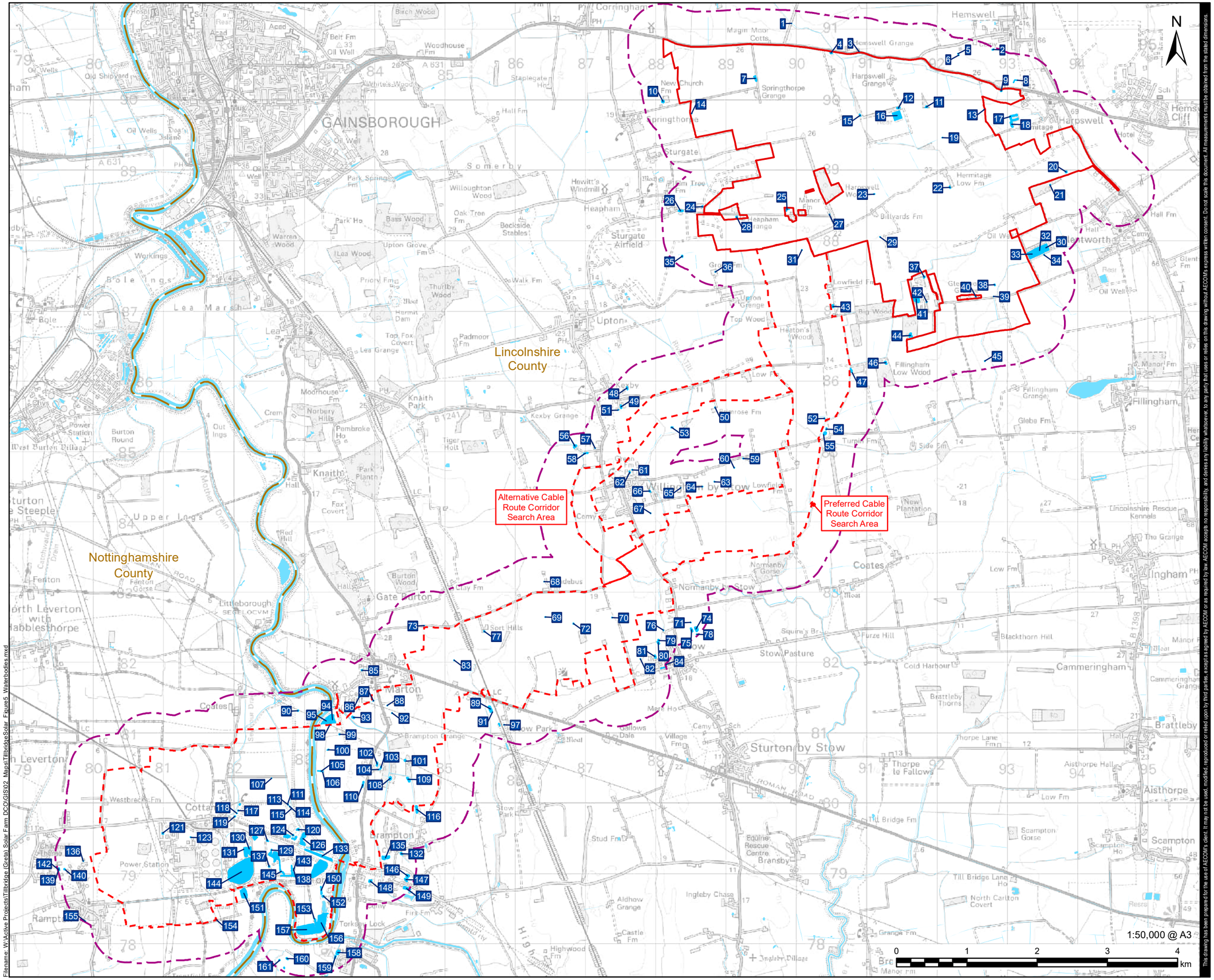
Phase 1 Habitat

FIGURE NUMBER

Figure 4.4

Revision: 0 Drawn: BF Checked: MC Approved: -- Date: 2022-09-21

Filename: W:\Active Projects\Tillbridge (Great) Solar Farm DCO\GIS\02_Maps\TillbridgeSolar_Figure5_Waterbodies.mxd



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PROJECT

Tillbridge Solar

CLIENT

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CONSULTANT

Aldgate Tower
2, Leman Street
London, E1 8FA
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T +44-0207-645-2000

LEGEND

- Principal Site
- Cable Route Corridor Options
- 500m Study
- County Boundary
- Waterbody/Watercourse

NOTES

ISSUE PURPOSE

PEA

PROJECT NUMBER

60677969

FIGURE TITLE

Waterbodies within 500m of the Proposed Scheme

FIGURE NUMBER

Figure 5

Appendix B: Legislation and Policy

The Conservation of Habitats & Species Regulations 2017 (as amended) (the 'Habitats Regulations')

The Habitats Regulations consolidate all the various amendments made to the Conservation (Natural Habitats, &c.) Regulations 1994 in respect of England and Wales. The 1994 Regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law. The Regulations came into force on 30th October 1994. In Scotland the Habitats Directive is transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the 1994 Regulations. The Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) transpose the Habitats Directive in relation to Northern Ireland.

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 "the 2019 Regulations" have been made and transfer the functions from the European Commission to the appropriate authorities in England and Wales. All other processes or terms in the 2017 Regulations remain unchanged and existing guidance is still relevant. The obligations of a competent authority in the 2017 Regulations for the protection of sites or species do not change.

The Habitat Regulations (Regulation 9(1)), as amended by the 2019 Regulations, require the Secretary of State and Welsh Ministers to secure compliance with the requirements of the Habitats Directives. Any new powers in the 2019 Regulations must be exercised in line with the Directives and retained EU case law up to 1 January 2021.

The Habitat Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.

Under the Habitat Regulations, competent authorities i.e. any Minister, Government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.

The Habitat Regulations place a duty on the Secretary of State to propose a list of sites which are important for either habitats or species (listed in Annexes I and II of the Habitats Directive respectively) to the European Commission. Once the Commission and EU Member States have agreed that the sites submitted are worthy of designation, they are identified as Sites of Community Importance (SCIs). The EU Member States must then designate these sites as Special Areas of Conservation (SACs) within six years. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs) classified under Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive). These sites form a network termed Natura 2000.

The Habitat Regulations enable the country agencies to enter into management agreements on land within or adjacent to a European site, in order to secure its conservation. If the agency is unable to conclude such an agreement, or if an agreement is breached, it may acquire the interest in the land compulsorily. The

agency may also use its powers to make byelaws to protect European sites. The Regulations also provide for the control of potentially damaging operations, whereby consent from the country agency may only be granted once it has been shown through Appropriate Assessment that the proposed operation will not adversely affect the integrity of the site. When considering potentially damaging operations, the country agencies apply the precautionary principle' i.e. consent cannot be given unless it is ascertained that there will be no adverse effect on the integrity of the site.

In instances where damage could occur, the appropriate Minister may, if necessary, make special nature conservation orders, prohibiting any person from carrying out the operation. However, an operation may proceed where it is or forms part of a plan or project with no alternative solutions, which must be carried out for reasons of overriding public interest. In such instances the Secretary of State must secure compensation to ensure the overall integrity of the Natura 2000 system. The country agencies are required to review consents previously granted under the Wildlife and Countryside Act 1981 for land within a European site, and may modify or withdraw those that are incompatible with the conservation objectives of the site.

The Habitat Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. Licenses may be granted for a number of purposes (such as science and education, conservation, preserving public health and safety), but only after the appropriate authority is satisfied that there are no satisfactory alternatives and that such actions will have no detrimental effect on wild population of the species concerned.

The Habitat Regulations make special provisions for the protection of European marine sites, requiring the country agencies to advise other authorities of the conservation objectives for a site, and also of the operations which may affect its integrity. The Habitat Regulations also enable the establishment of management schemes and byelaws by the relevant authorities and country agencies respectively, for the management and protection of European marine sites.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 (the ‘1981 Act’) is the major domestic legal instrument for wildlife protection in the UK, and is the primary means by which the following are implemented:

- The Convention on the Conservation of European Wildlife and Natural Habitats (‘the Bern Convention’); and The Council Directive 79/409/EEC on the Conservation of Wild birds (the ‘Bird Directive’)

Wild Birds

The 1981Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- kill, injure, or take any wild bird,
- take, damage or destroy the nest of any wild bird while that nest is in use or being built (also [take, damage or destroy the nest of a wild bird included

in Schedule ZA1] under the Natural Environment and Rural Communities Act 2006), or

- take or destroy an egg of any wild bird.

Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young. The Secretary of State may also designate Areas of Special Protection (subject to exceptions) to provide further protection to birds. The 1981 Act also prohibits certain methods of killing, injuring, or taking birds, restricts the sale and possession of captive bred birds, and sets standards for keeping birds in captivity.

Other Animals

The 1981 Act makes it an offence (subject to exceptions) to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. The Act also prohibits certain methods of killing, injuring, or taking wild animals.

Flora, Fungi and Lichens

The 1981 Act makes it an offence (subject to exceptions) to intentionally) pick, uproot or destroy:

- any wild plant listed in Schedule 8, or
- not being an authorised person, to intentionally uproot any wild plant not included in Schedule 8,
- to sell, offer or expose for sale, or possess (for the purposes of trade), any live or dead wild plant included in Schedule 8, or any part of, or anything derived from, such a plant.

Non-native Species

The 1981 Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9 in England and Wales. It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Countryside and Rights of Way (CRoW) Act 2000

The Countryside and Rights of Way Act 2000 applies to England and Wales only. Part III of the Act deals specifically with wildlife protection and nature conservation.

The CRoW Act 2000 places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Schedule 9 of the CRoW Act 2000 amends the SSSI provisions of the Wildlife and Countryside Act 1981, including increased powers for their protection and management of SSSIs. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increase penalties on conviction where the provisions are

breached; and include an offence whereby third parties can be convicted for damaging SSSIs.

Schedule 12 of the CRoW Act 2000 amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', include an offence of reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enable heavier penalties on conviction of wildlife offences.

Natural Environment and Rural Communities (NERC) Act 2006

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 41 (S41) of the NERC Act required the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list was drawn up in consultation with Natural England, as required by the NERC Act.

The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the NERC Act , to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the (now withdrawn) UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. They include terrestrial habitats such as upland hay meadows to lowland mixed deciduous woodland, and freshwater and marine habitats such as ponds and subtidal sands and gravels.

There are 943 species of principal importance included on the S41 list. These are the species found in England which were identified as requiring action under the (now withdrawn) UK BAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

Protection of Badgers Act 1992

Badgers and their setts (burrows) are protected under the Protection of Badgers Act 1992 (the ‘1992 Act’). This makes it an offence to kill or take a badger, to cruelly ill-treat a badger, or to interfere with a badger sett, including disturbing a badger while it is occupying a sett.

Licences to permit otherwise prohibited actions can be granted under section 10 of the 1992 Act for various purposes. This includes licences to interfere with a badger sett for the purpose of development as defined by section 55(1) of the Town and Country Planning Act 1990.

Licences may be granted in order to close down setts, or parts of setts, prior to development or to permit activities close to a badger sett that might result in disturbance. A licence will be required if a sett is likely to be damaged or destroyed in the course of development or if the badger(s) occupying the sett will be disturbed.

Licences can be applied for at any time, but a licence for development will not normally be issued unless full planning permission has been granted. The closure of setts under licence is normally only permitted during July to November, inclusive.

The Hedgerow Regulations 1997

The intention of the Hedgerow Regulations 1997 is to protect important countryside hedges from destruction or damage. They do not apply where planning permission has been granted and development consent orders generally include an article which has the same effect. There are various other exemptions under the Act, including:

- To make a new opening in substitution for an existing one that gives access to land. For example, a gate. However, the old opening must be filled in within 8 months;
- To obtain access to land where other means are not available or are only available at disproportionate cost;
- For the proper management of the hedgerow. This means real management, such as coppicing. But if the hedgerow is deliberately 'over-managed' this might qualify as removal.

If the proposed works are not exempt or subject to a current planning permission/development consent order with the necessary article included then the landowner must serve a Hedgerow Removal Notice in writing on their local planning authority. The authority then has 42 days (which period can be extended if the applicant agrees) to determine whether or not the hedge is considered 'important' under the regulations, and if so, whether or not to issue a Hedgerow Retention Notice. The local authority does not have to issue a Retention Notice, even if the hedgerow counts as important. If they do not issue a notice for an important hedge this is often on condition that certain things are done, e.g. reinstatement or replanting to a certain standard, or creation of an equivalent boundary elsewhere.

Water Framework Directive (WFD) 2017

The Water Framework Directive (WFD) (2000/60/EC) introduced a comprehensive river basin management planning system to help protect and improve the ecological health of our rivers, lakes, estuaries and coastal and groundwaters. This is underpinned by the use of environmental standards to help assess risks to the ecological quality of the water environment and to identify the scale of improvements that would be needed to bring waters under pressure back into a good condition.

National Planning Policy Framework

Paragraph 174 states that '*Planning policies and decision should contribute to and enhance the natural and local environment by:*

- *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);*
- *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;

- *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
- *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, where possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*

Paragraph 175 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'.

Paragraph 179 states that '*To protect and enhance biodiversity and geodiversity, plans should:*

- *identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation; and*
- *promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity'.*

Paragraph 180 states that 'When determining planning application, local planning authorities should apply the following principles:

- *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 planning permission should be refused;*
- *development on land within or outside a Site of Special Scientific Interest, 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 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 Sites of Special Scientific Interest;*
- *development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and*
- *development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate'.*

Paragraph 181 states that: 'The following should be given the same protection as habitats sites:

- *potential Special Protection Areas and possible Special Areas of Conservation;*
- *listed or proposed Ramsar sites; and*
- *sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites'.*

Paragraph 182 states that 'The presumption in favour of sustainable development does not apply where the plan or project is likely to have a significant effect on a habitats site (either alone or in combination with other plans or projects), unless an appropriate assessment has concluded that the plan or project will not adversely affect the integrity of the habitats site'.

Appendix C: LBAP Habitats & Species

Lincolnshire Biodiversity Action Plan

Habitats

Coastal and Marine:

- Coastal Sand Dunes;
- Peat and clay exposures
- *Sabellaria spinulosa* reefs
- Saline lagoons
- Saltmarsh

Farmland and Grassland:

- Arable field margins
- Grazing marsh
- Hedgerows and hedgerow trees
- Lowland calcareous grassland
- Lowland meadows

Heathland and Peatland:

- Heathland and peatland
- Lowland dry acid grassland

Rivers and Wetlands:

- Chalk streams and blow wells
- Fens
- Ponds, lakes and reservoirs
- Reedbeds and bittern
- Rivers, canals and drains
- Springs and flushes

Trees and Woodland:

- Lowland mixed deciduous woodland
- Traditional orchards
- Wet woodland
- Wood-pasture and parkland

Urban:

- Brownfield
- Churchyard and cemeteries
- Gardens and allotments
- Parks and open spaces

Species

Common Name	Scientific Name
a fungus (non lichenised)	*Mycena renati*

Common Name	Scientific Name
a fungus (non lichenised)	*Podoscypha multizonata*
a lichen	*Anaptychia ciliaris ciliaris*
a lichen	*Lecanora sublivescens*
Starry stonewort	*Nitellopsis obtusa*
Tassel stonewort	*Tolypella intricata*
Great tassel stonewort	*Tolypella prolifera*
Sea bryum	*Bryum warneum*
Rusty fork-moss	*Dicranum spurium*
Pitted frillwort	*Fossombronia foveolata*
Man orchid	*Aceras anthropophorum*
Ribbon-leaved water-plantain	*Alisma gramineum*
Tall thrift	*Armeria maritima elongata*
Purple milk-vetch	*Astragalus danicus*
Flat-sedge	*Blysmus compressus*
Slender hare's-ear	*Bupleurum tenuissimum*
Divided sedge	*Carex divisa*
Rare spring-sedge	*Carex ericetorum*
Basil thyme	*Clinopodium acinos*
Frog orchid	*Coeloglossum viride*
Deptford pink	*Dianthus armeria*
Glandular eyebright	*Euphrasia anglica*
Chalk eyebright	*Euphrasia pseudokerneri*
Red hemp-nettle	*Galeopsis angustifolia*
Early gentian	*Gentianella anglica*
Sea barley	*Hordeum marinum*
Marsh clubmoss	*Lycopodiella inundata*
Pennyroyal	*Mentha pulegium*

Common Name	Scientific Name
Fine-leaved sandwort	*Minuartia hybrida*
Bird's-nest	*Monotropa hypopitys hypophegea*
Tubular water-dropwort	*Oenanthe fistulosa*
Burnt orchid	*Orchis ustulata*
Pillwort	*Pilularia globulifera*
Sharp-leaved pondweed	*Potamogeton acutifolius*
Grass-wrack pondweed	*Potamogeton compressus*
Pasqueflower	*Pulsatilla vulgaris*
Corn buttercup	*Ranunculus arvensis*
Prickly saltwort	*Salsola kali kali*
Shepherd"s needle	*Scandix pecten-veneris*
Annual knawel	*Scleranthus annuus*
Greater water-parsnip	*Sium latifolium*
Small cord-grass	*Spartina maritima*
Marsh stitchwort	*Stellaria palustris*
Spreading hedge parsley	*Torilis arvensis*
a bryozoan	*Lophopus crystallinus*
Mud pond snail	*Omphiscola glabra*
Depressed (or compressed) river mussel	*Pseudanodonta complanata*
Witham orb mussel	*Sphaerium solidum*
Norfolk hawker	*Aeshna isosceles*
Thorne pin-palp	*Bembidion humerale*
Scarce four-dot pin-palp	*Bembidion quadripustulatum*
Necklace ground beetle	*Carabus monilis*
Hazel pot beetle	*Cryptocephalus coryli*
Six-spotted beetle	*Cryptocephalus sexpunctatus*
Mire pill-beetle	*Curimopsis nigrita*

Common Name	Scientific Name
Brush-thighed seed-eater	*Harpalus froelichi*
Oxbow diving beetle	*Hydroporus rufifrons*
Stag beetle	*Lucanus cervus*
Set-aside downy-back	*Ophonus laticollis*
Mellets downy-back	*Ophonus melletii*
Oolite downy-back	*Ophonus stictus*
Crucifix ground beetle	*Panagaeus cruxmajor*
Yellow pogonus	*Pogonus luridipennis*
Chequered skipper	*Carterocephalus palaemon*
Small heath	*Coenonympha pamphilus*
Large heath	*Coenonympha tullia*
Small blue	*Cupido minimus*
Dingy skipper	*Erynnis tages*
Duke of Burgundy	*Hamearis lucina*
Grayling	*Hipparchia semele*
Wall	*Lasiommata megera*
White admiral	*Limenitis camilla*
Silver-studded blue	*Plebejus argus*
Grizzled skipper	*Pyrgus malvae*
White letter hairstreak	*Satyrium w-album*
Brown hairstreak	*Thecla betulae*
Grey dagger	*Acronicta psi*
Knot grass	*Acronicta rumicis*
The forester	*Adscita statices*
Flounced chestnut	*Agrochola helvola*
Brown-spot pinion	*Agrochola litura*
Beaded chestnut	*Agrochola lychnidis*

Common Name	Scientific Name
Green-brindled crescent	*Allophyes oxyacanthae*
Ear moth	*Amphipoea oculea*
Mouse moth	*Amphipyra tragopoginis*
Large nutmeg	*Apamea anceps*
Dusky brocade	*Apamea remissa*
Deep-brown dart	*Aporophyla lutulenta*
Garden tiger	*Arctia caja*
The sprawler	*Asteroscopus sphinx*
Centre-barred sallow	*Atethmia centrago*
Marsh moth	*Athetis pallustris*
Dark brocade	*Blepharita adusta*
Minor shoulder-knot	*Brachylomia viminalis*
Mottled rustic	*Caradrina morpheus*
Haworth's minor	*Celaena haworthii*
The crescent	*Celaena leucostigma*
The streak	*Chesias legatella*
Latticed heath	*Chiasmia clathrata*
The concolorous	*Chortodes extrema*
Oak lutestring	*Cymatophorima diluta*
Small square-spot	*Diarsia rubi*
Figure of eight	*Diloba caeruleocephala*
Small phoenix	*Ecliptopera silaceata*
September thorn	*Ennomos erosaria*
Dusky thorn	*Ennomos fuscantaria*
August thorn	*Ennomos quercinaria*
Galium carpet	*Epirrhoe galiata*
Autumnal rustic	*Eugnorisma glareosa*

Common Name	Scientific Name
The spinach	*Eulithis mellinata*
Scarce pug	*Eupithecia extensaria occidua*
Garden dart	*Euxoa nigricans*
Double dart	*Graphiphora augur*
Small emerald	*Hemistola chrysoprasaria*
Ghost moth	*Hepialus humuli*
The rustic	*Hoplodrina blanda*
Rosy rustic	*Hydraecia micacea*
Brindled beauty	*Lycia hirtaria*
The lackey	*Malacosoma neustria*
Dot moth	*Melanchra persicariae*
Broom moth	*Melanchra pisi*
Pretty chalk carpet	*Melanthia procellata*
Rosy minor	*Mesoligia literosa*
Shoulder-striped wainscot	*Mythimna comma*
Scarce vapourer	*Orgyia recens*
Oblique carpet	*Orthonama vittata*
Barberry carpet	*Pareulype berberata*
Dark spinach	*Pelurga comitata*
Grass rivulet	*Perizoma albulata albulata*
Pale shining brown	*Polia bombycina*
Chalk carpet	*Scotopteryx bipunctaria*
Shaded broad-bar	*Scotopteryx chenopodiata*
White ermine	*Spilosoma lubricipeda*
Buff ermine	*Spilosoma luteum*
Hedge rustic	*Tholera cespitis*
Feathered gothic	*Tholera decimalis*

Common Name	Scientific Name
Blood-vein	*Timandra comae*
Pale eggar	*Trichiura crataegi*
The cinnabar	*Tyria jacobaeae*
Four-spotted moth	*Tyta luctuosa*
Oak hook-tip	*Watsonalla binaria*
Dusky-lemon sallow	*Xanthia gilvago*
The sallow	*Xanthia icteritia*
Dark-barred twin-spot carpet	*Xanthorhoe ferrugata*
Northern yellow splinter	*Lipsothrix errans*
Hairy canary fly	*Phaonia jaroschewskii*
Shining guest ant	*Formicoxenus nitidulus*
Moss carder-bee	*Bombus muscorum*
Large garden bumblebee	*Bombus ruderatus*
a mining bee	*Colletes halophilus*
Ruby-tailed wasp	*Chrysis fulgida*
White-clawed crayfish	*Austropotamobius pallipes*
Lagoon sand-shrimp	*Gammarus insensibilis*
a money spider	*Saaristoa firma*
River lamprey	*Lampetra fluviatilis*
Sea lamprey	*Petromyzon marinus*
Common skate	*Dipturus batis*
Tope shark	*Galeorhinus galeus*
Thornback ray	*Raja clavata*
European eel	*Anguilla anguilla*
Herring	*Clupea harengus*
Spined loach	*Cobitis taenia*
Cod	*Gadus morhua*

Common Name	Scientific Name
Halibut	*Hippoglossus hippoglossus*
Whiting	*Merlangius merlangus*
Smelt	*Osmerus eperlanus*
Plaice	*Pleuronectes platessa*
Atlantic salmon	*Salmo salar*
Brown/sea trout	*Salmo trutta*
Mackerel	*Scomber scombrus*
Sole	*Solea solea*
Common toad	*Bufo bufo*
Natterjack toad	*Epidalea calamita*
Great crested newt	*Triturus cristatus*
Slow worm	*Anguis fragilis*
Grass snake	*Natrix natrix*
Adder	*Vipera berus*
Common lizard	*Zootoca vivipara*
Skylark	*Alauda arvensis arvensis/scotica*
Tree pipit	*Anthus trivialis*
Scaup	*Aythya marila*
Bittern	*Botaurus stellaris*
Dark-bellied brent goose	*Branta bernicla bernicla*
Nightjar	*Caprimulgus europaeus*
Lesser redpoll	*Carduelis cabaret*
Linnet	*Carduelis cannabina autochthona/cannabina*
Twite	*Carduelis flavirostris bensonorum/pipilans*
Hawfinch	*Coccothraustes coccothraustes*
Common cuckoo	*Cuculus canorus*
Bewick's swan	*Cygnus columbianus bewickii*

Common Name	Scientific Name
Lesser spotted woodpecker	*Dendrocopos minor comminutus*
Corn bunting	*Emberiza calandra calandra/clanceyi*
Yellowhammer	*Emberiza citrinella*
Reed bunting	*Emberiza schoeniclus*
Herring gull	*Larus argentatus argenteus*
Black-tailed godwit	*Limosa limosa limosa*
Grasshopper warbler	*Locustella naevia*
Woodlark	*Lullula arborea*
Yellow wagtail	*Motacilla flava flavissima*
Spotted flycatcher	*Muscicapa striata*
Curlew	*Numenius arquata*
House Sparrow	*Passer domesticus*
Tree Sparrow	*Passer montanus*
Grey partridge	*Perdix perdix*
Wood warbler	*Phylloscopus sibilatrix*
Willow tit	*Poecile montanus Kleinschimdti*
Marsh tit	*Poecile palustris palustris/dresseri*
Dunnock	*Prunella modularis occidentalis*
Common bullfinch	*Pyrrhula pyrrhula pileata*
Arctic skua	*Stercorarius parasiticus*
Turtle dove	*Streptopelia turtur*
Starling	*Sturnus vulgaris vulgaris*
Song thrush	*Turdus philomelos clarkei*
Ring ouzel	*Turdus torquatus*
Lapwing	*Vanellus vanellus*
Water vole	*Arvicola amphibius*
Barbastelle	*Barbastella barbastellus*

Common Name	Scientific Name
Common dolphin	*Delphinus delphis*
Hedgehog	*Erinaceus europaeus*
Atlantic white-sided dolphin	*Lagenorhynchus acutus*
White-beaked dolphin	*Lagenorhynchus albirostris*
Brown hare	*Lepus europaeus*
Otter	*Lutra lutra*
Harvest mouse	*Micromys minutus*
Dormouse	*Muscardinus avellanarius*
Polecat	*Mustela putorius*
Noctule	*Nyctalus noctula*
Common seal	*Phoca vitulina*
Harbour porpoise	*Phocoena phocoena*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Brown long-eared bat	*Plecotus auritus*

Nottinghamshire Biodiversity Action Plan

Habitats

Woodland:

- Hedgerows (Including ancient and/or species-rich hedgerows)
- Mixed ash-dominant woodland
- Oak-birch woodland
- Parkland and wood pasture
- Planted coniferous woodland
- Wet broadleaved woodland

Wetland:

- Canals
- Ditches
- Eutrophic and mesotrophic standing waters
- Fens, marshes and swamps
- Reedbed

- Rivers and streams

Open:

- Farmland (arable farmland, arable field margins and improved grassland)
- Lowland calcareous grassland
- Lowland dry acid grassland
- Lowland heathland
- Lowland neutral grassland
- Lowland wet grassland
- Urban and post-industrial habitats

Species

Common Name	Scientific Name
Black Poplar	*Populus nigra*
Deptford Pink	*Dianthus armeria*
Nottingham autumn crocus	*Crocus nudiflorus*
Nottingham spring crocus	*Crocus vernus*
Dingy Skipper	*Erynnis tages*
Green Hairstreak	*Callophrys rubi*
Grizzled Skipper	*Pyrgus malvae*
Hazel Pot Beetle	*Cryptocephalus coryli*
White-clawed Crayfish	*Austropotamobius pallipes*
Atlantic Salmon	*Salmo salar*
Barn Owl	*Tyto alba*
Daubenton's Bat	*Myotis daubentoni*
Brandt's Bat	*Myotis brandti*
Whiskered Bat	*Myotis mystacinus*
Natterer's Bat	*Myotis nattereri*
Pipistrelle	*Pipistrellus pipistrellus*
Noctule Batt	*Nyctalus noctula*
Leisler's Bat	*Nyctalus leisleri*

Common Name	Scientific Name
Brown long-eared Bat	*Plecotus auritus*
Serotine	*Eptesicus serotinus*
Dormouse	*Muscardinus avellanarius*
Harvest mouse	*Micromys minutus*
Hedgehog	*Erinaceus europaeus*
Nightjar	*Caprimulgus europaeus*
Otter	*Lutra lutra*
Slow-worm	*Anguis fragilis*
Water Vole	*Arvicola terrestris*
Willow Tit	*Poecile montanus*

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Appendix C – Water Framework Directive (WFD) Screening

Tillbridge Solar

Water Framework Directive Screening Assessment

Tillbridge Solar Ltd

September 2022

Delivering a better world

Prepared for:

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Prepared by:

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Table of Contents

Figures

Tables

Glossary

EA – Environment Agency
EIA – Environmental Impact Assessment
IDB – Internal Drainage Board
LLFA – Lead Local Flood Authority
PV – Photovoltaic
RDB - River Basin District
RBMPs - River Basin Management Plans
SuDS – Sustainable Drainage Systems
WFD - Water Framework Directive

1. Introduction

Background

1.1 AECOM Limited (AECOM) has been commissioned by Tillbridge Solar Ltd to undertake a Water Framework Directive (WFD) Screening Assessment of the Tillbridge Solar scheme (hereafter referred to as 'the Scheme').

1.2 This WFD Screening Assessment is being carried out at a relatively early stage in the Scheme development alongside EIA scoping, so that statutory bodies can be consulted on the need for, and scope of any further more detailed WFD assessment.

1.3 Although at the time of writing there is relatively limited information available on the specific details of the Scheme, this is considered sufficient to carry out a WFD screening assessment in order to inform subsequent phases of the assessment alongside the EIA process.

1.4 The Scheme broadly comprises the activities listed below, that are considered in this screening assessment. However, further assessment may be required as more information becomes available throughout the planning and design process.

- Development of a Principal Site where the pototvoltaic panels (PV) will be located.
- Development of a cable route for connection to the electricity grid hereafter referred to as 'the Cable Route Corridor'.

1.5 The Principal Site and Cable Route Corridor are collectively referred to as 'the Site'.

The Site

1.6 The Site is located to the north west of Lincoln, Lincolnshire and covers eight WFD surface water bodies, potentially crossing approximately 20 watercourses of which eight are WFD-monitored and two are statutory Main Rivers.

1.7 The eight water bodies are divided equally across two River Basin Districts (RBDs) – Anglian and Humber; two Management Catchments - (Lower Trent and Erewash and Witham); and two Operational Catchments (Trent and Tributaries and Upper Witham). The WFD water bodies are provided in Table 1-1.

Table 1-1 WFD RBD, Management and Operational Catchments, and Water bodies

RBD	Management Catchment	Operational Catchment	Water body
Anglian	Witham	Upper Witham	Fillingham Beck - GB105030062490
			Skellingthorpe Main Drain - GB105030062390
			Till (Witham) – GB105030062500
			Tributary of Till - GB105030062480
Humber	Trent Lower and Erewash	Trent and tributaries	Eau from Source to Northorpe Beck - GB104028057970
			Marton Drain Catchment (trib of Trent) - GB104028057840
			Seymour Drain Catchment (trib of Trent) - GB104028058340
			Trent from Carlton-on-Trent to Laughton Drain - GB104028058480

1.8 The Site and WFD surface water bodies are shown in Figure 1-1 and WFD Groundwater bodies are shown in Figure 1-2.

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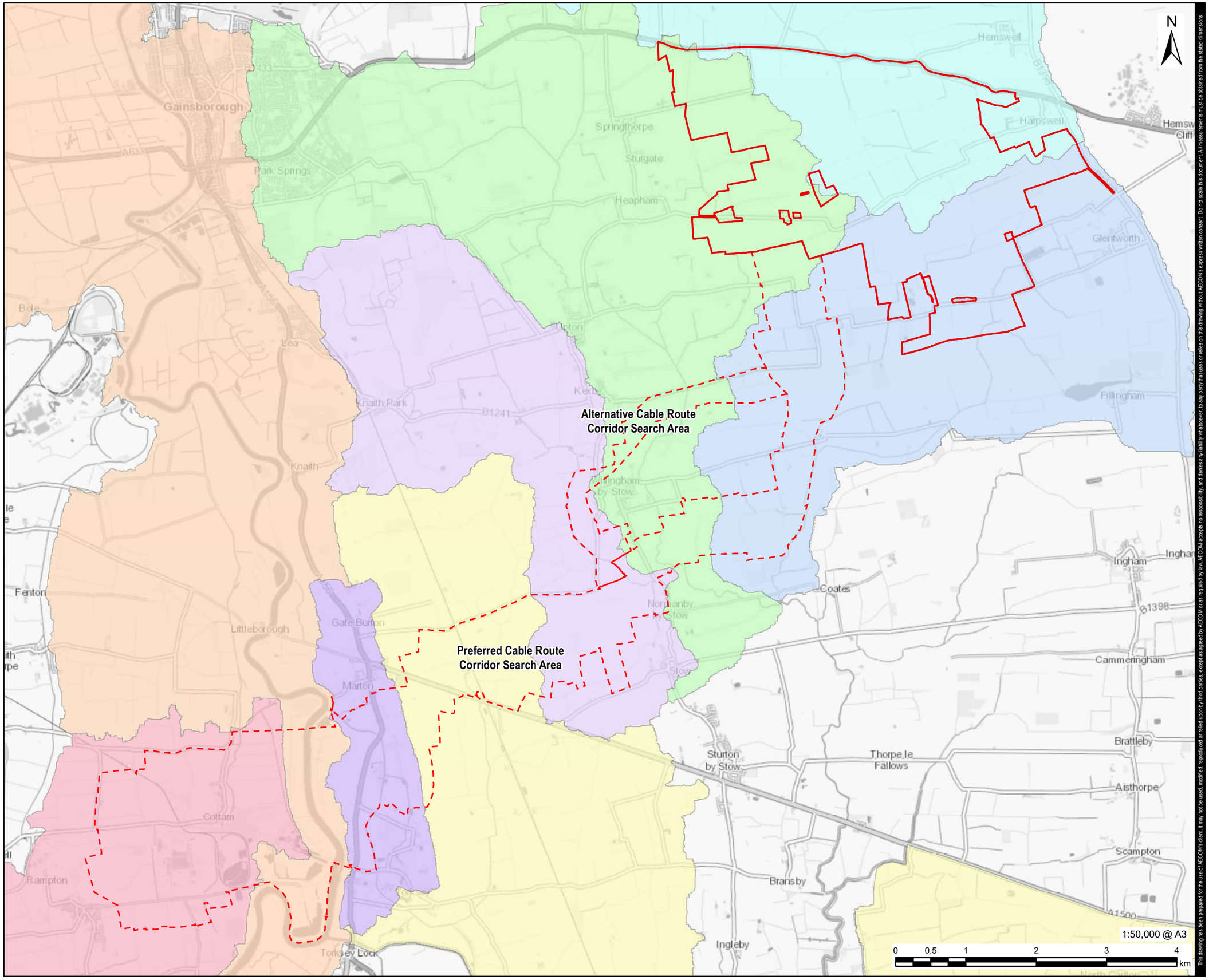

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LEGEND
- Principal Site
- Cable Route Corridor Options

WFD Surface Waterbodies
- Eau from Source to Northorpe Beck
- Fillingham Beck
- Marton Drain Catchment (trib of Trent)
- Seymour Drain Catchment (trib of Trent)
- Skellingthorpe Main Drain
- Till (Witham)
- Trent from Carlton-on-Trent to Laughton Drain
- Tributary of Till

NOTES

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EIA Scoping Report

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FIGURE TITLE
WFD Surface Waterbodies

FIGURE NUMBER
Figure 1-1

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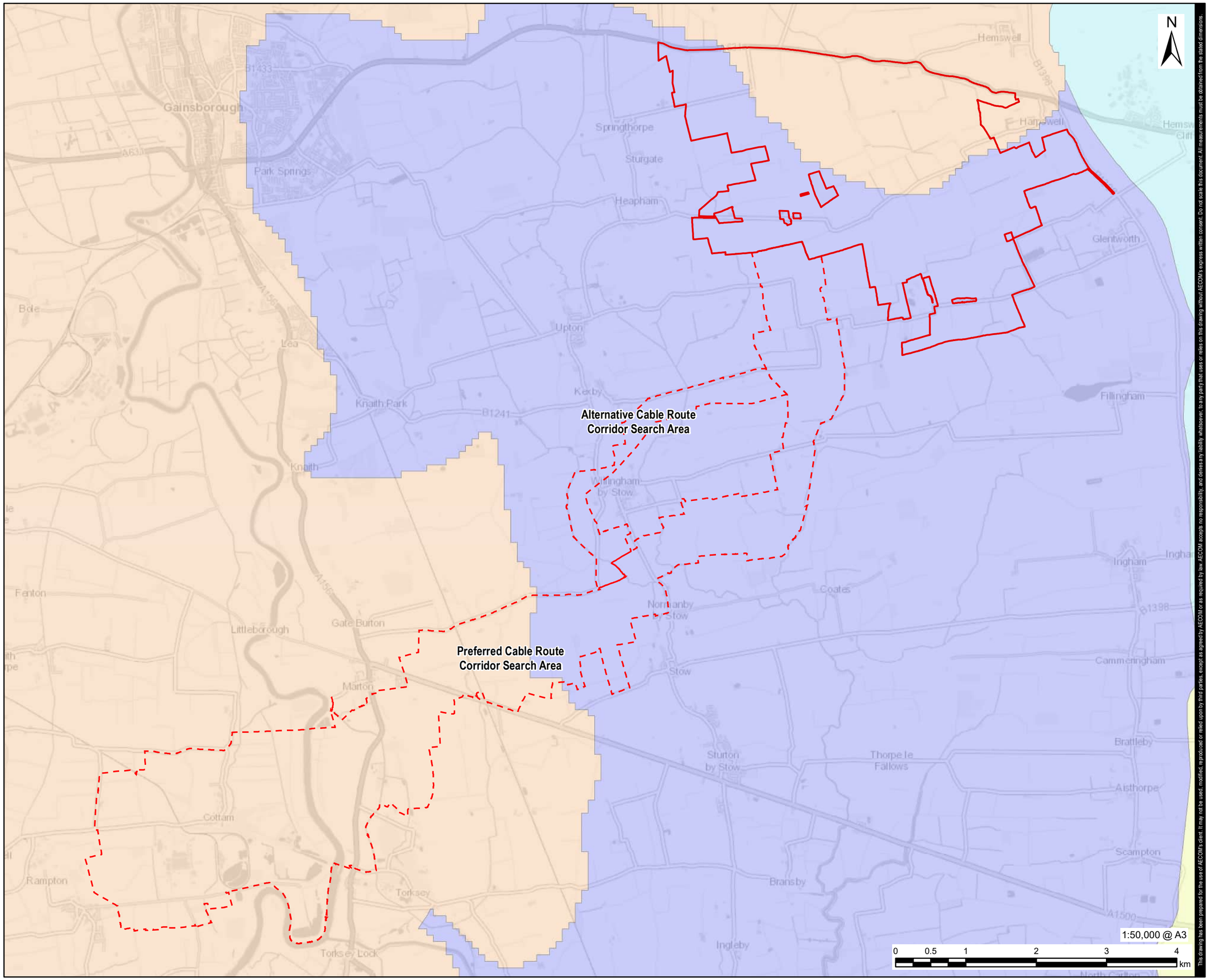

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LEGEND
- Principal Site
- Cable Route Corridor Options

WFD Ground Waterbodies
- Grimsby Ancholme Louth Limestone Unit
- Lower Trent Erewash - Secondary Combined
- Witham Lias
- Witham Limestone Unit

NOTES

ISSUE PURPOSE
EIA Scoping Report

PROJECT NUMBER
60677969

FIGURE TITLE
WFD Ground Waterbodies

FIGURE NUMBER
Figure 1-2

Introduction to the Water Framework Directive

1.9 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, referred to as the WFD, aims to protect and enhance the water environment.

1.10 The WFD takes a holistic approach to sustainable management of the water environment by considering interactions between surface water, groundwater and water-dependent ecosystems. Ecosystem conditions are evaluated according to interactions between classes of biological, chemical, physico-chemical and hydromorphological elements known as 'Quality Elements'.

1.11 Under the WFD, ‘water bodies’ are the basic management units, defined as all or part of a river system or aquifer. Waterbodies form part of a larger ‘river basin district’ (RBD), for which ‘River Basin Management Plans’ (RBMPs) are used to summarise baseline conditions and set broad improvement objectives. RBMPs are produced every six years, in accordance with the river basin management planning cycle. The current RBMPs at the date of this assessment are the 2015 Cycle 2 plans, which were due to be updated to Cycle 3 plans in 2021. However, full publication has been delayed and the Environment Agency (EA) is currently reviewing the results of a public consultation on the draft Cycle 3 plans that was held in the spring 2022.

1.12 In England, the Environment Agency is the competent authority for implementing the WFD, although many objectives are delivered in partnership with other relevant public bodies and private organisations, for example local planning authorities, water companies, rivers trusts, and private landowners and developers.

1.13 The EA is also responsible for managing flood risk and other activities on Main Rivers. Local planning authorities or drainage boards are responsible for consenting certain activities on Ordinary Watercourses. Local planning authorities are responsible for highways drains, and landowners are responsible for ditches and watercourses and also piped watercourses and culverts. While the EA is ultimately responsible for the WFD on any water body, local authorities are required to plan and consent WFD related activities on Ordinary Watercourses.

1.14 As part of its regulatory and statutory consultee role on planning applications and environmental permitting (under the Environmental Permitting Regulations (England and Wales) 2016), the EA and WFD-partnering organisations, must consider whether proposals for new developments have the potential to:

- Cause a deterioration of any quality element of a water body from its current status or potential; and / or
- Prevent future attainment of good status or potential where not already achieved.

1.15 Regulation 17 of the WFD states that, like other public bodies, local authorities have a statutory duty to “*have regard to the River Basin Management Plan*” and “any supplementary plans” covering proposed activities when exercising its functions. Local authorities must therefore reflect water body improvement priorities as outlined in RBMPs.

1.16 In determining whether a development is compliant or non-compliant with the WFD objectives for a water body, the EA and partnering organisations must also consider the conservation objectives of any Protected Areas (i.e. Natura 2000 sites or water dependent Sites of Special Scientific Interest) and adjacent WFD water bodies, where relevant (The Planning Inspectorate, 2017).

2. Methodology

2.1 There are no fixed methods for WFD assessment. The nature of the water environment and the breadth of the legislation mean that assessments are tailored to proposals on a case-by-case basis.

2.2 The following general guidance is available which has been applied for this assessment:

- Environment Agency (2016a). Water Framework Directive risk assessment. How to assess the risk of your activity.
- Environment Agency (2016b). Protecting and improving the water environment. Water Framework Directive compliance of physical works in rivers.
- The Planning Inspectorate (2017). Advice Note eighteen: The Water Framework Directive.

2.3 A stepwise approach consisting of screening, scoping and impact assessment phases is followed in order to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD. The general approach is described by The Planning Inspectorate's Advice Note eighteen (2017) and briefly summarised below.

Stage 1 Screening

2.4 Screening identifies the zone of influence of a proposed development, and if proposed activities pose a risk to the water environment. It is used to identify if there are activities that do not require further consideration for WFD objectives, for example activities which have been ongoing since before the current RBMP plan cycle and which have thus formed part of the baseline. This is the stage of assessment presented in this report.

Stage 2: Scoping

2.5 Scoping is used to identify any potential impacts of the proposed activities to specific WFD receptors and their water quality elements. This involves review of WFD impact pathways, shortlisting which WFD water bodies and quality elements could or could not be affected by proposed activities, and collecting baseline information from the relevant RBMP on the status and objectives for each water body.

Stage 3: Impact assessment

2.6 This involves rationalised assessment of water bodies and quality elements that could be affected by proposed activities, in order to identify any areas of WFD non-compliance. Proposed activities are reviewed in terms of both positive and negative impacts, and the baseline mitigation measures, enhancements, and contributions to the WFD objectives described in the RBMP. Any proposed activities with potentially deleterious impacts are reviewed simultaneously with their corresponding mitigation proposals, to determine a net effect on WFD objectives.

Stage 4: Mitigation commitments

2.7 Proposed mitigation activities relied upon to demonstrate compliance at any of the stages referred to above must be appropriately defined and sufficiently

secured. Mitigation could be secured through Development Consent Order requirements.

Stage 5: Regulation 19 Derogation

2.8 Where the potential for deterioration of water bodies is identified, and it is not possible to mitigate the impacts to a level where deterioration can be avoided, additional assessment is needed in the context of WFD Regulation 19 which covers procedures for WFD derogation.

2.9 Regulation 19 is a 'last resort' planning and legal process, and it is a matter for the Secretary of State to consider whether derogation under Regulation 19 is justified. An applicant would be required to provide detailed and often complex evidence to justify its case that the following four stringent tests have been met:

- Test (a): All practicable steps are to be taken to mitigate the adverse impacts on the water body concerned.
- Test (b): the reasons for modifications or alterations are specifically set out and explained in the RBMP.
- Test (c)(1): There is an overriding public interest in the Scheme and/or Test (c)(2): its benefits outweigh the benefits of the WFD objectives (i.e. that the benefits of the project to human health, human safety or sustainable development outweigh the benefits of achieving the WFD objectives).
- Test (d): The benefits of the project cannot be achieved by a significantly better environmental option (that are technically feasible and do not lead to disproportionate cost).

2.10 In addition, the Development must not permanently exclude or compromise achievement of the WFD objectives in other bodies of water within the same RBD and must be consistent with the implementation of other environmental legislation. In applying Regulation 19, steps must also be taken to make sure that the new provisions guarantee at least the same level of protection as the existing legislation.

Desk study

2.11 A high-level desk-based study was carried out to capture information pertaining the Scheme. Review of relevant information relating to the study area was undertaken to begin to develop a baseline for WFD catchments, watercourses, and surrounding areas. The following data sources were used for the desk study:

- Environment Agency WFD data (Environment Agency, 2022)
- Ordnance Survey maps (Ordnance Survey, 2022)
- Historical maps (National Library of Scotland, 2022)
- Geology and soil data (BGS, 2022)
- Natural environment maps and designations on the MAGIC website (MAGIC, 2022)
- Hydrological information (CEH, 2022)

Limitations and assumptions

2.12 At the time of writing (July 2022) limited information was available about the Scheme and the specific activities required to facilitate its construction. Therefore, assumptions have been made based on experience of other solar developments and professional judgement. In addition, no site surveys were conducted to support this assessment; instead, information has been gathered during a desk study exercise which have informed the assessment and a precautionary approach taken based on the information identified.

3. Baseline Desk Study

Catchment characteristics

3.1 The eight identified WFD water bodies broadly share the same, or very similar, characteristics; therefore, for expediency, a broad description of their host Operational Catchment is provided below and where they differ.

General characteristics

Upper Witham

3.2 The Upper Witham catchment has a maximum elevation of around 157 m Above Ordnance Datum (AOD) and drains broadly south to north, before turning sharply east towards its confluence with The Haven, near Boston, Lincolnshire. However, the Scheme is located in the northern portion of the catchment which is drained by the River Till and tributaries: this flow broadly north to south. The catchment is heavily influenced by a significant proportion of arable farmland and improved grassland that, in combination, comprises more than 80% of its area. This strong agricultural influence has resulted in an extremely modified surface water drainage network, with straightened and probably grossly over-deepened channels forming the typical plan-form of water courses. A complex system of artificial drains and navigable waterways further exacerbate the low-functionality of the catchments hydrological network.

Trent and Tributaries

3.3 The Trent and Tributaries water body is a sizeable catchment with a maximum elevation of around 90 m AOD and drains broadly south to north, eventually joining the River Humber east of Goole, East Riding of Yorkshire. The Scheme occupies a small portion of the catchment, most of which is comprised of the proposed Cable Route Corridor. Similarly, the catchment is heavily dominated by agricultural land which influences the character and planform of the surface water network therein. Moreover, the main River Trent is designated as ‘Artificial’ under the WFD due to extensive modification required to maintain it as a navigable waterway.

Catchment Geology and Soils

Upper Witham

3.4 Superficial geology within the Upper Witham Operational catchment is dominated by alluvial deposits that are bordered by older river terrace deposits that define the lateral boundary of formally actively meandering river systems. Bedrock geology is comprised of Triassic sedimentary mudstones, siltstones and sandstones belonging to the Lias Group (BGS, 2022); while soils are comprised of shallow, lime-rich soils to the east of the catchment and a higher proportion of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils to the east (Cranfield University, 2022).

Trent and Tributaries

3.5 Superficial geology in the Trent and Tributaries Operation Catchment is similarly comprises deposits of alluvium bordered by older river terrace deposits, with aeolian sand deposits and glacial till comprising the remainder of the catchment area. Bedrock geology is dominated by Triassic sandstone, mudstones and

siltstones (BGS, 2022) while soil is dominated by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (Cranfield University, 2022).

Catchment Hydrology

Upper Witham

3.6 The Upper Within Catchment has poor coverage of readily available hydrology data with just one National River Flow Archive gauge situated in the uppermost region of the catchment: no data are available for the screened-in WFD water bodies. Annual average rainfall for the region of the catchment upstream of 30001 - Witham at Claypole Mill[1] is 632 mm and 615 mm for the periods 1941-1970 and 1961-1990 respectively. River flow is reflective of the catchment's fairly small (297 km^2) area, with mean flow of 1.9m^3/s, baseflow (Q95) of 0.4 m^3/s and peak flow of 38 m^3/s.

Trent and Tributaries

3.7 The Trent and Tributaries catchment similarly has poor coverage of readily available hydrology data, with just one National River Flow Archive gauge situated in the uppermost region of the catchment: no data are available for the screened-in WFD water bodies. Nevertheless, annual average rainfall for the portion of the catchment upstream of the 28022 - Trent at North Muskham[2] is 756 mm and 747 mm for the periods 1941-1970 and 1961-1990 respectively. River flow is reflective of the sizeable (8231 km^2) catchment area upstream of the gauge, with mean flow of 90 m^3/s, baseflow (Q95) of 29 m^3/s and peak flow of over 1000 m^3/s.

Historical Channel Change

Upper Witham

3.8 Analysis of the historical mapping record (NLS, 2022) reveals very little channel change over long-term and more recent timeframes respectively. This is because modifications to watercourses and excavation of land drains for agriculture took place many centuries before the emergence of formal mapping. However, given the topographic character of the catchment, and its generally low-lying elevation, its pre-modified state probably resembled a system of extensive wetland and bog habitats with strong lateral connectivity to the Witham and its tributaries, and vertical connectivity with underlying groundwater.

Trent and Tributaries

3.9 Historical mapping reveals very little channel change due to modifications pre-dating formal Ordnance Survey (OS) mapping in the 19th Century. The Trent has a well-developed extremely dysfunctional and poorly connected floodplain that once occupied a complex network of riparian wetlands and floodplain bog. This has been lost to extensive land drainage, giving rise to the straightened and probably over-deepened surface water arrangement that comprises its contemporary drainage network.

WFD Status

3.10 The most recent (2019) WFD status of the eight screened-in surface water bodies and ground water bodies are provide in Table 3-1.

[1] https://nrfa.ceh.ac.uk/data/station/info/30001 - Accessed July 2022.
[2] https://nrfa.ceh.ac.uk/data/station/info/28022 - Accessed July 2022

Table 3-1 Summary of current Cycle 2 WFD status of the screened-in water bodies.

	Anglian				Humber			
	Surface Water							
Operational catchment	**Witham**				**Trent and Tributaries**			
Water bodies	Fillingham Beck	Skellingthorpe Main Drain	Till (Witham)	Tributary of Till	Eau from Source to Northorpe Beck	Marton Drain Catchment (trib of Trent)	Seymour Drain Catchment (trib of Trent)	Trent from Carlton-on-Trent to Laughton Drain
Water Body ID	GB105030062490	GB105030062390	GB105030062500	GB105030062480	GB104028057970	GB104028057840	GB104028058340	GB104028058480
Overall Water body status Objective	Moderate by 2015	Moderate by 2015	Moderate by 2015	Moderate by 2027	Good by 2027	Good by 2027	Good by 2027	Good by 2027
Artificial or Heavily Modified Water Body?	Heavily modified	Heavily modified	Heavily modified	No	No	Heavily modified	Heavily modified	Artificial
Overall Ecological Status	Moderate	Moderate	Moderate	Poor	Moderate	Moderate	Moderate	Moderate
Biological quality elements	Bad	Moderate	Good	Poor	Moderate	Good	Moderate	Bad
Physico-chemical	Moderate	Moderate	Moderate	High	Moderate	Moderate	Moderate	Moderate
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good
Specific Pollutants	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail
Priority Hazardous Substance	N/A	N/A	N/A	N/A	Good	Fail	Fail	Fail
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Good
	Groundwater							
Water Body	Witham Lias Water Body (GB40502G401400)				Lower Trent Erewash - Secondary Combined (GB40402G990300)			
Overall Water Body	Good				Good			
Quantitative	Good				Good			
Quantitative Status element	Good				Good			
Quantitative Dependent Surface Water Body Status	Good				Good			
Quantitative GWDTEs test	Good				Good			
Quantitative Saline Intrusion	Good				Good			

Quantitative Water Balance	Good	Good
Chemical (GW)	Good	Good
Chemical Status element	Good	Good
Chemical Dependent Surface Water Body Status	Good	Good
Chemical Drinking Water Protected Area	Good	Good
Chemical GWDTEs test	Good	Good

4. WFD Screening

WFD Screening

4.1 The purpose of the WFD screening stage is to identify a zone of influence of the Scheme and to determine whether that influence has the potential to adversely impact upon WFD water body receptors. The screening stage also identifies specific activities of the Scheme that could affect receptor water bodies' WFD status and carries them forward to subsequent stages of the assessment process. Water body receptors that are screened out are not carried forward and thus do not require further consideration, justification is provided. Certain activities on or near waterbodies are considered to be low risk by the EA, as summarised in Table 4-1. If the project or components of the project meet the criteria in Table 4-1 they may be screened out of any further assessment.

Table 4-1 WFD Low-Risk Activities (After Environment Agency 2016a)

Activity	Type of Modification
Low impact maintenance activities (encourage removal of obstructions to fish/eel passage)	Re-pointing (block work structures)
	Void filling ('solid' structures)
	Re-positioning (rock or rubble or block work structures)
	Replacing elements (not whole structure)
	Re-facing
	Skimming/ covering/ grit blasting
	Cleaning and/or painting of a structure
Temporary works	Temporary scaffolding to enable bridge re-pointing
	Temporary clear span bridge with abutments set-back from bank top
	Temporary coffer dam (if eel/ fish passage not impeded)
	Temporary flow diversion (if fish/ eel passage not impeded) such as flumes and porta-dams
	Repair works to bridge or culvert which do not extend the structure, reduce the cross-section of the river or affect the banks or bed of the river, or reduce conveyance
	Excavation of trial pits of boreholes in byelaw margin
	Structural investigation works of a bridge/ culvert/ flood defence such as intrusive tests, non-intrusive surveys
Bridges	Permanent clear span bridge, with abutments set-back from bank top
	Bridge deck/ parapet replacement/ repair works
	Replacing road surface on a bridge
Service crossing	Service crossing below the river bed, installed by directional drilling or micro tunnelling if more than 1.5 m below the natural bed line of the river
	Service crossing over a river. This includes those attached to the parapets of a bridge or encapsulated within the bridge's footpath or road
	Replacement, installation or dismantling of service crossing/ high voltage cable over a river
Other structures	Fishing platforms
	Fish/ eel pass on existing structure (where <2% water body length is impacted)
	Cattle drinks
	Mink rafts
	Fencing (if open panel/ chicken wire) in byelaw margin

Screening of WFD surface water bodies

4.2 The Scheme interacts with a number of WFD surface water bodies. WFD Screening of these water bodies is provided in Table 4-2.

Table 4-2 Screening of WFD surface water bodies potentially impacted by the Scheme

Water Body ID	Screening Outcome	Justification
Fillingham Beck (GB105030062490)	**In**	The footprint of the Scheme interacts with these water bodies. Thus, there is a risk to WFD quality elements and the ecological and chemical status of each receptor water body. Therefore, these water bodies are screened in for further assessment. However, this is based on a precautionary assessment due to limitations on available scheme information. It is possible that once further scheme information is known this initial screening decision could be altered. Thus, due to a lack of specific information on engineering activities associated with the Scheme, it assumed that watercourse would be intrusive; however, if the final proposed method of watercourse crossing is non-intrusive, i.e., subterranean cables routed well below watercourse hard beds, then these would likely be screened out.
Skellingthorpe Main Drain (GB105030062390)	**In**	
Till (Witham) (GB105030062500)	**In**	
Tributary of Till (GB105030062480)	**In**	
Eau from Source to Northorpe Beck (GB104028057970)	**In**	
Marton Drain Catchment (trib of Trent) (GB104028057840)	**In**	
Seymour Drain Catchment (trib of Trent) (GB104028058340)	**In**	
Trent from Carlton-on-Trent to Laughton Drain (GB104028058480)	**In**	

Screening of WFD groundwater bodies

4.3 The Scheme interacts with a number of WFD groundwater bodies. WFD Screening of these water bodies is provided in Table 4-3.

Table 4-3 Screening of WFD groundwater bodies potentially impacted by the Scheme

Water Body ID	Screening Outcome	Justification
Witham Lias (GB40502G401400)	**In**	The WFD ground water bodies underlay the Scheme and therefore may be impacted depending on the depth of foundations/excavations and thickness of overlying superficial deposits. Therefore, these water bodies are screened in for further assessment. However, this is based on a precautionary assessment due to limitations on available scheme information. It is possible that once further scheme information is known this initial screening decision could be altered.
Lower Trent Erewash - Secondary Combined (GB40402G990300)	**In**	
Blisworth Limestone Rutland formation (GB40401G444500)	Out	These WFD ground water bodies would not interact with the proposed Scheme because the Site does not overlay them or there is unlikely to be a mechanism by which impacts are transmitted to the underlying groundwater bodies. Therefore, these water bodies are screened out of any further assessment.
Grimsby Ancholme Louth Limestone Unit (GB40401G444600)	Out	
Cornbrash (Humber) (GB40402G444700)	Out	
Cornbrash (Anglian) (GB40502G445000)	Out	
Witham Limestone Unit A (GB40501G444800)	Out	
Blisworth Limestone Rutland formation (GB40501G444900)	Out	

Screening of activities

4.4 The Scheme comprises a number of activities that present a potential risk to the WFD status of the water body identified in the previous section. The screening assessment of activities pertaining to the Scheme is provided in Table 4-4.

Table 4-4 Screening of the Scheme's activities

Activity	Description of potential	Screening Outcome
Developable area including PV panels, and associated infrastructure	The developable area falls within the Eau from Source to Northorpe Beck, Till (Witham) and Fillingham Beck water bodies. This activity is therefore screened in for these water bodies because construction and operation phases pose a potential risk to WFD receptors or may prevent the identified water bodies from reaching their objectives. However, this is based on a precautionary assessment due to limitations on available Scheme information. It is possible that once further Scheme information is known this initial screening decision could be altered. For example, solar panels are typically set back 10m from watercourse centre lines, which would constitute a low risk activity for small watercourses.	**In**
Grid connection and indicative Cable Route Corridor	The indicative Cable Route Corridor sits with the Skellingthorpe Main Drain, Marton Drain Catchment (trib of Trent), Trent from Carlton-on-Trent to Laughton Drain, Seymour Drain Catchment (trib of Trent), Tributary of Till, Fillingham Beck, and Till (Witham) WFD water bodies. This activity is therefore screened in for these water bodies because its construction and operation pose a potential risk to WFD receptors or may prevent the identified water bodies from reaching their objectives. However, this is based on a precautionary assessment due to limitations on available Scheme information. It is possible that once further Scheme information is known this initial screening decision could be altered as watercourses may be crossed trenchlessly, which would constitute a low risk activity for small watercourses.	**In**

5. Potential impacts

Potential construction phase impacts

5.1 During construction, the following adverse impacts may occur:

- Pollution of surface water or groundwater (and any designated ecology sites that are water dependent) due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through uncontrolled site run-off including dewatering of excavations.
- Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required.

Construction phase mitigation

5.2 The Scheme includes the construction of a Cable Route Corridor to join the solar PV sites to the Cottam Power Station area. This will necessitate the crossing of watercourses and drainage ditches. The construction of cable route crossings of watercourses has the potential to result in modifications to WFD water bodies. Some of these may be temporary such as to provided field access across watercourses or for an open-cut excavation of the channel for the installation of the new cables. Where these are required (and agreed with statutory bodies) a pre-works survey will be undertaken to provide baseline data for full reinstatement of the channel. Where possible, options for enhancement will also be considered.

5.3 It is assumed that the Cable Route Corridor will cross more significant waterbodies using a non-intrusive and trenchless technique (e.g. horizontal directional drilling (HDD), micro-tunnelling or boring) at a suitable depth beneath the bed level to avoid the risk of future exposure by scour of the bed (typically cables will be at least 1.5 m below the bed of a watercourse).

5.4 Details on construction methodologies are not yet available. It is assumed that solar PV panels and other permanent development will be offset from watercourses by a minimum of 10 m measured from the centre line of the channel on narrow channels (i.e. typically 2-5 m wide) and from the bank edge on wider watercourses (as bank top is a variable feature). The purpose of this buffer reduces the risk of any pollutants entering the watercourse directly or direct physical impacts, whilst also providing space for mitigation measures (e.g. fabric silt fences) should they be required as identified at the Preliminary Environmental Information and Environmental Statement stages.

5.5 Construction would be managed using a Construction Environmental Management Plan (CEMP), which would be developed by the Principal Contractor and it will take into consideration the views of the local authority. It would include a Water Management Plan (WMP) which would provide site specific information on how the risks to the water environment from potential pollution and the risk of physical damage will be managed. These measures require Principal Contractor input and thus the WMP would not be developed until during the detailed design phase and pre-construction planning period, although the scope of the WMP can be defined in a Framework CEMP.

5.6 Works would be carried out in accordance with established best practice and the CEMP, which would include information on:

- Permissions and consents.
- Management of construction site runoff.
- Management of construction site spillage risk including the risk from 'frack-out' events from horizontal directional drilling.
- Management of flood risks and how they may increase the risk of water pollution.
- Management of works within, under and adjacent to watercourses.

5.7 It is anticipated that all WFD construction risks could be adequately mitigated with appropriate planning and management.

5.8 In addition, during decommissioning, potential impacts would be similar to the construction phase although it is anticipated that the power cables would be left in situ beneath watercourses and there would be less excavation works required close to watercourses. There may also be some additional wastewater in pipework of above ground installations that would need to be removed, tested, and potentially treated as waste rather than discharged to a watercourse or to ground.

Potential operation phase impacts

5.9 During the operational phase, the following adverse impacts may occur:

- Impacts on water quality in watercourses and groundwater from run-off and the potential for accidental spillages from new permanent hardstanding and maintenance activities, assuming surface water run-off does ultimately drain to a surface watercourse rather than simply to ground.
- Potential for impact on groundwater or surface water as a result of the use of firewater in the event of a fire in the battery storage areas.
- Potential impacts on hydrology as a result of the Scheme. This may also have a subsequent effect on aquatic habitats and water-dependent nature conservation sites.
- Potential for permanent physical impacts to watercourses if crossings are required for access and depending on the design of the structure used.
- Potential for impact of foul drainage / water supply in the area due to the offices / maintenance facilities required as part of the Scheme.
- The current arable fields are treated with fertilizer and pesticides under current land use. During the life of the project the use of such chemicals will be greatly reduced.

Operation phase mitigation

5.10 A Surface Water Drainage Strategy will be undertaken to ensure the risk of surface water flooding is not increased as a result of the Scheme, and any increased land take for foundations and any access roads.

5.11 Careful consideration of the Sustainable Drainage Systems (SuDS) features, in-keeping with local planning policy and through liaison with the Lead Local Flood Authority (LLFA), the three Internal Drainage Boards (IDBs) and Environment Agency, will be undertaken to ensure that the Surface Water Drainage Strategy

adequately attenuates and treats runoff from the Scheme, whilst minimising flood risk to the Site and surrounding areas.

5.12 In accordance with planning policy and general good practice, mitigation will be provided by restricting surface water discharge rates and providing on-site attenuation.

5.13 A water quality risk assessment of all above ground installations will be undertaken using the Simple Index Approach described in the SuDS Manual (2nd edition) (CIRIA Ref. 10.21). This will inform what, if any treatment measures are required to manage the risk from diffuse urban runoff to watercourses or ground.

5.14 Provided that a permanent on-site staff presence is required, options may include connecting to the nearest available public sewer or a self-contained independent non-mains domestic storage and / or treatment system. The alternative where this is not possible, would be for a self-contained foul drainage system to a septic tank or similar. These tanks would be regularly emptied under contract with a registered recycling and waste management contractor.

6. Conclusion

6.1 This WFD Screening Assessment has been prepared by AECOM Limited (AECOM) for Tillbridge Solar Ltd to assess the potential risks to WFD water body receptors' status posed by the proposed Scheme. Assessments have been made based on Site and design information available in July 2022.

6.2 On the basis of the information provided to AECOM, this assessment concludes that the Scheme could potentially impact on the WFD status or objectives of those surface water and groundwater bodies in the study area. Furthermore, the Scheme may prevent the achievement of the wider WFD objectives in the Humber and Anglian RBMPs. However, this is a precautionary assessment and reflects the limited Scheme information at this stage. As more information becomes available this screening assessment can be reviewed.

6.3 Based on the high-level screening presented above, it is recommended that further WFD scoping is undertaken to determine the level of risk posed by the Scheme to specific WFD biological, hydromorphological and chemical receptors. This would be facilitated through review of available WFD data; targeted field work; and consultation with the competent authority (The Environment Agency) in accordance with Advice Note 18 (The Planning Inspectorate, 2017). The scoping assessment would be extended to incorporate elements of the impact assessment (qualitatively) and consideration of mitigation measures. The Environment Agency will be consulted on the outcome of the extended WFD Scoping Assessment.

7. References

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Appendix D – Water Quality Data for Watercourse Catchments

Table D1:Summary of Water Quality for the Fillingham Beck (most recent 20 samples 04/11/2016 to 13/06/2022)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	8.154	8.47	7.72	8.421	7.912
Temperature of water	°C	9.955	17.1	2.7	15.41	4.64
Conductivity at 25^0C	µs/cm	862.7	1136	688	993.5	742.3
Ammoniacal Nitrogen as N	mg/l	0.052	0.088	0.031	0.077	0.034
Nitrogen, Total Oxidised as N	mg/l	9.616	20	0.54	15.18	3.059
Nitrate as N	mg/l	9.57285	19.9	0.527	15.16	2.946
Nitrite as N	mg/l	0.047	0.183	0.013	0.1128	0.015
Ammonia un-ionised as N	mg/l	0.001	0.0018	0.0004	0.0017	0.0004
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	221.4	250	157	244.3	189.8
Orthophospate, reactive as P	mg/l	0.255	0.869	0.063	0.661	0.080
Oxygen, Dissolved % saturation	%	103.23	142.5	60.1	129.88	84.71
Oxygen, Dissolved as O2	mg/l	11.762	15.5	5.78	14.32	8.842

Table D2: Summary of Water Quality for the River Till Heapham Road Bridge (most recent 20 samples 20/05/2020 to 11/05/2022)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	7.9805	8.47	7.5	8.217	7.688
Temperature of water	°C	9.43	17.1	3.7	15.37	4.54
Conductivity at 25^0C	µs/cm	902.1	1050	324	1045.1	763.2
Ammoniacal Nitrogen as N	mg/l	0.0877	0.21	0.033	0.146	0.034
Nitrogen, Total Oxidised as N	mg/l	9.475	27	1.5	19.3	4.18
Nitrate as N	mg/l	9.427	26.9	1.44	19.3	4.151
Nitrite as N	mg/l	0.053	0.16	0.018	0.088	0.021
Ammonia un-ionised as N	mg/l	0.001	0.003	0.0004	0.002	0.0005
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	223.4	300	88	272	169
Orthophospate, reactive as P	mg/l	0.494	2	0.093	1.2	0.1084
Oxygen, Dissolved % saturation	%	93.885	143.1	30.6	115.94	70.24
Oxygen, Dissolved as O2	mg/l	10.9	15.7	2.94	12.94	6.925

Table D3:Summary of Water Quality for the River Till Willingham Bridge (most recent 20 samples 10/10/2015 to 19/04/2017)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	8.138	8.4	7.71	8.385	7.885
Temperature of water	°C	9.25	21.3	2.5	15.55	4.05
Conductivity at 25^{0}C	µs/cm	894.4	1097	433	1056.1	660.1
Ammoniacal Nitrogen as N	mg/l	0.145	0.872	0.031	0.234	0.033
Nitrogen, Total Oxidised as N	mg/l	10.637	18.1	5.23	14.2	5.69
Nitrate as N	mg/l	10.581	18.1	5.19	14.2	5.595
Nitrite as N	mg/l	0.0666	0.286	0.019	0.114	0.023
Ammonia un-ionised as N	mg/l	0.0021	0.011	0.0006	0.0031	0.0006
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	234.188	293	115	288.5	176
Orthophospate, reactive as P	mg/l	0.601	2.15	0.09	1.5	0.130
Oxygen, Dissolved % saturation	%	110.094	143.6	77.2	137.75	89.05
Oxygen, Dissolved as O2	mg/l	12.767	17	8.86	16.8	9.355

Table D4:Summary of Water Quality for the Tributary of Till at Kexby Lane (most recent 20 samples 20/09/2016 to 20/05/2022)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	7.791	8.34	7.34	8.128	7.406
Temperature of water	°C	9.936	15.8	2.5	14.26	4.48
Conductivity at 25^0C	µs/cm	731.21	1010	504	886.6	605.2
Ammoniacal Nitrogen as N	mg/l	0.117	0.73	0.034	0.125	0.037
Nitrogen, Total Oxidised as N	mg/l	6.321	17	2.2	9.984	2.224
Nitrate as N	mg/l	6.283	16.8	2.17	9.952	2.196
Nitrite as N	mg/l	0.0386	0.19	0.016	0.047	0.0176
Ammonia un-ionised as N	mg/l	0.0012	0.003	0.0001	0.002	0.0002
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	207.526	258	110	240.4	189
Orthophospate, reactive as P	mg/l	0.0335	0.074	0.019	0.0528	0.0194
Oxygen, Dissolved % saturation	%	85.805	126	48.3	118.76	61.46
Oxygen, Dissolved as O2	mg/l	9.753	14.8	5.01	13.4	7.398

Table D5:Summary of Water Quality for the Marton Drain at Torksey (most recent 20 samples07/12/2006 to 06/12/2021)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	7.7425	8.27	7.41	7.903	7.492
Temperature of water	°C	950.4	1000	903	990.4	905.4
Conductivity at 25^0C	µs/cm	10.85	18.9	4	17.01	4.78
Ammoniacal Nitrogen as N	mg/l	0.0888	0.25	0.0411	0.142	0.047
Nitrogen, Total Oxidised as N	mg/l	8.339	29	0.31	20	0.465
Nitrate as N	mg/l	7.411	29	0.162	19.53	0.261
Nitrite as N	mg/l	0.031	0.089	0.0072	0.0598	0.009
Ammonia un-ionised as N	mg/l	0.0008	0.002	0.0003	0.002	0.0004
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	250.158	290	192	281	216.4
Orthophospate, reactive as P	mg/l	0.031	0.059	0.01	0.046	0.011
Oxygen, Dissolved % saturation	%	93.49	147.1	61	129.81	71.21
Oxygen, Dissolved as O2	mg/l	10.391	15.5	5.89	14.75	7.401

Table D6:Summary of Water Quality for the Seymour Drain at Torksey Ferry Road (most recent 20 samples 05/09/2012 to 23/05/2014)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	7.962	8.2	7.7	8.1	7.798
Temperature of water	°C	8.715	15.1	2.7	14.55	2.89
Conductivity at 25^0C	µs/cm	-	-	-	-	-
Ammoniacal Nitrogen as N	mg/l	0.086	0.201	0.037	0.1529	0.046
Nitrogen, Total Oxidised as N	mg/l	11.87	22.3	5.89	18.51	7.082
Nitrate as N	mg/l	-	-	-	-	-
Nitrite as N	mg/l	-	-	-	-	-
Ammonia un-ionised as N	mg/l	-	-	-	-	-
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	-	-	-	-	-
Orthophospate, reactive as P	mg/l	1.537	4.87	0.255	4.059	0.382
Oxygen, Dissolved % saturation	%	88.25	104	59	100.2	73.6
Oxygen, Dissolved as O2	mg/l	-	-	-	-	-

Table D7:Summary of Water Quality for the River Trent at Torksey (most recent 20 samples25/09/20112 to 09/05/2014)

Determinands	Units	Average	Max	Min	90th %ile	10th %ile
pH	pH units	8.036	8.83	7.41	8.378	7.576
Temperature of water	°C	10.085	20.7	3.6	16.21	4.65
Conductivity at 25^0C	µs/cm	925.2	1347	589	1123.9	696.8
Ammoniacal Nitrogen as N	mg/l	0.194	0.722	0.042	0.442	0.061
Nitrogen, Total Oxidised as N	mg/l	8.135	16.5	3.86	10.58	5.532
Nitrate as N	mg/l	-	-	-	-	-
Nitrite as N	mg/l	-	-	-	-	-
Ammonia un-ionised as N	mg/l	0.002	0.006	0.001	0.003	0.001
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	-	-	-	-	-
Orthophospate, reactive as P	mg/l	0.326	0.829	0.081	0.665	0.099
Oxygen, Dissolved % saturation	%	95.205	119.8	61.5	108.67	79.2
Oxygen, Dissolved as O2	mg/l	10.727	12.6	7.41	12.33	8.864

Table D8: Summary of WFD Standards for Lowland Inland Surface Waters

Determinand	Unit	Statistic	High	Good	Moderate	Poor	Bad
BOD	mg/l	90%ile	4	5	6.5	9	>9
Ammonia	mg/l	90%ile	0.3	0.6	1.1	2.5	>2.5
Dissolved Oxygen	% sat	10%ile	70	60	54	45	<45
pH	pH units	High-Good: 5 & 95%ile; Mod-Poor 10%ile	>6 & <9	>6 & <9	4.7	4.2	<4.2
Temperature	Degree Celsius (°C)	98%ile (not in salmonid WBs and canals)	25	28	30	32	>32

Appendix E – Ground Conditions Preliminary Risk Assessment

Tillbridge Solar

Stage 1 – Tier 1: Preliminary Risk Assessment

Tillbridge Solar Ltd

September 2022

Delivering a better world

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The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken between **July and August 2022** and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to AECOM's attention after the date of the Report.

The site reconnaissance consisted of a general external inspection of the site aimed at identifying any obvious signs of geotechnical hazards and potential sources of ground contamination affecting the site. An environmental compliance audit and/or detailed structural inspection of existing buildings were outside the project brief. Similarly, the site visit excluded detailed consideration of the ecological or archaeological aspects of the site, and if such are believed to be of potential significance then it is recommended that specialist advice is sought.

Any risks identified in this Report are perceived risks, based on the information reviewed during the desk study and therefore partially based on conjecture from available information. The study is limited by the non-intrusive nature of the work and actual risks can only be assessed following a physical investigation of the site.

The opinions expressed in this report and the comments and recommendations given are based on a desk assessment of readily available information and an initial site reconnaissance by an AECOM Engineer. At this stage intrusive investigations have yet to be undertaken at site to establish actual ground and groundwater conditions and to provide data for an assessment of the geo-environmental status of the site.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

Reference to historical Ordnance Survey (OS) maps and/or data provides invaluable information regarding the land use history of a site. However, it should be noted that historical evidence will be incomplete for the period pre-dating the first edition and between the release of successive maps and/or data.

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. AECOM specifically does not guarantee or warrant any estimate or projections contained in this Report.

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1. Executive Summary

A Tier 1 Preliminary Risk Assessment (PRA) of the proposed Tillbridge Solar scheme (hereafter referred to as 'the Scheme) has been undertaken by AECOM Limited (AECOM) to support an application for development consent.

The Scheme will comprise the construction, operation and maintenance, and decommissioning of solar photovoltaic (PV) generating panels and on-site energy storage facilities with a total capacity exceeding 50 megawatts (MW). The purpose of this report is to determine whether potentially contaminative land uses have taken place within, or in close proximity to the Scheme, which could have led to the contamination of underlying soils or groundwater. The assessment considers the Principal Site (i.e. where solar PVs will be installed) and does not consider the Cable Route Corridor (i.e. the connection from the Principal Site to the national grid at Cottam power station) as this area is expected to be refined as the Scheme design progresses.

The Principal Site comprises agricultural fields, with a tributary of the River Till flowing across the south-western part of the Principal Site, the River Eau at the north-eastern edge of the Principal Site and Fillingham Beck across the southern part.

The anticipated geology includes quaternary deposits over sedimentary bedrock of mudstone, limestone and sandstone formations. The superficial deposits and the bedrock are classified as Secondary Aquifers, except for Lincolnshire Limestone Formation, bordering the Principal Site to the east, which is classified as a Principal Aquifer.

The indicative floodplain map for the area, published by the Environment Agency (the EA), shows that the risk of surface water flooding at the Principal Site is generally very low (annual chance of flooding of less than 0.1%); with isolated patches of low (chance of flooding of between 0.1% and 1%), medium (chance of flooding of between 1% and 3%) and high risk (chance of flooding of greater than 3.3%) generally associated with the rivers located on the Principal Site.

Based on a review of historical maps, the Principal Site was undeveloped land/agricultural fields since the earliest available historical maps (late 1800s). Areas formerly associated with Sturgate Airfield (currently located 600m south-west of the Principal Site) extend across the south-western part of the Principal Site. Areas formerly associated with airfield also adjoin the Principal Site to the west, north of Common Lane.

Potential contaminative sources identified on-site include the historical use of the south-western part of the Principal Site as an airfield and an area characterised by a vegetated mound of unknown material, tyres and an abandoned vehicle (south-eastern part of the Principal Site). Small areas of potentially infilled land may be present on the Principal Site associated with pits and former ponds, which may have been filled with a variety of (potentially unlicensed) waste materials. A Pre-desk Study Assessment from Zetica indicates that a British bomber aircraft crashed on the Principal Site.

Off-site sources may include farmland, with farm buildings and yards where fuel and agricultural materials were/are stored, shown at various locations adjacent to the Principal Site; an active IGas Energy Plc. oil well, located adjacent south-east of the Principal Site; a former brick yard (adjacent north of the eastern part of the Principal Site); and a former metal recycling site/vehicle dismantler, adjacent west of the

Principal Site, south-east of Sturgate and north of Common Lane. The former metal recycling site is located within areas formerly associated with the Sturgate Airfield.

The potential risks identified have been assessed by the preliminary risk assessment as being very low to low. Limited intrusive Site Investigation and Risk Assessment is recommended in the areas of potential contamination to confirm the results of this PRA. Discarded materials and any hazardous materials potentially associated with the vegetated mound (and any associated contaminated soils) are required to be removed from the site to an appropriate facility, prior to construction.

A high-pressure gas main has been identified on the Principal Site during the site reconnaissance.

The information collected as part of this PRA suggests that there are no significant constraints with regards to contamination of soil and groundwater that would limit the development of the site as a solar farm.

The regional unexploded bomb (UXB) mapping published by Zetica shows that the Principal Site lies within a zone that experiences a low risk of UXB. However, part of the Principal Site extends across areas formerly occupied by a currently operative airfield, which is considered a wartime site of interest. A Pre-desk Study Assessment from Zetica recommends that a detailed Unexploded Ordnance (UXO) Assessment is commissioned to assess, and potentially zone, the UXO hazard level at the Principal Site, prior to the commencement of any intrusive works.

2. Introduction

2.1 Terms of Appointment

On the instructions of Tillbridge Solar Ltd (the Client), AECOM Limited (AECOM) has undertaken a Tier 1 Preliminary Risk Assessment (PRA) of the Tillbridge Solar scheme (hereafter referred to as 'the Scheme').

The Scheme will comprise the construction, operation and maintenance, and decommissioning of solar photovoltaic (PV) generating panels and on-site energy storage facilities with export connection to the National Grid. The Scheme will require a Development Consent Order (DCO).

A site location map for the Principal Site is included in Appendix A as Figure 1. Figure 1 shows the maximum area of land potentially required for the construction, operation and maintenance of the Principal Site and includes land required for permanent and temporary purposes. Note that this assessment considers only the Principal Site (i.e. where solar PVs will be installed) and does not consider the Cable Route Corridor (i.e. the connection from the Principal Site to the national grid at Cottam power station) as this area is expected to be refined as the Scheme design progresses.

The Principal Site consists of an approximately 1,400 ha area and comprises the following elements of the Scheme:

- Solar PV Array Works Area.
- Battery Energy Storage System.
- Associated Infrastructure.
- Non-Developable Area/Areas to be Considered for Mitigation.

The operational areas of the Site will be fenced and protected via security measures such as CCTV. Internal access tracks, habitat management and drainage will also be provided within the fenced areas on the Site.

Refer to *Chapter 3: Description of the Scheme* in the EIA Scoping Report for further details about the Scheme.

2.2 Report Objectives

The primary objective of this report is to determine whether potentially contaminative uses have taken place within, or in close proximity to the Principal Site which could have led to the contamination of underlying soils or groundwater. This report aims to identify and evaluate potential land quality risks and development constraints associated with the Scheme and to construct an initial conceptual site model that can be used to inform future decision making and design future ground investigation (if needed).

This report is prepared to support an eventual DCO application under the requirements of Planning Act 2008 (as amended) (Ref 1), the National Planning Policy Framework (2012) (Ref 2), and considers the potential implications of Part 2A of the Environmental Protection Act 1990 (Part 2A) (Ref 3) and the associated Contaminated Land (England) Regulations 2006 (as amended) (Ref 4). Relevant legislation is described in *Chapter 1: Introduction* of the EIA Scoping Report.

The planning policies from relevant National Policy Statements (NPS) that have been considered in this assessment include:

- Overarching NPS for Energy (NPS EN-1) (Ref 5), with particular reference to sections 5.3 Biodiversity and Geological Conservation and 5.15 Water Quality and Resources; and
- NPS for Electricity Networks Infrastructure (NPS EN-5), (Ref 6), with particular reference to impact of electricity networks on soils and geological conservation.

This report has been prepared in general accordance with the technical guidance and procedures described in the UK Government guidance Land Contamination: Risk Management (2019) (Ref 7); British Standard (BS) 5930:2015+A1:2020 Code of Practice for Ground Investigations (BSI) (Ref 8) and BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice (BSI) (Ref 9) to:

- Describe the geology, hydrogeology and shallow mining potential;
- Describe the environmental setting/sensitivity and current/historical land use of the Principal Site and surrounding area;
- Describe the findings of a reconnaissance visit to the Principal Site;
- Summarise the findings of any historical ground investigation work (if available);
- Provide an initial Conceptual Site Model (CSM) for the prevailing ground conditions; and
- Using the source-pathway-receptor model present a preliminary qualitative risk assessment of potential land contamination risks to human (chronic), environmental, and controlled water receptors from contamination sources on or in the vicinity of the Principal Site.

2.3 Sources of Information

This report has been prepared using a combination of published records (e.g. British Geological Survey (BGS), the EA and Department for Environment, Food & Rural Affairs (Defra)). These include statutory records and historical mapping supplied within a Envirocheck report (in WebGIS format) (July 2022) (Ref 10), published geological and hydrogeological mapping, historical borehole records, and observations made during the site reconnaissance visit completed on 21 July 2022. The site reconnaissance visit included a visual walkover (non-intrusive survey) of the Principal Site to identify the range of activities undertaken on-site and any obvious potential sources of ground contamination at the time of writing. The Public Register for Determined Contaminated Land Sites (Ref 40) and List of Landfill Sites (Ref 41) available from the West Lindsey District Council have been also reviewed for any contaminated land within the Principal Site and surrounding areas. A Pre-Desk Study Assessment that looks at readily available records for military activity has also been commissioned from Zetica and included as Appendix E.

Specific information sources are referenced throughout the document and a bibliography is included in Section 13 of this report.

3. Site Setting

3.1 Location

The Principal Site is located directly south of the A631, between the town of Gainsborough and village of Glentworth, in the county of Lincolnshire. The Principal Site is within the administrative area of West Lindsey District Council.

3.2 Description and Setting

The Principal Site comprises an area of approximately 1,400ha. The Principal Site is defined by the red line boundary shown in Figure 1 in Appendix A (hereafter referred to as 'the Principal Site Boundary'). The Principal Site Boundary shows the expected area of land required for the construction, operation and maintenance, and decommissioning of the Principal Site, but not including the Cable Route Corridor. It includes land required for temporary and permanent works. It is important to note that this may be subject to change as the design and EIA progress and comments from stakeholders and the public during the informal and statutory consultation are taken into account.

The Principal Site consists of agricultural fields mainly under arable production, with parcels of pasture, interspersed with individual trees, hedgerows, some small-scattered areas of woodland and farm access tracks. Where there are hedgerows, these generally form the boundaries of fields as they adjoin roads. Several small ponds are scattered across the Principal Site. The fields are separated by a few minor roads and tracks. There are also some agricultural buildings and dwellings dispersed within the main Principal Site area, but which are excluded from the Principal Site Boundary (see Figure 1 (Appendix A)). A vegetated mound of unknown material, discarded tyres and an abandoned car have been identified in an area in the south-eastern part of the Principal Site (refer to Section 7 and Figure 2 in Appendix A).

The topography of the area is relatively flat, with existing ground levels generally between 20m and 30m Above Ordnance Datum (AOD) according to online Ordnance Survey (OS) (Ref 11). B1398 Middle Street, which borders the Principal Site to the east, is defined in landscape terms by its ridge known as Lincolnshire Edge (and Lincoln Cliff). This area is relatively elevated (up to 60m AOD) compared to the general character of the area which is characterised by its flat rural landscape.

Relevant features immediately surrounding the Principal Site are summarised in Table 3-1.

Table 3-1. Features Surrounding the Principal Site

Direction	Summary
North	• The Principal Site is bound by A631 Harpswell Lane, with agricultural land beyond. • At the eastern extent, the residential settlement of Harpswell Hill Park adjoins the Principal Site to the north, north of A631 Harpswell Lane. The village of Hemswell is from approximately 500m north of the Principal Site. Isolated residential dwellings (Hemswell Grange and Moorlands Magin Moor) are also located on the A631 Harpswell Lane, adjacent north of the Principal Site. • A substation is located along the northern boundary of the site (eastern extent of the Principal Site), on the A631 Harpswell Lane, west of Harpswell. Figure 1 in Appendix A shows the substation to be within the current redline, however, it is likely to be excluded from the Principal Site Boundary in due course.
South	• To the south, the Principal Site is bound by agricultural land. • Farm buildings and associated dwellings are adjacent south of the Principal Site, on Common Lane and Kexby Road.

Direction	Summary
East	• The north-eastern part of the Principal Site is bound by B1398 Middle Street (proposed for roadside screen planting), with agricultural land beyond. • An active oil well, Glentworth Oilfield Well 1, is adjacent to the Principal Site. The oil well and associated infrastructure is operated by IGas Energy Plc, and is off Northlands Road (directly adjacent to the south-eastern part of the Principal Site) (refer to Section 7 and Figure 2 in Appendix A). • A reservoir (divided into three sections) is adjacent east of the Principal Site, between Northlands Road and Kexby Road. • The residential property of Northlands Cottages is located adjacent east the Principal Site, north-west of Glentworth. • An oil well is located 1.2km east of the southern part of the Principal Site (refer to Section 7).
West	• Farm buildings and associated dwelling of Church Farm are adjacent west of Principal Site, in School Lane. • Sturgate Airfield is approximately 600m south-west of the Principal Site. • Adjacent to the western boundary of the central part of the Principal Site, is a company that provides large outdoor festival tents. This area was formerly part of the larger Sturgate Airfield. This area also hosted a revoked licensed waste management facility, associated with a metal recycling site/vehicle dismantler (refer Figure 2 in Appendix A).

4. Geological and Environmental Setting

4.1 Introduction

The environmental setting including the topography, geology, hydrogeology and hydrology are the key factors that influence the way in which contaminants in the soil or groundwater can be transported on-site or off-site, and also the way in which contamination can affect applicable receptors including controlled waters and users of the Principal Site and surrounding areas.

The environmental setting of the Principal Site has been assessed by making reference to the information sources detailed in Section 2.3.

4.2 Geology and Soils

4.2.1 Published Geology & Exploratory Hole Records

AECOM has reviewed publicly available information. The published 1:50,000 scale geological map of the area produced by the BGS (Sheet 102, Market Rasen, 1999) (Ref 12) and the BGS Geoindex Onshore online geological mapping (Ref 13) (accessed July 2022) indicates that the Principal Site is underlain by the geological succession summarised in Table 4-1.

Table 4-1. Geological Succession from Published Mapping

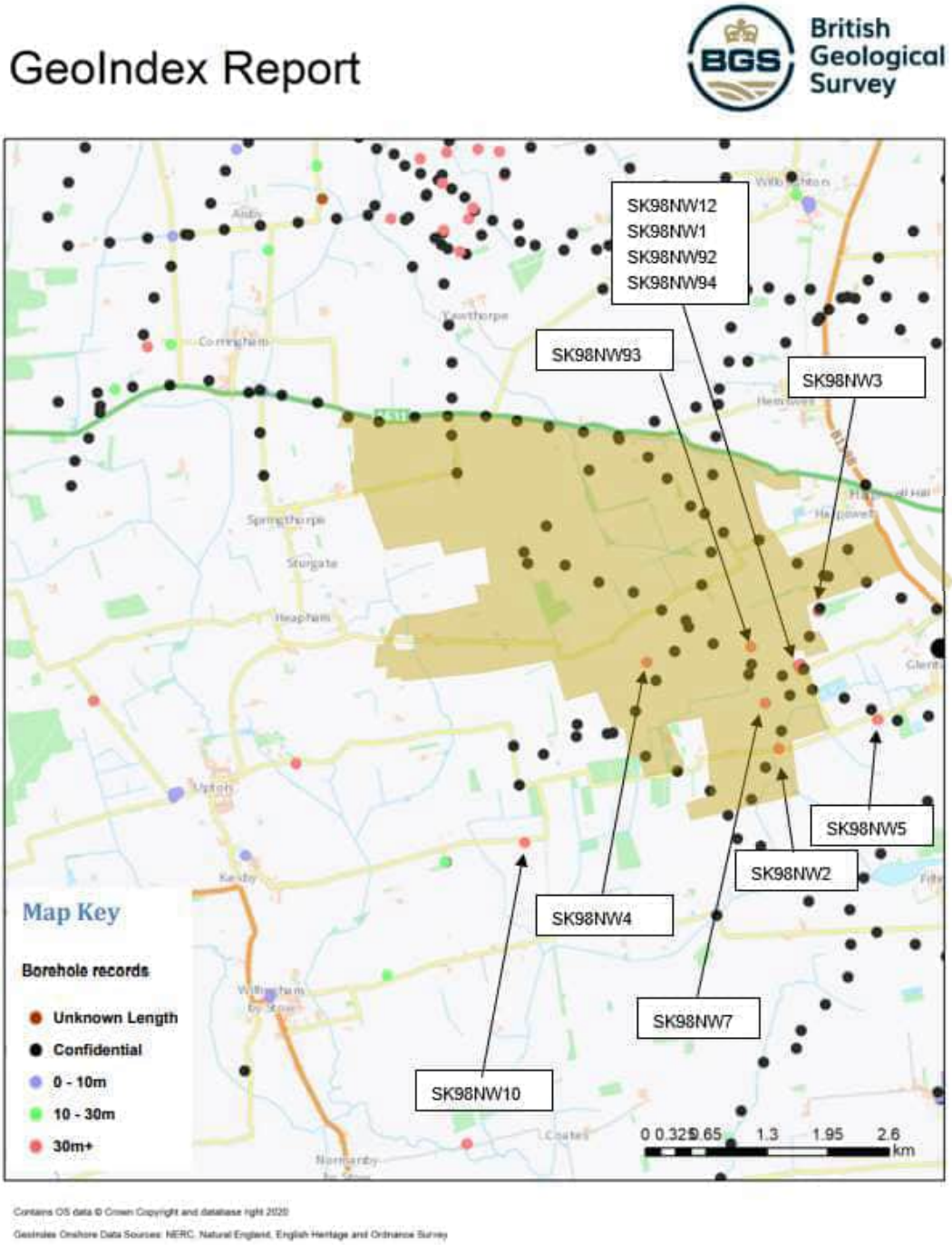
Age	Group or Parent	Geological Stratum	Description	Anticipated Thickness (m) (approximate)	Location
Superficial deposits					
Up to 0.0118 million years ago (Quaternary Period)	Fluvial deposits	Alluvium	Clay, silt, sand and gravel.	Variable	Limited to elongated areas along the River Eau and tributary (north-eastern part of the Principal Site) and Fillingham Beck and tributary (south-eastern part of the Principal Site)
0.116 to 0.86 million years ago (Mid Pleistocene)	NA	Till	Diamicton	Variable	Across most of the Principal Site
0.116 to 0.86 million years ago (Mid Pleistocene)	NA	Glaciofluvial deposits	Sand and gravel	Variable	Small areas across the eastern extent of the Principal Site, west and north of Glentworth.
Bedrock (from east to west)					
170.3 to 168.3 million years ago	Inferior Oolite Group	Lincolnshire Limestone Formation	Limestone	Up to 30m or more.	Along B1398 Middle Street and extending east.
174.1 to 170.3 million years ago	Inferior Oolite Group	Grantham Formation	Sandstone, siltstone and mudstone	Typically, about 2m to 5m.	Adjacent west of B1398 Middle Street.
182.7 to 174.1 million years ago	Lias Group	Whitby Mudstone Formation	Mudstone	120m	Between Harpswell and Glentworth
190.8 to 174.1 million years ago	Lias Group	Marlstone Rock Formation	Ferruginous limestone and ferruginous sandstone	10m	Between Harpswell and Glentworth, to the west of Whitby Mudstone Formation.
199.3 to 182.7 million years ago	Lias Group	Charmouth Mudstone	Mudstone	335m	Across most of the eastern part of Principal Site, from west of Glentworth to Glentworth Road.

Age	Group or Parent	Geological Stratum	Description	Anticipated Thickness (m) (approximate)	Location
		Formation (mudstone)			
190.8 to 209.5 million years ago	Lias Group	Scunthorpe Mudstone Formation	Mudstone and limestone; interbedded.	128m	Across the western part of the Principal Site.

Source: Geological Map BGS Sheet 102, Market Rasen, 1999. BGS Geoindex Onshore online geological mapping (accessed July 2022).

The BGS maintains an archive of historical exploratory borehole records throughout the UK. AECOM has searched the database and those which are considered to provide useful information on the ground profile at the Principal Site are highlighted as part of the extract shown in Figure 4-1 below. Eleven boreholes have been referenced in producing this report. Copies of these exploratory hole records are included as Appendix C and relevant information from the records is considered as part of the Preliminary Ground Model in Section 8.

Figure 4-1 Screenshot of relevant exploratory hole locations from BGS GeoIndex Viewer (Principal Site Boundary is shown in beige and is approximate)



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4.2.2 Soils and Soil Chemistry

Natural England reports the Agricultural Land Classification on the Principal Site to be Grade 3 (good to moderate) (Ref 14). However, Natural England maps represent a generalised pattern of land classification grades and are not sufficiently accurate for use in the assessment of individual fields. The maps do not show the subdivisions of Grade 3, which are normally mapped by a more detailed survey.

An Agricultural Land Classification survey is being undertaken at the Principal Site at the time of writing.

The UK Soil Observatory (UKSO) (Ref 16) provide indicative information on regional concentrations of five potentially harmful elements (PHEs): arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb) in soil. Elevated concentrations of these PHEs can exist because of natural geological conditions or possible anthropogenic contamination. The following estimated soil chemistry levels are attributed to the Principal Site based on the geometric mean concentrations of available data (presented in Table 4-2).

Table 4-2. Estimated Soil Chemistry

Potentially Harmful Element	Estimated geometric mean concentration (mg/kg)
Arsenic	<15
Cadmium	<1.8
Chromium	40 – 60; <100
Lead	<100
Nickel	<15; 15 – 30

Source: UKSO website

4.2.3 Ground Stability Records

Table 4-3 shows the variable risk of ground stability hazards across the Principal Site, taken from the Envirocheck® report (Ref 10).

Table 4-3. Ground Stability Records

Hazard Type	Hazard Potential
Collapsible Hazard	Very low
Compressible Hazard	No hazard
Ground Dissolution Hazard	No hazard
Landslide Hazard	Very low
Running Sand Hazard	No hazard to low
Shrinking or Swelling Clay Hazard	Low to very low

Source: Envirocheck® Report.

4.2.4 Mining and Mineral Extraction

4.2.4.1 Aggregate/Mineral Quarrying, Mining and Mineral Sites

One BGS recorded mineral site, Glentworth Oilfield Well 1, listed as active, is indicated in Northlands Road, directly adjacent to the east of the Principal Site. This site relates to liquid or gas extraction from carboniferous strata (sandstone), and it is operated by IGas Energy Limited (Ref 10) (refer to Figure 2 in Appendix A).

Table 4-4 presents the available information on mining and quarrying operations, past or present that are known to have taken place on-site and within 250m of the Principal Site Boundary (refer to Figure 2 in Appendix A).

Table 4-4. Quarrying (<250m of Principal Site)

National Grid Reference	Distance and Direction	Name	Operator	Status/ Material Quarried
492944, 390227	Adjacent north of the north-eastern part of the Principal Site	Harpswell Brick Yard (opencast)	NA	Ceased/Common clay and shale

Source: Envirocheck® Report.

4.2.4.2 Coal Mining

The Coal Authority's online mining checker (Ref 17) and the Envirocheck® report (Ref 10) identify the Principal Site as not being located on a coal field or an area that has been affected by coal mining. This is supported by the Coal Authority's Interactive Map Viewer (Ref 18), which also states that no evidence of historical or current mining is present.

4.2.5 Radon

The Public Health England (PHE) interactive map for radon (UKRadon.org) (Ref 20) indicates that most of the Principal Site is within a low probability radon area (less than 1% of homes are estimated to be above the Action Level). The PHE interactive map indicates that areas between Harpswell and Glentworth (eastern part of the Principal Site) are characterised by 1-3 % of homes estimated to be above the Action Level. Areas along B1398 Middle Street and adjacent to the west are characterised by over 30% of homes estimated to be above the Action Level. These areas coincide with areas where various bedrock formations are present directly beneath the Principal Site, due to the absence of superficial deposits.

4.2.6 Aquifer Classification

The Environment Agency's Groundwater Protection Policy adopts aquifer designations that are consistent with the Water Framework Directive. Definitions of the various aquifer types can be found on the Environment Agency section of the gov.uk website (Ref 19). According to this system, the superficial deposits underlying the Principal Site are classified as Secondary A Aquifers (Glaciofluvial deposits and Alluvium) and Secondary Undifferentiated Aquifers (Till). The solid geology of the Lincolnshire Limestone Formation is classified as a Principal aquifer; Marlstone Rock Formation as a Secondary A Aquifer; Scunthorpe Mudstone Formation as a Secondary B Aquifer; and Grantham Formation and Charmouth Mudstone Formation as Secondary Undifferentiated Aquifers. Whitby Mudstone Formation is classified as Unproductive Strata.

4.2.7 Groundwater Vulnerability

The Environment Agency's Simplified Groundwater Vulnerability Map in Magic (Ref 15) shows that the Principal Site is located in an area where the groundwater vulnerability to pollution is medium (in the central extent of the Principal Site; areas characterised by the presence of superficial deposits) and medium-high to high (in the eastern part of the Principal Site; areas where the bedrock directly underlies the Principal Site). Significant soluble rocks are likely to be present across the eastern part of the Principal Site, between Glenworth and Hemswell.

All associated terminology/definitions can be found on the Environment Agency section of the gov.uk website (Ref 19).

4.2.7.1 Source Protection Zones and Drinking Water Safeguarding Zones for Groundwater

In terms of identifying the risk of contamination from potentially polluting activities in a given area to groundwater sources (wells, boreholes and springs) used for supplying public drinking water, the Environment Agency identifies Source Protection Zones (SPZ). These show the extent of a groundwater source catchment and are divided into three zones, which can be found on the Environment Agency section of the gov.uk website.

The Principal Site does not lie within a SPZ (Ref 15). There is an area of Zone II (Outer Protection Zone) adjacent east of the Principal Site, east of the B1398 Middle Street. This zone is defined by the 400-day travel time from a point below the water table. Note that this SPZ is over 500m from the indicative areas of solar panels and associated infrastructure (developable areas). There are no other SPZ within 1km of the Principal Site.

The Principal Site does not lie within any Drinking Water Safeguard Zones for groundwater) (Ref 15).

4.2.8 Licensed Groundwater Abstractions

No licensed groundwater abstractions have been identified on-site and within 250m of the Principal Site.

Consultation regarding records of private abstractions held by West Lindsey District Council will be provided within the water chapter of the ES.

4.2.9 Risk of Flooding from Groundwater

The Envirocheck® report (Ref 10) indicates that there is a risk of groundwater flooding occurring at the Principal Site, both at the surface and of property situated below ground level. Refer to *Chapter 11: Flood Risk, Drainage and Surface Water* in the EIA Scoping Report for further details.

4.2.10 Surface Water Courses and Drainage

The Principal Site sits across three Water Framework Directive (WFD) surface waterbodies. The Eau from Source to Northorpe Beck covering the northern and central part of the Principal Site; the Till covering the western part of the Principal Site; and Fillingham Beck which covers the southern part of the Principal Site.

The northern extent of the Principal Site falls within the catchment of the WFD designated Eau Water Body (WFD ID: GB104028057970). The Eau borders the northern extent of the Principal Site, south of A631 (Ref 21). The latest available water quality classification (2019) shows the River Eau to be classified as having a Moderate Ecological Status and Fail Chemical Status. The Environment Agency indicates that River Eau is not achieving a ‘Good’ Chemical Status, due to sewage discharge and poor nutrient management. The surface water network within the Eau water body is comprised of agricultural ditches that drain to the Yawthorpe Beck, a tributary of the River Eau.

The western extent of the Principal Site falls within the catchment of the WFD designated Till (Witham) Water Body (WFD ID: GB105030062500) (Ref 21). A tributary of the River Till crosses the south-western part of the Principal Site. The latest available water quality classification (2019) shows the River Till to be classified as having a Moderate Ecological Status and Fail Chemical Status. The Environment

Agency indicates that River Till is not achieving a 'Good' Chemical Status, due to sewage discharge, poor nutrient management and trade/industry discharge.

The southern extent of the Principal Site falls within the catchment of the WFD designated Fillingham Beck Water Body (WFD ID: GB105030062490). Fillingham Beck, which becomes designated approximately 1.7km south of the Principal Site, is indicated across the southern part of the Principal Site. The Catchment Data Explorer website (Ref 21) indicates that the WFD Fillingham Beck Water Body is at 'Moderate' Ecological Status and 'Fail' for Chemical Status (in 2019). The Environment Agency indicates that Fillingham Beck is not achieving a 'Good' Chemical Status, due to sewage discharge, poor nutrient management and poor soil management and land drainage. The surface water network within the Fillingham Beck water body comprises a network of small, straightened Ordinary Watercourses that are probably artificial drainage ditches, or natural watercourses that have been deepened and modified to facilitate land drainage and agriculture.

In addition to the above watercourses, there are also numerous ponds located across the Principal Site. A reservoir is adjacent to the east of the Principal Site, east of Northland Road.

The Principal Site is not within a Drinking Water Safeguard Zone for surface water or Drinking Water Protected Areas for surface water. A Drinking Water Safeguard Zone for surface water is indicated adjacent east of the Principal Site (designation SWSGZ1000) (Ref 15), east of B1398 Middle Street, although noting that this Drinking Water Safeguard Zone is over 500m from the indicative areas of solar panels and associated infrastructure (developable areas). Drinking Water Safeguard Zones are established around public water supplies where additional pollution control measures are needed. The Drinking Water Safeguard Zone adjacent east of the Principal Site has been designated as water supplies are at risk from pesticides (carbetamide, clopyralid, metaldehyde, propyzamide and quinmerac) (Ref 15).

4.2.11 Licensed Surface Water Abstractions

No Licensed Surface Abstractions have been identified on-site and within 250m of the Principal Site.

Consultation regarding records of private abstractions held by West Lindsey District Council will be provided in the Flood Risk, Drainage and Surface Water chapter of the Environmental Statement.

4.2.12 Risk of Flooding from Surface Water

The indicative floodplain map (Ref 22) for the area, published by the Environment Agency, shows that the risk of surface water flooding at the Principal Site is generally very low (annual chance of flooding of less than 0.1%) with isolated patches of low (chance of flooding of between 0.1% and 1%), medium (chance of flooding of between 1% and 3%) and high risk (chance of flooding of greater than 3.3%) generally associated with the Eau River (northern part of the Principal Site, at Hemswell Grange), with the River Till's tributary (south-western part of the Principal Site) and with Fillingham Beck (southern part of the Principal Site). It is the intention that areas at higher risk of flooding will not be developed with solar panels/associated infrastructure, but will be used for landscape/ecology enhancement and mitigation only.

5. Historical & Planned Development

5.1 Historical Ordnance Survey Mapping & Aerial Photographs

Historical Ordnance Survey (OS) maps of the Principal Site and the wider environs were provided in the Envirocheck® Report (scales 1:2,500, 1:10,560 and 1:10,000) and from Google Earth Pro and these are reviewed in this section. Relevant features are presented in Figure 2 in Appendix A.

The historical Ordnance Survey (OS) maps obtained with the Envirocheck® Report date between mid-1880s and mid-1990s.

Table 5-1 presents a summary of the main features present on and within approximately 250m radius of the Principal Site. It should be noted that only indicative map scales are provided. Where dates are stated, these refer to the dates of maps on which the features are present, have changed use or are no longer annotated, and do not necessarily refer to the exact dates of existence of a particular feature. Development that may have occurred between map editions is recorded as occurring on the later published map, hence there are some limitations to the accuracy of the date of development unless supplementary evidence is available.

Table 5-1. Summary of Historical Mapping

Date/s	Key Features on-site	Key Features off-site
pre-1900	The Principal Site consists of agricultural fields, with limited woodland and farm access tracks. Several small ponds are scattered across the Principal Site. A small pit is indicated on-site, south of Harpswell Lane, in the eastern part of the Principal Site (historical map dated 1885; 1:10,560). This is likely associated with the Harpswell Brick Yard, which is shown off-site to the north. A small copse called Brick Kiln Holt is shown on the eastern boundary (historical map dated 1885; 1:10,560).	The Principal Site is surrounded by agricultural fields, with a few farm buildings adjacent to the Principal Site or 'within' the Principal Site area (but excluded from the Principal Site Boundary). The village of Harpswell is located adjacent north-east of the Principal Site. A brick yard and quarry or pit (Harpswell Brick Yard) is indicated adjacent to the north of the north-eastern part of the Principal Site (historical map dated 1885; 1:10,560).
1900-1910	A few parcels of land across the eastern part of the Principal Site are identified as allotments. A 'Windpump' is identified in the south-eastern part of the Principal Site adjacent to Glentworth Grange.	A smithy is indicated 50m east of the northern part of the Principal Site (historical map dated 1907; 1:10,560). A disused windmill is indicated 160m west of the northern part of the Principal Site (historical map dated 1907; 1:10,560).
1940-1950	No significant change since previous map.	No significant change since previous map.
1950-1960	The south-western part of the Principal Site, south of Common Lane, is shown as occupied by part of an airfield (later indicated as Sturgate airfield), which also extends further to the west. As a potential military target, the precise extent of the airfield is not shown on this map. However, the airfield seems to also occupy the areas to the north of Common Lane, adjacent to the west of the Principal Site (historical map dated 1956; 1:10,000).	A pit is indicated 80m east of the north-eastern part of the Principal Site, west of Harpswell. Military land is identified directly east of the Principal Site alongside the B1398 (historical map dated 1956; 1:10,000).
1970 - 1980	Unspecified tanks are indicated at Hermitage Low Farm House (central part of the Principal Site) (historical map dated 1974; 1:2,500). Unspecified tanks are indicated at Harpswell Low Farm (northern part of the Principal Site) (historical map dated 1978; 1:2,500).	Unspecified tanks are indicated at the western edge of Northlands Road (eastern part of the Principal Site – at the location of the current oil well). An unspecified tank is indicated adjacent to the north (eastern) border of the Principal Site associated with the electricity substation (which is assumed to be excluded from the Principal Site Boundary) (historical map dated 1978; 1:2,500). An unspecified tank is indicated 100m north of the central part of the Principal Site, at Hemswell Grange (historical map dated 1978; 1:2,500). An unspecified tank is indicated 250m east of the north-eastern part of the Principal Site, at Harpswell (historical map dated 1978; 1:2,500).

Date/s	Key Features on-site	Key Features off-site
1980-1990	Sturgate airfield is clearly marked on the map as partially on-site, and is shown to extend across the south-western part of the Principal Site, south of Common Lane and bordering the Principal Site to the west, north of Common Lane.	Unknown Filled Ground is indicated along the northern boundary of the Principal Site (in the north-eastern corner) associated with the former Harpswell Brick Yard. An electricity substation is indicated adjacent to the north (eastern) border of the Principal Site, at Harpswell Lane (north-eastern part of the Principal Site) (historical map dated 1983; 1:2,500). A substation is still present at this location as confirmed by the site reconnaissance (refer to Section 7).
1990 – 2000	No significant change since previous map.	No significant change since previous map.
2000 – 2010	No significant change since previous map.	The aerial photographs (Google Earth) dated between 2003 and 2008 show vehicles parked at the location of the current company that provides large outdoor festival tents (adjacent west of the Principal Site). This area is shown as cleared in the 2011 photograph. The planning application 133771, dated 2015 (refer to Table 5-2), indicates the change of use at this location from the storage of damaged motor vehicles and vehicle spares to the storage of marquees.
2010 - 2020	The aerial photograph (Google Earth) dated 2018 shows a squared feature under construction (NGR: 491444, 38984), south of Harpswell Grange, in the northern part of the Principal Site (shown as completed in 2019 aerial photograph). This is related to a lagoon for the storage of anaerobic digestate (refer to planning application 137647 in Table 5-2).	No significant change since previous map.

5.2 Planning Authority Records

A search of planning application records for the Principal Site and within 250m of the Principal Site using the search facility on the website of West Lindsey District Council (Ref 23) has been undertaken. Table 5-2 summarises the most relevant applications found during the search where potential for impact to the ground or controlled waters may have occurred. The search dated back to 2010 and included Harpswell, Glentworth, Heapham, Corringham and Springthorpe.

Table 5-2. Planning Authority Record

Decision date	Application Status	Location	Reference	Description
18 April 2018	No observation / objections	In the north (sited within the Principal Site area but expected to be excluded from the Principal Site Boundary). Harpswell Grange, Harpswell Lane, Harpswell, DN21 5UW	137647	County matters application to discharge conditions 3,4 and 5 of PL 013417- lagoon for the storage of anaerobic digestate.
31 August 2017	Granted with conditions	In the north (sited within the Principal Site area but expected to be excluded from the Principal Site Boundary). Harpswell Grange, Harpswell Lane, Harpswell, DN21 5UW	136725	Planning application for demolition of existing dwelling and erection of replacement dwelling - resubmission of 135018.
18 October 2010	Granted time limit +conditions	Off-site, adjacent north. Church Farm, Church Lane, Harpswell, Lincs, Lincolnshire, DN21 5UY	126560	Planning Application for new agricultural storage buildings, to allow relocation of existing farmstead - to replace extant planning permission M06-P-0960 granted 22 February 2008.
13 August 2022	Granted time limit +conditions	Off-site, adjacent south. Manor Farm, Common Lane, Heapham, Gainsborough, DN21 5XB	141506	Planning application to erect a covered manure store.

Decision date	Application Status	Location	Reference	Description
07 February 2019	Granted time limit +conditions	Off-site, adjacent south. Land off Common Lane, Heapham, Gainsborough, DN21 5XD	139019	Planning application for change of use for agricultural machinery storage building into log processing and forestry/tree surgery machinery and products.
26 November 2015	Granted time limit +conditions	Off-site, adjacent west. Mobile Structures Management Ltd, Storage Site, Common Lane, Heapham, Gainsborough, DN21 5XD	133771	Planning application for the change of use from the storage of damaged motor vehicles and vehicle spares to the storage of marquees. It is noted that the applicant purchased the site in 2015 and the site was already being used for the purposes for which permission is being sought. It is a retrospective application. Environmental Protection note appended to the application states: "verbally agreed no comments to make regarding contamination due to the change of use nature of the proposals" (Ref 24).

5.3 Other Relevant Site History

5.3.1 Oil Field

IGas Energy Plc. is an on-shore hydrocarbon producer, delivering natural gas and crude oil to the British energy market. The Site is part of the Gainsborough area, which is made up of 10 fields and a processing facility. As indicated in Section 4.2.4.1, Glentworth Oilfield Well 1, listed as active, is located at Northlands Road (adjacent to the east of the Principal Site). This site relates to liquid or gas extraction from carboniferous strata (sandstone). IGas Energy Plc. 2019 Annual Report available from the website (Ref 25) states that:

"*IGas operates an ISO 14001 certified Environmental Management System and by doing so demonstrates, via external assurance, that the systems and processes which we apply to our business in the management and determination of environmental risk are robust….the protection of the environment is a core business objective for IGas. We are committed to working with regulators to ensure that any activity is undertaken safely and with as little impact to the environment as possible. Throughout our operations and the lifecycle of our wells, robust safety measures are in place to protect the environment. IGas operates an ISO 14001 certified Environmental Management System and by doing so demonstrates, via external assurance, that the systems and processes which we apply to our business in the management and determination of environmental risk are robust. We work with the EA and the MPA to ensure that we adhere to high standards through a series of formal and informal audits, review and general discussion with the MPAs and other key regulators. … Throughout the project lifecycle we continually identify, evaluate and mitigate risk and have publicly committed to stringent evaluation prior to determining whether to conduct operations in areas of natural or cultural sensitivity. In England & Wales, onshore oil and gas exploratory activities require environmental permits issued under the Environmental Permitting Regulations (EPR 2010) and other permissions from the environmental regulator, depending on the methods used and the geology of the site. Amongst other things, these activities shall not be carried out within: (a) 10 metres of any watercourse; (b) a groundwater source protection zone 1 or 2, or where a source protection zone has not been defined then within 250 metres of any well, spring or borehole used for the supply of water for human consumption or food production purposes. This must include private water supplies; (c) a specified Air Quality Management Area (AQMA); (d) 200*

metres of a European Site or a Site of Special Scientific Interest; (e) 200 metres of the nearest sensitive receptor; and (f) a flood zone 3".

5.3.2 Sturgate Airfield

Sturgate Airfield is currently operational and located approximately 600m south-west of the Principal Site. On-line sources (Bomber County Aviation Resource website (Ref 27)) and historical maps (refer to Table 5-1) indicate that the south-western part of the Principal Site extends into areas historically occupied by the airfield. The website indicates that the construction of the airfield started in early 1943 and the airfield opened in March 1944. Post-war, the airfield was used by US Air Force until 1959, when it was transferred back to the RAF. Currently, most areas have returned to the original use as farmland, with only a small part of the airfield in use by civilian aircrafts.

On-line sources (Ref 28) also indicate that a bomb store associated with the airfield was located to the north-east of the airfield, and accessed from Common Lane. No detailed information is available; however, this feature may have been located in the area adjacent to the west of the Principal Site, latterly used as metal recycling site/vehicle dismantler, and currently occupied by the company that provides large outdoor festival tents.

5.4 Unexploded Ordnance Risk

5.4.1 Wartime Land-use

Based on a review of historical maps, the Principal Site was open land during wartime Britain and was undeveloped, meaning it was possible for bomb strikes to go unobserved. Part of the Principal Site is located across areas formerly occupied by the Sturgate Airfield, which is considered a wartime site of interest.

The Pre-desk Study Assessment from Zetica (Appendix E) identified one British bomber aircraft crashed on the Principal Site. The Pre-desk Study Assessment also indicates that "*during World War (WW) II the [Principal] Site was located in the Rural District of Gainsborough, which officially recorded 102 No. High Explosive bombs with a bombing density of 1.3 bombs per 405 hectares. No readily available records have been found to indicate that the [Principal] Site was bombed*".

5.4.2 Post War Development

An analysis of the post war historical map does not show visible changes on the land uses of the Principal Site which could indicate potential aerial bombing. However, due to its rural nature, the risk of unexploded Ordnance (UXO) going unnoticed does exist. An on-line search has been undertaken for any mention of recent ordnance discovery reported at or around the Principal Site. The search did not identify any records of ordnance in the study area.

5.4.3 Unexploded Ordnance Mapping

The regional unexploded bomb (UXB) mapping published by Zetica (Ref 30 and Appendix D) show that the Principal Site lies within a zone that experiences a low risk of UXB. It is estimated that the bombing density of the area is 15 bombs or less within 1000 acres.

However, a Pre-desk Study Assessment from Zetica (Appendix E) identified strategic targets in the vicinity of the Principal Site and recommends that a detailed UXO Assessment is commissioned to assess, and potentially zone, the UXO hazard level at the Principal Site, prior to the commencement of any intrusive works.

Historical and Planned Development Key Findings:

The maps show that areas formerly associated with Sturgate Airfield, constructed in the early 1940's, extended across the south-western part of the Principal Site, and border the Principal Site to the west. The remaining areas of the Principal Site were undeveloped land/agricultural fields since the earliest available historical maps (late 1800's), with contamination sources limited to potential application of pesticides and fertilisers for agricultural purposes. Potential contaminative sources identified locally on-site may be associated with small areas of infilled land (associated with former pits/small ponds) which may have been filled with a variety of (potentially unlicensed) waste materials. Farmland, including farm buildings and yards where fuel and agricultural materials were/are stored, are shown at various locations adjacent to the Principal Site. Several historical tanks (contents unknown) are shown in various locations on and adjacent to the Principal Site. An electrical substation exists adjacent the north of the eastern part of the Principal Site since early 1980s. The Pre-desk Study Assessment from Zetica (Appendix E) indicates that one British bomber aircraft crashed on the Principal Site. This may have potentially caused (local) contamination of the ground.

The planning records indicate the presence of various commercial activities and features (agricultural buildings for livestock, storage of damaged motor vehicles and vehicle spares) in the proximity of the Principal Site.

The Pre-desk Study Assessment from Zetica (Appendix E) indicates that "*during WWII the Site was located in the Rural District of Gainsborough, which officially recorded 102No. High Explosive bombs with a bombing density of 1.3 bombs per 405 hectares. No readily available records have been found to indicate that the Site was bombed*".

6. Regulated Activities and Statutory Consultation

6.1 Introduction

The key relevant features that characterise the Principal Site and surrounding area are summarised in this section, along with an indication of the risk to the land quality of the Principal Site.

Generally, any regulated activities within 250m of the Principal Site could, depending upon their nature, represent potential off-site sources of contamination. This section indicates the activities present within 250m. The extent of this study area has been developed using professional judgement on the basis that contamination migration beyond this distance is likely to be minimal. This principle has been applied in assessing similar sites.

6.2 Regulated Processes

Table 6-1 summarises information on regulated processes contained in the Envirocheck® sensitivity data (Ref 10). The Envirocheck® collates data from a variety of sources including the Environment Agency and the BGS.

There were no instances of the following data identified within the information sources reviewed:

- Contaminated Land Register Entries and Notices;
- Prosecutions Relating to Controlled Waters;
- Enforcement and Prohibition Notices;
- Integrated Pollution Controls;
- Local Authority Integrated Pollution Prevention and Control;
- Local Authority Pollution Prevention and Control Enforcements;
- Registered Radioactive Substances;
- Water Industry Act Referrals and Hazardous Substances (Control of Major Accident Hazards Sites (COMAH);
- Explosive Sites;
- Notification of Installations Handling Hazardous Substances (NIHHS);
- Planning Hazardous Substance Consents; and
- Planning Hazardous Substance Enforcements.

The Contaminated Land Register (Ref 40) accessed from the West Lindsey District Council website indicates that there are currently no entries within the West Lindsey District area for:

- Remediation notices;
- Appeals against remediation notices;
- Remediation declarations;
- Remediation statements;
- Appeals against charging notices;

- Designation of special sites;
- Notification of claimed remediation;
- Convictions for offences under Section 78M of the Act;
- Guidance issued under Section 78V(1) of the Act; and
- Other matters prescribed by Regulations.

Table 6-1. Summary of Regulatory Information

Subject	Number present		Details
	On site	0-250m	
Agency & Hydrological			
Discharge Consents	6	1	Five discharge consents are listed on-site and relate to sewage discharges, detailed as follows. • One discharge consent is listed at Springthorpe Grange (northern part of the Principal Site) and relates to sewage discharges into groundwater. Operator Miss N J Watson. • One discharge consent is listed at Harpswell Grange (northern part of the Principal Site) and relates to sewage discharges into groundwater. Operator Messrs F Pickering and Sons. • Two discharge consents are listed at Harpswell Hill Park (northern part of the Principal Site) and relate to sewage discharges – pumping station, and sewage emergency discharges into stream/river (River Eau Catchment). Operator Severn Trent Water Ltd. • One discharge consent is listed at Northlands Road (eastern part of the Principal Site), is operated by Glentworth Scottish Farms Ltd. Destination of the sewage discharge not provided. Note that a vegetated mound of unknown material, discarded tyres and an abandoned vehicle have also been observed at this location (refer to Section 7 and Figure 2 in Appendix A). • One discharge consent is listed at Glentworth Grange in Kexby Road (within the southern part of the Principal Site, but in an area excluded from the boundary), is operated by Glentworth Scottish Farms Ltd. Destination of the sewage discharge not provided.
Integrated Pollution Prevention and Control (IPPC)	NA	8	One effective IPPC, related to Igas Energy Production Limited, and associated with the oil well, is indicated adjacent to the east of the Principal Site, approximately 1km west of Glentworth. Another seven IPPC are listed as superseded by variation, at the same location.
Pollution Incidents to Controlled Waters	5	NA	Five pollution incidents to controlled waters are listed on-site, detailed as follows: • Two incidents occurred at Church Farm, in School Lane (western part of the Principal Site) and related to release of unknown miscellaneous pollutants to Somerby Beck, a tributary of River Till, in March and June 1993. Both these incidents are Category 2 (Significant Incident). • The incident indicated south-west of Glentworth Grange occurred in April 1994 and relates to release of chlorinated water, due to poor operational practice, in an unnamed watercourse. The incident is Category 1 (Major Incident). • The incident indicated west of Glentworth occurred in December 1995 and relates to release of oil/diesel, due to poor operational practice, in Fillingham Beck. The incident is Category 3 (Minor Incident). • The incident indicated west of Harpswell occurred in January 1995 and relates to release of oil/diesel, likely to be in a tributary of River Eau (considering the location of the incident). The cause of this incident was vandalism. The incident is Category 3 (Minor Incident).

Source: Envirocheck Report

6.3 Licensed Waste Management Facilities

There are no recorded landfill sites (operative or historical) located on-site and within 1km of the Principal Site (Ref 31 and Ref 41). There are no licensed waste management facilities on the Principal Site.

A licensed waste management facility, for a mining waste operation, held and operated by IGas Energy Production Limited, is located adjacent to the east of the Principal Site, at the location of the oil well site approximately 1km west of Glentworth.

A revoked licensed waste management facility, consisting of a metal recycling site (vehicle dismantler), operated by W J Furber Ltd, is located adjacent west of the Principal Site, east of Field View, approximately 1km east of Heapham.

A summary of the licensed waste management facilities on-site and within 250m of the Principal Site is given in Table 6-2.

Table 6-2. Licensed Waste Management Facilities (<250km of Principal Site)

National Grid Reference	Distance and Direction	Name	Operator	Status / Dates
489301, 388901	Adjacent west of the Principal Site	Metal recycling site (vehicle dismantler)	W J Furber Ltd	Revoked 26/05/2015
493099, 388088	Adjacent east the Principal Site	Mining Waste Operations	IGas Energy Production Limited	Active

Source: Envirocheck Report

6.4 Industrial Land Use

There are no active or inactive contemporary trade directory entries on the Principal Site. There are one active and three inactive entries within 250m of the Principal Site Boundary, as summarised in Table 6-3. Any significant inactive listings thought not to be covered by the historical development review in Section 5.1 are also noted if present and/or identified. With regards to contemporary trade directory entries, unless otherwise stated, the entry relates to an active listing. No fuel station entries have been identified on-site and within 250m of the Principal Site Boundary.

Table 6-3. Potentially Contaminative Industrial Land Use on and Within 250 m of the Principal Site

Subject	Location	Details
Contemporary Trade Directory Entries	Off-Site	Rinaldi Furniture - Workshops and Repair Centres: adjacent to the east of the northern extent of the Principal Site. G F Tatam & Son - Workshops and Repair Centres (inactive): adjacent to the east of the northern extent of the Principal Site. W J Furber Ltd - car breakers & dismantlers (inactive): adjacent to the west of the Principal Site, north of Common Lane. Abel Chatsworth - damp & dry rot control (inactive): southern part of the Principal Site (excluded from the Principal Site Boundary), on Kexby Road.
Gas Pipelines	On Site	Not provided in the Envirocheck data. Note that demarcating of no dig areas due to high pressure gas mains were observed in the central part of the Principal Site during the site reconnaissance (refer to Section 7).

6.5 Sensitive Land Uses

The Principal Site does not lie within any land-based designations, such as Sites of Special Scientific Interest (SSSI), Environmentally Sensitive Areas, Areas of Outstanding Natural Beauty, Nature Reserves, National Parks, Special Areas of Conservation and Special Protection Areas (Ref 15). The Principal Site is within a nitrate vulnerable zone (Ref 15).

There is no record of Local Geological Sites (LGS) or geological sites of interest on the Principal Site from on-line resources (Ref 15). West Lindsey District Council has been engaged to obtain records of any LGS or geological sites of interest on the Principal Site.

6.6 Regulatory Consultation

Liaison will be undertaken with West Lindsey District Council to obtain records of private and / or unlicensed groundwater and surface water abstractions within the study area as part of the Flood Risk, Drainage and Surface Water Environmental Statement Chapter.

West Lindsey District Council has been contacted to request records of any LGS or geological sites of interest, located within the study area. The response is awaited at time of writing.

7. Site Reconnaissance

An external inspection of the Principal Site was completed by a suitably qualified and experienced AECOM Geo-Environmental Engineer on 21st of July 2022. The aim of the visit was to identify the range of activities carried out on the Principal Site and any obvious potential sources of ground contamination.

A photographic record of the visit is included as Appendix B.

The Principal Site consists of agricultural fields used for crops or grazing. There are a number of lanes and farm buildings dotted throughout the Principal Site area, some of which are excluded from the Principal Site Boundary. Due to the size of the Principal Site, the site walkover took place at several locations spread evenly throughout the Principal Site. Access to some parts of the Principal Site was restricted due to landowner restrictions, hedgerows, foliage and fencing.

Photos 1 - 4 (in Appendix B) show the north-west of the Principal Site. Photo 5 is taken from the south of these western fields and shows a field containing crops. Photos 6 - 9 show crop fields and are taken from the western Principal Site Boundary, with a manure heap visible in Photo 8. The heap covered an area of approximately 10m x 20m.

Photo 10 shows the entrance to a private land parcel (off-site). The AECOM Geo-Environmental Engineer was informed by a local landowner that this gated compound is used by a company providing large outdoor festival tents and that this area had formerly been a part of the larger airfield (Sturgate Airfield). Photo 11 shows the area directly south (on-site), which is used to store agricultural materials. This was also stated to have previously been part of the airfield.

Photo 12 is taken looking north along a gravel track towards a line of Poplar trees from Common Lane (between Grange Farm and Manor Farm). The AECOM Geo-Environmental Engineer was informed by a local landowner that the area to the north of this was due to contain a large bunded chicken waste storage area to store material from a nearby chicken farm. It was stated that this would have a concrete base and was currently under construction.

Photos 13 and 14 are taken further to the east along Common Lane where the road bends to the south and show field access points. Through the gate to the north (Photo 13), lies a gravel track that runs adjacent to a woodland area (Harpswell Wood and Peter's Wood, excluded from Principal Site Boundary). Access to the eastern field is restricted by large boulders. The fields are shown in Photos 15 and 16. A large building which houses free-range chickens is located 300m north of Common Lane (Photo 18), the building is excluded from Principal Site Boundary. Within Harpswell Wood and Peter's Wood (excluded from Principal Site Boundary) which are to the east of the chicken house, a disused pheasant pen was identified with numerous feeders. Empty oil drums were noted in two locations with no visible or olfactory signs of contamination (see Photos 17 and 19).

To the north of Peter's Wood are further agricultural fields (photos 20 and 21 show the views to the west and east respectively). Posts were observed here, and in the distance, demarcating no dig areas due to high pressure gas mains. The route of this gas main could not be determined during the visit using these markers. To the south of the woodland area further along Common Lane (photos 22 and 23 show open agricultural fields on both sides of the road with open access). Further no dig posts were observed showing the gas main running underneath Common Lane. Billyards

Farm is located further north-east along Common Lane, surrounded by agricultural fields. Photo 24 shows the entrance to a track to the east of Billyards Farm, which gives access to the southern fields shown in Photos 25 and 26. Track access is currently restricted by a telegraph pole lying along the floor.

Photo 27 shows the agricultural fields to the north of Common Lane, and a no dig marker demarcating the high-pressure gas main was observed between Billyards Farm and Hermitage Low House Farm (Photo 28). Common Lane continues to the north-east towards Harpswell, with agricultural fields on either side and no hedgerows, Photos 29 and 30.

There is an oil well located to the south-east of the Principal Site (excluded from Principal Site Boundary). This facility comprises a track leading to a gated and fenced compound which contains four 'nodding donkey' pumps of varying sizes, a substation building, tanks for storing crude oil, and a small site office. Three of the smaller size pumps were operating at the time of the visit with the largest stationary (Photo 31). Two boreholes were observed in the corners of the compound (Photo 32).

What appeared to be a recently harvested field is to the south of the oil well compound (Photo 33) and is separated from the compound by an overgrown ditch (Photo 34). The ditch which was dry at the time of the site visit, continued to the north-east, cutting across another field to the east of the oil well compound (Photo 35). Photo 36 shows the agricultural fields are to the north of the compound.

Approximately 200m north of the oil well compound is a wooded area, adjacent to the east of which is a farm waste / storage area. A mound in the western section consists of overgrown loose sand or soil with fragments of concrete visible. The mound was noted to have a distinct smell similar to landfill and is approximately 30m x 20m in area. An abandoned car was present to the south with numerous parts and registration plate missing (Photos 37 and 38). A large amount of manure was stored on unbunded concrete hardstanding, and was approximately 30m x 20m in area (Photo 39). Directly north of the manure heap is a large pile of tyres approximately 10m x 5m in area shown in Photo 40. Photo 41 shows the agricultural fields further to the east.

An area of fly tipping consisting of sand and concrete building materials was found approximately 300m to the east of the Principal Site, shown in Photo 42.

Approximately 280m south of the oil well compound are a number of raised (approximately 5m high) reservoirs (Photo 43). The reservoirs are off-site but directly adjacent to the western site boundary. Waterfowl were observed, and no visual or olfactory evidence of contamination was noted.

Approximately 1.3 km south-east of the Principal Site is another oil well compound (Photo 44). This compound contains two smaller 'nodding donkeys', oil storage tanks, and a small site office. One 'nodding donkey' pump was currently being worked on by a drilling rig and tanker.

The north-eastern section of the Principal Site consists of agricultural fields with a number of farms located throughout and was accessed from A631 Harpswell Lane (Photos 45 – 48). An electricity substation is shown in Photo 46, which is assumed to be excluded from the Principal Site Boundary.

8. Preliminary Ground Model

Based on the review of published geological and hydrogeological information and a selection of historical borehole records, the ground conditions within the Principal Site are considered to comprise the following sequence presented in Table 8-1.

Table 8-1. Preliminary Ground Model

Geology	Description	Thickness	Groundwater
Alluvium	Clay, silt, sand and gravel. Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel.	Variable	Secondary A (Groundwater level not provided)
Till	Diamicton	Variable – 4.5m (refer to BGS borehole SK98NW7 – southern part of the Principal Site)	Secondary (undifferentiated) (Groundwater level not provided)
Glaciofluvial deposits	Sand and gravel	Variable	Secondary A (Groundwater level not provided)
Lincolnshire Limestone Formation	Limestone. Commonly includes sandy limestone in basal part and may contain substantial units of mudstone particularly from the Lincoln area northwards.	Up to 30m or more	Principal (Groundwater level not provided)
Grantham Formation	Sandstone, siltstone and mudstone. Mudstones, sandy mudstones and argillaceous siltstone-sandstone, which is commonly ferruginous, and containing generally abundant plant debris.	Typically 2m to 5m	Secondary (undifferentiated) (Groundwater level not provided)
Whitby Mudstone Formation	Mudstone. Medium and dark grey fossiliferous mudstone and siltstone, with thin siltstone or silty mudstone beds and rare fine-grained calcareous sandstone beds.	120 m	Unproductive (Groundwater level not provided)
Marlstone Rock Formation	Ferruginous Limestone and ferruginous sandstone. Sandy, shell-fragmental and ooidal ferruginous limestone interbedded with ferruginous calcareous sandstone, and	10 m	Secondary A (Groundwater level not provided)

Geology	Description	Thickness	Groundwater
	generally subordinate ferruginous mudstone beds.		
Charmouth Mudstone Formation	Mudstone. Dark grey laminated shales, and dark, pale and bluish grey mudstones.	131 m (refer to BGS borehole SK98NW12 – south-eastern part of the Principal Site)	Secondary (undifferentiated) (Groundwater level not provided)
Scunthorpe Mudstone Formation	Mudstone and limestone; interbedded. Grey, variably calcareous and silty, blocky or fissile mudstone with thin beds of argillaceous limestone (bioclastic or micritic) and calcareous siltstone.	108 m (refer to BGS borehole SK98NW10 – off-site)	Secondary B (Groundwater level not provided)

8.1 Preliminary Gas Risk Assessment

Significant thickness of Made Ground, natural organic deposits and degrading contaminant hotspots have the potential to generate hazardous gases (i.e. methane and carbon dioxide).

The principal source of potential ground gases at the Principal Site is considered to be the alluvial deposits underlying part of the eastern extent of the Principal Site, identified along the River Eau, Fillingham Beck and their tributaries (refer to Table 4-1). Ground gas may be also associated with decomposition of any putrescible materials in Made Ground, likely present in the proximity of farm buildings (many of which are excluded from the Principal Site Boundary); manure heaps and the vegetated mound of unknown material (on-site, refer to Section 7).

Former ponds and pits including the quarry at the former Harpswell Brick Yard to the north-east of the Principal Site could be a source of ground-gas, if infilled with unlicensed material, depending on their organic matter content. However, given the small sizes of these features, the presence of degrading contaminant hotspots that have the potential to generate hazardous gases (i.e. methane and carbon dioxide) is considered unlikely.

No historical landfills are located on-site or within 250m of the Principal Site.

An anaerobic lagoon is located at the Principal Site, south of Harpswell Grange (northern extent of the Principal Site). Typically, anaerobic lagoons are designed to hold and treat wastewater, via anaerobic bacteria degrading pollutants in the absence of oxygen. Potential emission from anaerobic lagoon includes nitrogen oxides, carbon monoxide, methane and sulphur oxides (Ref 26). Lagoons must be covered with a fixed cover and an appropriately designed air abatement and gas capture system. Provided that the requirements of relevant legislation relating to this feature have been integrated within the design, the risk from gases deriving from this feature are considered low. As such, the anaerobic lagoon will not be considered further in the assessment.

Due to the limited ground gases sources identified, and the current use of the Principal Site as agricultural land and the proposed land use as a solar farm, with no

permanently occupied buildings/structures, an intrusive investigation for ground gas is not considered to be necessary.

9. Initial Conceptual Site Model

9.1 Introduction

This section is aimed at identifying possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. It is based on the description of the Scheme as identified in *Chapter 3: Description of the Scheme* in the EIA Scoping Report. The aim of the initial conceptual site model (CSM) is to inform future decision making and the design of any future ground investigation (if needed).

9.2 Assessment Framework

The Principal Site, in terms of potential land contamination, will be regulated by the Local Planning Authorities (West Lindsey District Council) (Ref 1), taking account of the NPPF 2019 (Ref 2), with the Environment Agency, Natural England and Historic England acting as potential statutory consultees.

Environmental liabilities can arise through provisions contained within statutory legislation including Part 2A of the Environmental Protection Act 1990 (Ref 3), the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 33), the Water Resources Act 1991 (Ref 34), the Environmental Permitting (England and Wales) Regulations 2016 and the Water Act 2003 (Ref 36).

Current industry good practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Statutory Guidance to Part 2A (2012) and Land Contamination Risk Management (LCRM) (Ref 7).

The “suitable for use” approach is adopted for the assessment of contaminated land where remedial measures are undertaken where unacceptable risks to human health or the environment are realised taking into account the use (or proposed use) of the land in question and the environmental setting. The proposed end-use for the Principal Site is the installation of PV Panels and on-site energy storage facilities.

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- **Source:** hazardous substance that has the potential to cause adverse impacts; and
- **Pathway:** route whereby a hazardous substance may come into contact with the receptor: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- **Receptor:** target that may be affected by contamination: examples include human occupants/ users of site, water resources (surface waters or groundwater), or structures.

For a risk to be present, there must be a relevant/viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

The following sections detail the CSM which has been developed for the Principal Site with a view to assessing the potential risks/liabilities and constraints associated with the Principal Site in its current condition prior to any development. Risks associated with the proposed development have also been assessed based on a future land use scenario as a solar farm, including any potential sources of contamination, potential

receptors and potential contaminant pathways identified during this desk-based assessment.

9.3 Sources of Potential Contamination

9.3.1 On Site

The potential for a contaminant hotspot has been identified on the Principal Site. This includes the areas historically occupied by the airfield (south-western extent of the Principal Site) and the ground potentially impacted by the vegetated mound of unknown material, discarded tyres, abandoned vehicle and manure heap (south-eastern part of the Principal Site) (refer to Figure 2 in Appendix A). A manure heap was also present in the north-west of the Principal Site.

A small pit (northern part of the Principal Site), which may have been filled with a variety of (potentially unlicensed) waste materials, could be a potential source of local contamination. The presence of other small, infilled pits/historical ponds across the Principal Site cannot be excluded. One British bomber aircraft was reported to have been crashed on the Principal Site; however, the precise location is unknown. This could have caused local contamination of the ground.

Potential contaminants associated with the above sources include metals, semi-metals, asbestos, organic and inorganic compounds. In addition, there is the potential for landfill gases such as methane or carbon dioxide and leachate.

The Principal Site is occupied by agricultural land comprising arable fields. It is considered that although chemicals such as pesticides, herbicides and insecticides may have been used on-site and in its proximity, these chemicals typically have a low residency time in soils and they degrade rapidly in compliance with the requirements for crops and grazing prior to products being used for human consumption. Therefore, agricultural uses are not considered a potential significant source of contamination.

Pollution Incidents to Controlled Waters of Category 3 (Minor Accident) and Category 2 (Significant Accident) identified on the Principal Site occurred almost 30 years ago and are therefore not considered of concern. The Category 1 (Major Accident) occurred in 1994 is also of little significance, given the time passed, and the location at the southern edge of the Principal Site, downgradient from the rest of the Principal Site.

A few drums were identified during the site walkover in the central part of the Principal Site, by Peter's Wood and Harpswell Wood (refer to Photos 17 and 19 in Appendix B). Given that these were empty, and no sign of ground contamination was reported at these locations, the drums have not been included as a potential source of contamination in Table 9-1.

9.3.2 Off Site

The following potential sources of off-site contamination have been identified as requiring consideration:

- Farm buildings and yards where fuel, and agricultural materials were/are stored, (some of which historically had unidentified tanks) at various locations across the Principal Site (but excluded from the Principal Site Boundary) and adjacent to the Principal Site.
- The active IGas Energy Plc. oil well and associated Licenced Waste Management Facility (Mining Waste Operations) (adjacent east of the Principal Site).

- Areas formerly occupied by the Sturgate Airfield (adjacent west of the Principal Site).
- Revoked licenced waste management facility (metal recycling site/vehicle dismantler) (adjacent west of the Principal Site – across the area formerly occupied by the airfield).
- Former Harpswell Brick Yard with quarry (adjacent north of the north-eastern part of the Principal Site).
- Current electricity substation (adjacent north-east of the Principal Site).
- Active and former workshops and repair centres (adjacent east of the northern extent of the Principal Site).
- Former damp & dry rot control (adjacent south of the Principal Site).
- Former smithy (50m east of the northern extent of the Principal Site).

Most of the above sources, including the former brick yard and quarry, former smithy, and the commercial activities, are small scale, hence not considered to be a pertinent off-site source. Potential pathways from contaminants migration to the Principal Site from these locations are also restricted by the low permeability Till deposits, which underlie the majority of the Principal Site.

It is therefore considered that the relevant off-site sources are farm buildings and yards where fuel and agricultural materials were/are stored; the current electricity substation; the metal recycling site/vehicle dismantler and areas formerly occupied by the Sturgate Airfield.

The active IGas Energy Plc. oil well and associated Licenced Waste Management Facility (Mining Waste Operations) (adjacent east of the Principal Site) may also be considered a potential source of contamination due to potential leakages during operation. Tanks and an electricity substation have been also identified at this location. However, this site has an associated IPPC. This means that for this site the regulators have set permit conditions so as to achieve a high level of protection for the environment, including land and water.

9.4 Summary of potential sources

Table 9-1 indicates the potential contaminants that may be associated with the current land use.

Table 9-1. Potential Sources of Contamination

Source Reference	Location	Potential Sources	Associated Contaminants of Potential Concern (CoPC)
S1	On-Site	Made Ground (former quarry/pits) Material associated with the British bomber aircraft crashed on the Principal Site, and potentially dispersed across the Principal Site.	Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), total petroleum hydrocarbon (TPH), polyaromatic hydrocarbons (PAH), semi-volatile organic compound (SVOCs), Volatile Organic Compound (VOCs), asbestos and asbestos containing materials (ACMs). Ground gases (such as methane or carbon dioxide) and leachate.

Source Reference	Location	Potential Sources	Associated Contaminants of Potential Concern (CoPC)
S2	On-Site	Potentially hazardous materials at the location of the vegetated mound (with landfill odour), manure heap, tyres and the abandoned vehicle. This area is associated with a sewage discharge (refer to Table 6-3) Manure heap in the north west of the Principal Site.	Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), TPH, SVOCs, VOCs, asbestos, ACMs, pesticides and fertilisers.
S3	On-Site	Areas formerly occupied by the Sturgate Airfield	Heavy metals and inorganics (including acidic/alkaline pH, cyanide complex), oil/fuel hydrocarbons, aromatic hydrocarbons, chlorinated aliphatic hydrocarbons, PCBs, PFAS.
S4	Off-Site	Licenced Waste Management Facility (Mining Waste Operations) - Active IGas Energy Plc. oil well	Oil Polychlorinated biphenyls (PCBs) associated with electrical substation
S5	Off-Site	Revoked licenced waste management facility (metal recycling site/vehicle dismantler) (this area was also formerly occupied by the Sturgate Airfield)	Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), TPH, SVOCs, VOCs, asbestos, ACMs.
S6	Off-Site	Farm buildings and yards where fuel and agricultural materials were/are stored, including the chicken shed (Photo 18)	Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), TPH, SVOCs, VOCs, asbestos, ACMs, pesticides and fertilisers.
S7	Off-Site	Electrical substation	PCBs

9.5 Potential Receptors

9.5.1 On-Site Receptors

The principal human receptors on-site are considered to be: current site users, including farmers, site visitors and general public using PRoW; construction and maintenance workers; and future site users, including maintenance workers, and general public using PRoW, as these will remain following development.

The controlled water receptors include groundwater (Secondary Aquifers and Principal Aquifer), and surface water (River Eau, Fillingham Beck, tributaries of these watercourses, River Till's tributary, drains, ponds and reservoirs).

Property receptors include crops, livestock, existing buildings and future PV mounting structure and cables.

There are no sensitive ecological receptors associated with the Principal Site.

9.5.2 Off-Site Receptors

The principal human receptors off-site are considered to be neighbours in residential/commercial properties adjacent to the Principal Site and the general public in the areas adjacent the Principal Site. Residents/workers in the farm buildings and associated dwellings located across the Principal Site (but excluded from the Principal Site Boundary) have been considered as off-site receptors.

Property receptors include crops and livestock.

9.5.3 Summary of Potential Receptors

Potential receptors associated with the potential development are shown on Table 9-2.

Table 9-2. Potential Receptors

Receptor Reference	Receptor	Description
R1	Human Health: Acute[1]	Construction and maintenance workers
R2	Human Health: Acute	Current Site Users: farmers/site visitors/general public on the Site using the PRoW
R3	Human Health	Future Site Users: farmers/site visitors/trespassers/general public using the PRoW
R4	Human Health: Acute	Adjacent site users during earthworks, (neighbours in residential/commercial properties adjacent to the Principal Site and general public in the areas adjacent the Principal Site)
R5	Water Environment: Aquifers	Secondary A Aquifers (superficial deposits of the Alluvium and glaciofluvial deposits; and bedrock of the Marlstone Rock Formation) Secondary B Aquifer (bedrock of Scunthorpe Mudstone Formation) Secondary Undifferentiated (superficial deposits of the Till; and bedrock of Grantham Formation and Charmouth Mudstone Formation) Principal Aquifer (bedrock of Lincolnshire Limestone Formation)
R6	Water Environment: Surface waters	River Eau River Till's tributary Fillingham Beck Drains, ponds and reservoirs
R7	Property	Livestock and Crops
R8	Buildings & Infrastructure: Concrete	Future proposed infrastructures (PV Mounting Structure and cables)
R9	Buildings & Infrastructure: Structures	Proposed structures
R10	Buildings & Infrastructure: Services	Potable water supply pipes and other services (off-site).

[1] Refer to a considerable exposure to contaminated land in a short period of time (for example during construction activities).

9.6 Potential Pathways

9.6.1 On-Site Pathways

The human health exposure pathways that are considered viable based on UK guidance (Environment Agency, Contaminated Land Exposure Model "CLEA UK") (Ref 29) are listed below:

- Direct contact, dermal absorption or ingestion of soil.
- Ingestion of fruit and vegetables and/or waters.
- Inhalation of soil particulates derived from soils.
- Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion).

The evaluation of exposure pathways for controlled waters receptors requires an understanding of geological and hydrogeological pathways beneath the Principal Site. The controlled waters pathways considered viable with respect to the Principal Site are as follows:

- Spillage/loss/run off from surface direct to receiving water.
- Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater.
- Lateral migration in groundwater and baseflow into surface waters.

The property receptor (crops and livestock) pathways considered viable with respect to the Principal Site are as follows:

- Direct contact, dermal absorption or ingestion of soil / ingestion of fruit and vegetables and/ or waters/inhalation of soil particulates derived from soils.

The buildings and infrastructure pathways considered viable with respect to the Principal Site are as follows:

- Direct contact of buried concrete (proposed PV Mounting Structure and cables) with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate).
- Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches.

9.6.2 Summary of Potential Pathways

Potential pathways associated with the Scheme are shown in Table 9-3.

Table 9-3. Potential Pathways

Pathway Reference	Receptor	Description
P1	Human Health / Property: People (Human Health) and animals (Property)	Direct Pathway: direct contact, dermal absorption or ingestion of soil.
P2	Human Health / Property: People (Human Health) and animals (Property)	Indirect Pathway: inhalation of soil particulates or vapour derived from soils.
P3	Human Health: People (Human Health)	Indirect Pathway: migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/explosion)
P4	Water Environment: Surface water	Direct Pathway: spillage/loss/run off from surface direct to receiving water
P5	Water Environment: Groundwater	Indirect Pathway: leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater

Pathway Reference	Receptor	Description
P6	Water Environment: Surface water / Groundwater	Indirect Pathway: lateral migration in groundwater and baseflow into surface waters
P7	Property: Crops and livestock	Indirect Pathway: uptake via root system and ingestion
P8	Buildings and Infrastructure: Concrete	Direct Pathway: direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate).
P9	Buildings and Infrastructure: Supply pipes	Direct Pathway: direct contact of services and supply pipes with contaminated soils.
P10	Buildings & Infrastructure: Structures	Indirect Pathway: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches

10. Environmental Risk Assessment

10.1 Risk Assessment Principles

Current industry good practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on Land Contamination: Risk Management (LCRM) (Ref 7).

For a risk to be present, there must be a viable contaminant linkage (at the current site condition and/or during construction and/or when the Scheme is complete and operational); i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessments of risks associated with each of these contaminant linkages are discussed in the following sections. The methodology adopted within this Preliminary Risk Assessment does not intend to reflect the EIA Methodology, as described in *Chapter 6: Environmental Impact Assessment Methodology* in the EIA Scoping Report.

Using criteria broadly based on those presented in in Section 6.3 of the CIRIA Report "Contaminated Land Risk Assessment: A Guide to Good Practice" (CIRIA Report C552) (Ref 32), the magnitude of the risk associated with potential contamination at the DCO Principal Site has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity); and
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table 10-1.

10.2 Risk Assessment Framework

Table 10-1. Description of Severity of Risk

Term	Description
Severe	– Highly elevated concentrations likely to result in significant harm to human health. – Catastrophic damage to crops, buildings or property (e.g. by explosion). – Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects of water quality. – Major damage to aquatic or other ecosystems.
Medium	– Elevated concentrations which could result in significant harm to human health. – Significant damage to crops, buildings or property (e.g. damage to building rendering it unsafe). – Equivalent to EA Category 2 pollution incident including significant effect on water quality. – Significant damage to aquatic or other ecosystems.

Term	Description
Mild	– Exposure to human health unlikely to lead to significant harm. – Minor damage to crops, buildings or property (e.g. surface spalling to concrete). – Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality. – Minor or short-lived damage to aquatic or other ecosystems.
Minor	– No measurable effect on humans. – Repairable effects of damage to buildings, structures and services. – Equivalent to insubstantial pollution incident with no observed effect on water quality of ecosystems.

The probability of the risk occurring is classified according to the criteria in Table 10-2.

Table 10-2. Likelihood of Risk Occurrence

Likelihood	Explanation
High	Contaminant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 10-3.

Table 10-3. Risk based on Comparison of Likelihood and Severity

		Severity			
		SEVERE	**MEDIUM**	**MILD**	**MINOR**
Likelihood	**HIGH**	Very High	High	Moderate	Low
	LIKELY	High	Moderate	Moderate/Low	Low
	LOW	Moderate	Moderate/Low	Low	Very Low
	UNLIKELY	Moderate/Low	Low	Very Low	Very Low

10.3 Preliminary Risk Assessment

A CSM illustrating plausible contaminant linkages has been formulated for the Principal Site. The qualitative preliminary risk assessment of the possible linkages of the above sources (S1 to S7), transport pathways (P1 to P11) and receptors (R1 to R11) is provided in the Table 10-4.

The level of risk is determined based on the current condition of the Principal Site (i.e. the effects of mitigation measures are not included).

The preliminary risk assessment undertaken within this section does not consider acute[2] linkages for construction and maintenance workers. It is anticipated that these acute linkages will be managed by appropriate health and safety measures. As construction workers are protected under existing health and safety legislation, any potential effects are considered to be temporary and will be avoided, prevented and reduced through the implementation of standard mitigation measures to be incorporated into a CEMP. Work will be undertaken in accordance with relevant Construction Design Management (CDM) Regulations 2015 (Ref 37).

[2] Refers to a considerable exposure to contaminated land in a short period of time (for example during construction activities).

Table 10-4. Potential Sources, Pathways and Receptors

Source	*Pathway*	*Receptor*	*Potential Severity*	*Likelihood of Occurrence*	*Potential Risk*	*Justification*
S1: Made Ground (Infilled pits/quarry) Material associated with the British bomber aircraft crashed on the Principal Site, and potentially dispersed across the Principal Site. *Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), TPH, PAH, SVOCs, VOCs, asbestos and ACMs.* *Gases such as methane or carbon dioxide and leachate*	P1: Direct contact, dermal absorption or ingestion of soil.	R2: Current Site Users	Mild	Unlikely	Very Low	The British bomber aircraft crashed at the Principal Site may have resulted in localised ground contamination. Made ground of unknown quality may be associated with infilling of the pits/former ponds on site. The volume of the infill is relatively small and unlikely to represent a significant widespread issue. Current users are farmers and general public who might be exposed to soils. Future users include site visitors/trespassers/general public on the Principal Site using the PRoW who might be exposed to soils. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable, given the current use of the site as agricultural fields and the proposed use of the site as a Solar farm.
	P1: Direct contact, dermal absorption or ingestion of soil.	R3: Future Site Users	Mild	Unlikely	Very Low	
	P1: Direct contact, dermal absorption or ingestion of soil.	R7: Property (livestock/ crops)	Minor	Unlikely	Very Low	Livestock may be present on-site; and small grazing animals such as sheep may be present on-site after construction. The risk of harm to livestock and small grazing animals is considered to be very low, since limited potential for ground contamination has been identified at the Principal Site. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P2: Inhalation of soil particulates and vapour derived from soils.	R2: Current Site Users	Mild	Unlikely	Very Low	Limited potential for ground contamination has been identified at the Principal Site. Limited potential for soil vapour exists at the Principal Site, given the age of the potentially infilled pits/former ponds and quarry. Therefore, risk of inhalation of soil particulates is considered to be very low. Livestock may be present on-site; and small grazing animals such as sheep may be present on-site after construction. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
		R3: Future Site Users	Mild	Unlikely	Very Low	
		R7: Property (livestock)	Mild	Unlikely	Very Low	
	P3: Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion)	R3: Future Site Users	Medium	Unlikely	Low	Ground gas accumulation and potential explosion risk is generally unlikely at the Principal Site, given that limited potential sources of hazardous gases/vapours have been identified. The proposed development will include on-site structures such as inverters, transformers, battery storage and sub-stations. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Justification
	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Aquifers	Minor to Medium	Unlikely	Very Low to Low	Complete pathways may be present but current information suggests a gross source is unlikely. The risk of harm to groundwater from leaching of contaminants is considered between low (for Secondary A Aquifers – Alluvium, glaciofluvial deposits and Marlstone Rock Formation); and very low (for both Secondary B Aquifer - Scunthorpe Mudstone Formation; and Secondary (undifferentiated) Aquifers - Till, Grantham Formation and Charmouth Mudstone Formation). The risk is considered to be Low for Principal Aquifer - Lincolnshire Limestone Formation, as this aquifer only borders the Principal Site to the east.
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. The risk of harm to surface waters from lateral migration in groundwater and baseflow into surface waters is very low.
	P7: Uptake via root system	R7: Property (crops	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. Potential risk from direct contact with contaminated soils for crops is considered very low.
	P8: Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate).	R9: Buildings and Infrastructure: Concrete (PV Mounting Structure and cables)	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. Potential risk from direct contact with contaminated soils for buried concrete and infrastructure (PV Mounting Structure and cables) is considered very low.
	P9: Direct contact of services and supply pipes with contaminated soils.	R10: Buildings and Infrastructure: Supply pipes	Minor	Unlikely	Very Low	Complete pathways may be present for water supply pipes at properties located on-site and off-site from on-site sources, but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Justification
	P10: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches	R9: Buildings and Infrastructure: Structures	Mild	Unlikely	Very Low	Ground gas accumulation and potential explosion risk is generally unlikely at the Principal Site, given that limited potential sources of hazardous gases/vapours have been identified. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
S2: Potentially hazardous materials at the location of the vegetated mound (with landfill odour), manure heap, tyres and the abandoned vehicle. Manure heap in the north west of the Principal Site Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), TPH, SVOCs, VOCs, asbestos, ACMs, pesticides and fertilisers.	P1: Direct contact, dermal absorption or ingestion of soil.	R2: Current Site Users	Mild	Low	Low	Potentially hazardous materials may be associate with the vegetated mound; manure heaps, tyres and the abandoned vehicle. The volume of materials is relatively small and unlikely to represent a significant widespread issue. Current users are farmers and general public. Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	P1: Direct contact, dermal absorption or ingestion of soil.	R3: Future Site Users	Mild	Unlikely	Very Low	The mound, manure heaps, tyres and the abandoned vehicle (and any associated contaminated soils) will be removed from the Principal Site during the construction of Scheme. Potential residual contamination is unlikely to persist at this location. Future users include site visitors/trespassers/general public on the Principal Site using the PRoW who might be exposed to soils in this area. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable, given the proposed use of the Principal Site.
	P1: Direct contact, dermal absorption or ingestion of soil.	R7: Property (livestock/ crops)	Minor	Low	Very Low	Livestock may be currently present on-site; and small grazing animals such as sheep may be present on-site after construction. The risk of harm to livestock and small grazing animals is considered to be very low, considering the limited scale of these potentially contaminated areas. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P2: Inhalation of soil particulates and vapour derived from soils.	R2: Current Site Users	Minor	Low	Very Low	A distinct smell similar to landfill was observed at this location during the site reconnaissance. Therefore, risk of inhalation of vapours and soils particulates, albeit very low, exists. Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	P2: Inhalation of soil particulates and	R3: Future Site Users	Minor	Unlikely	Very Low	The mound, manure, tyres and the abandoned vehicle (and any associated contaminated soils) is expected to be removed from the Site prior to construction of Scheme. Potential residual contamination is unlikely to persist at this location.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Justification
	vapour derived from soils.					Therefore, risk of inhalation of soil particulates from this location is considered to be very low. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P3: Migration of hazardous gases/vapours via permeable strata into confined spaces (asphyxiation/ explosion)	R3: Future Site Users	Medium	Unlikely	Low	This contaminated source will be removed prior construction. Ground gas accumulation and potential explosion risk deriving from this source once the Scheme is complete is therefore highly unlikely. The Scheme will include switch housing/control room in terms of structures. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Secondary Aquifers	Minor	Likely	Low	Complete pathways may be present but current information suggests a gross source is unlikely. This area is underlain by Secondary (undifferentiated) Aquifers (Till over Charmouth Mudstone Formation). The risk of harm to groundwater from leaching of contaminants is considered low (for Secondary (undifferentiated) Aquifers - Till and Charmouth Mudstone Formation).
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. The risk of harm to surface waters from lateral migration in groundwater and baseflow into surface waters is very low.
	P7: Uptake via root system	R7: Property (livestock/ crops)	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Potential risk from direct contact with contaminated soils for crops is considered very low. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P8: Direct contact of buried concrete with contaminated soils (i.e. hydrocarbons) and aggressive ground conditions (pH and sulphate).	R8: Buildings and Infrastructure: Concrete (PV Mounting Structure and cables)	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. Potential risk from direct contact with contaminated soils for buried concrete and infrastructure (PV Mounting Structure and cables) is considered very low.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Justification
	P10: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches	R9: Buildings and Infrastructure: Structures	Mild	Low	Low	Ground gas accumulation and potential explosion risk is generally unlikely at the Principal Site, given that limited potential sources of hazardous gases/vapours have been identified. Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
S3: Areas formerly occupied by the Sturgate Airfield. Heavy metals and inorganics (including acidic/alkaline pH, cyanide complex), oil/fuel hydrocarbons, aromatic hydrocarbons, chlorinated aliphatic hydrocarbons, PCBs, PFAS.	P1: Direct contact, dermal absorption or ingestion of soil.	R2: Current Site Users	Mild	Low	Low	Potential localised contaminant hotspots may be associated with the area formerly occupied by the Sturgate Airfield. Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	P1: Direct contact, dermal absorption or ingestion of soil.	R3: Future Site Users	Mild	Unlikely	Very Low	Potential localised contaminant hotspots may be associated with the area formerly occupied by the Sturgate Airfield. This area will not be developed with the solar farm infrastructures but will be used for mitigation. Should any potentially contaminated ground, including isolated 'hotspots' of contamination and/or potential deposits of asbestos containing materials (ACM), be encountered, the contractor would be required to investigate the areas and assess the need for containment or disposal of the material. In the event that contamination is identified, appropriate remediation measures would be taken to protect construction workers, future site users, water resources, structures and services (refer to Table 10-5). Given the above, residual contamination is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable, given the proposed use of the site.
	P1: Direct contact, dermal absorption or ingestion of soil.	R7: Property (livestock/ crops)	Minor	Low	Very Low	Livestock may be currently present on-site; and small grazing animals such as sheep may be present on-site after construction. The risk of harm to livestock and small grazing animals is considered to be very low, since limited potential for ground contamination has been identified at the Principal Site. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Justification
	P2: Inhalation of soil particulates and vapour derived from soils.	R2: Current Site Users	Minor	Low	Very Low	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
		R7: Property (livestock/ crops)	Minor	Low	Very Low	
	P2: Inhalation of soil particulates and vapour derived from soils.	R3: Future Site Users	Mild	Unlikely	Very Low	Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P2: Inhalation of soil particulates and vapour derived from soils.	R7: Property (livestock/ crops)	Minor	Unlikely	Very Low	
	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Secondary Aquifers	Minor to Medium	Unlikely	Very Low to Low	Complete pathways may be present but given that area is unpaved, any potential contamination is likely already dispersed. The risk of harm to groundwater from leaching of contaminants is considered between low (for Secondary A Aquifers – glaciofluvial deposits) and very low (for Secondary B Aquifer - Scunthorpe Mudstone Formation).
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. The risk of harm to surface waters from lateral migration in groundwater and baseflow into surface waters is very low.

Source	*Pathway*	*Receptor*	*Potential Severity*	*Likelihood of Occurrence*	*Potential Risk*	*Justification*
	P7: Uptake via root system	R7: Property (livestock/ crops)	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. Potential risk from direct contact with contaminated soils for crops is considered very low.
	P9: Direct contact of services and supply pipes with contaminated soils.	R10: Buildings and Infrastructure: Services	Minor	Unlikely	Very Low	Complete pathways may be present for water supply pipes at properties located on-site and off-site from on-site sources, but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P10: Migration of hazardous gases/vapours via permeable strata into enclosed spaces and service/utility trenches	R10: Buildings and Infrastructure: Structures	Mild	Low	Low	Ground gas accumulation and potential explosion risk is generally unlikely at the Principal Site, given that limited potential sources of hazardous gases/vapours have been identified. Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
S4: Off-site Licenced Waste Management Facility (Mining Waste Operations) - Active IGas Energy Plc. oil well Oil PCB associated with electrical substation	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Secondary Aquifers	Minor	Unlikely	Very Low	This site is associated with an IPPC. This means that for this site the regulators have set permit conditions so as to achieve a high level of protection for the environment, including land and water. IGas Energy Plc. operate an ISO 14001 certified Environmental Management System that ensures robust safety measures are in place to protect the environment at this location (refer to 5.3). Leakage from the electrical substation and oils spill during operation cannot be excluded at this location. There is no record of historical incidents at this location.
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests this is unlikely. This area is underlain by Secondary (undifferentiated) Aquifers (Till over Charmouth Mudstone Formation). The risk of harm to groundwater from leaching of contaminants and migration to the Principal Site is considered very low for Secondary (undifferentiated) Aquifers - Till and Charmouth Mudstone Formation.

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk	Justification
S5: Off-site revoked licenced waste management facility (metal recycling site/vehicle dismantler) Heavy metals and inorganics (including sulphate, nitrate, phosphate, ammoniacal nitrogen, acidic/alkaline pH), TPH, SVOCs, VOCs, asbestos, ACMs. This area was also formerly occupied by the Sturgate Airfield	P2: Inhalation of particulates derived from soils	R2: Current Site Users	Mild	Low	Low	Potential localised contaminant hotspots may be associated with the area formerly occupied by metal recycling site/vehicle dismantler and the Sturgate Airfield, located adjacent to the Principal Site to the west. Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
		R3: Future Site Users	Mild	Low	Low	
	P2: Inhalation of particulates derived from soils	R7: Property (livestock/ crops)	Minor	Low	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. The risk of harm to livestock/small grazing animals is considered to be very low.
	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Superficial Secondary Aquifers	Minor	Low	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely, considering the time passed since these areas were developed. The absence of hardstanding across these areas is likely to have allowed the continual infiltration of rain and as such the leaching of potential contaminants into shallow perched / groundwater allowing dispersion and dilution of contaminants over time. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	Potential water receptors underlying these areas are Secondary B Aquifer - Scunthorpe Mudstone Formation and Secondary (undifferentiated) Aquifers – Till. The risk of harm to groundwater from leaching of contaminants and lateral migration to the Principal Site is considered very low.
S6: Off-site farm buildings and yards where fuel and agricultural materials were/are stored, including the chicken shed. Metals, semi-metals, asbestos, organic and inorganic compounds, pesticides and fertilizers.	P2: Inhalation of particulates derived from soils	R2: Current Site Users	Mild	Unlikely	Very Low	Potential localised contaminant hotspots may be associated with the farm buildings located across the Principal Site (but excluded from the Principal Site Boundary) and adjacent to the Principal Site at various locations; Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.
		R3: Future Site Users	Mild	Unlikely	Very Low	
	P2: Inhalation of particulates derived from soils	R7: Property (livestock/ crops)	Minor	Unlikely	Very Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. The risk of harm to livestock/small grazing animals is considered to be very low.

Source	*Pathway*	*Receptor*	*Potential Severity*	*Likelihood of Occurrence*	*Potential Risk*	*Justification*
	P4: Spillage/loss/run off from surface direct to receiving water	R6: Surface waters	Minor to Medium	Unlikely	Very Low to Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. The risk of harm to surface waters from run off from off-site contaminated soil is considered between very low (for drains and ponds located on-site) to low (River Eau, River Till's tributary, Fillingham Beck and tributaries).
	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Superficial Secondary and Principal Aquifers	Minor to Medium	Unlikely	Very Low to Low	Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. The risk of harm to groundwater from leaching of contaminants and lateral migration to the Principal Site is considered between low (for Principal Aquifer - Lincolnshire Limestone Formation and for Secondary A Aquifers – Alluvium, glaciofluvial deposits and Marlstone Rock Formation) and very low (for Secondary B Aquifer - Scunthorpe Mudstone Formation and for Secondary (undifferentiated) Aquifers - Till, Grantham Formation and Charmouth Mudstone Formation)
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	
S7: Off-site electrical substation (PCB).	P5: Leaching of chemicals and vertical migration via permeable unsaturated strata to shallow groundwater	R5: Superficial Secondary Aquifer	Minor	Unlikely	Very Low	An electrical substation is present adjacent north-east of the Principal Site since at least 1983. This area is paved and well maintained, but it may not have been in the same condition in the past. PCB may be present in soil, associated with oil in the electrical sub-station. Complete pathways may be present but current information suggests a gross source is unlikely. Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable. The risk of harm to groundwater from leaching of contaminants and lateral migration to the Principal Site is considered very low for the aquifers underlain this location, i.e. Secondary (undifferentiated) Aquifers – Till and Charmouth Mudstone Formation.
	P6: Lateral migration in groundwater and baseflow into surface waters	R6: Surface waters	Minor	Unlikely	Very Low	

10.4 Environmental Design and Management

A number of environmental mitigation measures are expected to be employed as standard to minimise impacts to both human health and controlled waters from the Scheme. The mitigation measures are anticipated to be implemented in order to avoid, prevent, reduce or offset the following potential impacts:

- Human exposure through direct contact / inhalation / dermal uptake of contaminants;
- Creation of preferential pathways and mobilisation of contamination;
- Contamination of natural soils, driving of contamination into an aquifer during piling, contamination of groundwater with concrete, paste or grout;
- Pollution and degradation of water quality of any underlying aquifer;
- Infiltration and / or run off into the local drainage / sewerage network – pollution of drainage and sewerage network and any adjacent surface water features;
- Run-off and infiltration of contaminants from material stockpiles;
- Contamination of drainage and sewerage network and / or groundwater; and
- Spread of nuisance dusts and soils to the wider environment and local roads.

A Framework Construction Environmental Management Plan (CEMP) will be developed, taking into account comments from the Local Planning Authority (LPA), as part of the DCO application for the Scheme. A detailed CEMP will be produced for the Scheme following the appointment of the Principal Contractor in accordance with a Requirement of the DCO, prior to commencing construction.

Table 10-5 lists the standard or tertiary mitigation measures which will be included in the Framework CEMP. These mitigation measures, defined by IEMA (Ref 38) are considered to be standard measures that form part of the general environmental management of the Scheme.

The assessment of potential effects set out in the preceding sections takes into account that these measures will be implemented.

Table 10-5. Construction Standard or Tertiary Environmental Mitigation Measures

Potential Impact	Mitigation / Enhancement Measure
Potential for risks to human health associated with waste generation, land contamination, airborne contamination and groundwater contamination. The discovery of ground contamination during groundworks. Levelling of the Principal Site including the possible introduction of new fill materials.	Ground investigation works (if required) will be undertaken prior to commencing construction. Results would be reviewed by the appointed contractor, including any additional investigation or mitigation measures beyond the impact avoidance measures stated here. Best practice avoidance and mitigation measures proposed include: • All workers would be required to wear Personal Protective Equipment (PPE) such as dust masks as applicable; • Containment measures would be implemented, including drip trays, bunding or double-skinned tanks of fuels and oils; all chemicals would be stored in accordance with their COSHH guidelines, whilst spill kits would be provided in areas of fuel/oil storage; • All plant and machinery would be kept away from surface water bodies wherever possible, checked regularly and, where necessary, the use of drip trays would be employed. Refuelling and delivery areas would be located away from surface water drains; • An emergency spillage action plan will be produced, which staff would have read and understood, and provisions made to contain any leak/spill; • Should any potentially contaminated ground, including isolated 'hotspots' of contamination and/or potential deposits of asbestos containing materials (ACM), be encountered, the contractor would be required to investigate the areas and assess the need for

Potential Impact	Mitigation / Enhancement Measure
	containment or disposal of the material. The contractor would also be required to assess whether any additional health and safety measures are required; • To further minimise the risks of contaminants being transferred and contaminating other soils or water, construction workers would be briefed as to the possibility of the presence of such materials; • In the event that contamination is identified, appropriate remediation measures would be taken to protect construction workers, future site users, water resources, structures and services; • The contractor would be required to place arisings and temporary stockpiles away from watercourses and drainage systems, whilst surface water would be directed away from stockpiles to prevent erosion; • The risk to surface water and groundwater from run-off from any contaminated stockpiles during construction works would be reduced by implementing suitable measures to minimise rainwater infiltration and/or capture runoff and leachates, through use of bunding and/or temporary drainage systems. These mitigation measures would be designed in line with current good practice, follow appropriate guidelines and all relevant licences/permits; • The contractor would ensure that all material is suitable for its proposed use and would not result in an increase in contamination-related risks on identified receptors, including any landscaped areas and underlying groundwater; • Any waters removed from excavations by dewatering would be discharged appropriately, subject to the relevant permits being obtained from the Environment Agency; • The contractor will implement a dust suppression/management system in order to control the potential risk from airborne contamination migrating off-site to adjacent sites; and • Piling design and construction works will be completed following the preparation of a piling risk assessment

10.5 Discussion of Acute Risk to Future Construction Workers & Off-Site Receptors.

The proposed works will be undertaken in compliance with Construction Design and Management (CDM) 2015 Regulations (Ref 37).

Prior to work commencing, a health and safety risk assessment should be undertaken by the appointed Principal Contractor and developed in accordance with current health and safety regulations. This assessment should cover potential risks to construction staff, permanent site staff and the local population. Based on the findings of this risk assessment, appropriate mitigation measures should be implemented during the construction period. These mitigation measures, defined by IEMA (Ref 38) are considered to be standard measures that form part of the general environmental management of the Scheme, and are integrated within the CEMP (refer to Table 10-5).

The greatest potential for generation of dust will be during the construction phase. Dust generation should be kept to a minimum in accordance with general industry good practice, as outlined in, for example, ‘Environmental Good Practice on Site Guide’, CIRIA Publication C741 (Ref 32) (refer to Table 10-5).

The risk to construction workers during the site preparation and construction phases in terms of potential exposure to high concentrations of contaminants is considered to be low given the historic and current land uses identified at the Principal Site. Should gross contamination be identified during the construction phase, then this may pose a potential acute risk to construction works. It is likely that the risks to construction workers can be effectively managed through good health and safety practices and protocols. Adoption of appropriate dust suppression techniques would also mitigate

the degree of potential particulate migration off-site; these will be included within the CEMP for the Scheme.

10.6 Decommissioning (2067)

Potential impacts from the decommissioning of the Principal Site are similar in nature to those during construction, as some groundwork would be required to remove infrastructure installed. A Decommissioning Environmental Management Plan will be prepared prior to construction to identify required measures to prevent pollution.

As a result, it is considered the decommissioning impacts and effects would mirror those of the construction phase. Standard mitigation measures (refer to Table 10-5) are expected to be applied during decommissioning.

11. Conclusions

The potential risks that have been identified from contaminated land have been assessed by the preliminary risk assessment as being very low to low.

A number of environmental design and management measures will be employed as standard best practice to minimise impacts to both human health and controlled waters during the construction and decommissioning phases of the Scheme. These will be incorporated into the Framework CEMP which will be provided alongside the Environmental Statement as part of the DCO application.

The information collected as part of this PRA suggests that there are no significant constraints with regards to contamination of soil and groundwater that would limit the development of the Principal Site for solar PV panels and associated infrastructure.

12. Recommendations

As indicated in the Pre-desk Study Assessment from Zetica, a detailed UXO assessment is recommended prior to the commencement of any intrusive works. While it is acknowledged that the Pre-desk Study Assessment by Zetica shows that no readily available records have been found to indicate that the Principal Site was bombed, the Principal Site includes areas formerly occupied by the Sturgate airfield which is considered a wartime site of interest.

Limited intrusive Site Investigation and Generic Quantitative Risk Assessment (GQRA) is recommended in the areas of potential contamination. Where features are off-site, the investigation locations will be on-site but adjacent/around the feature. Areas recommended to be included within the site investigation are:

- Areas formerly occupied by the Sturgate Airfield;
- Area covering the vegetated mound of unknown material, discarded tyres, abandoned vehicle and manure heap;
- Area around the manure heap near the western boundary;
- Area of the small pit south of Harpswell Lane;
- Areas of any historical tanks, small infilled pits or ponds identified;
- Around the chicken farm shed;
- Around the farm buildings and yards, especially where tanks had historically been identified;
- Around the active IGas Energy Plc. oil well and associated Licenced Waste Management Facility;
- Around the waste management facility (metal recycling site/vehicle dismantler) (the area formerly occupied by the airfield);
- Near the former Harpswell Brick Yard with quarry; and
- Near the current electricity substation on the northern boundary.

The results of the investigation can be used to refine the findings of this PRA, allow for any recommendations for further works, and allow for appropriate treatment and disposal of the materials in the vegetated mound (and any associated contaminated soils) to an appropriate facility, prior to construction.

A high-pressure gas main has been identified during the site reconnaissance. Full plans to map out the exact route of the pipe and information on appropriate clearances should be obtained prior to any intrusive works.

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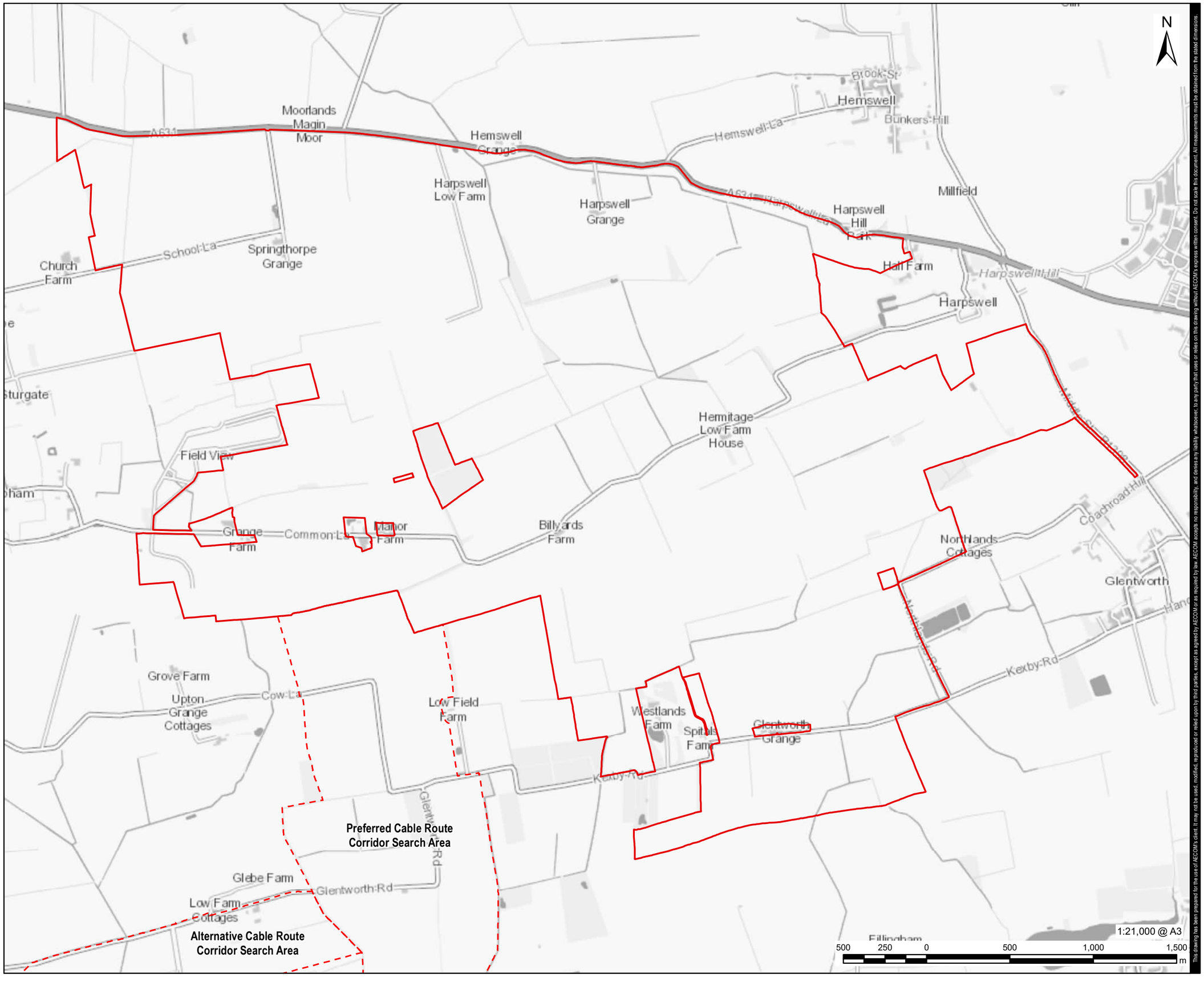
Appendix A – Figures

Revision: 0 Drawn: LL Checked: VM Approved: ST Date: 2022-09-22

Filename: \\na.aecomnet.com\fs\EMEA\London-UKLON06\Legacy\UKLON06PPSW001\UKLON06PPSW001-V1\DPE\Library\GIS_DATA\Projects\Greta III\Layout\Tillbridge Solar\Ground Conditions\220801_TillbridgeSolar_Figure1_SiteLocation.mxd



AECOM

PROJECT

Tillbridge Solar

CLIENT

Tillbridge Solar Limited

CONSULTANT

Aldgate Tower
2, Leman Street
London, E1 8FA
United Kingdom
T +44-0207-645-2000

LEGEND

- Principal Site
- Cable Route Corridor Options

NOTES

ISSUE PURPOSE

EIA Scoping Report

PROJECT NUMBER

60677969

FIGURE TITLE

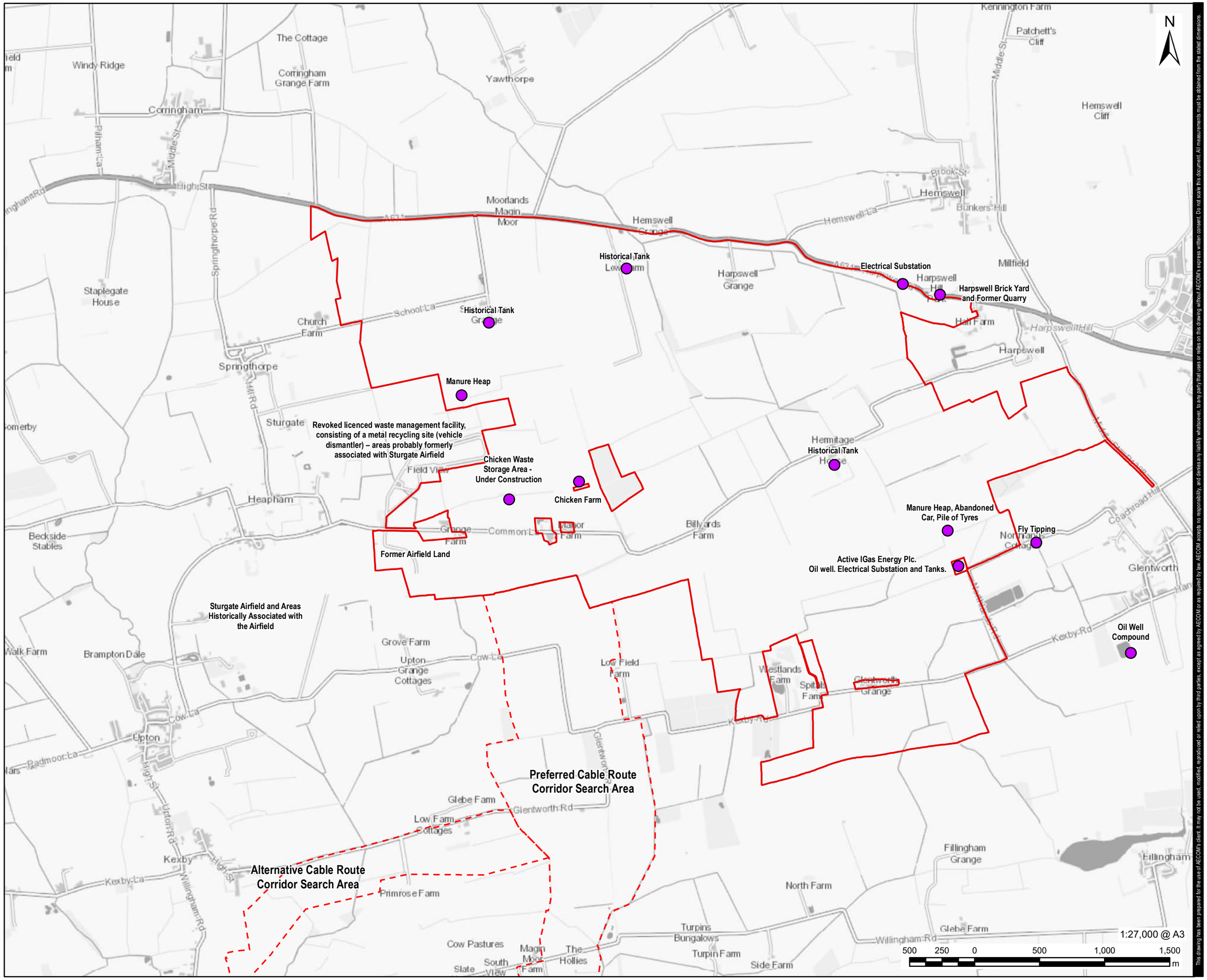
Site Location Figure

FIGURE NUMBER

Figure 1

Filename: \\na.aecomnet.com\fs\EMEA\London-UKLON06\Legacy\UKLON06PFPSW0011\UKLON06PFPSW001-V1DPE\Library\GIS_DATA\Projects\Greta III\Layout\Tillbridge Solar\Ground Conditions\220801_TillbridgeSolar_Figure2_PotentiallyContaminativeSources.mxd

Revision: 0 Drawn: LL Checked: VM Approved: ST Date: 2022-09-22



AECOM

PROJECT
Tillbridge Solar

CLIENT
Tillbridge Solar Limited

CONSULTANT
Aldgate Tower
2, Leman Street
London, E1 8FA
United Kingdom
T +44-0207-645-2000

LEGEND
- Principal Site
- Cable Route Corridor Options
- Source Location

NOTES
Contains Ordnance Survey Data © Crown Copyright and database right 2022.

ISSUE PURPOSE
EIA Scoping Report

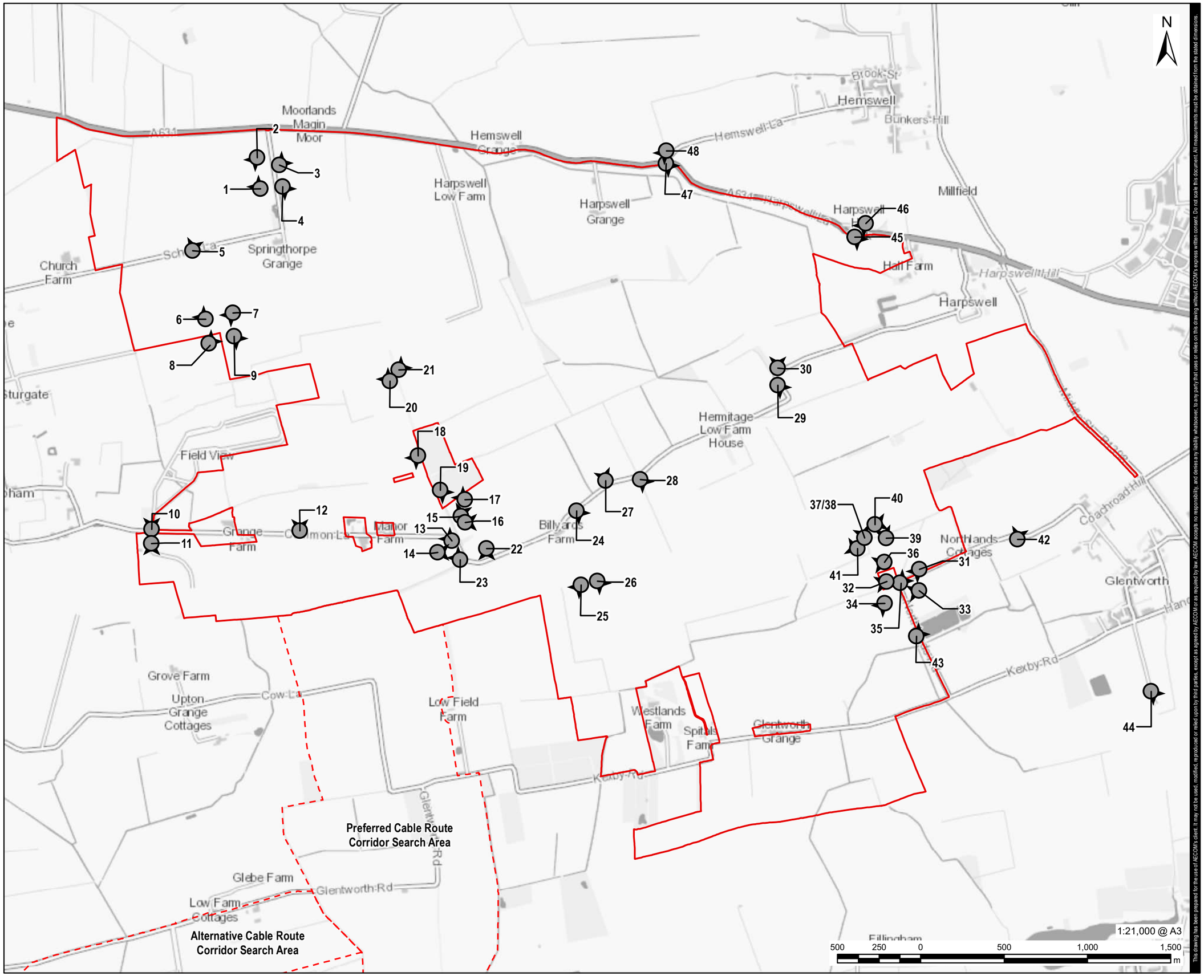
PROJECT NUMBER
60677969

FIGURE TITLE
Potentially Contaminative Sources (Approximate Locations)

FIGURE NUMBER
Figure 2

Filename: \\na.aecomnet.com\fs\EMEA\London-UKLON06\Legacy\UKLON06PFPSW001\UKLON06PFPSW001-V1\DPE\Library\GIS_DATA\Projects\Greta III\Layout\Tillbridge Solar\Ground Conditions\220801_TillbridgeSolar_Figure3_PhotoLocations.mxd

Revision: 0 Drawn: LL Checked: VM Approved: ST Date: 2022-09-22



AECOM

PROJECT
Tillbridge Solar

CLIENT
Tillbridge Solar Limited

CONSULTANT
Aldgate Tower
2, Leman Street
London, E1 8FA
United Kingdom
T +44-0207-645-2000

LEGEND
- Principal Site
- Cable Route Corridor Options
- Photo Location

NOTES

ISSUE PURPOSE
EIA Scoping Report

PROJECT NUMBER
60677969

FIGURE TITLE
Photo Locations

FIGURE NUMBER
Figure 3

Appendix B – Photographic Record

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
1	21/07/2022

Direction Photo Taken:

North West

Description

Agricultural field.

Photo No.	**Date:**
2	21/07/2022

Direction Photo Taken:

South West

Description

Agricultural field.

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	Site Location: Tillbridge Solar Farm	Project No. 60677969

Photo No.	Date:
3	21/07/2022

Direction Photo Taken:

North East

Description

Agricultural field.

Photo No.	Date:
4	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
5	21/07/2022

Direction Photo Taken:

North East

Description

Agricultural field.

Photo No.	**Date:**
6	21/07/2022

Direction Photo Taken:

North West

Description

Agricultural field.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
7	21/07/2022

Direction Photo Taken:

South West

Description

Agricultural field.

Photo No.	**Date:**
8	21/07/2022

Direction Photo Taken:

North East

Description

Agricultural field with access granted to horse riders. A large pile of manure approximately 20m x 5m is visible in the background.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
9	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field.

Photo No.	**Date:**
10	21/07/2022

Direction Photo Taken:

North

Description

Former part of airfield, now used by a company that provides large tents to festival companies.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
11	21/07/2022

Direction Photo Taken:

South

Description

Directly South of photo 10. Informed this was formerly part of the airfield and now used for agricultural storage.

Photo No.	**Date:**
12	21/07/2022

Direction Photo Taken:

North

Description

Hardcore access road leading to agricultural fields. Informed by local landowner that large bunded chicken waste storage area will be located at far end of road.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
13	21/07/2022

Direction Photo Taken:

North West

Description

Gates with path adjacent to wooded area.

Photo No.	**Date:**
14	21/07/2022

Direction Photo Taken:

East

Description

Two large boulders preventing access to field.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
15	21/07/2022

Direction Photo Taken:

North East

Description

Agricultural field.

Photo No.	**Date:**
16	21/07/2022

Direction Photo Taken:

East

Description

Agricultural field. Green space/wooded mound area in background.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
17	21/07/2022

Direction Photo Taken:

North West

Description

Wooded area (off-site) containing a disused pheasant pen. Oil drum, empty and with no visual signs of contamination around.

Photo No.	**Date:**
18	21/07/2022

Direction Photo Taken:

South West

Description

Large free-range chicken shed (off-site), currently housing 30,000 chickens, adjacent land is for roaming.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
19	21/07/2022

Direction Photo Taken:

South East

Description

Oil drums noted adjacent to path leading north. Drums were empty and showed no visible signs of contamination around.

Photo No.	**Date:**
20	21/07/2022

Direction Photo Taken:

North West

Description

Agricultural field. Number of posts designating “no dig” due to high pressure gas main in various locations

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
21	21/07/2022

Direction Photo Taken:

North East

Description

Agricultural field.

Photo No.	**Date:**
22	21/07/2022

Direction Photo Taken:

South

Description

Posts designating "no dig" due to high pressure gas main, this runs underneath the road.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
23	21/07/2022

Direction Photo Taken:

North West

Description

Agricultural field.

Photo No.	**Date:**
24	21/07/2022

Direction Photo Taken:

South East

Description

Partially paved access road, turns to grassed path access currently restricted by telegraph pole.

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	Site Location: Tillbridge Solar Farm	Project No. 60677969

Photo No.	Date:
25	21/07/2022

Direction Photo Taken:

South West

Description

Agricultural field.

Photo No.	Date:
26	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field.

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	Site Location: Tillbridge Solar Farm	Project No. 60677969

Photo No.	Date:
27	21/07/2022

Direction Photo Taken:

North

Description

Agricultural field.

Photo No.	Date:
28	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field. Another pole adjacent to the road demarcating the high pressure gas main.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
29	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field.

Photo No.	**Date:**
30	21/07/2022

Direction Photo Taken:

North

Description

Agricultural field with large concrete block restricting access.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
31	21/07/2022

Direction Photo Taken:

South West

Description

Oil well (off-site). 4 nodding donkeys, substation and crude oil storage tanks.

Photo No.	**Date:**
32	21/07/2022

Direction Photo Taken:

West

Description

A number of boreholes along the perimeter of the fenced enclosure (far corner of the photo).

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
33	21/07/2022

Direction Photo Taken:

West

Description

Agricultural field.

Photo No.	**Date:**
34	21/07/2022

Direction Photo Taken:

South West

Description

South of the oil well enclosure within 5m is a dry ditch, likely to carry water in wetter seasons.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
35	21/07/2022

Direction Photo Taken:

North East

Description

Agricultural field. Centre of field contains dry ditch, likely to carry water during wetter seasons.

Photo No.	**Date:**
36	21/07/2022

Direction Photo Taken:

West

Description

Agricultural field north of oil well enclosure. Borehole is located immediately adjacent to fence.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
37	21/07/2022

Direction Photo Taken:

North

Description

Area of suspected waste material with odour reminiscent of landfill. Vehicle missing various parts, wheels unattached and no registration plate.

Photo No.	**Date:**
38	21/07/2022

Direction Photo Taken:

North

Description

Material within western mound. Well vegetated loose sand like material with large fragments of what seems to be concrete.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
39	21/07/2022

Direction Photo Taken:

North

Description

Manure heap on concrete hardstanding.

Photo No.	**Date:**
40	21/07/2022

Direction Photo Taken:

East

Description

To the rear of the manure heap lies a large pile of tyres. Approximately 10m x 5m.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
41	21/07/2022

Direction Photo Taken:

North West

Description

Agricultural field.

Photo No.	**Date:**
42	21/07/2022

Direction Photo Taken:

North

Description

Off-site to the east evidence of fly tipping (mentioned anecdotally). Consists of building material, concrete and sand.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
43	21/07/2022

Direction Photo Taken:

East

Description

Pond off-site. No evidence of sheen was observed, water is clear with abundant waterfowl on pond.

Photo No.	**Date:**
44	21/07/2022

Direction Photo Taken:

South East

Description

Oil well compound to south of the Site (off-site). Two nodding donkeys and oil storage tanks. Lorry on site with drilling equipment.

AECOM

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	**Site Location: Tillbridge Solar Farm**	**Project No. 60677969**

Photo No.	**Date:**
45	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field.

Photo No.	**Date:**
46	21/07/2022

Direction Photo Taken:

South West

Description

Agricultural field. Pipe (likely for irrigation) runs over the surface. Electricity substation can be seen in the distance.

PHOTOGRAPHIC LOG

Client Name: Tillbridge Solar Ltd	Site Location: Tillbridge Solar Farm	Project No. 60677969

Photo No.	Date:
47	21/07/2022

Direction Photo Taken:

South East

Description

Agricultural field.

Photo No.	Date:
48	21/07/2022

Direction Photo Taken:

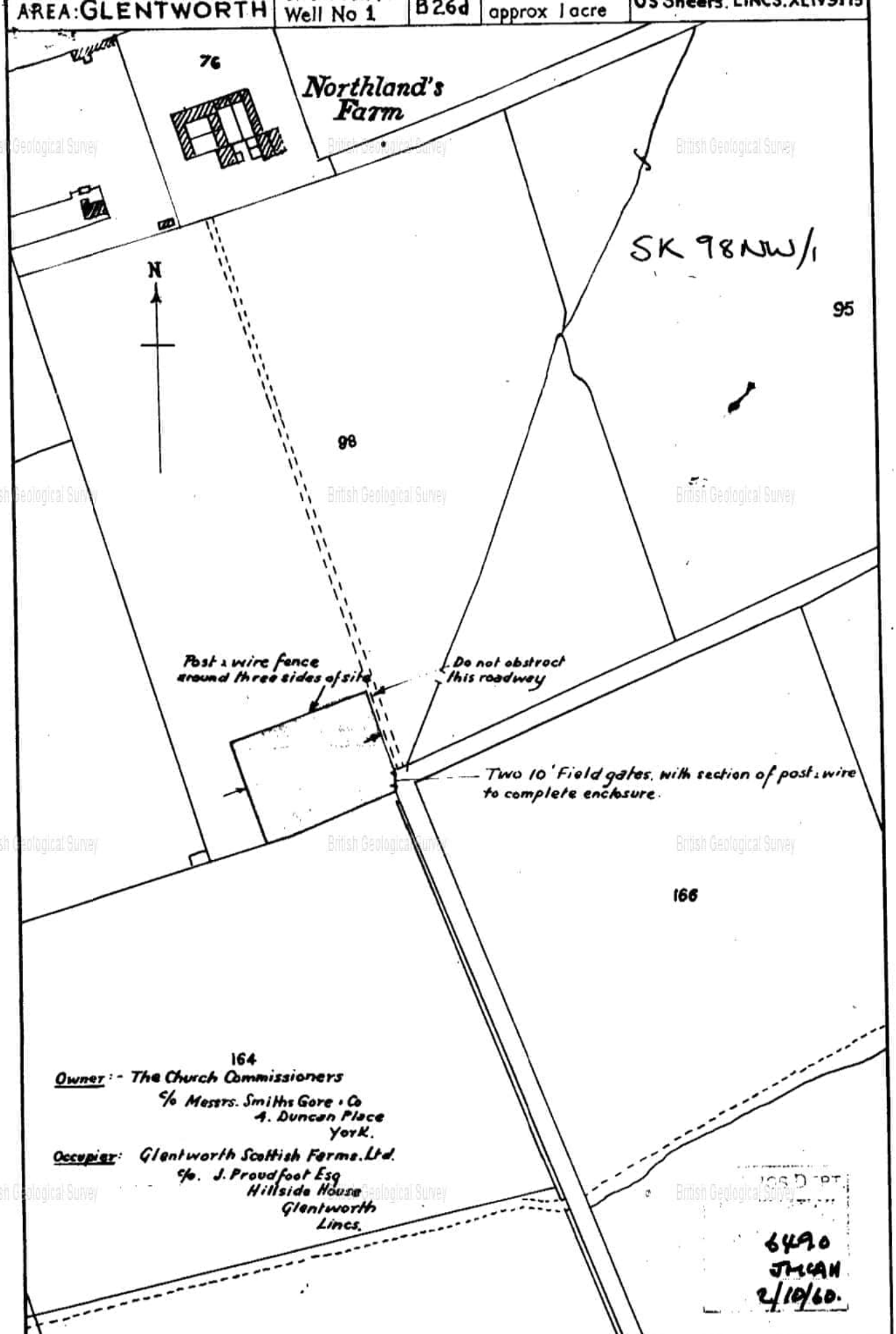
South West

Description

Agricultural field.

Appendix C – Exploratory Boreholes Records

AREA: GLENTWORTH | Well No 1 | B 26d | approx 1 acre | OS Sheets: LINCS. XLIV SW



Owner :- The Church Commissioners
c/o Messrs. Smiths Gore & Co
4. Duncan Place
York.

Occupier: Glentworth Scottish Farms. Ltd.
c/o. J. Proudfoot Esq
Hillside House
Glentworth
Lincs.

6490
JMcAH
2/10/60.

190

B P EXPLORATION Co. Ltd.

SP 550

Scale 1/2500
Date: 19.7.60

Record of Shaft or Bore for Minerals

6-inch Map Registered No.
Lincs 44 SW
SK 98 NW /1

Name of Shaft or Bore given by Geological Survey:
GLENTWORTH No 1 Oil Well

Name and Number given by owner:
As above

Nat. Grid Reference
SK 93128 88073

For whom made B.P. Exploration Co Ltd.

Town or Village GLENTWORTH County Lincs.

Exact site 360 yards S 8° E of Northlands Farm and 4800 feet W. of St. Michael's Church, Glentworth

Attach a tracing from a map, or a sketch-map, if possible.

1" N.S. Map No.	1" O.S. Map No.	Confidential or not
102		

Purpose for which made Oil

Ground Level at shaft bore relative to O.D. ——— If not ground level give O.D. of beginning of shaft bore RTE +84.7

Made by BP Rig National 50 Date of sinking 23-2-61 to 28-5-61

Information f[redacted] Date received BP Section arrived 10-11-61

Examined by [redacted]

SPECIMEN NUMBERS AND ADDITIONAL NOTES

This hole was an excellent producer on test, the producing sandstone being in the Coal Measures about 800 feet above the Clay Cross. This horizon may approximate to that of the 2 foot Marine Band.

The first core was directly below the producing sandstone, below this cores were taken of the strata above the Clay Cross, of a horizon in the "millstone Grit", and of the Carb. Limestone at the bottom of the well.

Tot. Core 8' + 10½' + 40' + 3' 158½ YPF 6764-6772 SN 6490
Pt. D/section see cor. 3 7193--7698

(For Survey use only) Geological Classification	Description of Strata	Thickness Ft	Thickness in.	Depth Ft	Depth in.
	Open hole: Chip samples D-ft 50 Lower Lias to 490, Rhaetic to 535. Keuper to 1393 Rentes to 2320 Permian upper red. 2492 Limestones & millstone grits (only 70') 3070 Base Permian 3091. Strata mainly Sandstones & fireclays to 3580. Producing sst to 3613	3613	—	3613	—
	Sandstone grey silky with plant debris at top and masses of brownish ironstone, passing down into silty lime with increasing numbers of polished fractures & surfaces below. Hard	7	9	3620	9
	Mudstone brown rooty, softer and darker at base, with lighter streaks		3	3621	—
	Loss of core, about	6	—	3627	—
	Open hole, including several seams one 36' at 4034	697	—	4324	—
	Sandstone, brown fine grained, thick bedded to massive, with even and strongly false bedding and micaceous partings. Dark crony spots at 4327'6, frequent from 4340. Bands of very thin to shaly bedding 4330 - 4335 and c. 4360. Latter with coaly seams and much carbonaceous debris on partings. Bed of abundant mudstone				

31882 – Wt. 28904 – Dd. P. 26 – 1000 – 11/58

GLENTWORTH No 1 Old Well Cont'd

SK 98 NW/1

GEOLOGICAL CLASSIFICATION	DESCRIPTION OF STRATA	THICKNESS Ft	THICKNESS in.	DEPTH Ft	DEPTH in.
	Item Argillaceous, contd.			4324	—
	with vague wisps of bedding, spots of clayey material, fine mica, and scattered carbonaceous fragments. The base is grey, with soft partings presenting strongly curved cross sections. The upper part of this rock has good oil-sand properties but DST's at 4294 - 4363 and 4326 - 4414 both gave no production.	42	3	4366	3
	Mudstone grey silty, varying to mid grey, over the middle with light grey siltstone bands and laminae. Traces of moisture present above 4369; since at least divert the bedding & are therefore original. Bedding of most of the silts is flat or gently curved; but some are disturbed. The base is very silty. No fossils noted	6	8	4372	11
	Sandstone greyish white with brownish traces; bedding rather thin; current bedding recorded. Thin band of siltstone at 4378'3. Dark wisps of bedding from 4386'6, with carbonaceous debris on partings. Bored at 4385, where some oil sand properties (but did not produce, see above). Base only approximate, due to core losses.	24	9	4397	8
	Mudstone grey silty with siltstone bands, rather soft & darker 4399 - 4401 and 4403 - 4403'9. Moisture in flat nodules 4400'4, 4401'8, 4403; also present in small nodules and masses. Bedding of siltstones varies from fine lenticles and wisps to considerable disturbance and overturning.	9	10	4407	6
	Mudstone hard grey, rather shaly, with creamy fawn spots on bedding at some horizons (very scattered). No fossils except very scattered stem fragment. One or two laminae of pale siltstone 4408'6 to base	1	3	4408	9
	Mudstone grey shaly with abundant siltstone laminae. Minute carbonaceous debris.		6	4409	3
	Mudstone hard grey, rather shaly, with silty laminations at top. 1½" ironstone band (brown siderite with white spot) with base at 4409'8.		6½	4409	9½
	Colour lamination persists; softer below. Mudstone rather hard, grey, with a few mussels at top; mostly hard to silty, colour laminated. Rather shaly MAC says mussels not certainly det.	1	1½	4410	11
	Mudstone grey, softer, rather shaly, with Naiadites sp. at top. Mottlings on bedding. No other fossils seen. MAC says this Naiadites is consistent with "modiolaris"				

GEOLOGICAL CLASSIFICATION	DESCRIPTION OF STRATA	THICKNESS FT	THICKNESS IN.	DEPTH FT	DEPTH IN.
	Brought forward			4411	9
	Mudstone grey with thin dark beds: one band with distinctive appearance, pale in colour, at 4412. Mottled bedding — structures like "worm tubes"		6	4412	3
	Mudstone mid grey, rather dark down, carbonaceous. Pyritised mussel fragments from 4412'6. Change above abrupt.		9	4413	—
	Mudstone dark grey rather silty, with abundant small Lingula	1	1	4414	1
	Note:— This band lithologically more resembles the 2 foot than the Clay Cross of Nottinghamshire; the fauna is much more limited than is often the case in the Clay Cross. On the other hand it is not unlike the Hewett Marine Band of Durham at the Clay Cross Horizon. It is considered to be the Clay Cross for the following reasons — (1) The Naiadites at 4411 (2) This interpretation involves less intense condensation in the sequence down to the Low Estheria band and 'Millstone Grit'				
	COAL, 2" recovered, supposed to be about 1'6. (thickness estimate by Geophysics)	1	6	4415	7
	Mudstone dark grey, greenish down, silty, rooty, with ironstone nodules. Stone roots pyritised. Passing into	2	—	4417	7
	Siltstone grey with roots and ironstone at top, the bedding mostly obscure, but where seen, fold and uneven. Several shallow angled "slips" in the bedding. These are not now fractures & are presumably pre-consolidation features. Marked false bedding @ 26-23'6. Plant stems (Calamites sp. etc.) at one horizon. Many impregnations at some horizons in the lower part; ironstone nodules frequent 4420 - 4425. Grey & light grey colored banding does not disclose any variation in hardness.	14	—	4431	7
	Loss of core	1	5	4433	—
	Open hole; includes at the base, Lower Coal measures with two thick seams near top, and Sandy measures correlated with the upper part of the Millstone Grit.	839	—	5272	—
	Mudstone mid grey, silty with abundant thin				

Name and Number of Shaft or Bore given by Geological Survey:
GLENTWORTH No 1 Oil Well, Cored.

6" Quarter Sheet Lincs 49 SE NW

Geological Classification	DESCRIPTION	Thickness			Depth		
	Brought forward.				5273	2½	
	Mudstone mid grey, slightly silty and micaceous, not pyritic at top, but pyrite increases down, especially from 5274. It is burrowed, less pronounced at base.	2	10½		5276	1	
	Alternating beds; mainly white or whitish sandstones in thin beds, extremely variable in grain size, rapidly changing from fine to coarse (with at least one "pebble bed. Where particles up to ½" D. at 5280) and back again: subordinate beds are dark silty mudstones with some pyrite and shaly bedded sandstone with carbonaceous micaceous partings - limestone, often pyritic, at several horizons. Where seen the bedding exhibits 'tabulated' cross sections. Not proved below about 5282, but probably extends to at least	8	11		5285	—	
	Loss of core. BP suggests silty beds	5	—		5290	—	
	Sandstone white, coarse grained, mostly thick bedded with thin bedded bands. Felspathic. Texture not open, whitish matrix. Slight false bedding.	5	8		5295	8	
	mudstone mid grey to dark grey, slightly micaceous, with frequent thin siltstone bands. These are mainly flat lying with uneven surfaces; the thickest are about ½" thick. Pyrite occurs from 5296'8, scattered at top, but prominent 5300-5305, often in masses up to 1" across, but mostly in small nodules. From 5306 silty beds are less prominent. The rock remains very micaceous, it is dark and rather more shaly. Plant debris at 5305, 5307; further siltstone bands occur in the range 5309-5311. The lowest foot is softer, but still the only fossils seen were plants.	16	4		5312	—	
	Open hole: dominantly sandy beds to 5690, then nearly all shaly to 6385. Below this, 'limestone'	1076	—		6388	—	
	Chert or cherty limestone, hard, grey or dark grey to black, splintery with hydrocarbon and or carbon on joints; bedding rather thick; fossils not abundant but a variety seen: extraction difficult. Chert forms dark nodules in limestone outside black chert bands.						
	Recovery 61%; represents core to	3	—		6391	—	
	(Remarks: Chert calcite veining. Productids, Crinoids etc.						
	Open hole: all limestone; to end of well at	109	—		6500	—	

N

191

202

Windpump

Stockproof post & wire fence on two sides of site.

66

New 20' Gated access & culvert

Owner :- The Church Commissioners
c/o Messrs. Smith Gore & Co
4. Duncombe Place
York.

Occupier: Glentworth Scottish Farms Ltd
c/o. J. Proudfoot Esq
Hillside House
Glentworth
Gainsborough
Lincs.

231

232

230

B P EXPLORATION Co Ltd.

SP 580

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

6-inch Map Registered No. SK 98 NW/2

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: GLENTWORTH No 2

For whom made British Petroleum

Town or Village ..... County .....

Exact site ..... Attach a tracing from a map, or a sketch-map, if possible.

Purpose for which made To prove oil bearing strata

Nat. Grid Reference

1" N.S. Map No.	1" O.S. Map No.	Confidential or not

Ground Level at shaft bore relative to O.D. ..... If not ground level give O.D. of beginning of shaft bore .....

Made by B.P. Date of sinking 1962

Information from Core examination Date received .....

Examined by [redacted]

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) GEOLOGICAL CLASSIFICATION	DESCRIPTION OF STRATA	THICKNESS FT	THICKNESS IN.	DEPTH FT	DEPTH IN.
	See official B.P. log for un-cored strata				
	Coring commenced @			3510	0
	Marl, red, with grey-green streaks and patches	1	6	3511	6
	Core missing	28	6	3530	0
	Mudstone, grey silty with plant-fragments; coaly traces @ 3532 ft 3 in	3	3	3533	3
	Core missing	16	9	3550	0
	Mudstone, grey, silty with pyrite cubes and ironstone nodules. Sporadic greenish lines	3	4	3553	4
	Mudstone, grey-brown rooty, with kaolinic surfaces (seat earth)	1	11	3555	6
	Siltstone, grey with kaolinic surfaces; sporadic laminae of silty mudstone	2	6	3558	0
	Mudstone, grey silty with siltstone laminae and nodules	2	10	3560	10

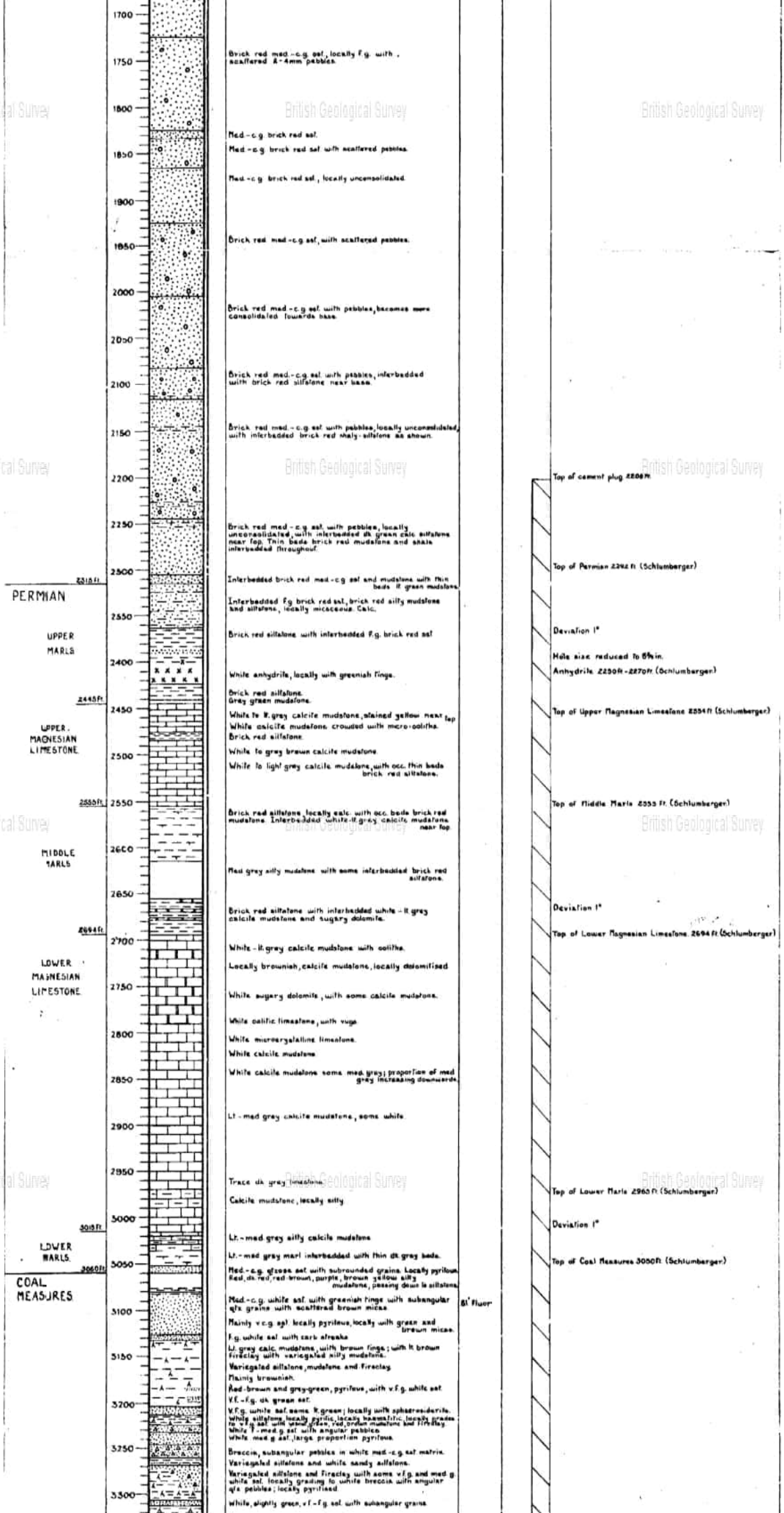
5982203/1 P565 4m 11/61 XL

Name of Shaft or Bore given by Geological Survey: Glentworth No 2.

No. SK 98 NW/2

Geological Classification	Description of Strata	Thickness Ft	Thickness in.	Depth Ft	Depth in.
	Cased Jurd.			3560	10
	Mudstone, dark grey with coaly traces	0	2	3561	0
	passing down to Seat Earth; mudstone, grey brown, rooty, with fissure surfaces				
	passing down to Siltstone, light grey with shale detrital accumulations and plant fragments.	5	4	3566	4
	Core missing	3	8	3570	0
	Coring Completed			3570	0

IS98203/2 P585 4m 11/61 XL


1700
1750
1800
1850
1900
1850
2000
2050
2100
2150
2200
2250
2500
2510 ft.
PERMIAN
2550
UPPER MARLS
2400
2450 ft.
2450
UPPER MAGNESIAN LIMESTONE
2500
2550 ft.
2550
MIDDLE MARLS
2600
2650
2694 ft.
2700
LOWER MAGNESIAN LIMESTONE
2750
2800
2850
2900
2950
3000
3018 ft.
LOWER MARLS
3050 ft.
3050
COAL MEASURES
3100
3150
3200
3250
3300
Brick red med.-c.g. sst., locally f.g. with scattered ¼-4mm pebbles.
Med.-c.g. brick red sst.
Med.-c.g. brick red sst. with scattered pebbles.
Med.-c.g. brick red sst., locally unconsolidated.
Brick red med.-c.g. sst. with scattered pebbles.
Brick red med.-c.g. sst. with pebbles, becomes more consolidated towards base.
Brick red med.-c.g. sst. with pebbles, interbedded with brick red siltstone near base.
Brick red med.-c.g. sst. with pebbles, locally unconsolidated with interbedded brick red shaly-siltstone as shown.
Brick red med.-c.g. sst. with pebbles, locally unconsolidated, with interbedded dk. green calc. siltstone near top. Thin beds brick red mudstone and shale interbedded throughout.
Interbedded brick red med.-c.g. sst and mudstone with thin beds lt. green mudstone.
Interbedded f.g. brick red sst., brick red silty mudstone and siltstone, locally micaceous. Calc.
Brick red siltstone with interbedded f.g. brick red sst.
White anhydrite, locally with greenish tinge.
Brick red siltstone.
Grey green mudstone.
White to lt. grey calcite mudstone, stained yellow near top.
White calcite mudstone crowded with micro-oolithe.
Brick red siltstone.
White to grey brown calcite mudstone.
White to light grey calcite mudstone, with occ. thin beds brick red siltstone.
Brick red siltstone, locally calc. with occ. beds brick red mudstone. Interbedded white-lt.grey calcitic mudstone near top.
Med grey silty mudstone with some interbedded brick red siltstone.
Brick red siltstone with interbedded white - lt.grey calcite mudstone and sugary dolomite.
White - lt.grey calcite mudstone with oolithe.
Locally brownish, calcite mudstone, locally dolomitised.
White sugary dolomite, with some calcite mudstone.
White oolitic limestone, with vugs.
White microcrystalline limestone.
White calcite mudstone.
White calcite mudstone some med.grey; proportion of med. grey increasing downwards.
Lt - med grey calcite mudstone, some white.
Trace dk. grey limestone.
Calcite mudstone, locally silty.
Lt.-med.grey silty calcite mudstone.
Lt.-med grey marl interbedded with thin dk grey beds.
Med.-c.g. qtzose sst. with subrounded grains. Locally pyritous. Red, dk. red, red-brown, purple, brown yellow silty mudstone, passing down to siltstone.
Med.-c.g. white sst. with greenish tinge with subangular qtz grains with scattered brown micas.
Mainly v.c.g. sst. locally pyritous, locally with green and brown micas.
F.g. white sst. with carb streaks.
Lt. grey calc. mudstone, with brown tinge; with lt brown fireclay with variegated silty mudstone.
Variegated siltstone, mudstone and fireclay.
Mainly brownish.
Red-brown and grey-green, pyritous, with v.f.g. white sst.
V.f.-f.g. dk green sst.
V.f.g. white sst. some lt.green; locally with sphaerosiderite.
White siltstone, locally pyritic, locally haematitic, locally grades to v.f.g. sst. with green, red, brown mudstone and fireclay.
White f.-med.g. sst. with angular pebbles.
White med.g. sst., large proportion pyritous.
Breccia, subangular pebbles in white med.-c.g. sst matrix.
Variegated siltstone and white sandy siltstone.
Variegated siltstone and fireclay with some v.f.g. and med.g. white sst. locally grading to white breccia with angular qtz pebbles; locally pyritised.
White, slightly green, v.f.-f.g. sst. with subangular grains.
81' Floor
Top of cement plug 2206ft
Top of Permian 2342 ft (Schlumberger)
Deviation 1°
Hole size reduced to 8¾in.
Anhydrite 2250ft - 2270ft (Schlumberger)
Top of Upper Magnesian Limestone 2554 ft (Schlumberger)
Top of Middle Marls 2653 ft. (Schlumberger)
Deviation 1°
Top of Lower Magnesian Limestone 2694 ft (Schlumberger)
Top of Lower Marls 2965 ft (Schlumberger)
Deviation 1°
Top of Coal Measures 3050ft (Schlumberger)

N

191

202

Windpump

Stockproof post & wire fence on two sides of site.

66

New 20' Gated access & culvert

Owner :- The Church Commissioners
c/o Messrs. Smith Gore & Co
4. Duncombe Place
York.

Occupier : Glentworth Scottish Farms Ltd
c/o J. Proudfoot Esq
Hillside House
Glentworth
Gainsborough
Lincs.

231

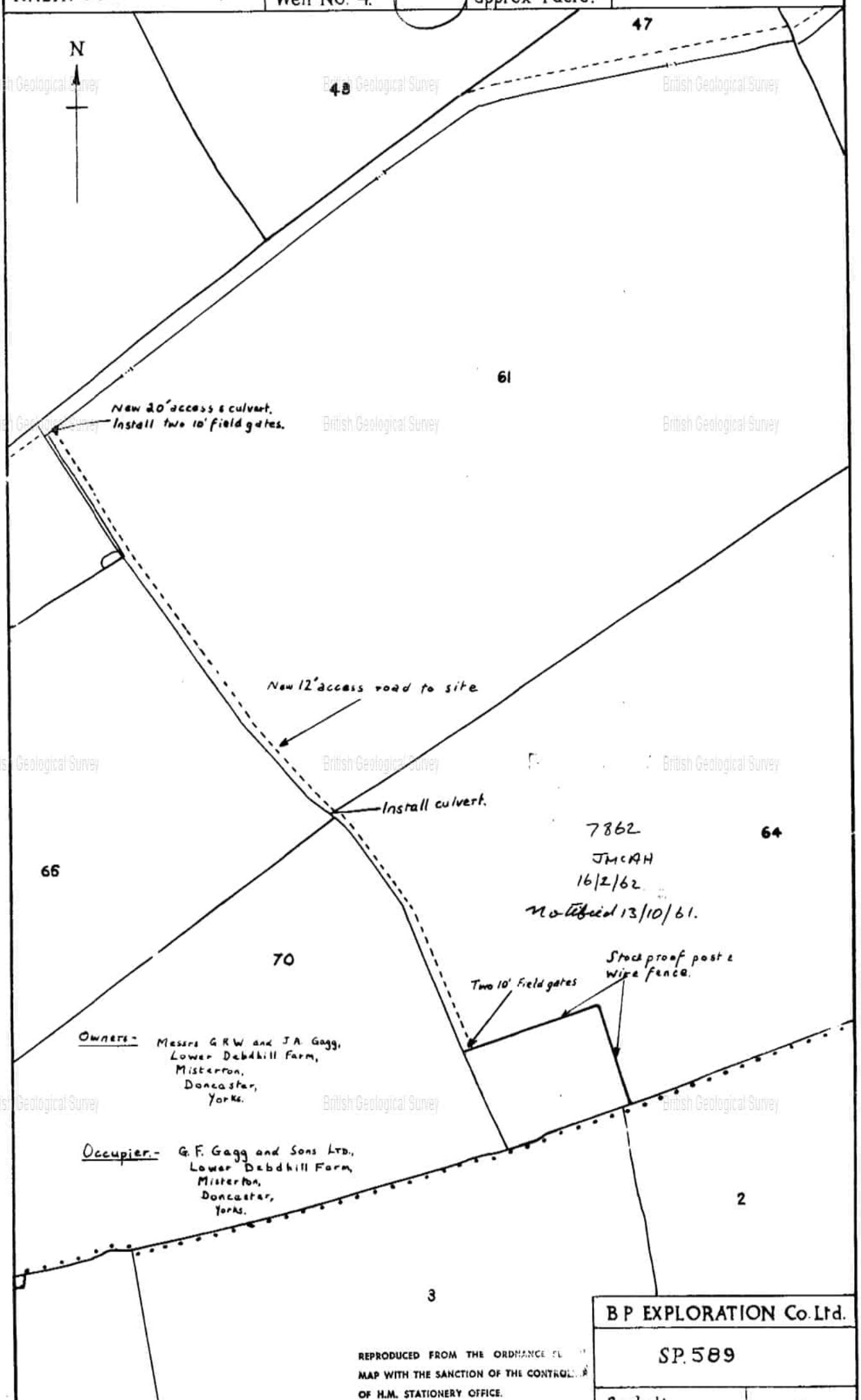
232

230

B P EXPLORATION Co. Ltd.

SP 580

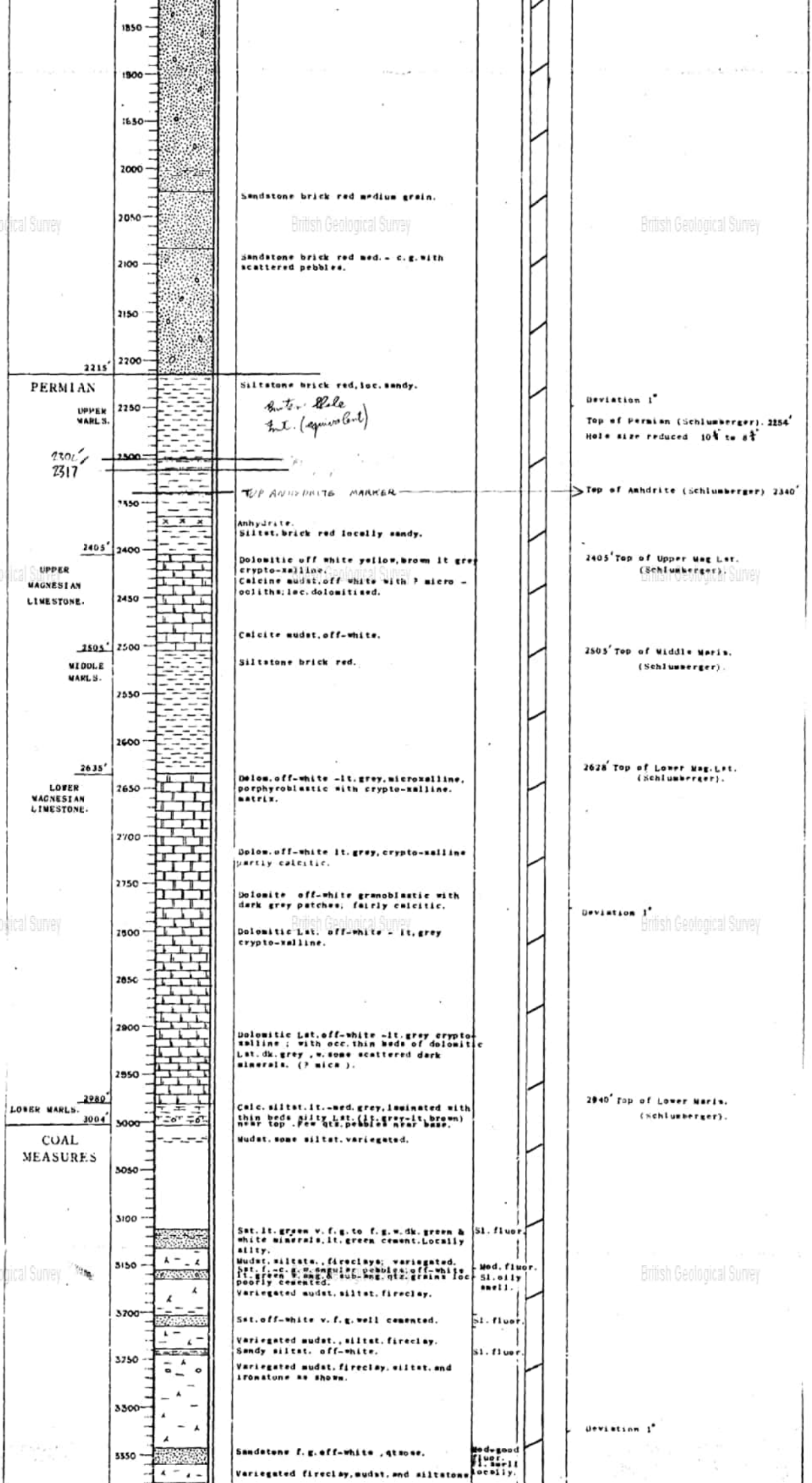
AREA: GLENTWORTH | Site Plan for Well No. 4. | 25e | approx 1 acre. | OS Sheets LINCS XLIII 12 & 16



B P EXPLORATION Co. Ltd.

SP. 589

Scale 1/2500 | J.A.J.L


1850
1900
1950
2000
Sandstone brick red medium grain.
2050
Sandstone brick red med. - c.g. with scattered pebbles.
2100
2150
2215'
2200
PERMIAN
Siltstone brick red, loc. sandy.
UPPER MARLS.
2250
Deviation 1°
Top of Permian (Schlumberger). 2254'
Hole size reduced 10" to 8½"
2300'
2317
2300
TOP ANHYDRITE MARKER
Top of Anhdrite (Schlumberger) 2340'
2350
Anhydrite.
Siltst. brick red locally sandy.
2405'
2400
Dolomitic off white yellow, brown lt grey crypto-xalline.
Calcine mudst. off white with ? micro - ooliths; loc. dolomitised.
2405' Top of Upper Mag Lst. (Schlumberger).
UPPER MAGNESIAN LIMESTONE.
2450
Calcite mudst. off-white.
2505'
2500
Siltstone brick red.
2505' Top of Middle Marls. (Schlumberger).
MIDDLE MARLS.
2550
2600
2635'
Dolom. off-white -lt. grey, microxalline, porphyroblastic with crypto-xalline matrix.
2628' Top of Lower Mag. Lst. (Schlumberger).
2650
LOWER MAGNESIAN LIMESTONE.
2700
Dolom. off-white lt. grey, crypto-xalline partly calcitic.
2750
Dolomite off-white granoblastic with dark grey patches, fairly calcitic.
Deviation 1°
2800
Dolomitic Lst. off-white - lt. grey crypto-xalline.
2850
2900
Dolomitic Lst. off-white -lt. grey crypto-xalline ; with occ. thin beds of dolomitic Lst. dk. grey , w. some scattered dark minerals. (? mica).
2950
2980'
2940' Top of Lower Marls. (Schlumberger).
LOWER MARLS.
3004'
3000
Calc. siltst. lt.-med. grey, laminated with thin beds silty Lst. (lt. grey-lt. brown) near top . Few qtz. pebbles near base.
COAL MEASURES
Mudst. some siltst. variegated.
3050
3100
Sst. lt. green v. f. g. to f. g. w. dk. green & white minerals, lt. green cement. Locally silty.
Sl. fluor.
3150
Mudst. siltsts., fireclays; variegated.
Sst. f.-c. g. w. angular pebbles off-white lt. green v. ang. & sub-ang. qtz. grains loc. poorly cemented.
Mod. fluor. Sl. oily smell.
Variegated mudst. siltst. fireclay.
3200
Sst. off-white v. f. g. well cemented.
Sl. fluor.
Variegated mudst., siltst. fireclay.
Sandy siltst. off-white.
Sl. fluor.
3250
Variegated mudst. fireclay, siltst. and ironstone as shown.
3300
Deviation 1°
3350
Sandstone f. g. off-white , qtzose.
Mod-good fluor. Sl. smell locally.
Variegated fireclay, mudst. and siltstone

7121/104

BP EXPLORATION COMPANY LIMITED

Name changed from D'Arcy Exploration Co. Ltd.

Telephone Nos.
BILSTHORPE 201, 202 & 203

Telegraphic Address
BEEPEE—KNEESALL

EAKRING
Postal Address:
P.O. Box 1
Southwell, Notts.

Our Reference: GLE/A.1/1511

13th October, 1961.

The Director,
Geological Survey and Museum,
Exhibition Road,
South Kensington,
London, S.W.7.

Dear Sir,

Glentworth No. 4 Proposed Trial Borehole
Licence Area B.26e

We enclose herewith, in duplicate, Site Plan No. 589, showing the approximate position of the above trial borehole which it is our intention to drill.

A $14\frac{3}{4}$" hole will be drilled to 1425 feet and $11\frac{3}{4}$" casing set from surface to that depth. From 1425 feet a $10\frac{5}{8}$" hole will be drilled to 2500 feet and thence an $8\frac{5}{8}$" hole to final depth of approximately 5200 feet. If oil production is proved, $6\frac{5}{8}$" casing will be set from surface to below the oil-producing sand.

We regret that we are at present unable to forecast a start date for drilling operations at this location, but will inform you of the exact date in due course.

Yours faithfully,

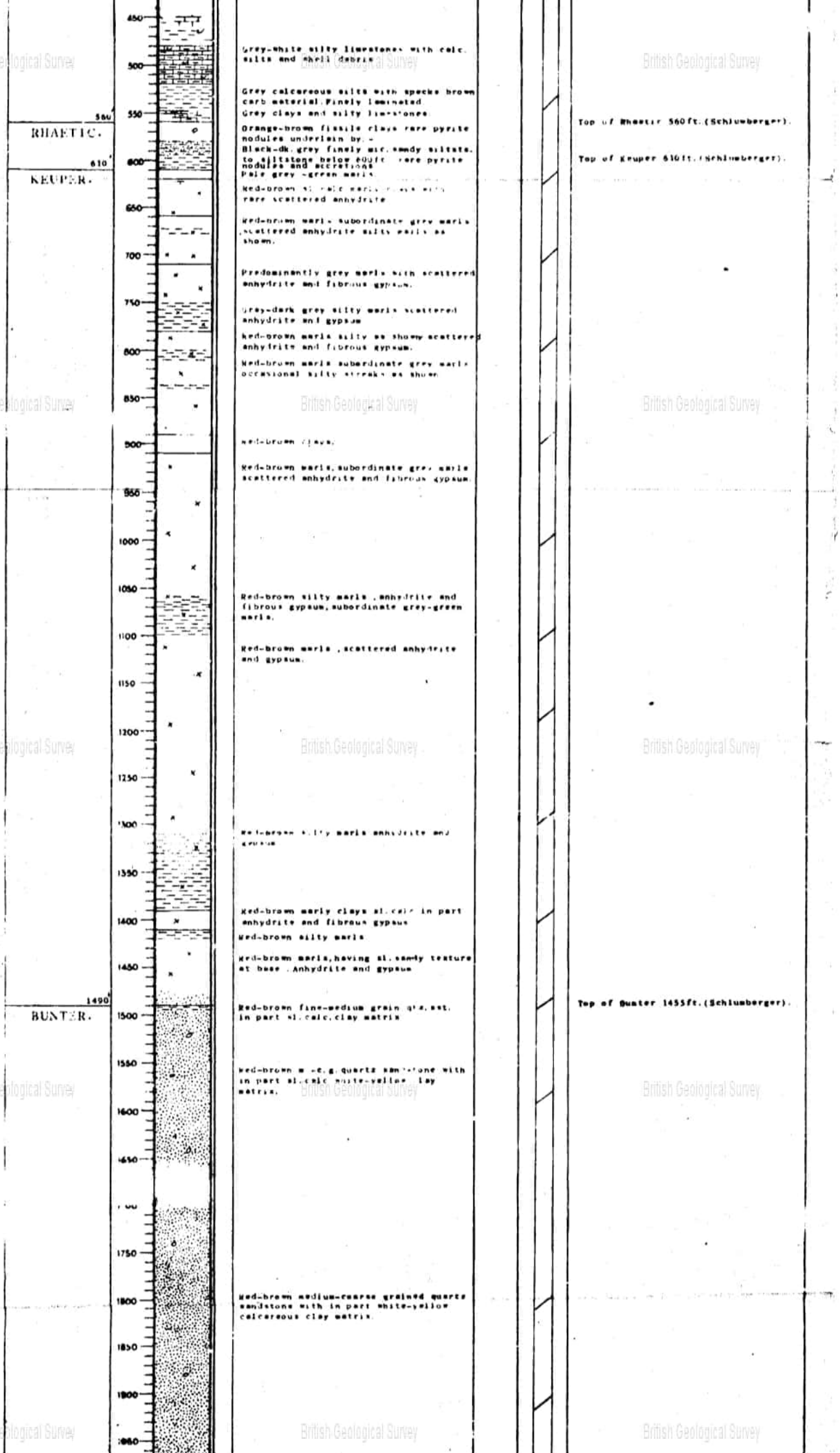
For BP EXPLORATION COMPANY LIMITED

[redacted]

J. B. Acres

Enclosures

FC/FEK


RHAETIC.
560'
KEUPER.
610'
BUNTER.
1490'
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
Grey-white silty limestones with calc. silts and shell debris
Grey calcareous silts with specks brown carb material. Finely laminated
Grey clays and silty limestones
Orange-brown fissile clays rare pyrite nodules underlain by:-
Black-dk. grey finely mic. sandy siltsts. to siltstone below 600ft rare pyrite nodules and accretions
Pale grey -green marls
Red-brown sl. calc marls, rare silts rare scattered anhydrite
Red-brown marls subordinate grey marls, scattered anhydrite silty marls as shown.
Predominantly grey marls with scattered anhydrite and fibrous gypsum.
Grey-dark grey silty marls scattered anhydrite and gypsum
Red-brown marls silty as shown scattered anhydrite and fibrous gypsum.
Red-brown marls subordinate grey marls occasional silty streaks as shown
Red-brown clays.
Red-brown marls, subordinate grey marls scattered anhydrite and fibrous gypsum.
Red-brown silty marls, anhydrite and fibrous gypsum, subordinate grey-green marls.
Red-brown marls, scattered anhydrite and gypsum.
Red-brown silty marls anhydrite and gypsum
Red-brown marly clays sl. calc in part anhydrite and fibrous gypsum
Red-brown silty marls
Red-brown marls, having sl. sandy texture at base. Anhydrite and gypsum
Red-brown fine-medium grain qtz. sst. in part sl. calc. clay matrix
Red-brown m.-c.g. quartz sandstone with in part sl. calc white-yellow clay matrix.
Red-brown medium-coarse grained quartz sandstone with in part white-yellow calcareous clay matrix.
Top of Rhaetic 560ft. (Schlumberger).
Top of Keuper 610ft. (Schlumberger).
Top of Bunter 1455ft. (Schlumberger).

7121/18 [redacted]

BP EXPLORATION COMPANY LIMITED

Name changed from D'Arcy Exploration Co. Ltd.

Telephone Nos.
BILSTHORPE 201, 202 & 203

Telegraphic Address
BEEPEE—KNEESALL

EAKRING
Postal Address:
P.O. Box 1
Southwell, Notts.

Our Reference: GLE/A.1/1509

13th October, 1961.

SK 98 NW/5.

The Director,
Geological Survey and Museum,
Exhibition Road,
South Kensington,
London, S.W.7.

Dear Sir,

Glentworth No. 5 Proposed Trial Borehole
Licence Area B.26e

We enclose herewith, in duplicate, Site Plan No. 591, showing the approximate position of the above trial borehole which it is our intention to drill.

A $14\frac{3}{4}$" hole will be drilled to 1425 feet and $11\frac{3}{4}$" casing set from surface to that depth. From 1425 feet a $10\frac{5}{8}$" hole will be drilled to 2500 feet and thence an $8\frac{5}{8}$" hole to final depth of approximately 5200 feet. If oil production is proved, $6\frac{5}{8}$" casing will be set from surface to below the oil-producing sand.

We regret that we are at present unable to forecast a start date for drilling operations at this location, but will inform you of the exact date in due course.

Yours faithfully,

For BP EXPLORATION COMPANY LIMITED

[redacted]

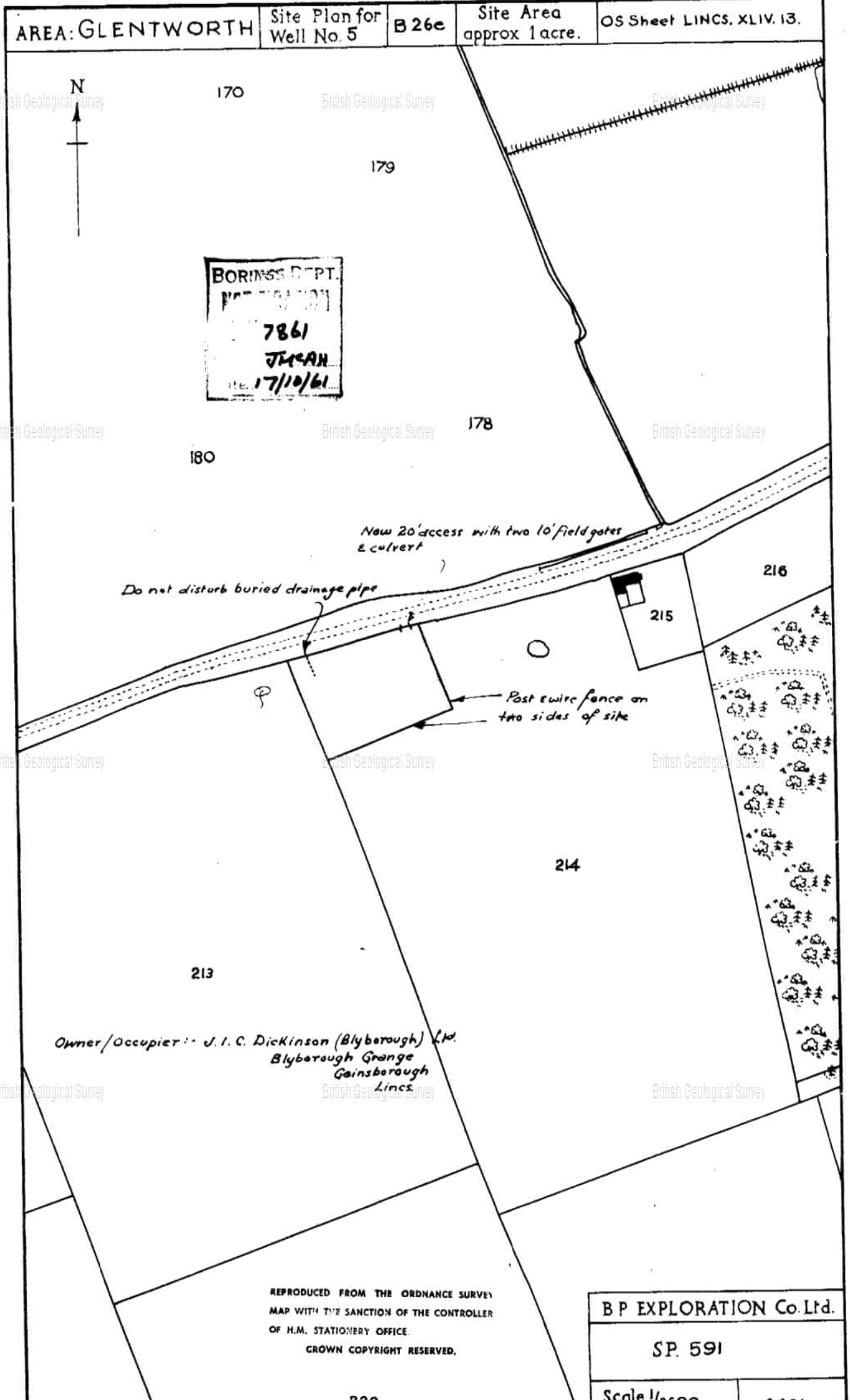
J. B. Acres

Enclosures

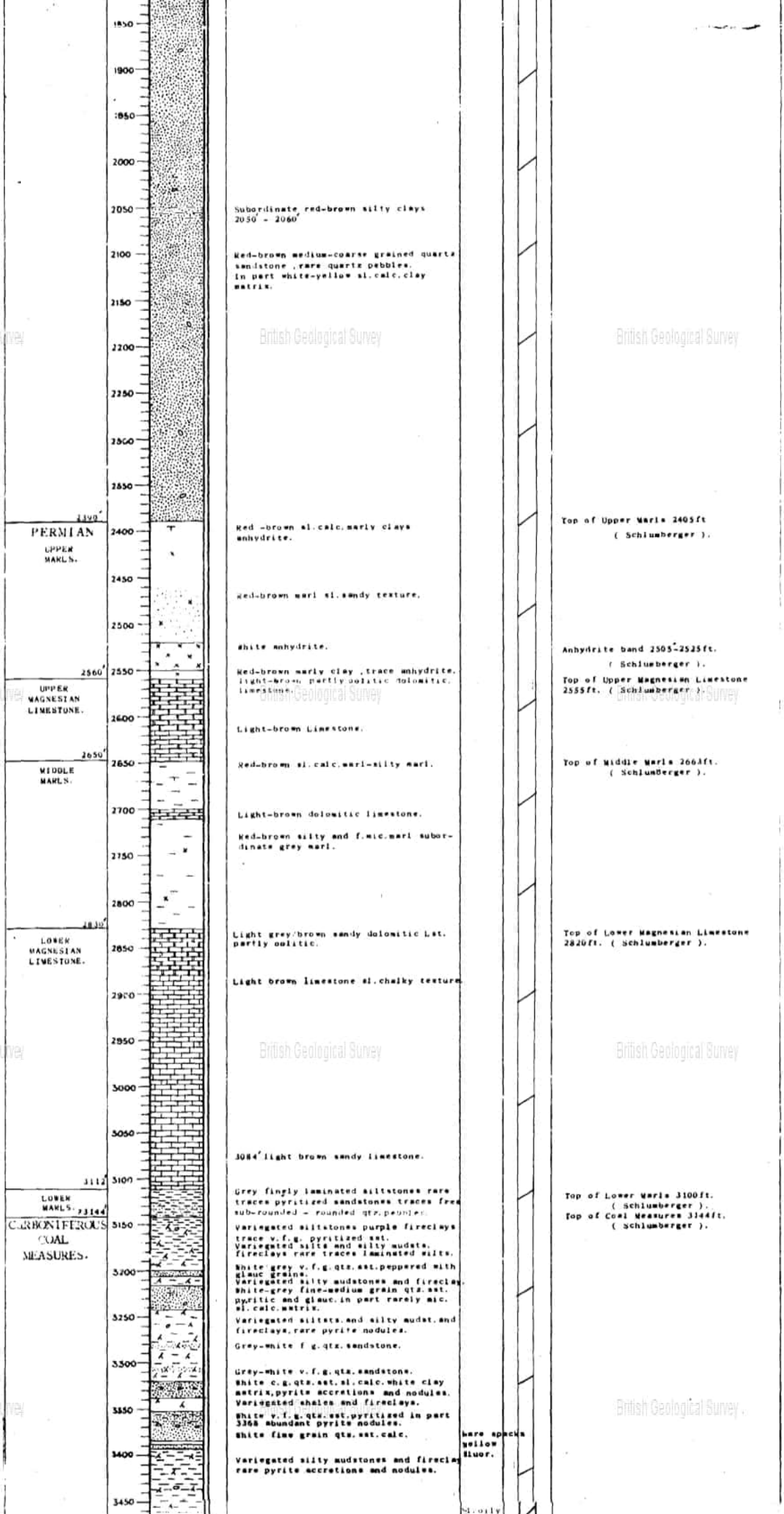
FC/FEK

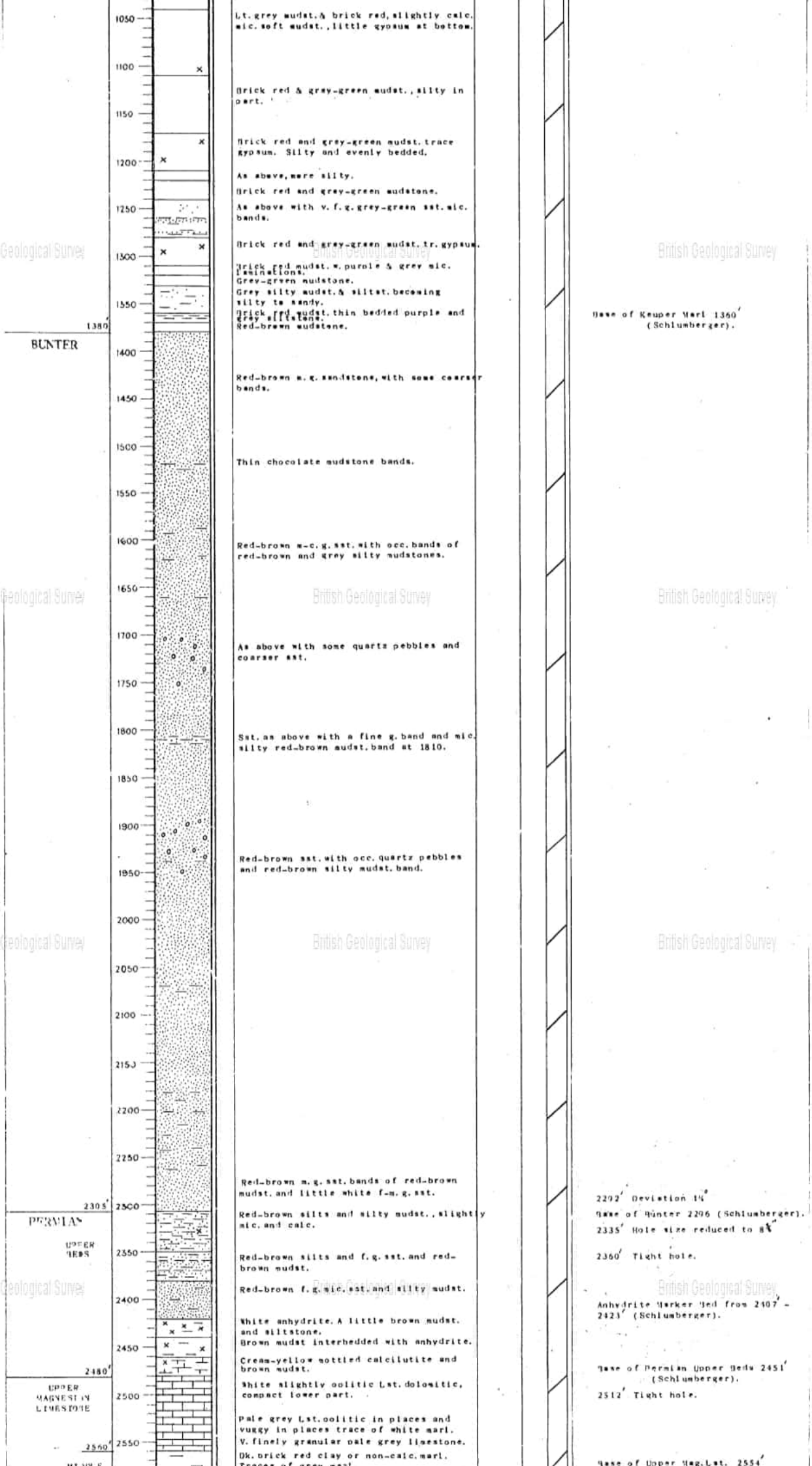
[redacted]

AREA: GLENTWORTH	Site Plan for Well No. 5	B 26e	Site Area approx 1 acre.	OS Sheet LINCS. XLIV. 13.

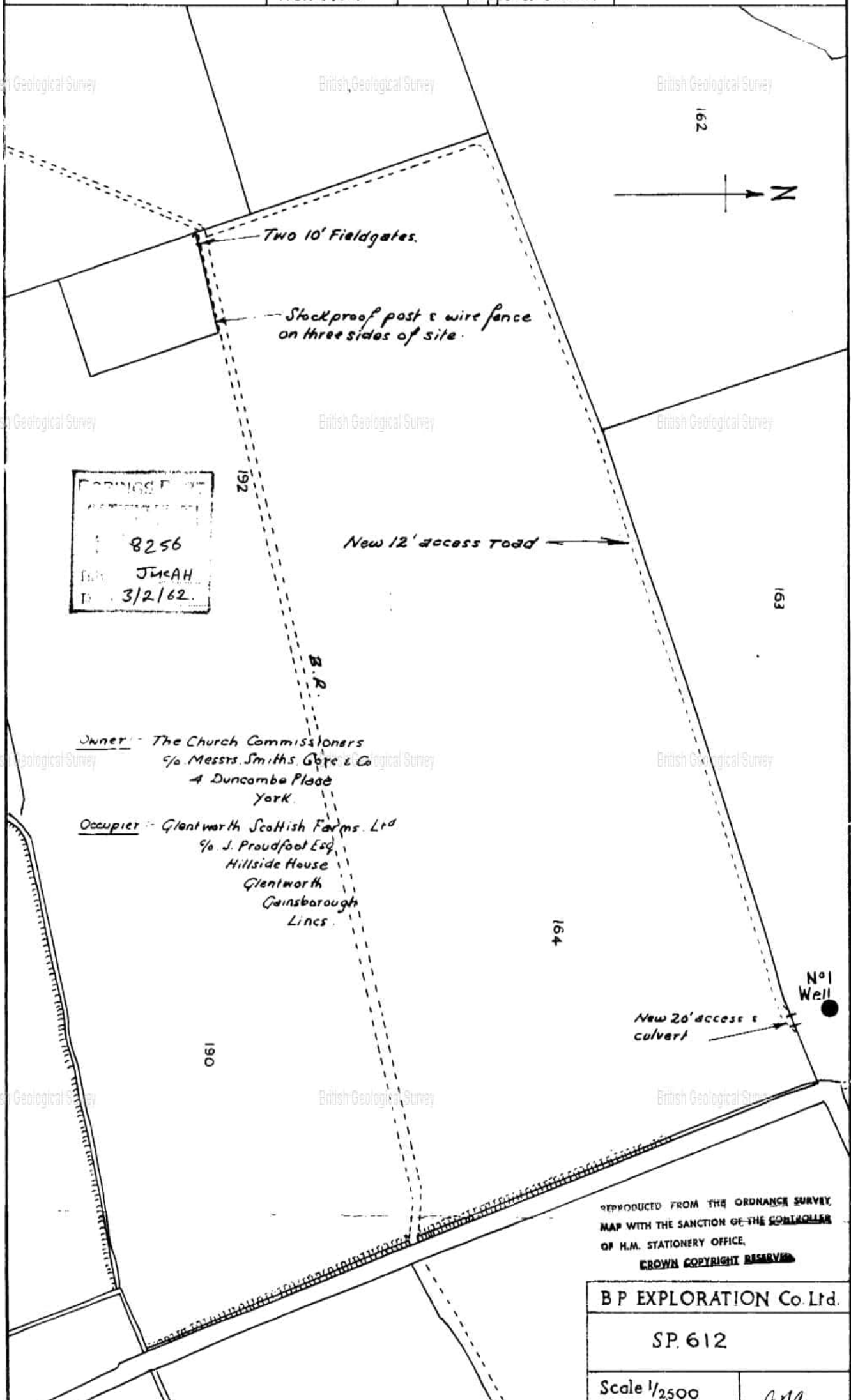


B P EXPLORATION Co. Ltd.	
SP. 591	
Scale 1/2500	


1850
1900
1950
2000
2050
2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
2600
2650
2700
2750
2800
2850
2900
2950
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
2340'
PERMIAN
UPPER MARLS.
2560'
UPPER MAGNESIAN LIMESTONE.
2650'
MIDDLE MARLS.
2830'
LOWER MAGNESIAN LIMESTONE.
3112'
LOWER MARLS.
3144'
CARBONIFEROUS COAL MEASURES.
Subordinate red-brown silty clays 2050' - 2060'
Red-brown medium-coarse grained quartz sandstone , rare quartz pebbles. In part white-yellow sl.calc.clay matrix.
Red -brown sl.calc.marly clays anhydrite.
Red-brown marl sl.sandy texture.
White anhydrite.
Red-brown marly clay , trace anhydrite. light-brown partly oolitic dolomitic limestone.
Light-brown Limestone.
Red-brown sl.calc.marl-silty marl.
Light-brown dolomitic limestone.
Red-brown silty and f.mic.marl subordinate grey marl.
Light grey/brown sandy dolomitic Lst. partly oolitic.
Light brown limestone sl.chalky texture.
3084' light brown sandy limestone.
Grey finely laminated siltstones rare traces pyritized sandstones traces free sub-rounded - rounded qtz.pebbles.
Variegated siltstones purple fireclays trace v.f.g. pyritized sst. Variegated silts and silty mudsts. fireclays rare traces laminated silts.
White grey v.f.g.qtz.sst.peppered with glauc grains. Variegated silty mudstones and fireclay.
White-grey fine-medium grain qtz.sst. pyritic and glauc.in part rarely mic. sl.calc.matrix.
Variegated siltsts.and silty mudst.and fireclays,rare pyrite nodules.
Grey-white f g.qtz.sandstone.
Grey-white v.f.g.qtz.sandstone.
White c.g.qtz.sst.sl.calc.white clay matrix,pyrite accretions and nodules.
Variegated shales and fireclays.
White v.f.g.qtz.sst.pyritized in part 3368 abundant pyrite nodules.
White fine grain qtz.sst.calc.
Variegated silty mudstones and fireclay rare pyrite accretions and nodules.
rare specks yellow fluor.
Top of Upper Marls 2405ft (Schlumberger).
Anhydrite band 2505-2525ft. (Schlumberger).
Top of Upper Magnesian Limestone 2555ft. (Schlumberger).
Top of Middle Marls 2663ft. (Schlumberger).
Top of Lower Magnesian Limestone 2820ft. (Schlumberger).
Top of Lower Marls 3100ft. (Schlumberger).
Top of Coal Measures 3144ft. (Schlumberger).


1050
1100
1150
1200
1250
1300
1350
1380'
BUNTER
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
2050
2100
2150
2200
2250
2300'
PERMIAN
UPPER BEDS
2350
2400
2450
2480'
UPPER MAGNESIAN LIMESTONE
2500
2550
2560'
Lt. grey mudst. & brick red, slightly calc. mic. soft mudst., little gypsum at bottom.
Brick red & grey-green mudst., silty in part.
Brick red and grey-green mudst. trace gypsum. Silty and evenly bedded.
As above, more silty.
Brick red and grey-green mudstone.
As above with v. f. g. grey-green sst. mic. bands.
Brick red and grey-green mudst. tr. gypsum.
Brick red mudst. w. purple & grey mic. laminations.
Grey-green mudstone.
Grey silty mudst. & siltst. becoming silty to sandy.
Brick red mudst. thin bedded purple and grey siltstone.
Red-brown mudstone.
Red-brown m. g. sandstone, with some coarser bands.
Thin chocolate mudstone bands.
Red-brown m-c. g. sst. with occ. bands of red-brown and grey silty mudstones.
As above with some quartz pebbles and coarser sst.
Sst. as above with a fine g. band and mic. silty red-brown mudst. band at 1810.
Red-brown sst. with occ. quartz pebbles and red-brown silty mudst. band.
Red-brown m. g. sst. bands of red-brown mudst. and little white f-m. g. sst.
Red-brown silts and silty mudst., slightly mic. and calc.
Red-brown silts and f. g. sst. and red-brown mudst.
Red-brown f. g. mic. sst. and silty mudst.
White anhydrite. A little brown mudst. and siltstone.
Brown mudst interbedded with anhydrite.
Cream-yellow mottled calcilutite and brown mudst.
White slightly oolitic Lst. dolomitic, compact lower part.
Pale grey Lst. oolitic in places and vuggy in places trace of white marl.
V. finely granular pale grey limestone.
Dk. brick red clay or non-calc. marl.
Base of Keuper Marl 1360' (Schlumberger).
2292' Deviation 1¼°
Base of Bunter 2296 (Schlumberger).
2335' Hole size reduced to 8¾"
2360' Tight hole.
Anhydrite Marker Bed from 2407' - 2423' (Schlumberger).
Base of Permian Upper Beds 2451' (Schlumberger).
2512' Tight hole.

AREA: GLENTWORTH	Well No. 7	B26e	approx 1 acre.	OS Sheet. LINCS. XLIV. 13

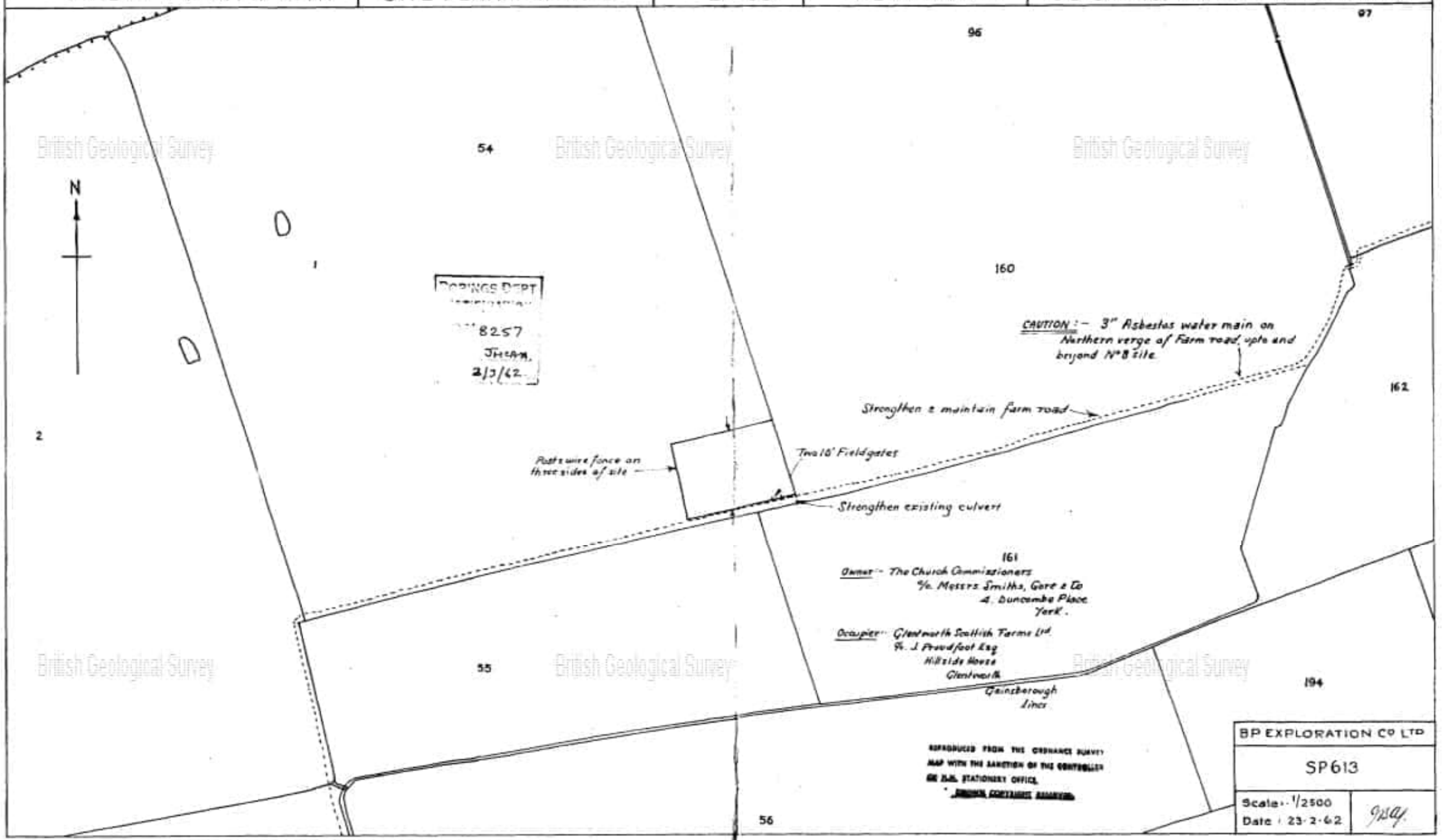


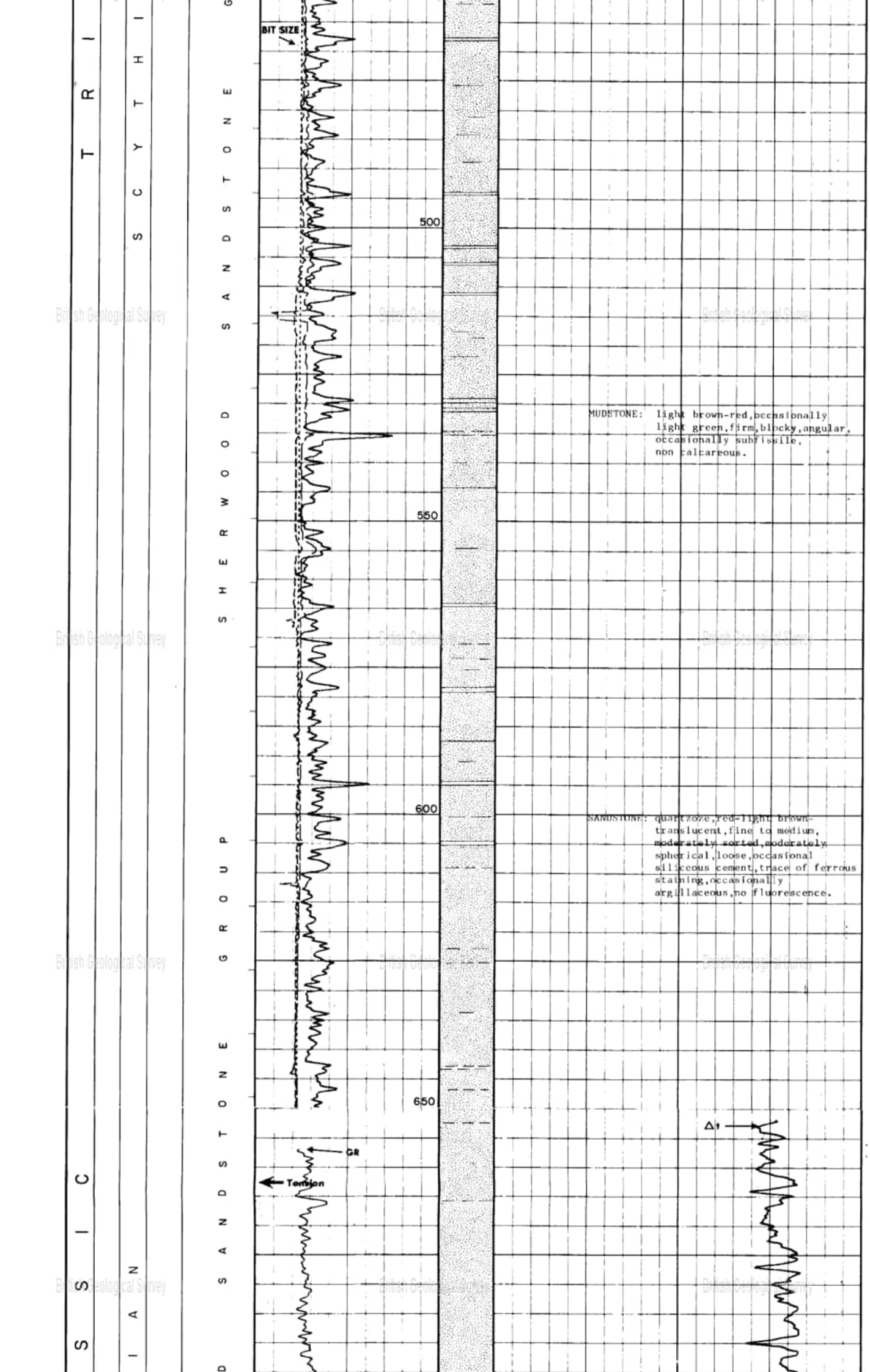
B P EXPLORATION Co. Ltd.	
SP. 612	
Scale 1/2500	JBA

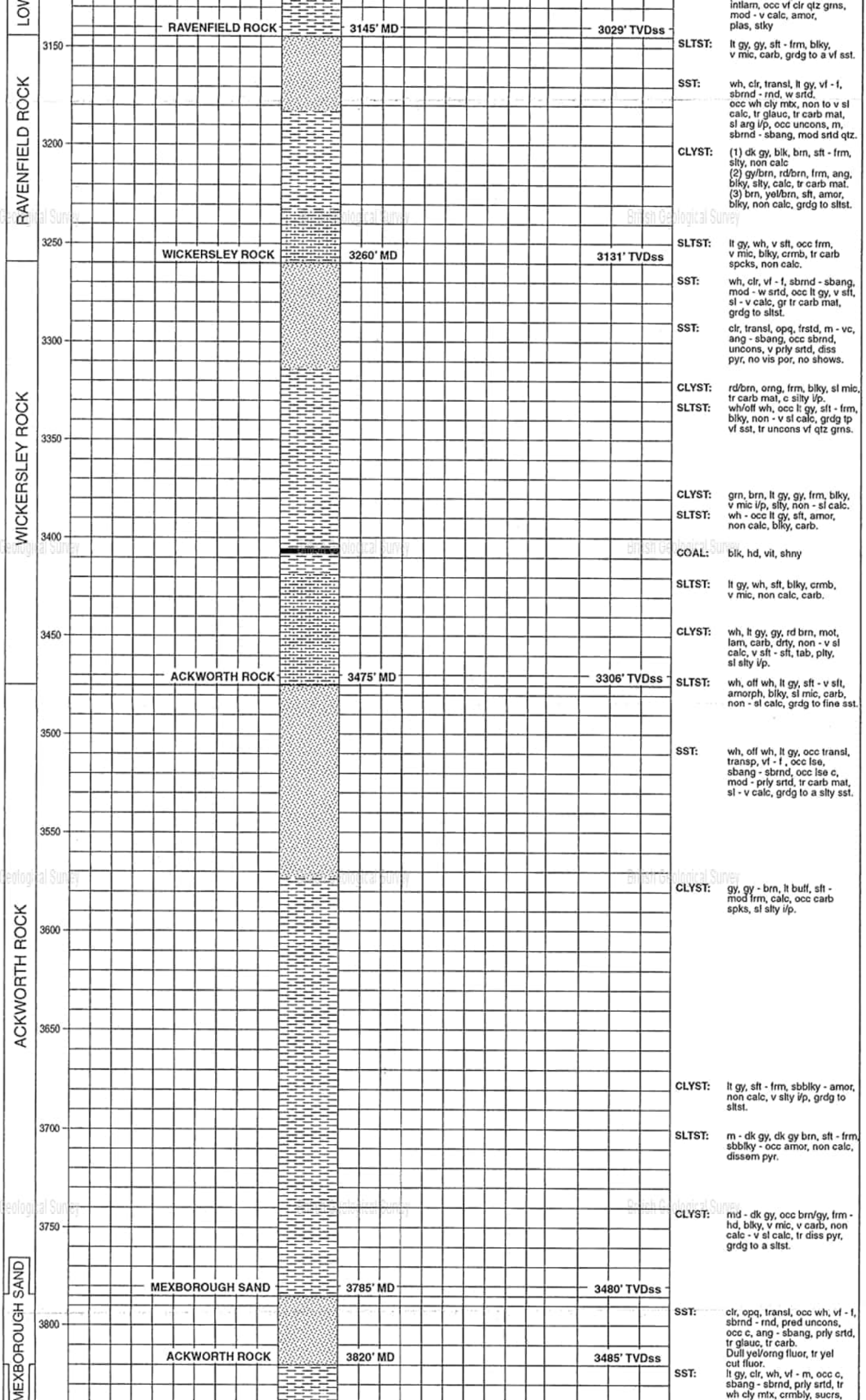
SK 98 NW/8 12.

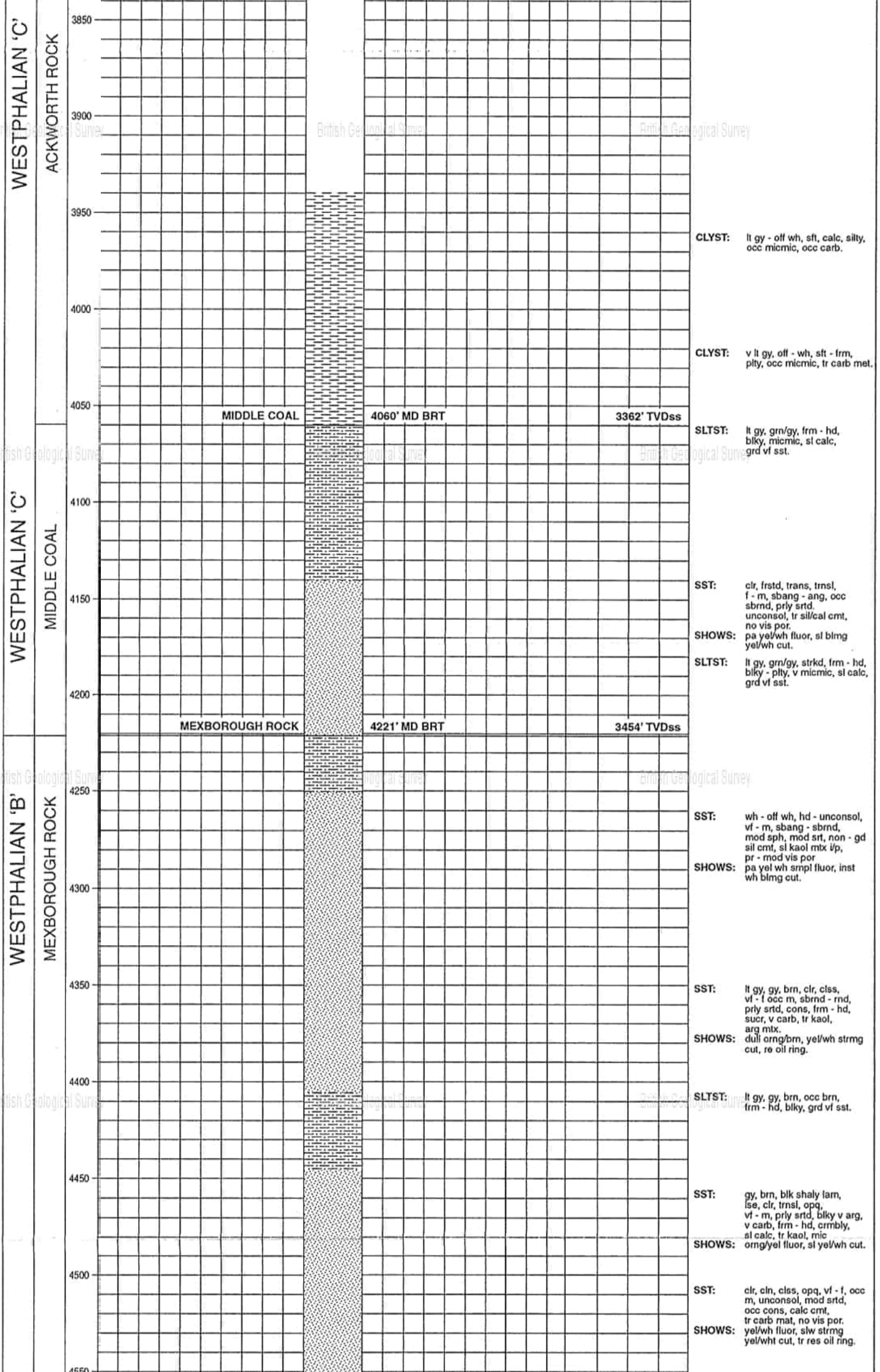
49

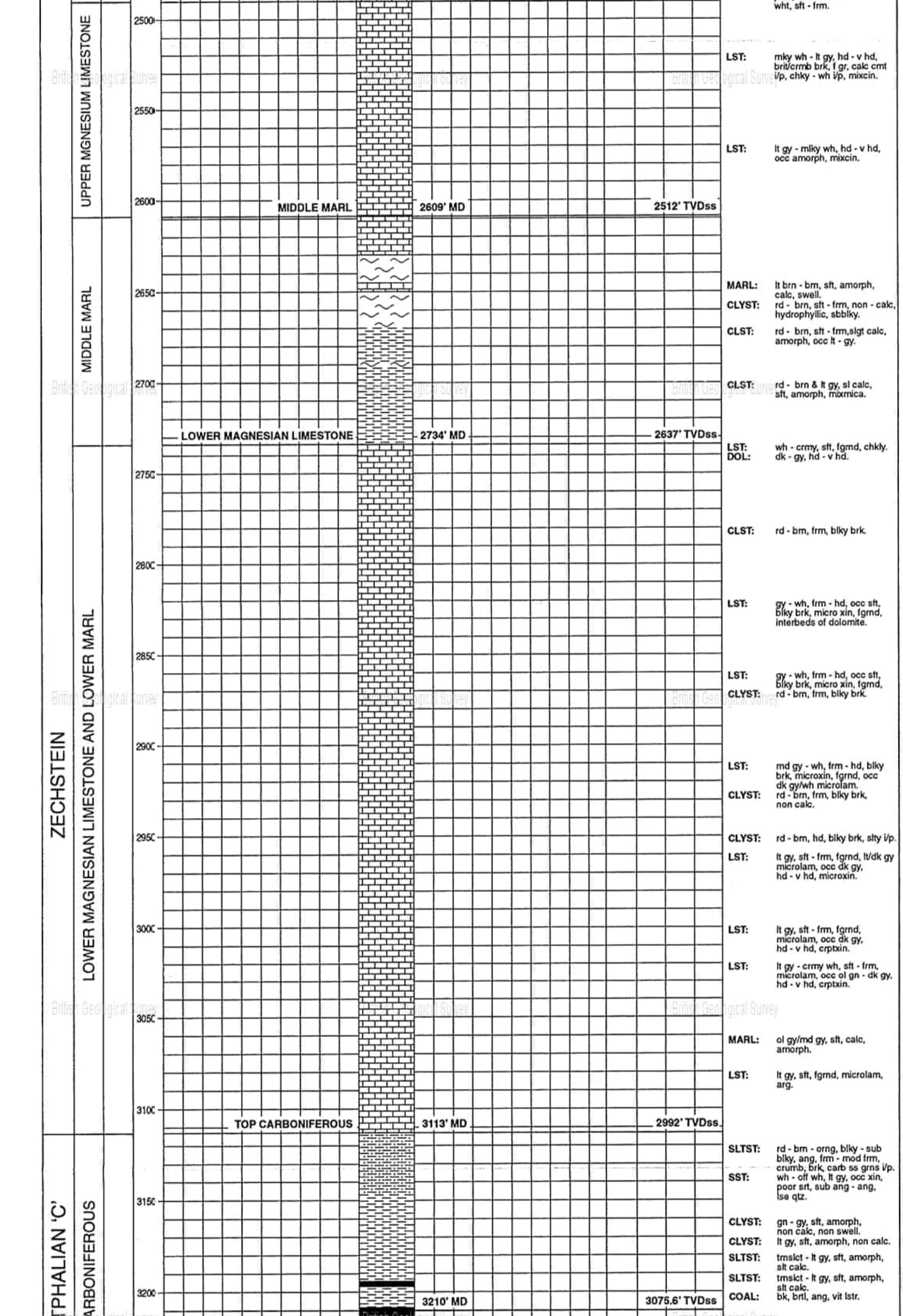
AREA : GLENTWORTH	SITE PLAN. WELL Nº8	B 26e	SITE AREA 1 Acre	OS SHEETS. LINCS XLIII. 16 & XLIV. 13




TRIASSIC
SCYTHIAN
SHERWOOD SANDSTONE GROUP
SHERWOOD SANDSTONE GROUP
BIT SIZE
500
550
600
650
MUDSTONE: light brown-red, occasionally light green, firm, blocky, angular, occasionally subfissile, non calcareous.
SANDSTONE: quartzoze, red-light brown-translucent, fine to medium, moderately sorted, moderately spherical, loose, occasional siliceous cement, trace of ferrous staining, occasionally argillaceous, no fluorescence.
GR
Tension
Δt


LOW
RAVENFIELD ROCK
WICKERSLEY ROCK
ACKWORTH ROCK
MEXBOROUGH SAND
RAVENFIELD ROCK
3145' MD
3029' TVDss
WICKERSLEY ROCK
3260' MD
3131' TVDss
ACKWORTH ROCK
3475' MD
3306' TVDss
MEXBOROUGH SAND
3785' MD
3480' TVDss
ACKWORTH ROCK
3820' MD
3485' TVDss
3150
3200
3250
3300
3350
3400
3450
3500
3550
3600
3650
3700
3750
3800
intlarn, occ vf clr qtz grns, mod - v calc, amor, plas, stky
SLTST: lt gy, gy, sft - frm, blky, v mic, carb, grdg to a vf sst.
SST: wh, clr, transl, lt gy, vf - f, sbrnd - rnd, w srtd, occ wh cly mtx, non to v sl calc, tr glauc, tr carb mat, sl arg i/p, occ uncons, m, sbrnd - sbang, mod srtd qtz.
CLYST: (1) dk gy, blk, brn, sft - frm, slty, non calc
(2) gy/brn, rd/brn, frm, ang, blky, slty, calc, tr carb mat.
(3) brn, yel/brn, sft, amor, blky, non calc, grdg to sltst.
SLTST: lt gy, wh, v sft, occ frm, v mic, blky, crmb, tr carb spcks, non calc.
SST: wh, clr, vf - f, sbrnd - sbang, mod - w srtd, occ lt gy, v sft, sl - v calc, gr tr carb mat, grdg to sltst.
SST: clr, transl, opq, frstd, m - vc, ang - sbang, occ sbrnd, uncons, v prly srtd, diss pyr, no vis por, no shows.
CLYST: rd/brn, orng, frm, blky, sl mic, tr carb mat, c silty i/p.
SLTST: wh/off wh, occ lt gy, sft - frm, blky, non - v sl calc, grdg tp vf sst, tr uncons vf qtz grns.
CLYST: grn, brn, lt gy, gy, frm, blky, v mic i/p, slty, non - sl calc.
SLTST: wh - occ lt gy, sft, amor, non calc, blky, carb.
COAL: blk, hd, vit, shny
SLTST: lt gy, wh, sft, blky, crmb, v mic, non calc, carb.
CLYST: wh, lt gy, gy, rd brn, mot, lam, carb, drty, non - v sl calc, v sft - sft, tab, plty, sl slty i/p.
SLTST: wh, off wh, lt gy, sft - v sft, amorph, blky, sl mic, carb, non - sl calc, grdg to fine sst.
SST: wh, off wh, lt gy, occ transl, transp, vf - f , occ lse, sbang - sbrnd, occ lse c, mod - prly srtd, tr carb mat, sl - v calc, grdg to a slty sst.
CLYST: gy, gy - brn, lt buff, sft - mod frm, calc, occ carb spks, sl slty i/p.
CLYST: lt gy, sft - frm, sbblky - amor, non calc, v slty i/p, grdg to sltst.
SLTST: m - dk gy, dk gy brn, sft - frm, sbblky - occ amor, non calc, dissem pyr.
CLYST: md - dk gy, occ brn/gy, frm - hd, blky, v mic, v carb, non calc - v sl calc, tr diss pyr, grdg to a sltst.
SST: clr, opq, transl, occ wh, vf - f, sbrnd - rnd, pred uncons, occ c, ang - sbang, prly srtd, tr glauc, tr carb. Dull yel/orng fluor, tr yel cut fluor.
SST: lt gy, clr, wh, vf - m, occ c, sbang - sbrnd, prly srtd, tr wh cly mtx, crmbly, sucrs,


WESTPHALIAN 'C'
ACKWORTH ROCK
WESTPHALIAN 'C'
MIDDLE COAL
WESTPHALIAN 'B'
MEXBOROUGH ROCK
3850
3900
3950
4000
4050
4100
4150
4200
4250
4300
4350
4400
4450
4500
4550
MIDDLE COAL
4060' MD BRT
3362' TVDss
MEXBOROUGH ROCK
4221' MD BRT
3454' TVDss
CLYST: lt gy - off wh, sft, calc, silty, occ micmic, occ carb.
CLYST: v lt gy, off - wh, sft - frm, plty, occ micmic, tr carb mat.
SLTST: lt gy, grn/gy, frm - hd, blky, micmic, sl calc, grd vf sst.
SST: clr, frstd, trans, trnsl, f - m, sbang - ang, occ sbrnd, prly srtd, unconsol, tr sil/cal cmt, no vis por.
SHOWS: pa yel/wh fluor, sl blmg yel/wh cut.
SLTST: lt gy, grn/gy, strkd, frm - hd, blky - plty, v micmic, sl calc, grd vf sst.
SST: wh - off wh, hd - unconsol, vf - m, sbang - sbrnd, mod sph, mod srt, non - gd sil cmt, sl kaol mtx i/p, pr - mod vis por
SHOWS: pa yel wh smpl fluor, inst wh blmg cut.
SST: lt gy, gy, brn, clr, clss, vf - f occ m, sbrnd - rnd, prly srtd, cons, frm - hd, sucr, v carb, tr kaol, arg mtx.
SHOWS: dull orng/brn, yel/wh strmg cut, re oil ring.
SLTST: lt gy, gy, brn, occ brn, frm - hd, blky, grd vf sst.
SST: gy, brn, blk shaly lam, lse, clr, trnsl, opq, vf - m, prly srtd, blky v arg, v carb, frm - hd, crmbly, sl calc, tr kaol, mic
SHOWS: orng/yel fluor, sl yel/wh cut.
SST: clr, cln, clss, opq, vf - f, occ m, unconsol, mod srtd, occ cons, calc cmt, tr carb mat, no vis por.
SHOWS: yel/wh fluor, slw strmg yel/wht cut, tr res oil ring.


ZECHSTEIN
UPPER MGNESIUM LIMESTONE
MIDDLE MARL
LOWER MAGNESIAN LIMESTONE AND LOWER MARL
ETPHALIAN 'C'
ARBONIFEROUS
2500
2550
2600
2650
2700
2750
2800
2850
2900
2950
3000
3050
3100
3150
3200
MIDDLE MARL
2609' MD
2512' TVDss
LOWER MAGNESIAN LIMESTONE
2734' MD
2637' TVDss
TOP CARBONIFEROUS
3113' MD
2992' TVDss
3210' MD
3075.6' TVDss
wht, sft - frm.
LST: mky wh - lt gy, hd - v hd, brit/crmb brk, f gr, calc cmt i/p, chky - wh i/p, mixcin.
LST: lt gy - mlky wh, hd - v hd, occ amorph, mixcin.
MARL: lt brn - brn, sft, amorph, calc, swell.
CLYST: rd - brn, sft - frm, non - calc, hydrophyllic, sbblky.
CLST: rd - brn, sft - frm,slgt calc, amorph, occ lt - gy.
CLST: rd - brn & lt gy, sl calc, sft, amorph, mixmica.
LST: wh - crmy, sft, fgrnd, chkly.
DOL: dk - gy, hd - v hd.
CLST: rd - brn, frm, blky brk.
LST: gy - wh, frm - hd, occ sft, blky brk, micro xln, fgrnd, interbeds of dolomite.
LST: gy - wh, frm - hd, occ sft, blky brk, micro xln, fgrnd,
CLYST: rd - brn, frm, blky brk.
LST: md gy - wh, frm - hd, blky brk, microxln, fgrnd, occ dk gy/wh microlam.
CLYST: rd - brn, frm, blky brk, non calc.
CLYST: rd - brn, hd, blky brk, slty i/p.
LST: lt gy, sft - frm, fgrnd, lt/dk gy microlam, occ dk gy, hd - v hd, microxln.
LST: lt gy, sft - frm, fgrnd, microlam, occ dk gy, hd - v hd, crptxln.
LST: lt gy - crmy wh, sft - frm, microlam, occ ol gn - dk gy, hd - v hd, crptxln.
MARL: ol gy/md gy, sft, calc, amorph.
LST: lt gy, sft, fgrnd, microlam, arg.
SLTST: rd - brn - orng, blky - sub blky, ang, frm - mod frm, crumb, brk, carb ss grns i/p.
SST: wh - off wh, lt gy, occ xln, poor srt, sub ang - ang, lse qtz.
CLYST: gn - gy, sft, amorph, non calc, non swell.
CLYST: lt gy, sft, amorph, non calc.
SLTST: trnsict - lt gy, sft, amorph, slt calc.
SLTST: trnsict - lt gy, sft, amorph, slt calc.
COAL: bk, brtl, ang, vit lstr.

Appendix D – Zetica UXO Map

UNEXPLODED BOMB RISK MAP

SITE LOCATION

Location: DN21 5UY,
Map Centre: 493610,389886

LEGEND

- **High:** Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.
- **Moderate:** Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.
- **Low:** Areas indicated as having 15 bombs per 1000acre or less.

miltary | **industry** | **UXO find**
transport | **dock** | **Luftwaffe targets**
utilities | **Bombing decoy** | **other**

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: **+44 (0) 1993 886682**

email: **uxo@zetica.com**

web: **www.zeticauxo.com**

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

Appendix E – Pre-Desk Study Assessment from Zetica

Pre-Desk Study Assessment

Site:	Tillbridge Solar Farm, Hemswell, Lincolnshire
Client:	AECOM
Contact:	Maria Vigano
Date:	4th August 2022
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	Harpswell Airfield opened in 1916, on land adjacent to the Site, as a Home Defence Landing Group (HDLG). By the end of WWI, the airfield expanded and became a night flying training ground for the Royal Air Force (RAF).
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure and public utilities. ■ Royal Flying Corps (RFC) Harpswell. ■ Military barracks, camps, and training areas.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	RAF Harpswell closed in 1919. The airfield was reopened in January 1937 as RAF Hemswell and was used as a bomber airfield.
WWII Military Activity on or Affecting the Site	No. 61 and No. 144 bomber squadrons were the first units stationed at the airfield flying Hadley Page Hampden medium bombers. No. 300 and No. 300 were the next units stationed at the airfield flying Vickers Wellington bomber aircraft from July 1941. Readily available records have been found indicating that 1No. British bomber aircraft crashed on the Site.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure and public utilities. ■ RAF Hemswell. ■ Military barracks, camps, and training areas. ■ Anti-Aircraft (AA) and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the Rural District (RD) of Gainsborough, which officially recorded 102No. High Explosive (HE) bombs with a bombing density of 1.3 bombs per 405 hectares (ha). No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	Post-WWII, RAF Hemswell continued to be a bomber airfield until the late 1950s. In 1958, RAF Hemswell gained the responsibility as one of the main headquarters in Britain for the Douglas Thor nuclear missile. RAF Hemswell closed in 1967 and was passed the Care and Maintenance. The Military Gliding School continued until 1974 when the RAF officially left the airfield.

Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.
Further information	For information about Zetica's detailed UXO desk studies and other UXO services, please visit our website: www.zeticauxo.com. Details and downloadable resources covering the most common sources of UXO hazard affecting sites in the UK can be found **here**. If you have any further queries, please don't hesitate to get in contact with us at uxo@zetica.com or 01993 886 682.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

Appendix F – Further PRoW Review

Harpswell – northeast of Principal Site boundary:

- PRoW Harps/92/1- a footpath which runs within the vicinity of the northern extent of the Principal Site, running in a north-south direction for approximately 370m to the west of Harpswell, south of the A631.

Heapham/ Sturgate – northwest of Principal Site boundary:

- PRoW Heap/1117/1 – a bridleway which runs within the vicinity of the north-western extent of the Principal Site, running in an east-west direction for approximately 165m to the south of Sturgate, south of Springthorpe village. It links within PRoW Heap/57/3 in the east.
- PRoW Heap/57/3 – a footpath which runs within the vicinity of the north-western extent of the Principal Site, running in a north-south direction for approximately 670m from Sturgate to Heapham and linking within PRoW Heap/1117/1 in the north.
- PRoW Heap/1170/1 – a bridleway which runs within the vicinity of the north-western extent of the Principal Site, running in an east-west direction for approximately 700m to the east of Sturgate, south of Springthorpe.
- PRoW Heap/57/1 – a footpath which runs within the vicinity of the north-western extent of the Principal Site, running in a north-south direction for approximately 300m through Heapham, south of Springthorpe and linking within PRoW Heap/56/2 and Heap/57/2 in the south.
- PRoW Heap/56/2 – a footpath which runs within the vicinity of the north-western extent of the Principal Site, running in an east-west direction for approximately 100m through Heapham and linking within PRoW Heap/55/1 and Heap/56/1 in the west and PRoW Heap/57/1 and Heap/57/2 in the east.
- PRoW Heap/56/1 - a footpath which runs within the vicinity of the north-western extent of the Principal Site, running in a north-south direction for approximately 75m through Heapham and linking within PRoW Heap/56/2 in the south.
- PRoW Heap/55/1 – a footpath which runs within the vicinity of the north-western extent of the Principal Site, running in a north-south direction for approximately 200m through Heapham and linking within PRoW Heap/56/2 in the north.
- PRoW Heap/54/1 - a footpath which runs within the vicinity of the northern extent of the Principal Site, running in a north-south direction for approximately 400m to the west of Heapham, south of the A631.

Glentworth/ Fillingham – east of Principal Site boundary:

- PRoW Gltw/90/1 – a footpath which runs within the vicinity of the eastern extent of the Principal Site, running in a north-south direction for approximately 80m On Northlands Road, north of Glentworth. It links within PRoW Gltw/90/2 and Gltw/90/3 in the south.
- PRoW Gltw/90/2 – a footpath which runs within the vicinity of the eastern extent of the Principal Site, running in a north-south direction for approximately 240m from Northlands Road into Glentworth village. It links within PRoW Gltw/90/1 in the north.

- PRoW Gltw/90/3 – a footpath which runs within the vicinity of the eastern extent of the Principal Site, running in an east-west direction for approximately 300m from Northlands Road into Glentworth village.
- PRoW Fill/85/1 - a bridleway which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 900m. It links within PRoW Gltw/85/1 in the north and PRoW Fill/85/2 and Fill/767/1 in the south.
- PRoW Fill/85/2 - a bridleway which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 750m to join Willingham Road, just west of Glebe Farm. It links within PRoW Fill/85/1 and Fill/767/1 in the north.
- PRoW Fill/767/1 - a bridleway which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 600m to join Willingham Road, just south of North farm. It links within PRoW Fill/85/1 and Fill/85/2 in the east.

Ingham – south of Principal Site boundary:

- PRoW Fill/86/1 – a bridleway which runs within the vicinity of the southern extents of the Principal Site, running in a north-south direction for approximately 700m to the south of Glebe Farm before linking within PRoW Ingh/24/1 in the south.
- PRoW Ingh 24/1 – a bridleway which runs within the vicinity of the southern extents of the Principal Site, running in an east-west direction for approximately 850m linking within PRoW Fill/86/1 in the west and PRoW Ingh/24/2 in the east.
- PRoW Ingh/24/2 – a bridleway which runs within the vicinity of the southern extents of the Principal Site, running in a north-south direction for approximately 600m into Ingham and linking within PRoW Ingh 24/1 in the north.
- PRoW Fill/87/1 – a footpath which runs within the vicinity of the southern extents of the Principal Site, running in a north-south direction for approximately 570m to the south of Willingham Road before linking within PRoW Ingh/18/1 in the south.
- PRoW Ingh/18/1 - a footpath which runs within the vicinity of the southern extents of the Principal Site, running in a north-south direction for approximately 500m to the south of Willingham Road. It links within PRoW Fill/87/1 in the north and PRoW Ingh/17/2, Ingh/18/2 and Ingh/17/1 in the south.
- PRoW Ingh/18/2 - a footpath which runs within the vicinity of the southern extents of the Principal Site, running in a north-south direction for approximately 470m into Ingham, west of the B1398 (Middle Street). It links within PRoW Ingh/18/1, Ingh/17/2 and Ingh/17/1 in the north.
- PRoW Ingh/17/1 – a footpath which runs within the vicinity of the southern extents of the Principal Site, running in an east-west direction for approximately 700m to the east of Short Lane. It links within PRoW Ingh/17/2, Ingh/18/1 and Ingh/18/2 in the east.
- PRoW Stow/83/1 – a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 2.4km from Squire's Bridge on Ingham Road through Coates and linking within PRoW Ingh/26/3 in the east.

- PRoW Ingh/26/3 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 550m and linking within PRoW Ingh/26/2 and Ingh/238/1 in the south.
- PRoW Ingh/26/2 – a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 680m on Long Lane to the west of Ingham and linking within PRoW Ingh/26/1 and Ingh/25/1 in the east, and PRoW Ingh/238/1 and Ingh26/2 in the west.
- PRoW Ingh/26/1 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 430m on Long Lane into Ingham and linking within PRoW Ingh/26/2 and Ingh/25/1 in the west.
- PRoW Ingh/238/1 – a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 380m adjacent to Low Farm to the west of Ingham. It links within PRoW Ingh/26/3 and Ingh/26/2 in the north, and PRoW Ingh/27/5 and Ingh/27/4 in the south.
- PRoW Ingh/25/1 – a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 450m to the west of Ingham and linking within PRoW Ingh/26/2 and Ingh/26/1 in the north and PRoW Ingh/27/3 and Ingh/27/4 in the south.
- PRoW Ingh/27/5 – a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 400m from Stow Lane, just north of Blackthorn Hill and then in an east-west direction for approximately 200m before linking within PRoW Ingh/238/1 and Ingh/27/4 in the east.
- PRoW Ingh/27/4 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 600m to the west of Ingham and linking within PRoW Ingh/238/1 and Ingh/27/5 in the west, and PRoW Ingh/27/3 and Ingh/25/1 in the east.
- PRoW Ingh/27/3 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 700m to the west of Ingham and linking within PRoW Ingh/25/1 and Ingh/27/4 in the west, and PRoW Ingh/27/1 and Ingh/27/2 in the east.
- PRoW Ingh/27/1 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 350m into Ingham and linking within PRoW Ingh/27/3 and Ingh/27/2 in the south.
- PRoW Ingh/27/2 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 300m from Stow Lane to the west of Ingham and linking within PRoW Ingh/27/1 in the north.
- PRoW Ingh/20/3 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 600m just south of Lincolnshire Rescue Kennels to the east of Ingham and linking within PRoW Ingh/20/4 and Ingh/20/2 in the south.
- PRoW Ingh/20/4 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 200m to the east of Ingham and linking within PRoW Ingh/20/3 and Ingh/20/2 in the north.

- PRoW Ingh/20/2 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 250m to the east of Ingham and linking within PRoW Ingh/20/3 and Ingh/20/4 in the north and PRoW Ingh/20/1 in the south.
- PRoW Ingh/20/1 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 100m in Ingham and linking within PRoW Ingh/20/2 in the east.
- PRoW Ingh/22/1 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 100m adjacent to Grange Close in Ingham village.
- PRoW Ingh/235/1 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 50m across Ingham Village Green.
- PRoW Ingh/21/1 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 600m from Ingham All Saints Church and linking within PRoW Ingh/21/2 and Ingh/21/3 in the south.
- PRoW Ingh/21/2 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in an east-west direction for approximately 650m from the B1398 (Middle Street) to the east of Ingham and linking within PRoW Ingh/21/1 and Ingh/21/3 in the west.
- PRoW Ingh/21/3 - a footpath which runs within the vicinity of the southern extent of the Principal Site, running in a north-south direction for approximately 200m from Stow Lane to the east of Ingham and linking within PRoW Ingh/21/1 and Ingh/21/2 in the north.

Kexby – west of Cable Route Corridor boundary:

- PRoW Kexb/59/3 - a footpath which runs within the vicinity of the north-western extent of the Cable Route Corridor, running in a north-south direction for approximately 200m through Kexby and linking within PRoW Kexb/59/2 in the north and PRoW Kexb/60/1 and Kexb/59/4 in the south.
- PRoW Kexb/59/2 - a footpath which runs within the vicinity of the north-western extent of the Cable Route Corridor, running in an east-west direction for approximately 280m across Kexby Village.
- PRoW Kexb/58/1 - a footpath which runs within the vicinity of the north-western extent of the Cable Route Corridor, running in an east-west direction for approximately 650m from Kexby Lane Farm to Willingham Road.
- PRoW Kex/60/1 - a footpath which runs within the vicinity of the north-western extent of the Cable Route Corridor, running in a north-south direction for approximately 300m to the south of Kexby and linking within PRoW Kexb/59/3 in the north and PRoW Kexb/59/4 in the south.
- PRoW Kexb/59/4 - a footpath which runs within the vicinity of the north-western extent of the Cable Route Corridor, running in a north-south direction for approximately 500m to the east of Willingham Road and linking within PRoW Wlgm/59/1 in the south.

Willingham by Stow – west of Cable Route Corridor boundary:

- PRoW Wlgm/59/1 – a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 380m to the east of Gainsborough Road and linking within PRoW Wlgm/59/5 in the south.
- PRoW Wlgm/59/5 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 200m into Willingham by Stow and linking within PRoW Wlgm/59/1 and Wlgm/59/2 in the north and PRoW Wlgm/881/1 in the south.
- PRoW Wlgm/59/2 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 100m to the north of Willingham by Stow and linking within PRoW Wlgm/59/5 in the east and PRoW Wlgm/61/1 and Wlgm/59/3 in the west.
- PRoW Wlgm/61/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 150m to the north of Willingham by Stow and linking within PRoW Wlgm/59/2 and Wlgm/59/3 in the east and PRoW Wlgm/62/1 in the west.
- PRoW Wlgm/59/3 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 200m just east of St Helens Church bus stop and linking within PRoW Wlgm/61/1 and Wlgm/59/2 in the north and PRoW Wlgm/62/1 in the south.
- PRoW Wlgm/62/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 180m from Gainsborough Road into Willingham by Stow and linking within PRoW Wlgm/61/1 in the north and PRoW Wlgm/59/3 in the south.
- PRoW Wlgm/881/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 100m and a north-south direction for approximately 50m to the east of Bethel Chapel House in Willingham by Stow. It links within PRoW Wlgm/59/5 in the west.
- PRoW Wlgm/515/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 200m between School Lane and Grange Lane in Willingham by Stow.
- PRoW Wlgm/538/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 350m alongside Grange Farm to the east of Willingham by Stow.
- PRoW Wlgm/63/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 70m between Grange Lane and the B1241 in Willingham by Stow.
- PRoW Wlgm/64/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 300m between the B1241 and Marton Road and linking within PRoW Wlgm/976/1 and Wlgm/976/2 in the south.
- PRoW Wlgm/976/2 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 30m to the east of Marton Road and linking within PRoW Wlgm/64/1 and Wlgm/976/1 in the east.

- PRoW Wlgm/976/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 200m to the southwest of Willingham by Stow and linking within PRoW Wlgm/64/1 and Wlgm/976/2 in the west.

Marton/ Trent Port – west of Cable Route Corridor boundary:

- PRoW Mton/66/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 1.75km south of Littleborough Lane along the River Trent and linking within PRoW Mton/66/2 and Mton/823/1 in the south.
- PRoW Mton/67/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 600m between Littleborough Road and the River Trent and linking within PRoW Mton/66/2 and Mton/66/3 in the south.
- PRoW Mton/66/2 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 30m along the River Trent and linking within PRoW Mton/66/1 in the west and PRoW Mton/67/1 and Mton/66/3 in the east.
- PRoW Mton/66/3 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 300m along the River Trent to Trent Port and linking within PRoW Mton/67/1 and Mton/66/2 in the north and PRoW Mton/824/1 in the south.
- PRoW Mton/823/1 - a footpath which runs within the vicinity of the western extent of the Cable Route Corridor, running in a north-south direction for approximately 300m along the River Trent to Trent Port and linking within PRoW Mton/66/1 in the north and PRoW Mton/824/1 in the south.
- PRoW Mton/824/1 – an open byway which runs within the vicinity of the western extent of the Cable Route Corridor, running in an east-west direction for approximately 100m to the west of Trent Port and linking within PRoW Mton/823/1, Mton/66/3 and Mton/66/4 in the east.

Stow – south of Cable Route Corridor boundary:

- PRoW Stow/845/1 - a footpath which runs within the vicinity of the southern extent of the Cable Route Corridor, running in an east-west direction for approximately 70m, just east of St Mary's Church in Stow.
- PRoW Stow/71/1 - a footpath which runs within the vicinity of the southern extent of the Cable Route Corridor, running in a north-south direction for approximately 150m to the west of Stow and linking within PRoW Stow/71/2 and Stow/71/3 in the south.
- PRoW Stow/71/2 - a footpath which runs within the vicinity of the southern extent of the Cable Route Corridor, running in an east-west direction for approximately 550m to the west of Stow and linking within PRoW Stow/71/1 and Stow/71/3 in the east.
- PRoW Stow/71/3 - a footpath which runs within the vicinity of the southern extent of the Cable Route Corridor, running in a north-south direction for approximately 500m to the west of Sturton Road and linking within PRoW Stow/71/1 and Stow/71/2 in the north and PRoW Stur/71/4 in the south.
- PRoW Stow/72/1 - a footpath which runs within the vicinity of the southern extent of the Cable Route Corridor, running in a north-south direction for approximately

700m between Stow and Sturton by Stow and linking within PRoW Stur/72/3 in the south.

Appendix G – Major Accidents and Disasters Matrix

	Major accident or disaster	Relevant for long list?	Why? (Note if risk to the project, or project exacerbates risk.)	Potential receptors	Covered already in proposed ES? If so, where?
1. Geological disasters					
1.1	Landslides	No	The risk of landslides will be considered as part of the geotechnical design, ensuring that the risk is designed out, both in terms of the vulnerability of the Scheme to these types of event; however given the flat nature of the land this risk is considered minimal. The Scheme is not anticipated to increase the risk of landslip happening onsite or elsewhere; it will not significantly change the erosion potential of the soil or stability of the land.	N/A	N/A
1.2	Earthquakes	No	The Scheme is not located in a geologically active area and as such earthquakes are not considered to be a real risk or serious possibility.	N/A	N/A
1.3	Sinkholes	No	The risk of sinkholes will be considered as part of the geotechnical design, ensuring that the risk is designed out, both in terms of the vulnerability of the Scheme to these types of event, and also in terms of the potential for the Scheme to increase the risk of such an event happening.	N/A	N/A
2. Hydrological disasters					
2.1	Floods	Yes	Both the vulnerability of the Scheme to flooding, and its potential to exacerbate flooding, will be covered in the Flood Risk Assessment, and also reported in the ES (both in terms of the risk to the Scheme and increased risk caused by the Scheme).	Property and people in areas of increased flood risk.	Chapter 10: Flood Risk, Drainage and Surface Water (including Flood Risk Assessment). Mitigation will be considered and, where necessary, incorporated into the Scheme design.
2.2	Limnic eruptions	No	Not applicable as there are no lakes nearby.	N/A	N/A
2.3	Tsunami/Storm surge	No	Not applicable as the Scheme is not in a coastal location.	N/A	N/A

Major accident or disaster		Relevant for long list?	Why? (Note if risk to the project, or project exacerbates risk.)	Potential receptors	Covered already in proposed ES? If so, where?
3. Meteorological disasters					
3.1	Blizzards	No	The Scheme is considered to be no more vulnerable than any other development.	N/A	N/A
3.2	Cyclonic storms	No	Although there are storms in the UK, their destructive force tends to be much less than in other parts of the world and the Scheme is not particularly vulnerable to any potential effects.	N/A	N/A
3.3	Droughts	No	Droughts are only considered as a disaster due to water shortages for essential services and where there are indirect impacts on food production, loss of soils etc. The Scheme is not considered to be vulnerable to drought.	N/A	N/A
3.4	Thunderstorms	No	As the Scheme includes metal components, there is a risk of lightning strikes. However, these risks will be removed or reduced through inbuilt control systems and can be scoped out at this stage.	N/A	N/A
3.5	Hailstorms	No	The Scheme is considered to be no more vulnerable than any other development.	N/A	N/A
3.6	Heat waves	No	While impacts are expected as a result of projected temperature increases (due to climate change), these temperature increases are not expected to have a significant impact on the Scheme. It is anticipated that the cooling systems for the battery energy storage systems, will regulate temperatures to within safe conditions.	N/A	No
3.7	Tornadoes	No	Although there are tornadoes in the UK, their destructive force tends to be much less than in other parts of the world and the Scheme is not particularly vulnerable to any potential effects.	N/A	No
3.8	Fires	Yes	There may be some potential for fire as a result of the battery storage element of the Scheme. However, the battery energy storage system	Local residents, habitats	Chapter 3: Scheme Description

	Major accident or disaster	Relevant for long list?	Why? (Note if risk to the project, or project exacerbates risk.)	Potential receptors	Covered already in proposed ES? If so, where?
			will include cooling systems, which are designed to regulate temperatures to within safe conditions to minimise the risk of fire. In addition, the Scheme design will include adequate separation between battery banks to ensure that an isolated fire would not become widespread and lead to a major incident. Fire detection and suppression features could be installed to detect (e.g. multispectrum infrared flame detectors) and suppress fire (e.g. water base suppression systems) to minimise the effect of any fire.	and species.	
3.9	Air Quality Events	No	The Scheme is not located within any Air Quality Management Areas (AQMA). Although there are likely to be emissions during construction and decommissioning of the Scheme, it is considered that these can be managed through the implementation of a Construction Environmental Management Plan. Good practice measures will be set out in a Framework Construction Environmental Management Plan to be appended to the ES.	N/A	N/A
4. Transport					
4.1	Road Accidents	Yes	The risk posed by spillage from hazardous loads as a result of a road traffic accident during construction or decommissioning will be considered in the Flood Risk, Drainage and Water Resources chapter of the ES. The potential for glint and glare to affect road users will be considered within a technical appendix to the ES if any risks are identified.	Aquatic environment Road users	Chapter 10: Flood Risk, Drainage and Surface Water Glint and Glare Study Mitigation will be considered and, where necessary, incorporated into the Scheme design.
4.2	Rail Accidents	Yes	The cable route corridor for Cable Route Corridor crosses the railway line connecting Gainsborough to Saxilby and Lincoln. The crossing will be designed to meet the specific requirements of Network	Rail users	No

	Major accident or disaster	Relevant for long list?	Why? (Note if risk to the project, or project exacerbates risk.)	Potential receptors	Covered already in proposed ES? If so, where?
			Rail and therefore the risk of a rail accident as a result of the crossing will be minimised. An Approval in Principle Report for the preferred crossing option will be completed in accordance with Network Rail's current guidelines 'NR/L2/CIV/003 Level 2 Engineering Assurance of Building and Civil Engineering Works'.		
4.3	Aircraft Disasters	Yes	The potential for glint and glare to affect aircraft will be considered within a technical appendix to the ES if any risks are identified.	Pilots and aircraft	Glint and Glare Study Mitigation will be considered and, where necessary, incorporated into the Scheme design.
5. Engineering Accidents/Failures					
5.1	Bridge Failure	No	Not applicable as no bridges used or constructed as part of Scheme.	N/A	N/A
5.2	Tunnel Failure or Fire	No	None nearby	N/A	N/A
5.3	Dam Failure	No	The Scheme is not located within or near any registered reservoirs (assumed with volumes >10,000m^3). The Site is therefore at low risk of flooding from reservoirs.	N/A	N/A
5.4	Flood Defence Failure	Yes	This will be covered in the Flood Risk Assessment and will also be reported in ES, both in terms of the risk to the Scheme and increased risk caused by the Scheme.	Property and people in areas of increased flood risk.	Chapter 10: Flood Risk, Drainage and Surface Water (including Flood Risk Assessment). Mitigation will be considered and, where necessary, incorporated into the Scheme design.
5.5	Mast and Tower Collapse	No	Not applicable as there are no masts or towers nearby.	N/A	N/A

Major accident or disaster	Relevant for long list?	Why? (Note if risk to the project, or project exacerbates risk.)	Potential receptors	Covered already in proposed ES? If so, where?
5.6 Building failure or fire	No	No buildings close enough to the Scheme for it to be affected by building failure or fire.	N/A	N/A
5.7 Utilities failure (gas, electricity, water, sewage, oil, communications)	Yes	The Scheme has the potential to affect existing utility infrastructure below ground. To identify any existing infrastructure constraints, both consultation and a desk based study will be undertaken.	Employees and local residents	No, however, consultation with relevant utilities providers is a routine part of solar development and consultees will include water, gas and electricity utilities providers and telecommunications providers as appropriate. Information obtained from consultation will be used to inform the layout design.
6. Industrial Accidents				
6.1 Defence industry	No	Not applicable as there is no defence manufacturing nearby.	N/A	N/A
6.2 Energy Industry (fossil fuel)	No	The Scheme will connect into the national grid at Cottom Power Station, which is a decommissioned coal-fired power station. The risk of an industrial accident from this plant affecting the Scheme is minimal due to its decommissioned status.	N/A	N/A
6.3 Nuclear Power	No	Not applicable as there are no nuclear power stations nearby.	N/A	N/A
6.4 Oil and gas refinery/storage	No	Not applicable as there is no relevant industry nearby.	N/A	N/A
6.5 Food Industry	No	Not applicable as there is no relevant industry nearby.	N/A	N/A
6.6 Chemical Industry	No	Not applicable as there no relevant industry nearby.	N/A	N/A
6.7 Manufacturing Industry	No	Not applicable as there no relevant industry nearby.	N/A	N/A

Major accident or disaster		Relevant for long list?	Why? (Note if risk to the project, or project exacerbates risk.)	Potential receptors	Covered already in proposed ES? If so, where?
6.8	Mining / Extractive Industry	No	There is the potential for current or past quarrying activity in the vicinity to lead to unstable ground conditions, particularly on the Sunnica East Site due to the active quarry on-site. However, the risk will be considered as part of the geotechnical design, ensuring that the risk is designed out.	N/A	N/A
7.	Terrorism/Crime/Civil unrest	No	The Scheme is unlikely to be more of a target for these types of incident due to its rural location and low number of exposed targets.	N/A	N/A
8.	War	No	The Scheme is no more vulnerable than any other infrastructure.	N/A	N/A
9.	**Disease**				
9.1	Human disease	No	The Scheme is no more vulnerable than any other infrastructure.	N/A	N/A
9.2	Animal disease	No	The Scheme is no more vulnerable than any other infrastructure.	N/A	N/A
9.3	Plant disease	Yes	New planting may be susceptible to biosecurity issues, such as the increased prevalence of pests and diseases, due to climate change.	Habitats and species	Chapter 12: Landscape and Visual Amenity (including Biodiversity and Landscape Management Plan) The planting design will take account of biosecurity risks through a wider mix of species including some non-natives.

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